FEAR OF FLOATING
AND DOMESTIC LIABILITY DOLLARIZATION

Adam Honig*
Department of Economics
Amherst College

June 2005

Abstract

Previous attempts to analyze the effect of liability dollarization on "fear of floating" have focused exclusively on the role played by foreign liabilities. Liability dollarization of the domestic banking system, however, poses a similar risk as dollar-denominated deposits and credit impose a source of currency risk on domestic banks and firms respectively. Findings from a large cross-country sample indicate that domestic liability dollarization plays a central role in producing a "fear of floating" among emerging market countries and developing nations. This is an important result because domestic liability dollarization is more reversible than the dollarization of foreign liabilities, providing a reason for optimism that these countries can regain flexibility in the choice of exchange rate regime and overcome their "fear of floating."

JEL Classification: F33, G21.

Keywords: Fear of floating; Unofficial dollarization.

* Correspondence: Adam Honig, Department of Economics, Campus Box 2201, Amherst College. Amherst, MA 01002-5000. Email, ahonig@amherst.edu. Phone: (413) 542-5032. Fax: (413) 542-2090.

1. Introduction

The optimal currency area literature (Mundell, 1961; McKinnon, 1963) provides valuable insights into the choice of exchange rate regime in advanced economies. Unfortunately, this decision is more complicated for emerging markets and developing nations, which face a host of additional concerns. A serious issue that has received much recent attention is the dollarization of liabilities.[1] Unhedged foreign-currency-denominated liabilities are a major source of vulnerability for both firms and banks because large depreciations can lead to significant reductions in net worth (Mishkin, 1996; de Nicoló, Honohan and Ize, 2005). This process can lead to sharp contractions in output and is one of the reasons why many emerging markets exhibit a "fear of floating" (Calvo and Reinhart, 2002). Specifically, emerging markets are concerned about large exchange rate movements, particularly large depreciations, because of the effect on balance sheets, and thus policymakers limit exchange rate volatility. This restricts their ability to conduct independent monetary policy. Mishkin and Savastano (2001), for example, point out that liability dollarization poses problems for inflation targeting regimes as the monetary authorities are unable to ignore movements in the exchange rate. In fact, many emerging markets and developing nations have chosen to fix their exchange rates, completely abdicating their role in monetary policy, as the only solution, even though this may be a sub-optimal outcome. For these reasons, liability dollarization is one of the central issues in open economy macroeconomics.

Micro-level evidence of the effect of real depreciations on firm balance sheets, a fundamental cause of "fear of floating," has been presented in a number of studies. Harvey and Roper (1999) find that balance sheet effects played a significant role in the Asian crisis. They

[1] Following the standard vocabulary, this paper employs the terms "dollar" when referring to any foreign currency and "peso" when referring to any domestic currency.

argue that Asian corporations issued significant amounts of foreign currency-denominated debt and were counting on fixed exchange rates to persist. Concern among policy makers about balance sheet effects is a primary reason why Asian firms bet on currency stability. This was a risky bet as foreign currency borrowing left these firms vulnerable to an exchange rate depreciation. The *Emerging Markets Review* published a special issue analyzing balance sheet effects from firms in six Latin American countries. Most of the included studies found negative balance sheet effects of deprecations on investment. In the case of Argentina, for example, Galiani, Levy Yeyati and Schargrodsky (2003) argue that the large share of dollar-denominated debt provided an implicit guarantee against a large depreciation. In the event that a depreciation would occur, the high level of liability dollarization would provide political pressure to protect dollar borrowers.

While these studies analyze micro-level data on firms in a small sample of countries, this paper uses a large cross-country sample of aggregate data on liability dollarization. A cross country study allows for an explicit test of an effect of liability dollarization on the choice of exchange rate regime; in other words, a test of "fear of floating." The analysis in this paper extends to banks as well. The message, however, is similar: a large share of dollar debt, whether it is of domestic firms or banks, gives powerful incentives for policymakers to ensure currency stability, producing a "fear of floating."

To date, attempts to establish empirically the effect of liability dollarization on "fear of floating" have focused exclusively on the role played by foreign liabilities (Alesina and Wagner, 2004; Ganapolsky, 2003; Hausman, Panizza and Stein, 2001). Liability dollarization of the domestic banking system, however, poses a similar risk. When banks accept dollar deposits from domestic residents, they assume foreign exchange risk. Although banks make dollar loans

to domestic firms in order to reduce currency mismatches on their balance sheets, this does not hedge their foreign exchange exposure; while it eliminates currency risk for the bank, there is still dollar-loan default risk. Moreover, dollar-denominated credit imposes currency risk on firms who earn revenue in pesos because large depreciations leave the firm unable to repay the dollar loan. Thus domestic liability dollarization, including both dollar deposits and dollar credit, can play a role in emerging market banking crises.[2]

Using a database on unofficial dollarization of domestic banking systems in emerging market countries and developing nations, this paper tests whether or not domestic liability dollarization contributes to "fear of floating." Thus I focus on the domestic component of "Original Sin," that is, the inability to borrow locally in local currency, which has received less attention in the literature. I find that domestic liability dollarization plays a central role in producing a "fear of floating" among emerging market countries and developing nations.

This is an important result as domestic liability dollarization is more reversible than the dollarization of foreign liabilities. Eichengreen, Hausman and Panizza (2002) argue that emerging markets are forced to borrow *externally* in one of the major currencies because the currencies of small countries offer little diversification benefits to foreign lenders relative to the additional transactions costs they imply, irrespective of country heterogeneity. Building a reputation for sound monetary and fiscal policy, however, can still reverse domestic dollarization. Honig (2002) demonstrates that improvements in government quality can reduce domestic dollarization. In addition, building a track record of low inflation will spur the growth

[2] In fact, there are reasons to believe that domestic liability dollarization of firm balance sheets may pose more risk than foreign dollar borrowing as it is usually firms in the tradables sector, who are likely to earn revenue in dollars and therefore unlikely to experience currency mismatches, that borrow from abroad in dollars (Calvo, Izquierdo and Mejía, 2004). Domestic firms who borrow locally in dollars are far more likely to earn revenue in local currency and therefore more likely to default on dollar debt in the event of a large depreciation. Due to a lack of extensive cross-country data on foreign dollar borrowing of domestic firms, I am unable to test whether domestic dollar borrowing of firms contributes more to "fear of floating" than foreign dollar borrowing.

of domestic capital markets requiring less foreign borrowing (Jeanne, 2003). Warnock and Burger (2003) find that countries with stronger institutions have larger local-currency bond markets. Therefore, if domestic liability dollarization is a source of "fear of floating," as demonstrated here, there is reason for optimism that emerging markets and developing nations can regain flexibility in the choice of exchange rate regime by reversing the dollarization process.

The rest of the paper is organized as follows. Section 2 presents the empirical methodology and the data. Section 3 discusses the results of the estimation. Section 4 summarizes the findings and draws policy implications.

2. Methodology and Data

Using annual data on deposit and credit dollarization for 1988-2001, I estimate the following ordered probit regression:

$$Regime_{it} = \beta_1 Dollarization_{it-1} + \beta_2 Openness_{it-1} + \underline{\delta}' Controls_{it} + \varepsilon_{it} \quad (1)$$

The dependent variable *Regime* is based on Reinhart and Rogoff's (2003) *de facto* exchange rate regime classification and captures the degree of exchange rate flexibility. The variable ranges in value from 1 (pegs or crawls), 2 (managed floats) to 3(floats).[3] In the base specification, I exclude observations for which the regime is classified as "freely falling" under the Reinhart and Rogoff classification (defined as annual inflation of greater than 40%) since the goal of the paper is to determine the effect of dollarization on the *chosen* degree of exchange rate flexibility. Presumably, countries experiencing freely falling exchange rates are not in this

[3] I group pegs and crawls because there are only 9 observations of pegged exchange rates in most of the regressions.

situation because they choose to be. Eliminating observations for which the exchange rate is "freely falling" also mitigates an endogeneity problem as those are the situations in which exchange rate behavior is most likely to affect unofficial dollarization. To verify that the results are not based on the exclusion of these observations, I also estimate the model including freely falling exchange rates, both as a separate category and also combined with the floating category.

I do not consider the issue of whether *de facto* exchange rate behavior deviates from the *de jure* exchange rate regime as in Calvo and Reinhart (2002) and Alesina and Wagner (2004). In analyzing the effect of domestic liability dollarization on "fear of floating," I am concerned with actual exchange rate behavior, regardless of whether or not it differs from stated exchange rate policy. However, I also estimated the model using the *de jure* classification and obtained similar results although the coefficients tended to be smaller. This is not surprising given that "fear of floating" should be reflected in the choice of *de facto* regime.

In order to analyze the contribution that domestic liability dollarization makes to "fear of floating," it is crucial to choose the measure of unofficial dollarization that best captures exposure to currency risk. One method of estimating banks' exposure to foreign exchange risk is to determine the extent to which they match dollar deposits of residents with dollar credit to domestic firms. However, matching dollar deposits with dollar loans to domestic firms who earn revenue in domestic currency does not affect the bank's overall risk position. It only replaces foreign exchange risk with dollar loan default risk. In addition, the borrowing firm also faces currency risk if it has to repay in dollars. Therefore, bank currency mismatch does not adequately capture total exposure to currency risk.

I therefore introduce *total* unofficial dollarization of the domestic banking system, defined as dollar deposits of residents *plus* dollar credit to the resident private sector.[4] Dollar deposits represent an unhedged source of currency risk for banks while dollar credit, which does not hedge the bank's dollar liabilities, is a source of currency risk for firms. I initially assume that all firms earn revenue in pesos. This measure avoids the problem of the mismatch variable, namely that a bank without any dollar mismatch but substantial dollar loans is still subject to currency risk if the borrowing firms who earn revenue in pesos are unable to repay in the event of a large depreciation. In addition, this measure incorporates currency risk for the firm in order to provide a more complete picture of currency risk facing the economy.

Consider, for example, the extreme case in which the ex-post depreciation is so large that the firm cannot repay any of the dollar loan to the bank since its peso assets are now worthless. In this case the bank has not protected itself from currency risk by matching its dollar liabilities with dollar loans. The firm still owes the bank dollars with no assets to repay the loan and the bank still owes its depositors dollars, also with no available assets to make this payment. Therefore, it is clear that the ex-ante unhedged source of currency risk for the bank is just its dollar deposits, while the ex-ante unhedged source of currency risk for the firm is just the dollar loan from the bank. The total ex-ante unhedged source of currency risk for the system is then dollar deposits plus dollar credit to domestic firms, which is equivalent to the gross dollar liabilities in the system, or total unofficial dollarization. The risk measure is thus

$$= Liab\$(firm) + Liab\$(bank)$$
$$= Assets\$(bank) + Liab\$(bank)$$
$$= \textit{dollar credit} + \textit{dollar deposits}$$

[4] Due to a lack of data, I cannot account for cash holdings of foreign currency or for the foreign currency deposits of domestic residents and firms held abroad.

which is the total unofficial dollarization of the economy.[5] In terms of the amount of unhedged dollar liabilities, matching dollar deposits with dollar loans only compounds the problem because it imposes a source of currency risk on the firm, while not hedging the dollar liabilities of the bank. If the bank had lent in pesos then at least the firm would be spared the effects of the depreciation. Thus, it is not double-counting to include both dollar loans and dollar deposits when measuring unhedged dollar liabilities.[6]

This raises an obvious question: if lending in dollars to firms who earn revenue in pesos does not protect the bank from the currency risk stemming from its dollar deposits, what is the benefit to the bank of making dollar loans? The answer is that not all large ex-post depreciations leave the firm unable to repay any of the dollar loan. In these cases, the bank is able to recover more of the loan and limit the loss of net worth when it has lent in dollars as opposed to pesos, implying that the firm incurs a larger loss of net worth when it borrows in dollars. Thus, when at least some of the loan can be repaid following a depreciation, the currency denomination of the loan affects the distribution of total loss of net worth between the bank and the firm.

This result has implications for the appropriate measure of currency risk. Although making dollar loans increases the unhedged dollar liabilities of the firm, it may in some cases, as noted above, result in a smaller loss of net worth for the bank following a depreciation than that implied by peso lending. If I incorporate the positive role that dollar lending can play in protecting banks, the new risk measure

$$= Liab\$(firm) + [Liab\$(bank) - \gamma_1 Assets\$(bank)]$$

[5] Total unofficial dollarization is scaled by total bank credit, which is the total liabilities of firms to domestic banks, plus total bank liabilities. To capture the importance of dollar credit and dollar deposits in the economy, it would be preferable to scale by total firm liabilities plus total bank liabilities, but data on total firm liabilities were unavailable. Dollar mismatch is scaled by bank liabilities. Deposit dollarization is scaled by total bank liabilities.

[6] I also include measures of both credit and deposit dollarization in the regression, without combining them beforehand. I cannot reject the hypothesis that the coefficients are identical, suggesting that equal weight should be placed on each when combining the two variables, as the total dollarization variable does.

$$= Assets\$(bank) + [Liab\$(bank) - \gamma_1 Assets\$(bank)]$$
$$= (1-\gamma_1) Assets\$(bank) + Liab\$(bank)$$

If I assume that the currency risk for the firm caused by a dollar loan is exactly offset by the benefit that dollar loan bestows on the economy by limiting the loss of net worth for the bank under certain depreciations, then $\gamma_1 = 1$ and the risk measure is just $Liab\$(bank)$ or the net dollar liabilities of the banking system. Since this is equivalent to the bank's dollar deposits, I also use measures of deposit dollarization (specifically the ratio of dollar deposits to both total deposits and total bank liabilities) as the dependent variable in the regression. Because dollar loans bankrupt the firm for very large depreciations, yielding no benefit to the bank, they increase currency risk in net so that $\gamma_1 < 1$. Therefore, $Liab\$(bank)$ represents a lower limit on risk. Thus the best measure of risk is most likely somewhere in between $Liab\$(bank)$ and $Assets\$(bank) + Liab\$(bank)$.

This assumes, however, that firms earn revenue in pesos, an assumption I have made to this point. However, firms in the tradables sector, especially exporters, usually earn revenue in dollars. If one assumes that all firms earn revenue in dollars, then both of these variables over-estimate risk and the appropriate measure is dollar mismatch. Specifically, firms face no currency mismatch since they borrow in dollars and earn revenue in dollars, while banks only face risk to the extent that they do not match dollar liabilities with dollar assets. Since in reality some firms earn revenue in dollars and others in pesos, dollar mismatch represents the true lower bound on risk while total dollarization represents the upper bound, with $Liab\$(bank)$ somewhere in between.

Therefore, in addition to using the different measures of dollarization as regressors, I also use a linear combination of dollar mismatch and total dollarization where the weight depends on

the extent to which firms earn revenue in dollars. For example, the weight on mismatch equals one if the ratio of exports to GDP equals one, .5 if the ratio equals .5, and zero if the ratio equals zero. The greater the degree of exporting, the more likely it is that firms earn revenue in dollars and therefore the more appropriate dollar mismatch is as a measure of the unhedged dollar liabilities in the banking system. Although I use all measures of dollarization in separate regressions, the weighted dollarization variable is the most accurate measure of the risks posed by domestic dollarization.

Finally, to confirm the finding that dollar-denominated *foreign* liabilities contribute to "fear of floating" (Alesina and Wagner, 2004; Ganapolsky, 2003; Hausman, Panizza and Stein, 2001), I define a bank's external dollar mismatch as the foreign liabilities of domestic banks minus foreign assets, divided by total bank liabilities.[7] As opposed to domestic borrowers, foreign borrowers earn revenue in dollars and thus pose no dollar-loan default risk to domestic bank lenders. Therefore, mismatch is a good measure of currency risk in the external context whereas in the domestic context it is not. Including measures of both domestic and external liability dollarization in the regression did not in general affect the coefficients obtained in separate regressions.

Aggregate data on deposit dollarization are available for 92 emerging markets and developing nations going back to 1988 while data on credit dollarization are available for 41. Since countries with data on credit dollarization also have data on deposit dollarization, data on dollar mismatch and total dollarization are limited to countries with data on credit dollarization. Regions covered include Latin America, the Middle East, Eastern Europe, Africa and Asia.

[7] The data provided by the IMF does not actually provide the currency of denomination for these foreign assets and liabilities. However, since the sample consists exclusively of emerging markets, I assume, following Domaç and Peria (2000), that these foreign assets and liabilities are denominated in dollars. Data on external dollar borrowing of domestic firms were unavailable.

Table 1 presents descriptive statistics for the dollarization variables. The median of dollar mismatch is close to zero, indicating that domestic banks tend to match dollar deposits with dollar loans. The reason, as previously discussed, is that making dollar loans to domestic firms does reduce currency risk even if it does not necessarily hedge dollar deposits of residents. In addition, banks are often regulated to limit currency mismatches. The median of external dollar mismatch is also close to zero. Since weighted dollarization is a linear combination of dollar mismatch and total dollarization, its median not surprisingly falls in between the medians of those two variables.

One further point about liability dollarization needs emphasizing. Although we do not know, due to a lack of data, the extent to which these dollar liabilities are hedged with forward contracts, the total amount of dollar liabilities should at least be indicative of the total amount of *unhedged* dollar liabilities for two reasons. First, not all forward contracts eliminate foreign exchange risk. If a forward contract is made with other domestic banks or firms who earn revenue in pesos, then the country's aggregate net foreign exposure remains unchanged. Whether domestic redistribution of this risk is stabilizing is unclear (Eichengreen and Hausman, 1999). Second, as Eichengreen and Hausman point out, hedging opportunities with foreigners are limited as they are usually unwilling to sell dollars forward in exchange for domestic currency because of the "Original Sin" of emerging markets.

The extent to which the economy is open also affects the choice of exchange rate regime. Liability dollarization and openness together determine the amount of unhedged dollar liabilities. Liability dollarization is simply the amount of dollar liabilities while openness determines the degree to which these dollar liabilities are hedged with dollar-denominated assets. In a more open economy in which firms earn revenue in dollars, dollar credit is more likely to hedge the

dollar liabilities of domestic banks because dollar borrowing of domestic firms is more likely to be matched with dollar revenue. Thus, for a given level of dollarization, a less open economy is more likely to experience "fear of floating" as these dollar liabilities are less likely to be matched with dollar assets. Therefore, I also include a measure of openness, the lagged ratio of trade to GDP, as a regressor.

Moreover, the effect of the dollarization variables on the choice of exchange rate regime should depend on the degree of openness in the economy and in particular, the extent to which firms earn revenue in dollars. For example, consider the extreme case in which all firms earn revenue in dollars. Then an increase in deposit dollarization should not contribute to a "fear of floating" as banks' dollar liabilities are likely to be fully hedged. If this is the case in all countries, then the coefficient on deposit dollarization should be small. On the other hand, if all firms earn revenue in local currency, then dollar deposits are likely to be a source of currency risk for domestic banks and domestic firms as well, assuming banks match their dollar liabilities with dollar credit. This situation is likely to lead to a coefficient that is larger in absolute value. In separate regressions, therefore, I interact the dollarization variables with the ratio of exports to GDP and the ratio of trade to GDP. The interaction term should have a positive coefficient as the negative effect of increased dollarization on exchange rate flexibility should be smaller (in absolute value) in more open economies.

Dollar liabilities can also be hedged in financial markets through the use of forward contracts. Just as the effect of the dollarization variables should depend on the extent to which firms earn revenue in dollars, the effect should also depend on the ability to hedge through derivatives contracts. In separate regressions, therefore, I interact the dollarization variables with a dummy variable indicating the presence of a forward market.

In addition to the dollarization and openness variables, I include as a regressor a composite government quality measure. There are a number of reasons to think that government quality affects "fear of floating." First, improvements in government quality reduce unofficial dollarization by increasing confidence in the domestic currency (Honig, 2002). Absent the risk posed by dollarization, governments are not forced into choosing hard pegs out of the fear that large depreciations will destroy balance sheets. Moreover, not only does improved government quality provide more flexibility to the choice of exchange rate regime, it also affects the choice of regime itself. Greater credibility of monetary and fiscal policy associated with high government quality means that the benefits of hard pegs as commitment devices are no longer substantial. In addition, the independent monetary policy that accompanies a more flexible exchange rate regime is more effective in low dollarization environments in which policymakers do not have to worry that expansionary policy will lead to a depreciation that harms firm and bank balance sheets.

The government quality variable enters both linearly and as a quadratic term (Alesina and Wagner, 2004). The reason is that there are countries with good institutions that prefer to float and do so because they have enough credibility to implement independent monetary policy. But there are also countries with poor institutions that are forced to float because they do not have ability to maintain a fixed exchange rate regime. Thus the relationship between government quality and the exchange rate regime may be U-shaped.

The composite government quality variable, *GovQual*, is based on several variables from the *International Country Risk Guide*. *Bureaucracy Quality* (range 0-4) measures institutional strength and quality of the bureaucracy as well as autonomy from political pressure. Higher scores also indicate that the bureaucracy has the ability to operate without drastic changes in

policy when governments change. *Corruption* (range 0-6) within the political system measures the extent to which government officials are able to assume positions of power through patronage rather than ability and to which they can be influenced by illegal payments. Finally, *Law and Order* (range 0-6) assesses the strength and impartiality of the legal system and popular observance of the law. Higher scores also indicate well functioning political institutions, implying that this variable should be able to account for sound policy as well.[8]

Finally, I include a number of macro variables that affect the choice of exchange rate regime. The fact that domestic dollarization is still significant after controlling for these variables indicates that it contributes to "fear of floating." The theory of optimal currency areas (Mundell, 1961) suggests that open economies are more likely to adopt a fixed exchange rate regime because of the trade gains from stable exchange rates. I therefore include the lagged ratio of trade to GDP as an explanatory variable. This variable is also included, as previously discussed, to capture the extent to which dollar liabilities are hedged with dollar assets. Since smaller countries, which tend to be open and trade internationally, are more likely to adopt fixed exchange rates, I use the log of real GDP to account for country size. I also include the growth rate of real GDP. The growth rate of GDP measures either the incentive to engage in expansionary exchange rate policy or, conversely, the need for the countries to "tie their own hands."

As a robustness test, I include a number of other control variables. I include region and year dummies. I add the ratio of central bank foreign exchange reserves to M1, the growth in domestic credit and lagged inflation (Edwards, 1996). The ratio of central bank foreign exchange reserves to M1 reflects the ability of the central bank to maintain a pegged exchange

[8] I also estimate the model using averages of these variables taken over the 1980's to reflect long-run structural characteristics that only change gradually over time. Results were similar.

rate. Countries with a higher rate of growth of domestic liquidity will have a lower ability to sustain the peg. I also include measures of financial market openness and depth.[9] Exchange rate volatility due to capital flows is likely to be greater in countries with more open financial markets, leading to greater exchange rate intervention. On the other hand, more developed financial markets can handle volatility in capital flows with less volatility in the exchange rate. Finally, one argument for adopting a fixed exchange rate in the presence of high inflation is to import monetary policy credibility. I therefore include lagged inflation as a regressor. The base regression results were robust to the inclusion of these variables.

Before discussing the results, the issue of potential endogeneity must be addressed. It is possible that there is feedback from the exchange rate regime to the dollarization variables. The reason is that under floating regimes, domestic lenders, whether they are domestic depositors lending to domestic banks or domestic banks lending to domestic firms, might be more concerned about the value of the peso and therefore decide to denominate loans in dollars. Eliminating observations for which the exchange rate regime is classified as "freely falling" should alleviate the problem as these are the situations most likely to lead to increased use of the dollar as a store of value, both by domestic depositors and domestic banks. In addition, the dollarization variables enter the base regression with a lag to mitigate potential endogeneity. Lagging the dollarization variables had virtually no effect.

Moreover, the direction of the bias suggests that the absolute value of the coefficients of the dollarization variables, the sign of which should be negative, are actually underestimated. The reason is that if more flexible exchange rates with greater exchange rate volatility tend to

[9] Specifically, I add a dummy variable indicting an open capital account, the ratio of M2 to GDP, the stocks-traded turnover ratio defined as the total value of shares traded during the year divided by the average market capitalization for the year, the total value of stocks traded as a percent of GDP, domestic credit to the private sector as a percent of GDP and credit provided by the banking sector as a percent of GDP.

promote dollarization, then the covariance between the dollarization regressors and the error term is positive. If the true effect of dollarization on the exchange rate regime dependent variable is negative as a result of "fear of floating," then the positive covariance implies that the absolute value of the negative coefficient found in the estimation is actually under-estimated. So in fact, potential endogeneity in this case stacks the cards against finding an effect of dollarization on "fear of floating."

It is also possible that the strong correlation between fixed exchange rates and high levels of dollarization is the result of omitted variables bias. For example, high inflation in the past may have led to dollarization as well as the choice to peg the exchange rate in order to regain credibility. To address this issue, I include in a separate regression a variable that indicates the number of years in the past ten that annual inflation exceeded 100%. This variable is insignificant and its addition does not change the coefficient or significance of the dollarization variables.

There can also be feedback from the exchange rate regime to the ratio of trade to GDP, the variable that measures openness. There is a large empirical literature that attempts to document the effect of the exchange rate regime on openness to trade. Rose (1999), Rose and Frankel (2002), Rose and Glick (2002), and Rose and Van Wincoop (2001) find that reducing exchange rate volatility tends to promote trade. I therefore lag the openness variable in the base regression to mitigate this problem. I also constructed trade shares using aggregated fitted values from bilateral trade equations based on geography, population, land area and a dummy variable indicating whether a country is landlocked (Frankel and Romer, 1999). The results were almost identical.

3. Empirical Results

Table 2 presents results for the estimation of the effect of domestic liability dollarization on "fear of floating."[10] The dependent variable represents the choice of exchange rate regime with higher values indicating more flexible exchange rate arrangements. The value of one indicates pegs/crawls, two indicates managed floats and three, floats (excluding freely falling exchange rates). For all the different measures of domestic dollarization except dollar mismatch, an increase in dollarization is associated with a less flexible exchange rate regime.[11] These results provide strong evidence for an effect of domestic liability dollarization on "fear of floating."[12]

In addition, the coefficients of the linear and quadratic government quality term confirm the results of Alesina and Wagner (2004) that the relationship between government quality and exchange rate flexibility is U-shaped.[13] The openness variable almost always has a negative coefficient and is significant in roughly one-half of the regressions. The coefficient is theoretically ambiguous as countries that trade more might prefer fixed exchange rates, while more open economies might display less "fear of floating" and prefer more flexible exchange rate arrangements. However, when I used predicted trade shares using geographical variables, the coefficient tended to be positive, indicating that the negative feedback from flexible regimes to trade may have been causing the negative OLS coefficient. Using predicted trade shares did not affect the coefficients of the dollarization regressors.

[10] Coefficients are not multiplied by 100 in the tables.

[11] Clustering the standard errors to account for serial correlation within countries did not reduce the significance of the coefficients.

[12] As a robustness check, I ran separate regressions for each dollarization variable, first estimating the effect of the dollarization variable by itself and then adding each control variable one at a time. The effects of the dollarization variables remained significant. Tables are available on request.

[13] The standard deviation of *GovQual* is close to one, so a one-unit increase also represents an increase in one standard deviation.

In order to estimate the magnitude of these effects, Table 2A presents the marginal effects of changes in the dollarization variables on the probability of choosing a particular exchange rate regime. Each row represents a separate regression corresponding to the columns in Table 2. For brevity, I present only the effects of the dollarization variables. Although I will refer to "coefficients," I actually report dF/dx, the change in the probability of a particular exchange rate regime given a change in the regressors, evaluated at the mean of the regressors. Note that for the middle category, managed float, the sign of the marginal effects depends on values of the regressors. Only for the outer categories, pegs/crawls and floats, is the sign of the marginal effects unambiguous.

An increase in the ratio of dollar credit to total bank credit of one percentage point increases the probability that a country will choose a fixed exchange rate by 1.3 percentage points, reduces the probability of a managed float by 1.1 and reduces the probability of a float by .3. An increase in the ratio of dollar deposits to total bank liabilities of one percentage point increases the probability that a country will choose a fixed exchange rate by .9 percentage points, reduces the probability of a managed float by .6 and reduces the probability of a float by .3. A change in dollar mismatch does not have a significant effect on the probability of choosing a particular exchange rate regime, although as discussed earlier, dollar mismatch is not necessarily a good measure of the currency risk posed by dollarization. However, the coefficients of the total dollarization variable are large and significant. An increase in total dollarization of one percentage point increases the probability of a peg by 1.9 percentage points, reduces the probability of a managed float by 1.5 and reduces the probability of a float by .4. An increase in the weighted dollarization variable of one percentage point increases the probability of a peg by 2.2 percentage points, reduces the probability of a managed float by 1.6 and reduces the

probability of a float by .6. These coefficients are large and significant, providing convincing evidence for an effect of domestic liability dollarization on "fear of floating."

Table 2B presents the results from including interactions terms of the different dollarization variables with various measures of trade openness, financial market openness and financial market depth. Only the coefficients of the particular dollarization variable and the interaction term are presented. As previously discussed, the effect of dollarization on "fear of floating" should depend on the extent to which firms earn revenue in dollars or the extent to which dollar liabilities can be hedged in financial markets. The interaction term should be positive as increased hedging ability would be expected to reduce the absolute value of the negative effect of dollarization on exchange rate flexibility. The interaction terms with the ratio of trade to GDP have the correct sign in all specifications and are significant when using the ratio of dollar credit to total credit and external mismatch, although the coefficients are small. The coefficients are also small when interacting with the ratio of exports to GDP.

The interaction terms with the dummy variable indicating the presence of a forward market are insignificant. One explanation, as previously discussed, is that forward contracts do not necessarily provide good hedges. Hedging with other domestic residents does not alter a country's net foreign exchange exposure. Moreover, hedging opportunities with foreigners may be limited as foreigners are usually unwilling to take long positions in the domestic currency.

It is important to determine whether cross-sectional or time-series variation is driving the significance of the dollarization variables in Table 2. In general, there is far more cross-sectional variation in both the dependent and independent variables than time-series variation. This is especially true of the government quality variables but applies to the dollarization variables as well. It is therefore likely that cross-sectional variation is driving the results. To confirm this

suspicion, I estimate a linear probability model using the same ordinal dependent variable and compare the fixed effects and between estimator coefficient estimates. It is not surprising that fixed effects estimation yields insignificant results due to the lack of within-country variation whereas the between estimator coefficients were highly significant, both statistically and in magnitude. While these results are suggestive, they should be interpreted with caution given well known problems with linear probability models. In addition, the between estimator treats countries that do not change their exchange rate regime the same as countries with changing regimes but with the same average value. I therefore also estimate an ordered probit model in which I use only one observation for each country, regressing the exchange rate regime at the end of the sample period on the average of the regressors during the sample period. The results were quite similar, indicating again the importance of cross-sectional variation.[14]

To verify that the exclusion of freely falling exchange rates from the sample is not driving the results, I redefine the dependent variable. In Table 3, the dependent variable takes on the value 1 for pegs/crawls, 2 for managed floats and 3 for floats or freely falling exchange rates. The grouping of freely falling exchange rates with floats does not change the main results. The ordered probit coefficients are equally significant although somewhat smaller in magnitude. In Table 4, I put freely falling exchange rates into a separate category. The coefficients of all the domestic dollarization variables are still significant, while the magnitudes are once again smaller. As discussed earlier, including freely falling exchange rates tends may reduce the absolute value of the coefficients because of potential positive feedback to domestic dollarization. The fact that the coefficients are still significantly negative suggests that domestic dollarization does contribute to "fear of floating."

[14] Tables for both sets of regressions are available on request.

Finally, the last columns of Tables 2, 3 and 4 present results for the effect of *external* liability dollarization on "fear of floating." The regressor of interest is the external mismatch variable, defined as the foreign liabilities of domestic banks minus foreign assets, divided by total bank liabilities. External mismatch is significant at the 1% level in all three tables. These results match those found in previous studies that foreign liabilities contribute to "fear of floating." Moreover, including measures of both domestic and external liability dollarization in the regressions did not affect the coefficients obtained in separate regressions.

4. Conclusion

Previous attempts to analyze the effect of liability dollarization on "fear of floating" have focused exclusively on the role played by foreign liabilities. By contrast, this paper examines the effect of dollarization of the domestic banking system in emerging markets countries and developing nations. The findings provide strong evidence that domestic liability dollarization contributes to "fear of floating."

It is, therefore, possible that a country that is unable to reduce the risk posed by liability dollarization might choose to peg even though it would otherwise prefer to float based on optimal currency area considerations. Clearly, this is a sub-optimal outcome. However, unlike foreign borrowing, which is almost exclusively dollar-denominated due to the "Original Sin" of emerging markets, there is still hope that emerging markets can reverse the domestic liability dollarization process by building a reputation for sound policy and good governance. In other words, if emerging markets can achieve redemption from "Original Sin" in the domestic sense, then domestic liability dollarization should not always be treated as an initial condition that should frame the choice of exchange rate regime in emerging markets. For some countries, this

may be appropriate (Calvo, 1999), but for many others, unofficial dollarization should be viewed as an endogenous market response to bad policy, an outcome that can and should be reversed.[15] Although they may be forced in the short run to limit exchange rate movements while there are still large unhedged dollar liabilities, countries experiencing this problem should choose to fix (or even officially dollarize) as opposed to float, only if they would make the *same* choice without this source of currency risk. If not, they should reverse dollarization so that floating does not involve so much risk. Only then can emerging market countries and developing nations choose an exchange rate regime without "fear of floating."

Acknowledgements

I have greatly benefited from comments from two anonymous referees. I also wish to thank Frederic Mishkin, Richard Clarida, Linda Goldberg, Geoffrey Woglom, Beth Yarbrough, Jean Boivin, Mitali Das, Francisco Ciocchini, Paulo Barelli for invaluable comments and helpful discussions. Finally, I would like to thank seminar participants at the Amherst College faculty seminar and the Five College faculty seminar.

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[15] Forced measures to de-dollarize an economy such as punitive reserve requirements and mandatory holding periods for dollar deposits are almost always met with significant capital flight and declines in bank credit (Reinhart, Rogoff and Savastano, 2003). Thus de-dollarizing without improving government quality involves significant costs.

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Table 1
Summary statistics for dollarization variables

	No. Obs.	Median	Std. Dev.
Dollar Credit/Total Bank Credit	273	28.9	25.5
Dollar Deposits/Total Bank Liabilities	738	16.0	18.6
Dollar Mismatch/Total Bank Liabilities	257	2.5	20.9
Total Dollarization/(Total Bank Credit + Liabilities)	257	27.9	20.6
Weighted Dollarization	237	18.0	19.6
External Dollar Mismatch/Total Bank Liabilities	961	-2.0	20.9

Notes: All ratios expressed in percentage terms.

Table 2
Effect of Dollarization on "Fear of Floating"

Dependent variable: Regime (1 peg/crawl, 2 managed float, 3 float)						
Dol. Credit/(Tot. Credit) lag	-0.036					
	(5.14)***					
Dol. Deposits/(Tot. Liab.) lag		-0.024				
		(5.00)***				
Dol. Mismatch/(Tot. Liab.) lag			0.015			
			(1.57)			
Tot. Dol./(Tot. Credit+Liab.) lag				-0.051		
				(5.60)***		
Weighted Dol. Lag					-0.057	
					(5.30)***	
External Dol. Mismatch lag						-0.017
						(2.66)***
GovQual	-3.769	-1.439	-3.720	-3.487	-4.367	-0.419
	(3.81)***	(2.74)***	(4.03)***	(3.32)***	(3.92)***	(1.28)
GovQual squared	0.504	0.199	0.533	0.472	0.608	0.073
	(3.43)***	(2.38)**	(3.87)***	(3.05)***	(3.75)***	(1.30)
Trade/GDP lag	-0.004	-0.007	0.002	-0.010	-0.015	-0.004
	(0.71)	(2.41)**	(0.43)	(1.77)*	(2.50)**	(1.63)
Log Real GDP	0.222	0.037	0.284	0.048	0.075	0.068
	(2.71)***	(0.78)	(3.13)***	(0.48)	(0.69)	(1.66)*
Growth Rate Real GDP	-0.095	-0.007	-0.117	-0.100	-0.114	-0.059
	(2.58)***	(0.40)	(3.35)***	(2.59)***	(2.99)***	(3.96)***
No. of Obs.	137	317	123	123	118	447
No. of Countries	26	53	25	25	25	53
Pseudo *R*-square	0.31	0.09	0.15	0.34	0.32	0.04

Notes: All ratios and growth rates expressed in percentage terms. Absolute value of z statistics in parentheses. * significant at 10%; ** 5%; *** 1%

Table 2A
Effect of Dollarization on "Fear of Floating" - marginal effects

	Peg/Crawl	Managed	Float
Dol. Credit/(Tot. Credit) lag	0.013	-0.011	-0.003
	(5.57)***	(4.24)***	(3.03)***
Dol. Deposits/(Tot. Liab.) lag	0.009	-0.006	-0.003
	(5.10)***	(4.42)***	(4.39)***
Dol. Mismatch/(Tot. Liab.) lag	-0.006	0.003	0.003
	(1.58)	(1.49)	(1.56)
Tot. Dol./(Tot. Credit+Liab.) lag	0.019	-0.015	-0.004
	(5.99)***	(4.25)***	(2.84)***
Weighted Dol. lag	0.022	-0.016	-0.006
	(5.37)***	(3.79)***	(3.09)***
External Dol. Mismatch lag	0.006	-0.004	-0.002
	(2.66)***	(2.59)***	(2.56)**

Notes: All ratios and growth rates expressed in percentage terms. Absolute value of z statistics in parentheses. * significant at 10%; ** 5%; *** 1%

Table 2B
Effect of Dollarization on "Fear of Floating" - with interaction terms

Dependent variable: Regime (1 peg/crawl, 2 managed float, 3 float)					
Dol. Credit/(Tot. Credit) lag	-0.056				
	(3.67)***				
Dol. Deposits/(Tot. Liab.) lag		-0.032			
		(2.72)***			
Dol. Mismatch/(Tot. Liab.) lag			0.030		
			(1.59)		
Tot. Dol./(Tot. Credit+Liab.) lag				-0.064	
				(3.09)***	
External Dol. Mismatch lag					-0.074
					(5.24)***
Interaction w/	0.000	0.000	0.000	0.000	0.001
Trade/GDP	(1.67)*	(0.79)	(0.96)	(0.73)	(4.46)***
Dol. Credit/(Tot. Credit) lag	-0.042				
	(3.23)***				
Dol. Deposits/(Tot. Liab.) lag		-0.019			
		(1.91)*			
Dol. Mismatch/(Tot. Liab.) lag			0.046		
			(2.50)**		
Tot. Dol./(Tot. Credit+Liab.) lag				-0.049	
				(2.75)***	
External Dol. Mismatch lag					-0.075
					(5.95)***
Interaction w/	0.000	0.000	-0.001	0.000	0.002
Exports/GDP	(0.55)	(0.52)	(2.09)**	(0.13)	(5.24)***
Dol. Credit/(Tot. Credit) lag	-0.036				
	(3.90)***				
Dol. Deposits/(Tot. Liab.) lag		-0.024			
		(3.80)***			
Dol. Mismatch/(Tot. Liab.) lag			0.034		
			(2.46)**		
Tot. Dol./(Tot. Credit+Liab.) lag				-0.063	
				(3.62)***	
External Dol. Mismatch lag					-0.042
					(3.42)***
Interaction w/	-0.009	-0.003	-0.053	-0.006	0.021
Forward Market	(0.88)	(0.46)	(2.58)***	(0.44)	(1.45)

Notes: All ratios and growth rates expressed in percentage terms. Absolute value of z statistics in parentheses. * significant at 10%; ** 5%; *** 1%

Table 3
Effect of Dollarization on "Fear of Floating" - alternative dependent variable

Dependent variable: Regime (1 peg/crawl, 2 managed float, 3 float/freefall)						
Dol. Credit/(Tot. Credit) lag	-0.016					
	(3.80)***					
Dol. Deposits/(Tot. Liab.) lag		-0.009				
		(2.73)***				
Dol. Mismatch/(Tot. Liab.) lag			0.025			
			(3.52)***			
Tot. Dol./(Tot. Credit+Liab.) lag				-0.022		
				(4.27)***		
Weighted Dol. lag					-0.021	
					(3.26)***	
External Dol. Mismatch lag						-0.019
						(3.66)***
GovQual	-1.116	-0.205	-0.840	-0.515	-0.972	-0.031
	(1.50)	(0.44)	(1.17)	(0.69)	(1.28)	(0.11)
GovQual squared	0.147	0.012	0.133	0.070	0.137	0.004
	(1.28)	(0.16)	(1.22)	(0.61)	(1.18)	(0.07)
Trade/GDP lag	-0.010	-0.005	-0.005	-0.014	-0.013	-0.007
	(2.57)**	(2.28)**	(1.42)	(3.30)***	(2.92)***	(3.58)***
Log Real GDP	0.092	0.006	0.132	-0.050	0.004	0.055
	(1.41)	(0.15)	(1.73)*	(0.62)	(0.05)	(1.51)
Growth Rate Real GDP	-0.100	-0.056	-0.124	-0.100	-0.103	-0.091
	(4.15)***	(4.03)***	(4.73)***	(4.05)***	(4.17)***	(7.34)***
No. of Obs.	178	389	162	162	157	546
No. of Countries	26	55	25	25	25	54
Pseudo *R*-square	0.15	0.05	0.14	0.15	0.13	0.09

Notes: All ratios and growth rates expressed in percentage terms. Absolute value of z statistics in parentheses. * significant at 10%; ** 5%; *** 1%

Table 4
Effect of Dollarization on "Fear of Floating" - alternative dependent variable

Dependent variable: Regime (1 peg/crawl, 2 managed float, 3 float, 4 freefall)						
Dol. Credit/(Tot. Credit) lag	-0.009					
	(2.46)**					
Dol. Deposits/(Tot. Liab.) lag		-0.007				
		(2.08)**				
Dol. Mismatch/(Tot. Liab.) lag			0.028			
			(4.02)***			
Tot. Dol./(Tot. Credit+Liab.) lag				-0.013		
				(2.78)***		
Weighted Dol. lag					-0.009	
					(1.66)*	
External Dol. Mismatch lag						-0.020
						(3.91)***
GovQual	-0.442	0.094	-0.090	0.043	-0.299	0.032
	(0.69)	(0.21)	(0.14)	(0.07)	(0.45)	(0.11)
GovQual squared	0.057	-0.030	0.029	-0.003	0.048	-0.004
	(0.57)	(0.40)	(0.29)	(0.03)	(0.46)	(0.08)
Trade/GDP lag	-0.007	-0.004	-0.005	-0.010	-0.009	-0.007
	(2.12)**	(1.96)*	(1.44)	(2.62)***	(2.10)**	(3.63)***
Log Real GDP	0.118	0.014	0.137	0.013	0.059	0.066
	(1.92)*	(0.34)	(1.89)*	(0.18)	(0.78)	(1.84)*
Growth Rate Real GDP	-0.098	-0.062	-0.123	-0.100	-0.102	-0.094
	(4.42)***	(4.61)***	(5.08)***	(4.42)***	(4.46)***	(7.68)***
No. of Obs.	178	389	162	162	157	546
No. of Countries	26	55	25	25	25	54
Pseudo *R*-square	0.10	0.04	0.12	0.10	0.08	0.08

Notes: All ratios and growth rates expressed in percentage terms. Absolute value of z statistics in parentheses. * significant at 10%; ** 5%; *** 1%

Appendix A

Below I list the variables and sources used. The data is annual and it covers the period 1988–2001.

Table A1

Variable	Description and Source
Dollarization Variables	
Dollar Credit	Foreign currency credit issued by domestic banks to the resident private sector. Source: IMF Country Reports.
Dollar Deposits	Foreign currency deposits of residents held in domestic banks. Source: IMF Country Reports.
Total Credit	Total credit issued by domestic banks to the resident private sector. Source: IMF Country Reports.
Total Liabilities	Total liabilities of domestic banks. Source: IMF Country Reports.
Foreign Assets	Foreign assets of domestic deposit money banks. Source: IFS.
Foreign Liabilities	Foreign liabilities of domestic deposit money banks. Source: IFS.
Exchange Rate Regime Variables	
de facto regime	Source: Reinhart and Rogoff (2003)
de jure regime	Source: IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*.
Macro Variables	
Trade (% of GDP)	Exports plus Imports divided by GDP. Source: IFS and WDI.
Exports (% of GDP)	Exports divided by GDP. Source: IFS and WDI.
Real GDP	GDP in 2000 dollars. Source: IFS and WDI.
Growth in Real GDP	Annual percentage change of real gross domestic product. Source: WDI.
Central bank foreign exchange reserves (% of M1)	Central bank foreign exchange reserves as percent of M1. Source: IFS.
Growth in Domestic Credit %	Annual percentage change in domestic credit. Source: IFS.
Inflation %	Annual percentage change in Consumer price index. Source: IFS and WDI.
Financial Market Openness and Depth	
Presence of Forward Market	Dummy variable for whether a forward market was reported to exist, as opposed to being reported to be underdeveloped, heavily regulated, or nonexistent. Source: IMF's Annual Report on Exchange Arrangements and Exchange Restrictions.
Open Capital Account	Dummy variable indicating an open capital account. Source: IMF's Annual Report on Exchange Arrangements and Exchange Restrictions
M2 (% of GDP)	Money and quasi money (M2) as % of GDP: comprises the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. Source: WDI.
Stocks traded, total value (% of GDP)	Total value of stocks traded as percent of GDP. Source: WDI.

Stocks traded, turnover ratio %	The total value of shares traded during the year divided by the average market capitalization for the year. Average market capitalization is calculated as the average of the end-of-year values for the current year and the previous year. Source: WDI.
Credit to private sector (% of GDP)	Domestic credit provided by banking sector (% of GDP): includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. The banking sector includes monetary authorities and deposit money banks, as well as other banking institutions where data are available. Source: WDI.
Domestic credit provided by banking sector (% of GDP)	Domestic credit to private sector (% of GDP): refers to financial resources provided to the private sector, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include credit to public enterprises. Source: WDI.
Government Quality Variables	
Bureaucracy Quality	Bureaucratic Quality, scale of 0-4. Source: International Country Risk Guide, published by The PRS group.
Corruption	Corruption in Government, scale of 0-6. Source: International Country Risk Guide, published by The PRS group.
Law and Order	Measures law and order tradition, scale of 0-6. Source: International Country Risk Guide, published by The PRS group.