

Deposit Dollarization

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Introduction

Deposit Dollarization (“DD”) means that banks in a given country accept deposits denominated in a currency (“dollars”) other than their own local currency (“pesos”). This practice is very widespread and growing larger. It is easily measured by dividing the volume of foreign currency deposits in a banking system by the total deposits of the system. Barajas and Morales (2003) report that the level of DD ranges between 5% in Mexico and 93% in Bolivia. De Nicoló, Honohan and Ize (2003) estimate that this measure is increasing on average by about 1% per year, though it varies greatly among countries. Honohan and Shi (2003) estimate the rate of increase as 1.7% per year. It is most widespread in Latin America and Central and Eastern Europe, less widespread but still a factor in most other developing areas.

At a broad level, DD is a consequence of globalization. When countries open their borders to the flow of financial capital, a number of consequences follow. Economic growth tends to be accelerated, liquidity tends to increase, financial development accelerates, but instabilities increase as well. In particular, depositors often prefer to move at least part of their wealth into a currency stronger than their own. The offering of dollar deposits by international banks forces local banks to offer them as well. If citizens are able to take their deposits abroad, local banks need to offer similar instruments to keep the deposits at home. Local banks may need to serve clients in other countries, and they may need a level of funding not available in the local market.

The evolving academic literature on DD focuses on what causes it, and why the level is so different among countries, what are its consequences for monetary policy, what benefits it brings and what risks it poses. This paper is concerned primarily with the extent to which DD increases the risk or cost of a financial crisis.

DD’s has significant effects, both good and ill. The good consequences are clear and the bad ones noteworthy but a source of major alarm only if they occur in combination with other risk factors. The effects may be grouped as follows: DD has *liquidity* effects, including that it facilitates *capital flight*, and it also increases *bank risk*. DD keeps banks more liquid than they would otherwise be, and so facilitates a higher level of financial development than would be possible if depositors were forced to keep all deposits in pesos. By facilitating high levels of lending even when peso fundamentals deteriorate, DD maintains capital flows where they might otherwise dry up.

The flip side of this benefit is that withdrawals of DD at a time of crisis may contribute to a liquidity contraction and to capital flight. As we shall see in more detail below, liquidity contraction is generally not a problem because the government (unless constrained by a currency board) can offset the flight of dollars by increased peso liquidity. Capital flight is definitely an issue, since local depositors can move their money out of the country by simply writing a check and depositing it outside the country – no government-approved currency sale is required. This benefits the depositors but complicates life for the government.

But the main problem with DD is its tendency to increase bank risk. Dollar deposits pay a relatively low rate of interest, while peso assets usually earn high rates of interest. Banks with DD are tempted to earn this spread and run the related devaluation risk – this is known by banks as a “short dollar position”. But even if banks attempt to hedge themselves against devaluation risk by holding dollar loans or bonds, they have simply laid off the devaluation risk to their borrowers. In this sense the risk is not hedged but simply transformed into default risk.

DD and bank risk

I shall draw a distinction between two types of deposit dollarization: External Deposit Dollarization (“EDD”) means foreign entities holding dollar deposits in the local banks. This is often initiated by the local banks when their motive is to increase aggregate funding or lower the cost of their funding. EDD may be thought of as DD plus capital inflow. When a bank seeks external funding it will normally be in dollars or other industrial-country currency because external investors typically are not willing to hold peso assets, a condition sometimes described as “original sin”.

In contrast, Internal Deposit Dollarization (“IDD”) means indigenous agents holding dollar deposits in the local banks. This arises most often from the desires of local customers to protect their savings from the inflation and devaluation risk inherent in local pesos. With IDD the balance between dollar deposits and peso deposits is in significant part a function of interest rates. Because pesos seem to be an “inferior good,” peso deposits carry higher interest rates. A local depositor needs to decide whether the interest rate differential is sufficient to compensate for the higher inflation and devaluation risk of pesos. Changing levels of anxiety and interest rates determine the equilibrium between the two currencies.

External Deposit Dollarization

Local banks in developing countries frequently seek funding from outside sources, most often from international banks in industrialized countries. Such funding is typically available only in “dollars” because international banks are typically unwilling to hold assets in “pesos.” The motivation of the local bank may be (1) to increase funding and liquidity generally, (2) to obtain low interest rates, or (3) to match-fund dollar-linked loans or other assets that the local bank holds. Whatever the motive, the result is EDD.

The motivation of the international banks is to obtain a premium interest rate while taking only a short-term risk. International banks often prefer deposits in developing country banks over loans to developing country firms because (1) bank deposits carry an implicit government guarantee whereas loans do not, (2) deposits are short-term whereas loans tend to longer terms, and (3) the Basel rules on required capital favor bank deposits for eight countries.

Point (3) bears particular emphasis. The BIS capital rules (Basel I) require international banks in general to hold 8% capital against risky assets including most private sector loans. However, if the asset is a bank deposit in an OECD country, this drops to 1.6%, and if such a deposit is under one year term it drops to zero. OECD membership includes eight countries that are less than fully industrialized: Greece and Turkey since 1961, and since 1994-96 Czech Republic, Slovak Republic, Hungary, Poland, Korea and Mexico.

In the buildup to the 1997-98 financial crisis in East Asia, Korean banks took on large amounts of 364-day dollar deposits specifically to exploit these rules. But EDD is not a stable source of funding, and these deposits could not be rolled over between the autumn of 1997 and the autumn of 1998. The resulting liquidity squeeze was a central factor in Korea’s financial crisis of that period.

International banks have been the least reliable of all capital sources in recent years. While FDI continued to flow freely in 1997-2003, and while net securities flows diminished but remained generally positive, net bank flows reversed sharply as international banks demanded repayment and the IMF accommodated those demands to avoid defaults by its East Asian clients.

Thus EDD must be considered an unstable source of funding. While it does not by itself cause any financial crises, its presence will tend to accelerate any financial crisis that comes along for other reasons, as in Korea.

Internal Deposit Dollarization

New internal dollars are created when an internal agent holding pesos decides to make a dollar-denominated deposit in a local bank. The local bank accepts the pesos and gives the depositor a *claim* for an equivalent amount of dollars. This creates two currency imbalances: the depositor now holds a dollar asset, and the bank owes a dollar liability. The country's balance sheet is not altered but two balance sheets within the country are altered in opposite directions: the depositor acts conservatively: he accepts a low interest rate but will benefit by increased purchasing power if the peso devalues. The bank is non-conservative: it gets cheap funding but is at risk if the peso devalues.

The bank does not need to hold many "real" dollars, e.g. liquid claims on international banks, to conduct this business – just enough for liquidity, to be able to honor a certain flow of withdrawals. If withdrawals exceed this level, the bank must appeal to the central bank to convert pesos into dollars, and the central bank might or might not have the reserves to do this. However, the bank usually does try to hedge its devaluation risk by making local dollar-based loans or buying dollar-linked bonds in amounts at least approximately equal to the dollar deposits.

Otherwise put, IDD means that a bank has increased a customer's safety from devaluation risk by taking the risk on its own books, where it either rests or gets passed on to the bank's borrowers. The risk, once created, can be passed around but cannot be made to go away.

Hedging

Hedging with dollar-based loans. Making a dollar-based loan to a local party appears to hedge the bank's risk but in reality transmits the devaluation risk to the borrower: now the borrower's debts will rise relative to its assets if the peso devalues. Unless the borrower is a significant exporter, i.e. earns dollars for repayment, the borrower is at increased risk of default if the peso devalues, so that the bank has to some degree has just translated its devaluation risk into increased default risk. Such a hedge is clearly imperfect. Galindo and Leiderman (2003) cite a number of studies suggesting in the aggregate that the firms borrowing the dollars cannot hedge themselves fully against devaluation risk.

Hedging with dollar-linked bonds. Where local investors are reluctant to hold peso deposits, they are probably also leery of buying their government's peso-denominated bonds. The government may therefore offer dollar-denominated or dollar-linked bonds to finance its budget deficits. The largest single market for such bonds is the banking system. Thus the same credibility problem that caused the banks to offer dollar deposits also creates an asset class with which they often try to hedge the devaluation exposure created by the dollar deposits.

But as with dollar-based loans, this does not really shed the risk exposure but rather translates it into increased sovereign default risk. Unless the government has substantial dollar reserve holdings, it may not be able to honor all of its internal dollar-linked debt at a time of crisis, and stiffing the banks may be easier than defaulting to other internal parties or to external lenders.

In both cases, then, the banking risk created by DD cannot be fully hedged. The depositor gains a measure of protection against devaluation, and the bank and its borrowers take on increased risk in all cases. Thus DD always increases banking system risk.

Tables 1 and 2 of Barajas and Morales (2003) confirm that banks generally balance dollar liabilities with dollar-linked assets in the Latin American countries that are the subject of that paper. But the balance is not exactly one-for-one, and there are interesting country patterns. In several strong countries like Mexico and Chile, banks have more dollar loans than dollar deposits, perhaps recognizing the need to over-hedge since the hedge is bound to be imperfect. Such banks might even benefit from a devaluation of their currencies since they have over-compensated DD. But several weak countries like Costa Rica and Paraguay show the reverse pattern: more dollar funding than dollar assets. This pattern is worrying because the “short dollar” position boosts current profits (because of the spread between dollar deposit rates and peso lending rates) but exposes the banks to unhedged risk of peso devaluation.

Capital flight

The DD bank is at risk in a further way. If a devaluation crisis should begin, capital will tend to flee as rapidly as possible. In a pure-peso economy, those wishing to cash out their pesos need to go to the central bank for permission to do so, and that permission may be withheld in event of crisis. But holders of dollar deposits typically require no further permission to take their capital out of the country: they have only to write a dollar check and send it to a New York bank.

The sudden reduction of local bank deposits is likely to provoke a systemic liquidity problem, in which banks either find new deposits or begin to call in loans. The latter would be seriously contractionary, so government will probably accommodate the banks by pumping in peso liquidity. But this “confirms” the financial crisis by adding to inflationary pressure, driving up interest rates and shortening financing terms. Thus by facilitating capital flight, DD may act as an accelerator of a financial crisis. Such consequences were very prominent in 1997-98, when EDD could not be rolled over.

The accelerator interpretation of dollarization risk is supported by Arteta (2003). This empirical study finds that DD has little power to predict a banking or currency crisis within the coming year – DD can continue at a high level with no immediate crises ensuing. But the *cost* of a crisis, measured as effect on GDP growth rate, is materially worse in the presence of high levels of DD. Thus DD makes crises worse but does not by itself cause them.

DD levels and interest rates

An important reason why DD levels are a poor predictor of financial crises is that different kinds of anxiety have opposite effects on such levels. A complete picture would require knowing the levels of dollar deposits by local parties in foreign banks as well, which is generally not available. If depositors believe that local banks will not be willing or able to pay back dollar deposits, then DD will decline and foreign deposits will rise. If they have confidence that local banks can pay, but worry about bursts of peso inflation, DD will increase.

Furthermore, all of these calculations are influenced by interest rates. The difference between interest on local dollar deposits and those on foreign dollar deposits measures anxiety about the ability or willingness of local banks to repay the dollars (which is also dependent on the country’s foreign exchange position). The interest rate on peso deposits less that on local dollar deposits less the difference between expected peso inflation and expected dollar inflation represents anxiety about an unexpected burst of peso inflation. A careful examination of levels and trends in these interest rates will yield insights into local sentiment about these risks.

Summary

The above discussion implies that DD is most relevant to crisis analysis when it is combined with interest rate information and other indicators of bank or government vulnerability. Here are some candidates:

- *Excessive nonperforming loans in the banking system.* If the banking system is burdened with loans that are not paying, and therefore the system is likely *de facto* insolvent, a flight of deposits at some point is a distinct possibility.
- *Excessive foreign exchange risk in banks.* The short dollar position is a constant temptation for banks. A currency mismatch in this direction heightens the risk of the banking system and raises the cost of any devaluation.
- *Excessive debt.* Financial crises are usually triggered either by a flight from the banks or by a sovereign default. If the country has a large and growing external debt relative to exports, the risk of default and subsequent turmoil are high. High and rising internal government debt is also a strong signal that trouble could lie ahead.
- *Low levels of foreign exchange reserves.* If the central bank is running low on foreign exchange, its capacity to protect the exchange value of its currency is reduced, and the probability of default on external debt is increased. These conditions increase the chances of capital flight.
- *Rigid foreign exchange regime.* Most developing countries constrain the real or nominal values of their currencies with some sort of trading bands. Countries with fragile banking systems often display a particular “fear of floating”. These rigidities tend to make breaks, when they occur, more severe and more costly.

In the following two sections I shall track the interaction of DD with the above indicators in two recent financial crises: Turkey and Argentina.

Turkey in 2000-2001

The Turkish financial crisis in February 2001 provides an excellent illustration of the fragilities noted above and their interaction with DD. It also illustrates the behavior of DD during an actual crisis.

- *Nonperforming loans in the banking system.* The Turkish state banks were deeply corrupt in 2000-2001. It was increasingly public knowledge that the major state banks each had several billion dollars worth of NPLs mainly due to connected lending to politicians’ favored supporters. In addition, they had accumulated an aggregate of about \$20 billion in “duty losses”, which arise from lending to favored borrowers at interest rates about half the level of deposit rates.
- *Foreign exchange risk.* Turkish banks were widely known to be addicted to the short dollar position. But this is hard to document; dollar deposits are reported for Turkey, but not dollar-based loans or bonds. A related measure, however, foreign liabilities less foreign assets for deposit money banks in the IFS database, rose from \$4.3 billion in January 2000

to \$10.6 billion in January 2001 just before the crisis broke (See Figure 1).

- *Debt.* The Turkish government ran persistent budget deficits in the 1990s that rose from 3% of GDP in 1990 to 11% in 2000. Government debt to GDP rose from 30% to 51% in the same period suggesting increasing pressure on the banks. The external debt of the country rose to 230% of exports by 2000, substantially more than most other developing countries during the same period.¹
- *Rigid foreign exchange regime.* In 2000 the Turkish government implemented a stabilization plan whose main feature, following the wisdom of the day, was a relatively fixed exchange rate against the dollar. Stabilization was in real terms rather than nominal. As shown in Figure 2, the real rate appreciated about 8% in the few months before the break.
- *Foreign exchange reserves.* Turkey began 2000 with 7.1 months of imports in reserves. This number declined to about 5.0 for much of 2000, and hit a sudden low of 3.5 during the mini-crisis in November 2000. It quickly recovered, however, to about 6.0 in February 2001, when the main crisis hit.

In other words, Turkey in 2000 displayed *all* of the banking risk factors I have enumerated. What then happened? A precursor crisis occurred in November 2000 as Demirbank failed and the IMF quickly made \$10 billion available to Turkey to forestall a run on the banks. The main crisis was triggered by problems of funding internal debt, aggravated by a dispute between the President and Prime Minister, as recounted by the *Financial Times* of February 20, 2001:

The Turkish Treasury will hold what was supposed to be its biggest auction of treasury bills, with the aim of raising the Turkish lira equivalent of about Dollars 4.5bn (Pounds 3bn). But the auction will take place against the background of a public row involving the prime minister and the president that yesterday drove lira bond prices down to a two-year-low.

The trouble began when Bulent Ecevit, prime minister, stormed out of a meeting of the National Security Council yesterday morning, after President Ahmet Necdet Sezer reportedly accused his government of impeding investigations into corruption.

As news of the political row spread, bond yields shot up, ending the day at a two-year-high of about 88 per cent from 63 per cent. The volatile Istanbul stock exchange closed 14 per cent down, while the central bank sold more than Dollars 4.9bn in foreign exchange sales, as investors rushed to buy dollars.

The government needs the money from today's auction to help redeem Dollars 5.8bn in domestic debt that matures tomorrow. If it cannot raise the money from the markets, analysts said the government might have to print money in violation of its IMF disinflation programme...

The dispute comes as Turkey is trying to rebuild confidence in a long-running IMF-sponsored disinflation programme. Last December, the IMF stepped in to offer Turkey a Dollars 10bn aid package after its programme was threatened by a financial crisis triggered by worries over the health of the banking system.

¹ Brazil's level was comparable, and of major countries only Argentina ran a higher level of external debt to exports (see below).

This account shows most of the ingredients of the crisis quite clearly. First, there is a background of concern that the fragility of the banking system would soon trigger a crisis. Second, the difficulty of rolling over internal debt was a major problem. While economists often suggest that internal debt should not matter much (because internal currency can always be printed), the text shows that this view is too facile – the mere possibility of a decision to go that route would itself trigger a flight from the local currency. Third, capital flight had already begun as \$4.9 billion of local currency was dumped in a single day.

The bill auction resulted in only \$2.2 billion being raised despite shortening the term of the bills to just one month and setting an astonishing 144% rate of interest. Within two days, overnight money rates hit 4000% and the Turkish lira was floated. The currency plunged 28% in a single day. The resulting “twin crisis” – a joint collapse of banks and currency that closely resembled the East Asia crisis of 1997-98 – led to a decline in real GDP of 9.4% for 2001.

What was the role of dollar and lira deposits in these events? Figure 1 suggests that dollar deposits pulled back some but not catastrophically: they dropped from \$38 billion just before the crisis to \$32 billion afterward, but then recovered their previous levels. Nevertheless, the role of dollars and lira in the deposit market was central to the events. *Euromoney* magazine in April 2001 offered a closer look:

The liquidity needs of the four state banks, which account for almost 40% of the deposit base, pulled the system down. In February, when the crisis struck, the payments system collapsed because state banks defaulted on their interbank obligations. The large private banks had huge overnight deposits in state banks, their preferred customers because they paid the biggest interest and took the biggest loans. When they felt that devaluation was round the corner, the private banks rushed to pull their money out and convert it to foreign currency. The state banks did not have sufficient cash to meet these unexpected calls and screamed. The central bank started pumping them with money. But the money thus loaned bounced back immediately as cash seeking foreign currency. When demand for dollars passed the \$6 billion mark in one day, the central bank consulted with the IMF and stopped the process...

Some estimates put the open foreign exchange positions at \$14 billion to \$15 billion. The actual loss from devaluation could also be much bigger because what appears as foreign exchange on the books of a number of banks is in fact Turkish lira. In order to circumvent the legal open position foreign exchange limit, some banks had deposited large sums of foreign currency with overseas foreign banks with instructions that they be used to buy Turkish treasury bills. Although no specific figures are available, large sums of money are believed to be involved.

According to this account the capital flight was initiated by the private Turkish banks. The *state* banks, which were desperately trying to help the government fund its deficits, offered exceptionally high rates of interest on overnight lira deposits. The *private* banks took advantage of these rates and stayed in lira until the last possible moment, hoping to jump out of the car just before it crashed. That jumping out consisted of pulling the overnight deposits and presenting the lira to the central bank for conversion into dollars.

Thus, while the holders of dollar deposits in Turkish banks had a convenient way of fleeing if they had chosen to do so, it was not primarily the depositors who fled, but the banks themselves. The banks were doubtless much better informed than their dollar depositors, and beat their depositors to the punch, so to speak. Figure 1 shows that foreign liabilities of Turkish banks did fall from \$23 billion in December 2000 to \$8 billion by December 2001, and foreign assets also declined. This reflected the difficulty Turkish banks encountered throughout 2001 in rolling over their foreign borrowings, and is separate from the dollar deposits.

Did the reduction in dollar deposits of about \$6 billion in the first quarter of 2001 make the banks illiquid? The answer is no. The Turkish government responded to the loss of these dollar deposits by pumping lira into the banking system, as suggested by the *Euromoney* text and as is confirmed by the numbers. Figure 3 shows the total size of the Turkish banks' balance sheets during 2000-2001. Total asset size, in both dollar and real terms, increased about 25% in the year leading up to the crisis, suggesting easy credit and a lending boom mentality. After the crisis, the dollar value of banking assets dropped from \$125 billion to \$80 billion, but this was because of the collapse in the Turkish exchange rate. In real terms the value of banking assets came down somewhat, but then settled into about the level of December 2000 as the liquidity injection took effect.

In summary, then, what do we learn from the Turkish crisis? Dollar deposits were not the cause of the crisis, but they had secondary effects:

1. Dollar deposits kept the financial system liquid, even excessively liquid, in the year leading up to the break.
2. Dollar deposits facilitated speculation – banks left some of the dollar deposits unhedged, and held them in super-high-rate overnight lira deposits at the state banks or in Turkish treasury bills.
3. Dollar depositors were not the main agents triggering the crisis; rather, the private banks in which such deposits were held were the main agents. The depositors' reaction times were slower than the banks'.
4. When dollar deposits did decline somewhat after the crisis hit, the liquidity impact of that withdrawal was readily neutralized by the central bank's infusion of local currency.
5. Insofar as dollar deposits were hedged with dollar loans, most borrowers lost substantial value because of the devaluation. Defaults to the banks were severe in 2001.

The *Euromoney* article estimated the total cost of bailing out the Turkish banking system at \$50 billion, about 25% of GDP. Of this, \$20 billion was duty losses of state banks, \$10-12 billion were from nonperforming loans of state banks, and the balance, about \$20 billion, arose from foreign exchange speculation and default problems of the private banks.

Argentina in 2001-2002

The Argentine collapse of 2001-2002 seemed to bear little resemblance to the Turkish crisis of a year earlier, yet there were some common elements. Let us begin by looking at the risk factors in Argentina prior to the crisis:

- *Nonperforming loans in the banking system.* This was not a major factor in Argentina during 2001. The Argentine banking system was more than 50% foreign owned, and bank regulation was the most sophisticated in Latin America. NPL levels were apparently reasonable, although the five-year recession had taken its toll on the borrowers.
- *Foreign exchange risk.* The Argentine banks appeared to run some net foreign exchange risk. The Carlos Arteta database indicates a net *positive* exposure to peso/dollar rate declining from \$7.1B in 1995 to \$3.7B in 1999 before turning to a *negative* \$1.6B in 2000. Unfortunately, no figures were provided for 2001. But a related measure

in the IFS monthly database, the difference between deposit money banks' foreign assets and foreign liabilities, declined from negative \$4.8B in January 2001 to negative \$9.1B by December.

- *Debt.* This was the real risk factor in Argentina. The public sector borrowing requirement was 2-3% of GDP annually, rising to 3.6% in 2000 and 5.7% in 2001. Central government debt rose from 29% of GDP in 1993 to 54% in 2001. External debt of all borrowers stayed at the astonishingly high level of 350-400% of exports throughout 1993-2001.
- *Rigid foreign exchange regime.* Argentina had famously implemented a currency board firmly linking its peso to the dollar. This rigidity meant that no monetary measures were available to pull the economy out of its four-year recession, and all government deficits had to be borrowed. It was the combination of currency board with ever-growing debt and deficits that proved unsustainable.
- *Foreign exchange reserves.* The currency board was designed in part to prevent foreign exchange reserves from depleting. Thus Argentina's reserves were adequate.

The long recession was becoming intensely painful by 2001. Real GDP fell by 11% over 1999-2001, and unemployment rose to 18%. In October 2001, after two IMF packages had failed to pull the country out of recession, the government announced a proposal to restructure domestic debt, extending maturities and cutting interest to 7% when market rates were around 25%. In November Fitch and Standard & Poor's characterized this as a default.

Analysts began watching closely for signs of a run on the banks, which would bring the long-running saga to its culmination. In a four-week period during July and early August about \$5 billion was withdrawn. In November 2001 bank withdrawals again picked up momentum, and interbank interest rates soared to 500% as banks had difficulty meeting the withdrawals, and on December 2 the government froze deposit withdrawals and capital exports (the "*corralito*").

Because of the currency board system, it made little formal difference whether depositors were withdrawing dollars or pesos. But during 2001 speculation about a possible collapse increased, and this sentiment was best measured by interest rates on pesos, dollars in Argentine banks and dollars in international banks ("Eurodollars"), as shown in Figure 4. At the beginning of 2001, interest rates on all three were essentially the same. But a gap opened between Argentine dollar deposits and Eurodollars, representing the possibility that the country might freeze Argentine dollar deposits – which it eventually did. And an even wider gap opened between Argentine dollar deposits and Argentine peso deposits, reflecting the possibility that the currency board would break, which also occurred. During the course of 2001, about \$15 billion of peso deposits and \$7 billion of dollar deposits were withdrawn, together representing about 20% of deposits.

In rapid succession during December 2001 riots erupted in the streets, the President resigned, Argentina defaulted on its \$155 billion of external debt, a new "third" currency was announced, more riots occurred, a court rejected the *corralito* and another president resigned. In January 2002 riots continued, a third president resigned and the currency board was abandoned.

The government eventually seized the dollar assets in the banks and converted bank dollar deposits to pesos at an artificial rate, in effect bankrupting the banks. No amount of good bank management or good bank regulation could prevent the equity of all banks from being

wiped out. In May Standard & Poors estimated at \$9.8 billion the losses suffered by the nine well-managed, well-regulated foreign banks.

I noted earlier that the liquidity risk of DD withdrawal is not usually a problem because the government can create pesos to replace the missing dollars. But Argentina is an exception, since the currency board precluded creating pesos. Thus one particular problem in Argentina was that the banks' balance sheet size shrank during 2001 from \$11.6B in January to \$10.0B by December. This was not necessarily a function of DD, since pesos withdrawn could readily be converted to dollars until the currency board broke in early 2002.

Figure 5 shows how DD in Argentina grew from 50% in 1997 to more than 70% by 2001. Although this was hedged at the level of the banks, it does proxy for rising FX exposure in the economy as the century closed. Furthermore, it is a very interesting warning sign that the credibility of the peso was eroding, long before that became a headline issue. The Moody's dollarization vulnerability indicator, which divides dollar deposits by dollar assets plus the country's dollar reserves, seems to be especially useful as a warning of impending crisis in this case.

Lessons from the Argentine crisis, for the purpose of this study, could be summarized as follows:

1. The Argentine banking system was heavily dollarized, with DD reaching more than 70%. The banks hedged themselves by dollar loans, but the currency risk was doubtless severe for the firms, since Argentina has few exports, and eventually this damaged the banks as well.
2. The liquidity risk of DD mattered a lot in this case, since no pesos could be printed to restore liquidity. The banks' assets shrank materially in 2001, further aggravating the recession.
3. DD undoubtedly facilitated some capital flight, but the system collapsed before capital flight could reach large scale. Given the rigidities of the currency board, capital flight leads to massive domestic illiquidity.

Quantitative risk measures

I have looked at the theoretical risks created by DD, and the specific ways these played out in two important recent cases. I now turn to the practical question: what can we quantify, and what measures will increase our ability to predict the timing and magnitude of financial crises?

The Moody's database contains the basic levels of DD in those countries for which data are available, and these are reproduced as Table 1. High absolute levels are obviously of interest, and those cases will be briefly discussed below. But also, the rate of change of DD is informative: any abrupt increase or decrease in DD merits closer examination. Change in either direction is of interest.

For example, DD in the Dominican Republic jumped from 27% in 2002 to 50% in 2003. This was no doubt associated with the Baninter collapse in mid-2003, though it is not clear from the available data whether the increase happened before or after the formal acknowledgement of the scandal. Because this collapse had such a huge fiscal cost, its most powerful effect was to undermine the local currency, causing DD to increase. Unfortunately, it may be difficult to get DD data quickly enough to be able to monitor evolving situations. A related measure that may be more easily obtained is, as noted earlier, the interest rate paid by local banks on dollar deposits compared with international dollar deposit rates (LIBOR).

Table 2 shows this differential as derived from IFS, which is current through February 2004 (90-day LIBOR is taken from the Wharton Research Database Service). Unfortunately, only 14 countries have current local dollar rates recorded in IFS, but even these are revealing. The data seem to divide into two groups: eight countries with differentials substantially greater than 1% and six countries with differentials well under 1%.

Comparing the names with Table 1, we see the first group generally has DD levels of 25% or more. The very high differential rates for Georgia, Azerbaijan and Ukraine suggest serious doubt that the banks of those countries will honor their dollar deposits. In fact, looking at the geographic distribution of the names in Table 2 we may conclude that such doubts are very high in Eastern Europe and quite high also in Central America and the Caribbean.

It will surely be worthwhile to seek sources of dollar interest rate data more current than IFS and use this interest rate level as an ongoing tool for monitoring countries with DD above 25%.

If DD is risky primarily when combined with other factors, it seems useful to enumerate and quantify these further factors and examine where they and high levels of DD exist in combination. Let us return to the risk factors and see whether and how they can best be quantified:

- *Nonperforming loans in the banking system.* This variable, though critically important in understanding bank risk, is difficult to estimate. Stated levels by banks and their regulators are often unrealistically low and/or based on permissive definitions of NPL. Estimates by independent parties are reported from time to time in the financial press but must be manually collected. The prevalence of asset management companies has reduced the impact of NPLs on bank risk but has not in general reduced the fiscal cost of NPLs. I shall not attempt to quantify this variable in this paper.
- *Foreign exchange risk.* This is best measured by the difference between the foreign currency assets and the foreign currency liabilities of banks, divided by total banking system assets. This is the measure called “*fep*” (foreign exchange position) in Arteta (2003). Unfortunately, Arteta’s data stop in 1999 and are by now quite out of date; they are reproduced as Table 3. It would be worthwhile to get an analyst to replicate and update Arteta’s data.
- *Government debt.* Total government debt to GDP is an important statistic but is surprisingly difficult to obtain on a comparable basis across countries. Table 4 shows the IFS data on this measure for all countries on which it is available. As can be seen, the list is short and inconsistent across countries.
- *Rigid foreign exchange regime.* For this variable I recommend the classification of actual exchange rate rigidity published as Appendix 3 of Reinhart and Rogoff (2002). (This article was more formally published in the *Quarterly Journal of Economics* in February 2004, but without Appendix 3. I can supply Appendix 3 in pdf format (50 pages)). These data end in 2001. One way to update them is to use as a proxy a three- or five-year moving average of volatility in monthly FX rates, which is the primary measure underpinning the Reinhart & Rogoff classifications.

- *Foreign exchange reserves.* Moody's creates a "dollarization vulnerability" measure which is foreign currency deposits in the banking system divided by the sum of FX reserves in the central bank and foreign assets of domestic banks. This combines the dollarization level with the level of foreign exchange reserves. Moody's measure is reproduced as Table 5.

When we read these vulnerability measures against the DD measure, what do we learn? A good starting point is Table 1. This table leads off with the three countries that have actually adopted the dollar as their sole currency: Ecuador, El Salvador, and Panama, for which DD is necessarily 100%. These countries have a very special problem: having sworn off the printing of any local currency, they must borrow any deficits that occur. Thus all three have relative high debt. Furthermore they may not devalue their currencies to seek a new equilibrium, and so may be prone to extended recessions, as in Argentina.

Panama's public sector debt to GDP stood at 69% for 2002 in Table 4, a relatively high value. Ecuador's comparable number for 2003 is 55%. Although El Salvador does not show on Table 4, a recent press report referred to "the government's decision to exchange local debt for longer-term foreign loans, which has increased external debt levels to more than 40 per cent of GDP."² That would put El Salvador's external debt at about \$50 billion or 150% of exports. According to the IIF, Panama's external debt was 190% of exports in 2003, and Ecuador's was 236%. In other words, all three of these fully dollarized countries have a serious debt problem. All three are among the IMF's largest clients. Table 2 shows that the risk premium on El Salvador banks has risen from 2.01% in February 2003 to 2.32% in February 2004.

Politically, El Salvador is relatively stable, with a newly elected President determined to hold with economic orthodoxy even at the cost of slow or no growth. Panama is also reasonably stable, but Ecuador is extremely volatile politically. The numbers lead us to expect a financial breakdown arising from a sovereign default in all three countries – but because of its volatility Ecuador may be the first to break. Its efforts to buy back debt and maintain IMF support are both shaky at best. Ecuador and El Salvador top the dollarization vulnerability list in Table 5.

The next two countries in Table 1 are Uruguay and Bolivia, both more than 90% dollarized. Given its shortage of foreign exchange, Uruguay is #5 on the vulnerability measure. Its public sector debt rose rapidly to 119% of GDP following devaluation in 2003. An effort to restructure internal debt was moderately successful, and recent press has been more optimistic, but the numbers still are very grim: The IIF report of May 2003 estimated year-end external debt to exports at a breathtaking 427%. A sovereign default by Uruguay must be considered probable, and this warrants keeping a close eye on interest rate data if they can be obtained.

Bolivia fares somewhat better on the numbers, including a positive over-hedging of bank risk as of 1999 in Table 3 – which should be updated. But Bolivia is highly fragile politically. Based on this, a sovereign default in Bolivia is also a distinct possibility. Table 2 shows that the risk premium on Bolivian banks has declined from 1.60% in early 2003 to about half that level as of February 2004. This measure should be closely monitored in Bolivia – it is a sensitive indicator of confidence in the banks, given the high degree of dollarization.

² John Authors and Sara Silver (both former students of mine!) in the *Financial Times*, March 20, 2004.

The above brief survey is intended simply to illustrate the way in which these risk measures interact with DD. Because such interactions can be quite different from country to country, this topic lends itself more to case-by-case analysis than to econometric analysis.

Conclusion

DD is a growing phenomenon and bears careful attention. It adds to liquidity and financial development throughout the developing world, but also adds to banking risk. There is good academic evidence that global capital flows and financial development enhance economic growth but increase banking risk, and DD may be seen as a component of this process. DD is not negative for a country, but it can serve as an accelerator of crises.

Countries with high levels of DD will often try to keep their currencies more closely aligned with the dollar or euro than countries with low levels, particularly when NPLs or short dollar positions are prevalent in the banks. This is one syndrome or combination of symptoms that suggests trouble ahead. It seems particularly prevalent in the weaker transition countries of Central and Eastern Europe. It may be worthwhile to undertake a more detailed study of this issue in this region. Turkey in 2001 was a prime example of this pattern.

The other syndrome is high dollarization combined with excessive internal and external debt. This seems particularly widespread in the weaker countries of Central and South America. Such countries are often quite fragile politically, and are likely to be highly dependent on the IMF. One should examine the level of government bonds in the banking systems of such countries to understand the risk that sovereign default would wipe out the banking system, as it did in Argentina.

Figure 1
FX Position of Turkish Banks
(in \$ billions)

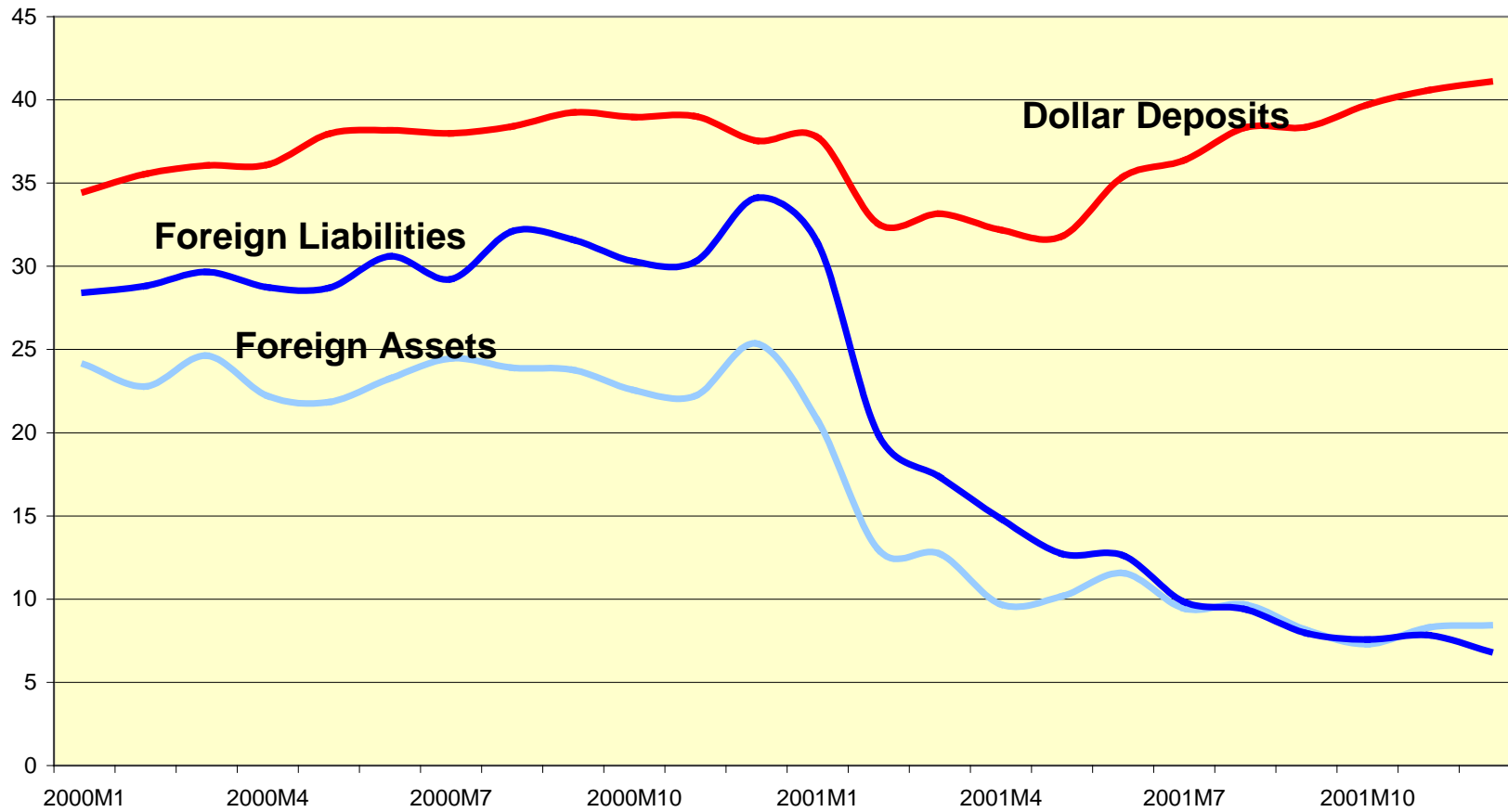


Figure 2
Turkish Real Exchange Rate

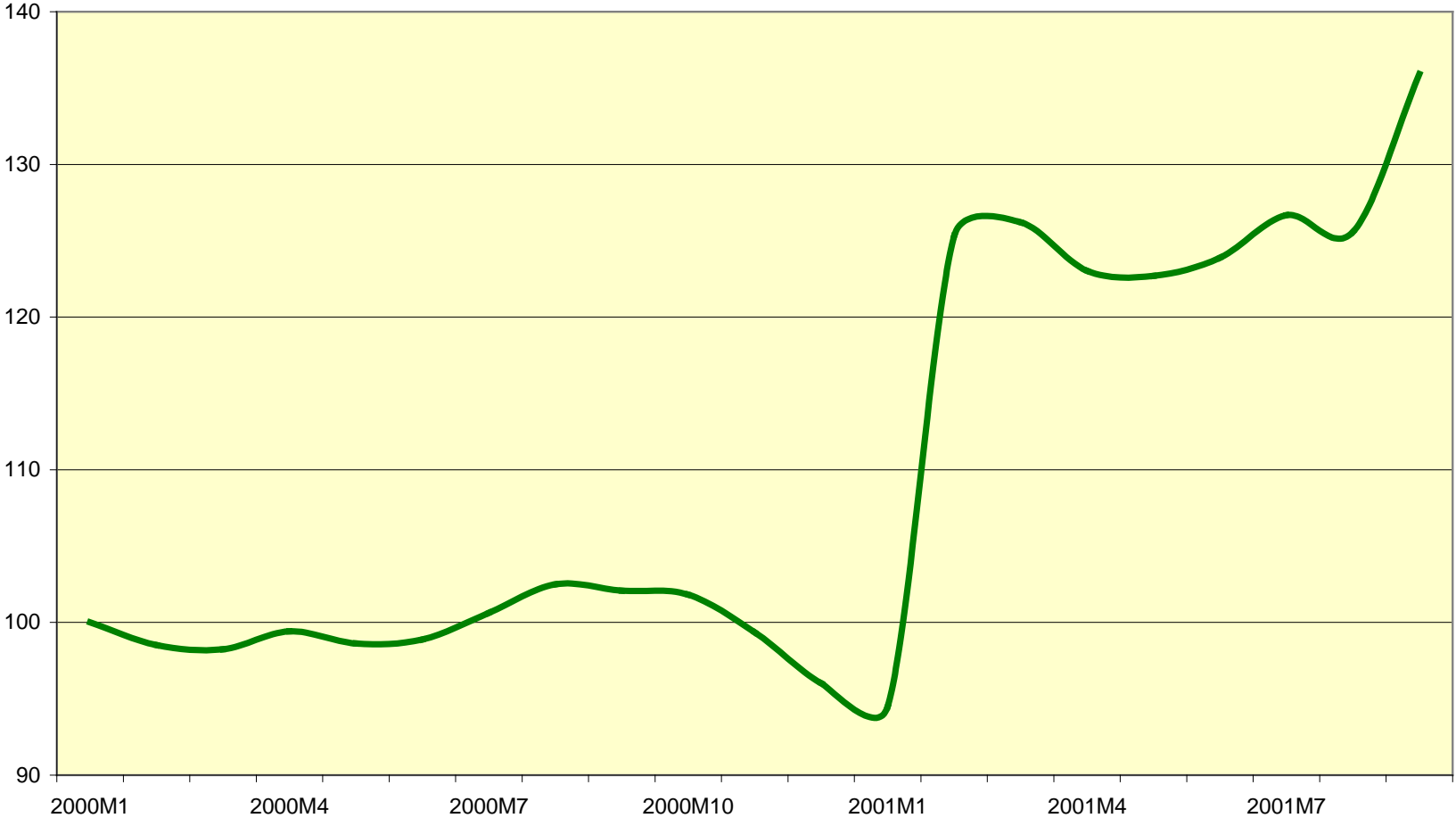


Figure 3
Total Assets of Turkish Banks

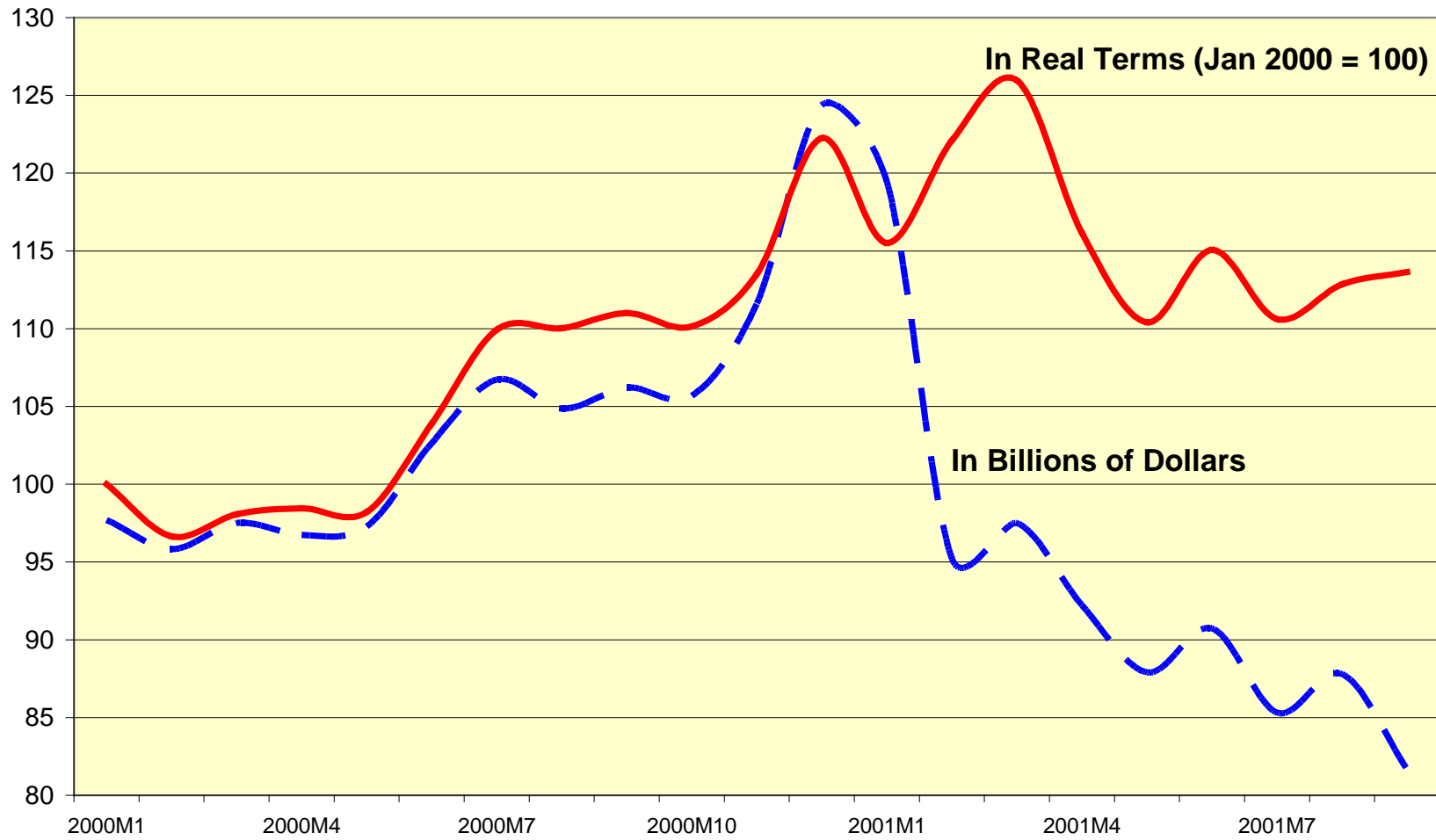


Figure 4
Argentine Bank Deposit Rates

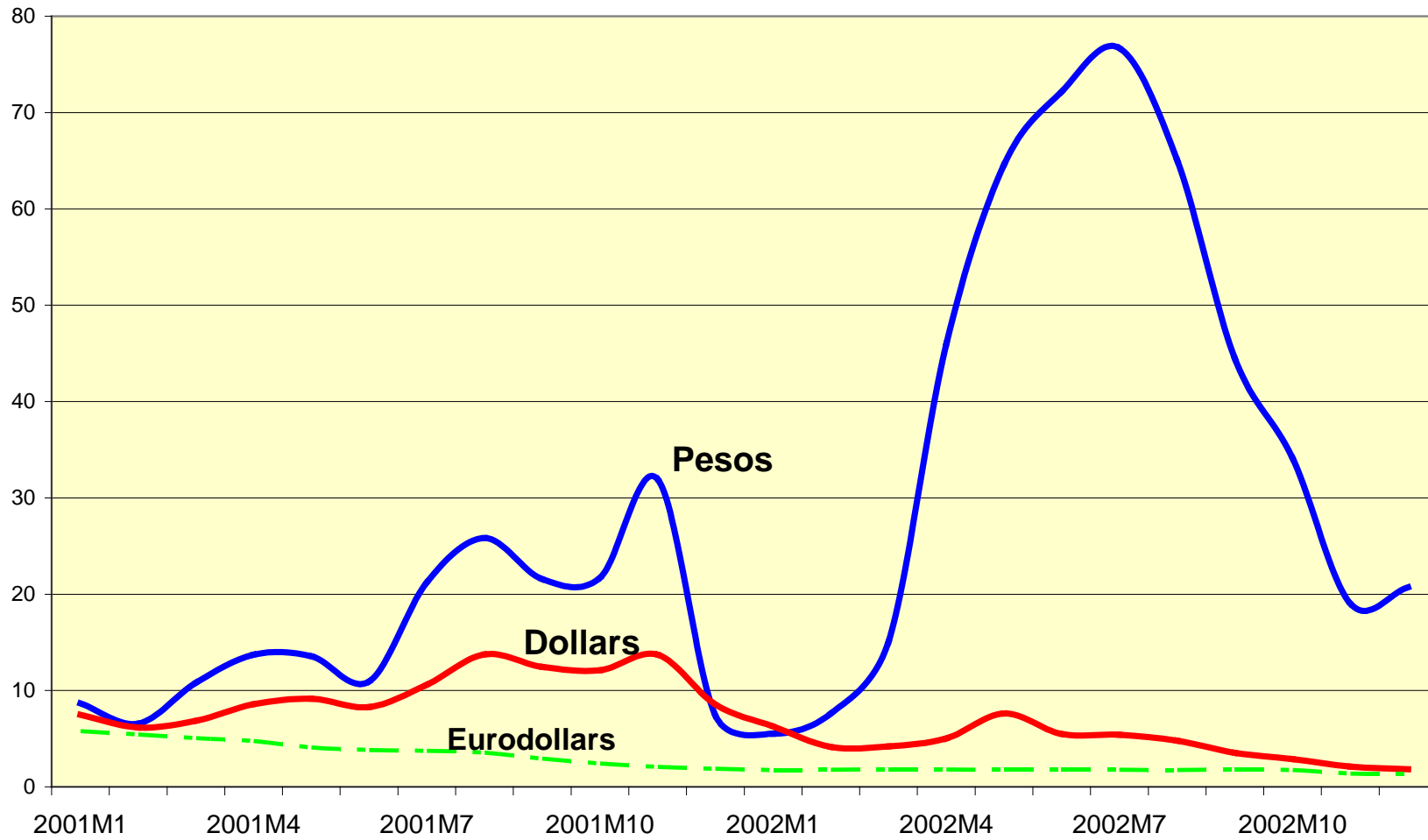


Figure 5
Argentina: Moody's Dollarization Measures

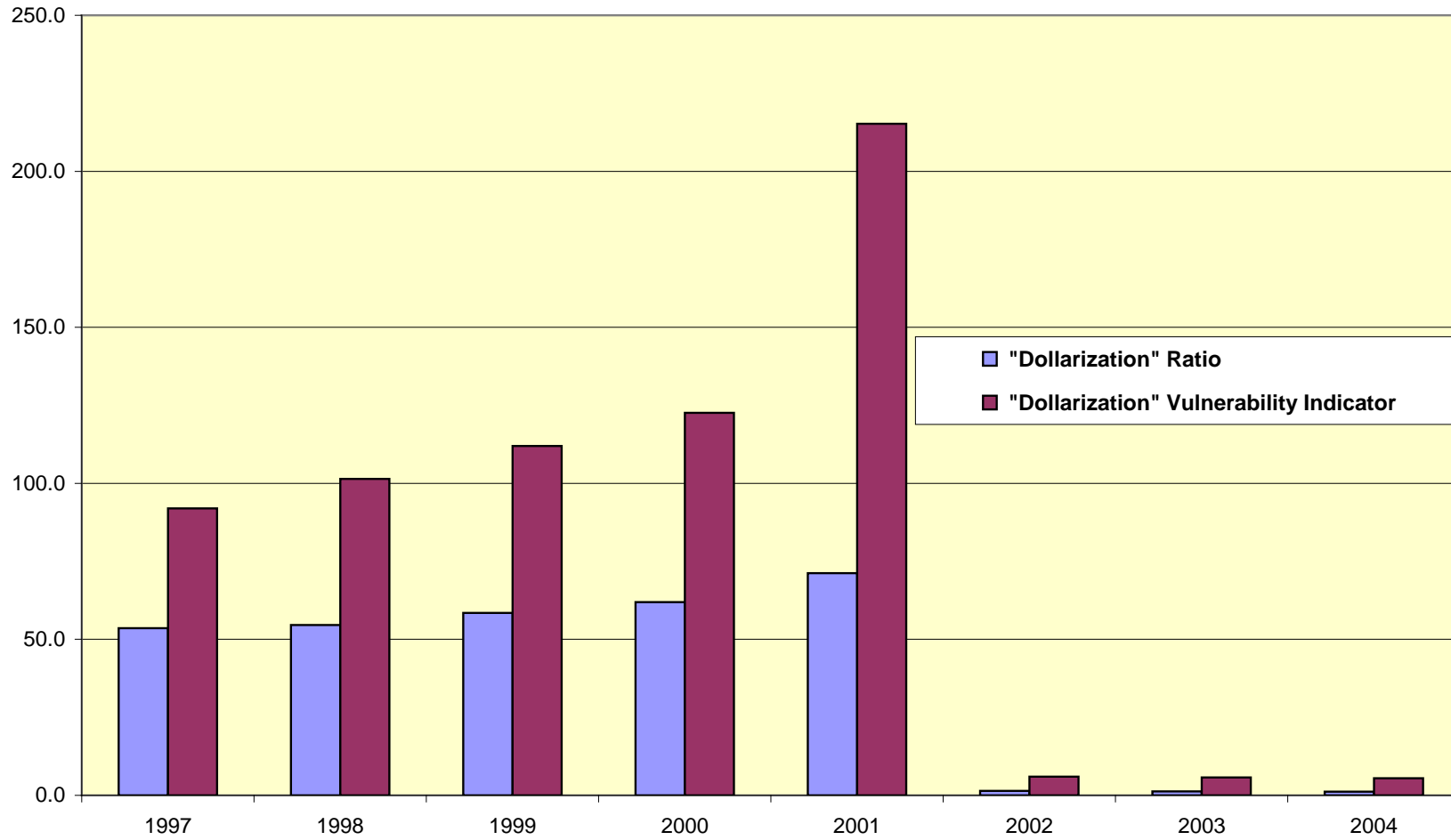


Table 1
Moody's Data on Deposit Dollarization

Country	2001	2002	2003
El Salvador	100.0	100.0	100.0
Panama	100.0	100.0	100.0
Ecuador	100.0	100.0	100.0
Uruguay	91.9	93.6	94.8
Bolivia	89.9	90.8	90.3
Romania	98.3	82.7	
Nicaragua	73.7	76.7	72.0
Peru	74.3	73.2	71.9
Lebanon	69.1	68.5	68.5
Paraguay	66.2	68.5	66.2
Croatia	73.9	67.8	64.0
Jordan	63.3	65.6	
Kazakhstan	64.0	60.0	
Bulgaria	59.1	55.1	55.7
Turkey	54.6	55.1	48.4
Bahrain	58.9	52.7	42.4
Costa Rica	48.2	48.0	48.0
Moldova	51.6	41.6	52.2
Russia	34.3	35.2	
Egypt	36.4	34.9	
Honduras	33.1	34.2	35.7
Vietnam	36.6	33.1	
Lithuania	42.9	32.7	29.1
Ukraine	32.4	32.1	33.5
Philippines	39.0	32.0	
Barbados	36.7	30.8	32.0
Jamaica	28.1	30.2	32.1
Dominican Republic	20.0	26.8	50.0
Trinidad & Tobago	24.0	25.6	26.4
Saudi Arabia	21.9	22.5	
Indonesia	20.2	18.4	
Oman	10.3	14.1	13.5
Belize	12.4	12.4	12.3
Mauritius	12.5	11.9	
Chile	10.9	10.4	10.0
Pakistan	19.1	10.4	
Guatemala	5.3	7.7	11.7
South Africa	8.0	5.6	5.5
Mexico	5.9	5.0	4.6
India	4.3	3.6	
Malaysia	3.4	2.6	2.5
Thailand	1.5	1.5	
Argentina	71.2	1.4	1.3
Venezuela	0.2	0.2	0.1
Colombia	0.0	0.0	0.0
Brazil	0.0	0.0	0.0

Table 2
Local Dollar Deposit Rates Less 90-Day LIBOR

Country	2003M1	2003M2	2003M3	2003M4	2003M5	2003M6	2003M7	2003M8	2003M9	2003M10	2003M11	2003M12	2004M1	2004M2
Georgia	8.51	8.24	8.09	7.67	7.59	7.67	7.86	8.33	8.62	8.91	8.20	6.91		
Azerbaijan	8.35	7.34	7.99	7.25	7.10	7.21	7.42	7.80	8.24	8.11	7.61	7.82	7.89	7.94
Ukraine	3.95	4.82	4.40	5.02	4.98	5.00	4.98	4.10	4.44	4.76	5.24	5.82	5.60	5.59
Nicaragua	4.33	4.52	4.34	4.44	5.12	4.51	4.25	3.51	3.46	3.03	2.98	2.76	3.02	2.95
Moldova	2.05	1.76	1.52	2.02	1.47	1.84	1.69	1.64	1.96	2.26	2.60	3.10	3.22	3.48
El Salvador	2.06	2.01	2.07	2.11	2.25	2.38	2.36	2.29	2.36	2.25	2.30	2.32	2.32	2.32
Trinidad and Tobago	2.00	2.03	1.49	1.45	0.89	1.08	0.93	1.19	1.43	1.55	1.75			
Honduras	1.95	1.83	1.76	1.67	1.59	1.80	1.75	1.59	1.57	1.56	1.33	1.49		
Philippines	0.63	0.67	0.75	0.75	0.74	0.93	0.81	0.76	0.75	0.77	0.81	0.83	0.71	0.77
Indonesia	1.37	1.28	1.28	1.12	1.10	1.21	1.10	0.97	0.86	0.85	0.69	0.45	0.35	
Bolivia	1.60	0.94	0.81	0.96	0.98	0.99	0.90	0.81	0.62	0.62	0.57	0.64	0.65	0.71
Chile	0.08	0.03	0.06	0.07	0.10	0.19	0.31	0.40	0.33	0.37	0.46	0.55	0.61	0.62
Paraguay	0.57	-0.09	-0.16	0.01	0.39	0.25	0.29	0.17	0.15	0.06	0.13	-0.25	-0.34	
Argentina	0.43	-0.03	-0.17	-0.18	-0.31	-0.20	-0.30	-0.41	-0.52	-0.54	-0.55	-0.55	-0.50	-0.51

Table 3
Arteta Data on Foreign Exchange Position of Banks

Country	1997	1998	1999
Estonia	15.0%	23.6%	21.5%
Bolivia	15.4%	20.9%	20.4%
Peru	8.6%	11.7%	10.2%
Georgia	-0.2%	8.1%	10.2%
Armenia	-15.3%	17.5%	9.3%
Hungary	5.7%	7.2%	8.9%
Israel	3.3%	4.0%	4.8%
Colombia	7.1%	5.8%	3.6%
Mexico	5.5%	5.1%	3.0%
Lithuania	1.0%	4.1%	2.3%
Venezuela	0.1%	0.1%	0.6%
Bahamas, The	0.5%	0.4%	0.5%
Chile	3.0%	1.9%	0.4%
Guatemala			-0.1%
Malaysia	0.3%	-0.1%	-0.4%
Ukraine		0.0%	-0.6%
Moldova		6.7%	-1.0%
Argentina	3.3%	2.5%	-1.1%
Nicaragua	-15.3%	-10.9%	-1.5%
Egypt, Arab Rep.	-1.0%	-0.5%	-1.9%
Czech Republic	-4.9%	-4.8%	-2.3%
Indonesia	6.3%	10.5%	-2.7%
Papua New Guinea	-5.7%	-3.8%	-3.2%
Uruguay		-1.8%	-3.7%
Saudi Arabia	-8.5%	-5.0%	-3.8%
Poland	-7.9%	-3.9%	-3.8%
Russian Federation	-1.2%	0.3%	-4.9%
Turkmenistan		-3.5%	-5.2%
Paraguay	-1.1%	-5.9%	-9.2%
Haiti	-12.4%	-10.5%	-11.6%
Costa Rica	-16.9%	-15.1%	-13.6%
Maldives	-15.3%	-15.4%	-13.6%
Albania	-16.5%	-14.9%	-16.6%
Mongolia	-18.8%	-4.9%	-18.5%
Sao Tome and Principe	-27.0%	-26.8%	-22.3%
Lao PDR	-16.3%	-16.2%	-22.7%
Cambodia	-2.3%		
Vietnam	-9.2%	-13.3%	

Table 4
IFS Data on Government Debt to GDP

Country	Description	2001	2002	2003
Lebanon	Central government gross debt % GDP	162.5	171.3	177.2
Argentina	Central government debt % GDP	53.8	156.8	
Uruguay	Public sector debt % GDP	60.2	118.5	
Israel	Public sector debt % GDP	97.0	105.3	
Turkey	General government debt % GDP	100.6	99.0	
Uruguay	Central government debt % GDP	41.9	98.5	
Brazil	Public sector debt % GDP	78.4	94.1	87.2
Saudi Arabia	Central government domestic debt % GDP	93.7	94.1	
Qatar	General government debt % GDP	76.4	82.4	
Egypt	General government debt % GDP	68.4	75.7	85.8
Indonesia	Central government debt % GDP	87.8	74.8	
Panama	Public sector debt % GDP	69.7	69.3	
India	Central government debt % GDP	64.8	68.6	69.6
Kenya	Public sector debt % GDP	70.5	65.6	70.2
Colombia	Public sector debt % GDP	49.8	58.6	55.6
Ecuador	Public sector debt % GDP	67.8	58.3	55.3
Hungary	General government debt % GDP	53.5	57.1	59.1
Thailand	Public sector debt % GDP	57.6	56.6	50.3
Bulgaria	General government debt % GDP	69.8	56.0	
Ecuador	Central government debt % GDP	61.1	52.7	49.2
Croatia	General government debt % GDP	51.6	51.2	
Pakistan	General government domestic debt % GDP	50.6	47.3	46.0
Peru	Public sector debt % GDP	46.1	47.0	47.5
Poland	General government debt % GDP	40.3	45.8	50.6
Malaysia	Federal government debt % GDP	43.6	45.7	
Slovakia	General government debt % GDP	48.7	43.4	42.8
Venezuela	Central government debt % GDP	30.4	42.7	45.7
Russia	General government debt % GDP	51.1	42.1	
South Africa	Central government debt % GDP	42.8	37.1	
Philippines	National government domestic debt % GDP	34.0	36.6	
Czech Republic	General government debt % GDP	25.2	28.9	37.6
Romania	General government debt % GDP	25.1	24.3	
Mexico	Central government debt % GDP	22.5	24.0	24.7
South Korea	Central government debt % GDP	19.6	19.5	
Chile	Central government debt % GDP	15.0	16.5	15.3
Costa Rica	Public sector debt % GDP	57.8		

Table 5
Moody's Dollarization Vulnerability Measure

Country	2001	2002	2003
Ecuador	233.5	298.1	288.2
El Salvador	262.7	268.0	243.3
Nicaragua	196.9	216.1	88.5
Dominican Republic	83.6	166.0	300.0
Uruguay	132.1	157.1	242.6
Lebanon	174.0	145.6	123.7
Costa Rica	135.9	139.2	131.7
Turkey	134.7	115.4	105.7
Egypt	126.8	110.4	
Croatia	100.9	105.9	113.6
Paraguay	110.0	98.8	92.5
Peru	95.5	92.0	93.3
Kazakhstan	88.1	70.3	
Romania	91.2	70.3	
Jordan	64.7	63.9	
Vietnam	58.1	60.7	
Philippines	54.9	56.2	
Honduras	45.8	48.6	51.7
Ukraine	44.9	44.7	39.5
Lithuania	44.7	44.1	38.6
Indonesia	42.0	42.4	
Bulgaria	40.0	42.1	44.0
Jamaica	34.8	41.9	45.8
Saudi Arabia	32.7	38.2	
Belize	35.2	38.1	41.4
Russia	35.3	36.7	
Trinidad & Tobago	32.9	36.3	38.3
Bolivia	30.6	33.0	31.2
Moldova	41.1	32.5	34.0
Mauritius	34.4	26.5	
South Africa	28.4	26.1	28.0
Mexico	29.8	24.5	22.3
Chile	24.9	24.4	24.7
Pakistan	43.5	23.1	
Oman	17.8	19.4	16.7
Guatemala	10.5	16.6	22.4
India	14.1	10.7	10.1
Barbados	14.0	9.0	8.9
Bahrain	9.1	8.8	8.3
Malaysia	7.6	6.5	6.0
Argentina	215.2	6.0	5.7
Thailand	3.2	3.1	
Venezuela	0.5	0.2	0.1
Colombia	0.0	0.0	0.0
Brazil	0.0	0.0	0.0

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