

## V. Corporate Vulnerability: Have Firms Reduced Their Exposure to Currency Risk?

### Firms Facing More Currency Volatility

Foreign currency financing can be a double-edged sword for companies in emerging markets. Foreign currency borrowing (usually in dollars) give firms options to secure funding at a lower cost and at longer maturities, yet can leave firms' balance sheets vulnerable to currency swings. In the 1990s and early this decade, sharp currency depreciations in several countries in Latin America drove up the value of firms' foreign currency debt relative to their assets and income, impairing many firms' ability to service debt. This, in turn, exacerbated the banking difficulties that many of these countries experienced.

Over the past decade, firms in many countries in Latin America have faced higher day-to-day fluctuations in exchange rates, as these countries now allow greater exchange rate flexibility to better adjust to external shocks and provide more independence to monetary policy. Moreover, by switching to more flexible regimes, countries have also removed the perception of implicit guarantees prevailing under pegged regimes. Under fixed or pegged regimes, the central bank would attempt to keep currency volatility within a preannounced range, effectively providing free currency risk insurance to the private sector.

This chapter looks at how firms have managed currency movements in this new environment, which has a bearing on the vulnerabilities of the corporate sector arising under a flexible exchange

### Exchange Rate Volatility Across Periods 1/

	Nominal Exchange Rate 2/		Real Exchange Rate 2/	
	1995–98	2004–07	1995–98	2004–07
Argentina	0.01	1.15	0.33	1.20
Brazil	0.78	3.40	0.96	3.40
Chile	1.61	2.22	1.60	2.21
Colombia	2.53	3.25	2.72	3.34
Mexico	2.67	1.84	2.92	1.88
Peru	0.98	1.02	1.10	1.10

Sources: IMF, International Financial Statistics; and IMF staff calculations

1/ The first period is January 1995 to December 1998, except for Mexico, where it corresponds to the period January 1996 to December 1998. The second period is January 2004 to December 2007.

2/ Standard deviation of monthly percentage changes of the bilateral exchange rate with respect to the U.S. dollar.

rate regime. This is especially important given the heightened exchange rate volatility and the sharp depreciation of currencies in the region in the past few months.

The chapter draws on a new micro-level database that links corporate balance sheet and stock market data for 1,200 publicly traded firms (both financial and nonfinancial) in Argentina, Brazil, Chile, Colombia, Mexico, and Peru.<sup>25</sup> For non-financial enterprises, the data set also provides detailed information on a firm's share of assets, liabilities, and sales in foreign currency.<sup>26</sup> With these data at hand, the chapter first describes the evolution of firms' net foreign currency positions over a relatively long time span (1992–2007). We complement this balance sheet analysis by exploring the sensitivity of firms' stock market valuations to exchange rate changes in two sub-periods, 1995–98 and 2004–07, and test whether

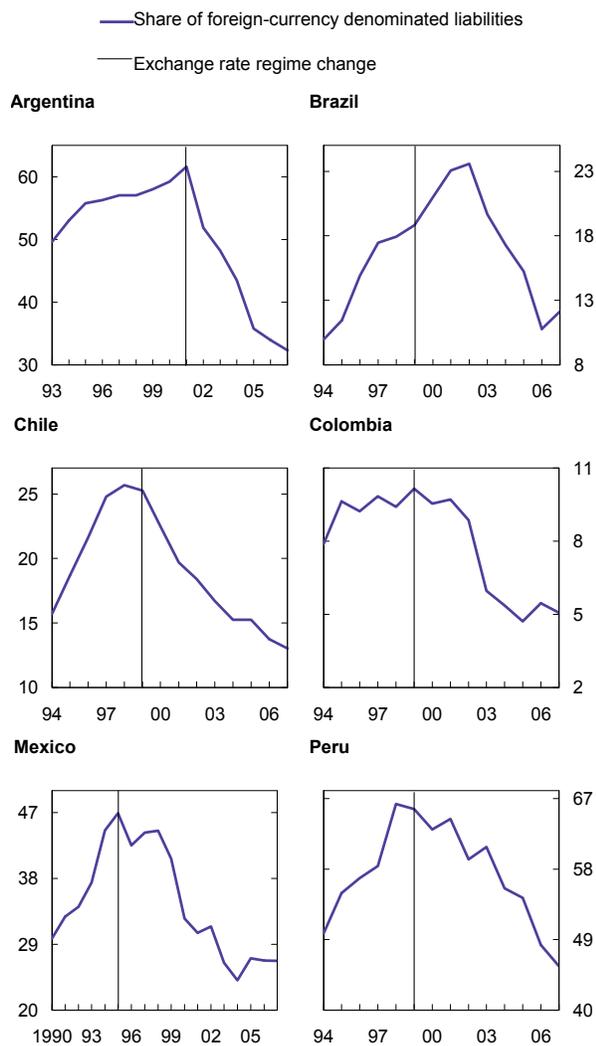
<sup>25</sup> Focusing only on publicly listed firms may have the disadvantage that since many small firms are typically not quoted in the stock market, the sample may not be representative of the whole economy. On the other hand, focusing on publicly listed corporations has the benefit that financial statistics are more reliable and comprehensive than for private firms.

<sup>26</sup> The database is described in more detail in Appendix 5.1.

Note: This chapter was prepared by Herman Kamil and Bennett Sutton. The authors are grateful for the support of Benedict Clements and David Moreno.

### Sharp Decline in Foreign Currency Debt Contracting by Non-Financial Firms

(Annual averages across firms)



Source: IMF staff calculations.

the response of firms' market values to currency fluctuations has changed over time.

The results show that firms have become, on average, substantially more insulated from currency risk in the more recent period. They have relied less on foreign currency liabilities, and have reduced currency mismatches by using operational hedges (i.e., exports and dollar assets) more systematically. Using stock market return data, we find that for a significant fraction of firms, the impact of exchange rate changes on equity prices has declined considerably since mid-2000. Taken

together, these results suggest that firms are better prepared to deal with exchange rate shocks than in previous crises. Companies seem to have become more aware of exchange rate risk, and have taken steps to adapt their balance sheet structure and risk-management practices to meet the potential challenges posed by greater exchange rate flexibility.

### Stronger Balance Sheets

Over the past 10 years, many firms in the nonfinancial sector have sharply cut their balance sheet exposure to a sudden devaluation by reducing the share of debt contracted in foreign currency. At the same time, they have reduced their cash-flow sensitivity to exchange rate changes by matching more systematically their foreign currency debt relative to their foreign currency revenues (as measured by their exports and dollar assets).

Looking at the trends of foreign currency exposure by country, we see that foreign currency debt as a share of total debt of nonfinancial firms rose sharply during the 1990s and then began to fall rapidly, typically when countries introduced flexible exchange rate regimes.<sup>27</sup> These shares have been relatively low in Brazil and Colombia, which actively discouraged financial dollarization, but reached fairly high levels in the two highly dollarized countries in the sample, Argentina and Peru. The sharp decline in foreign currency liabilities in Argentina since 2001 reflects, of course, the end of the convertibility scheme. The average share of foreign-currency-denominated

<sup>27</sup> Two additional facts are worth highlighting. First, the decline in the share of foreign currency debt is observed both in the tradable and nontradable sectors. Second, the decline in corporate liability dollarization in the most recent period is significant even after eliminating mechanical valuation effects, i.e., the appreciation of domestic currencies vis-à-vis the U.S. dollar. See Kamil (2008) for a more detailed discussion of these stylized facts.

liabilities in Latin America dropped from 35 percent in 1998 to 17 percent in 2007.<sup>28</sup>

Also, in all six countries, firms have built up considerable foreign exchange buffers, by hedging a higher share of their dollar liabilities with export revenues and assets denominated in foreign currency. In the cases of Brazil, Chile, and Colombia, the sum of firm-level exports and dollarized assets is now, on average, much larger than foreign currency liabilities.<sup>29</sup>

## Beyond Balance Sheets: A Market-Based Approach

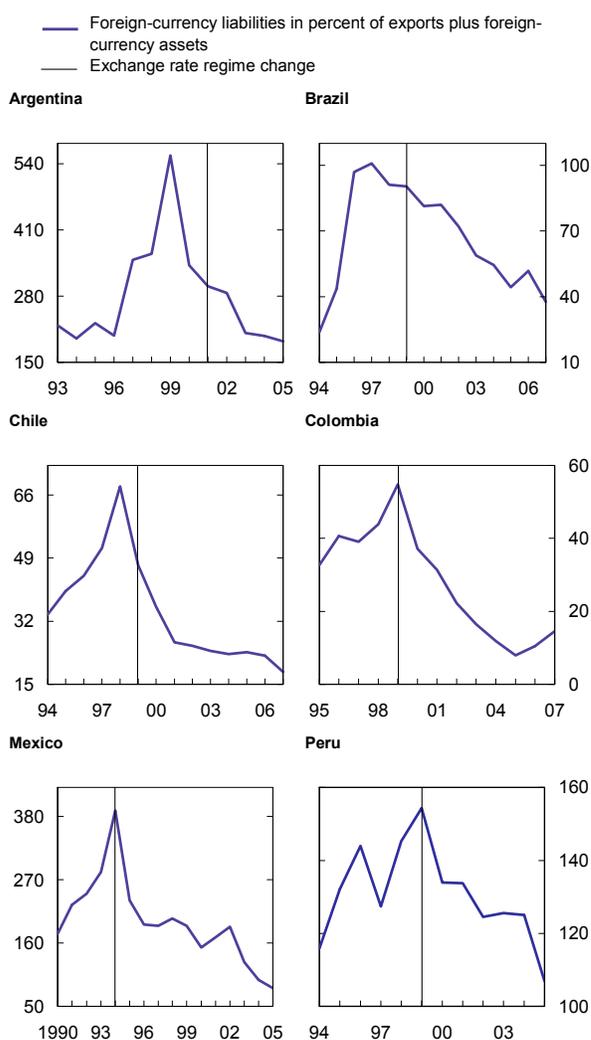
While balance sheets appear stronger, currency volatility can still affect a firm's financial position and operating performance through many other channels. Firms may rely on imported intermediate inputs, introducing currency risk into their cost structure. Firms can also be sensitive to exchange rate changes through multinational operations or competition in domestic markets with foreign companies. In highly competitive industries where markups are low, for example, exchange rate changes may affect profitability, since it may be more difficult to alter the price charged to customers. Finally, firms may purchase financial derivatives contracts to offset their balance-sheet exchange rate risk.

Yet information on the sensitivity of a firm's multinational activities and profit margins to currency movements is typically unavailable. Moreover, financial derivative positions are off-balance sheet, and often not reported. In this section we use an alternative way to gauge a firm's overall foreign currency exposure, by estimating the contemporaneous impact of exchange rate movements on a firm's stock-market valuation.

<sup>28</sup> A similar reduction in financial dollarization is observed in household deposits in the banking sectors of Argentina, Chile, Mexico, and Peru (see Rennhack and Nozaki, 2006).

<sup>29</sup> These ratios, however, may underestimate the sensitivity of net income to an exchange rate depreciation, as they do not include firm-level imports, for which data are unavailable.

### Better Use of Natural Currency Hedging (Annual medians across firms)



Source: IMF staff calculations.

Stock prices' reaction to exchange rate changes should, in principle, summarize the multiple channels through which exchange rate fluctuations can affect firms' value.

In line with the literature, stock-market exchange rate exposure is defined as the percentage change in a firm's stock price following a 1 percent depreciation of the nominal effective exchange rate.<sup>30</sup> A firm has a positive (negative) exposure when nominal share values

<sup>30</sup> See Dominguez and Tesar (2006) and references therein.

**Fraction of Firms Exposed to Currency Fluctuations in the Most Recent Period 1/**

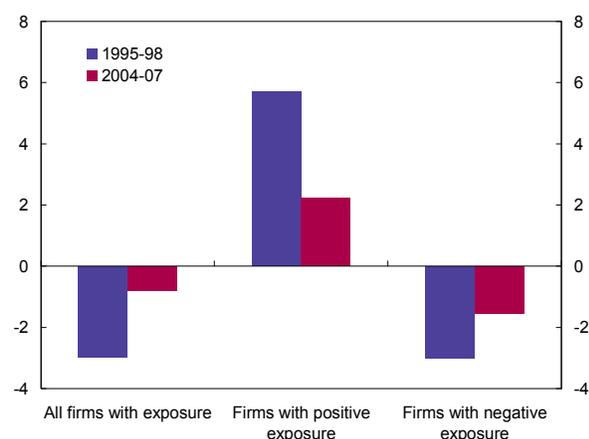
	Exposed Firms (Percent of All Publicly-Traded Firms in each Country)		Market Capitalization of Exposed Firms (Percent of Total Market Capitalization in each Country)	
	1995-98	2004-07	1995-98	2004-07
	Argentina	44.8	11.5	84.2
Brazil	34.7	16.7	76.1	10.8
Chile	19.6	6.6	45.2	2.4
Colombia	44.8	7.5	56.6	12.1
Mexico	18.4	10.7	43.3	5.3
Peru	26.1	15.5	48.9	15.5

Sources: Economatca; and IMF staff calculations.

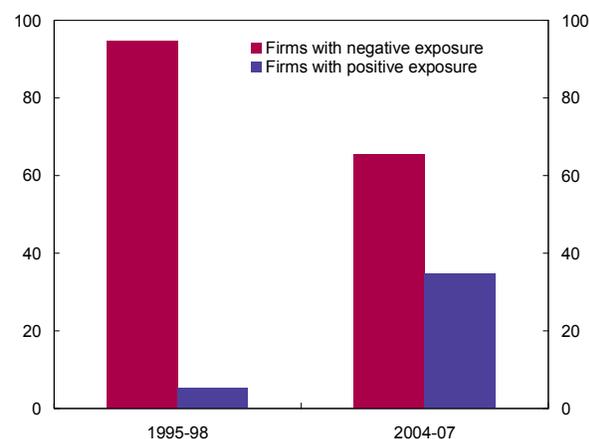
1/ Refers to firms with a statistically significant exchange-rate exposure coefficient (regardless of sign).

**Magnitude and Direction of Foreign Exchange Exposure 1/**

**Average elasticity of stock prices to a 1 percent exchange rate devaluation 2/**



**Proportion of firms negatively and positively exposed to exchange rate devaluations**



Sources: Economatca; and IMF staff calculations.

1/ Only firms with an exchange-rate exposure coefficient statistically different from zero are used in calculations.

2/ Average of exchange-rate exposure coefficients, weighted by firm's average market capitalization (in U.S. dollars) during the period.

are, on average, favorably (adversely) affected by a depreciation of the domestic currency.<sup>31</sup> If exchange rate changes have no statistically significant effects on a firm's stock returns, the firm is said to have no currency exposure.

To apply this approach, weekly stock-market data for all financial and nonfinancial publicly traded firms in six Latin American countries (Argentina, Brazil, Chile, Colombia, Mexico, and Peru) were collected between January 1995 and December 2007.<sup>32</sup> The average sensitivity of each firm's stock price to currency fluctuations was estimated for two subperiods: 1995–98 and 2004–07. Using these two periods allows for a comparison of firms' behavior before and after many countries adopted more flexible exchange rates regimes. Also, choosing the 2004–07 period provides enough time to capture the effects of long-term trends, such as the development of markets to hedge currency risk.

The estimates support the view that firms' currency exposure has declined substantially in the more recent period. Specifically we find:

- *Fewer firms exposed.* During 1995–98, the fraction of firms exposed to currency risk ranged from a low of 18 percent for Mexico to a high of almost 45 percent for Argentina. By 2004–07, the fraction of firms exposed to exchange rate fluctuations had decreased in all countries, especially in Argentina, Brazil, Colombia, and Chile. The shift is even more striking when we consider the share of market capitalization accounted for by those firms that have exchange rate exposure. In Brazil, for example, this

<sup>31</sup>Likewise, for a firm with positive (negative) exposure, an exchange rate *appreciation* would decrease (increase) its stock market value, all else equal.

<sup>32</sup> In estimating the effect of exchange rates on firms' stock prices, controls are introduced to account for other factors that may simultaneously affect the value of the firm, like world stock market returns and world commodity prices. Appendix 5.1 presents the methodology in more detail and discusses the possible limitations of this approach.

share decreased from 76 percent in 1995–98 to 11 percent in the more recent period.<sup>33</sup> The fact that the market capitalization accounted for by firms with currency exposure has fallen more than proportionally to the fraction of exposed firms, suggests that it is mostly larger firms that have become increasingly insulated from currency risk. Given the economies of scale involved in operating in hedging markets, small and medium-sized firms may have less access to hedging strategies than large firms.<sup>34</sup>

- *Firms that remain exposed have, on average, a relatively lower degree of exposure.* In Mexico during 1995–98, for example, a 1 percent nominal depreciation (appreciation) would have reduced (increased) the value of the average firm's equity by 2 percent. However, by 2004–07, for the firms that remained exposed to currency risk, a 1 percent depreciation (appreciation) would have reduced (increase) the share price by 1.1 percent.<sup>35</sup>
- *The nature of the exposure has also changed between these two periods.* In the early sub-period of 1995–98, the vast majority of firms exposed to currency risk would have been harmed (helped) by

unanticipated depreciation (appreciation) of the exchange rate. In contrast, during the most recent period, of the firms that are still exposed to currency risk, a significant share would be helped (harmed) by an unanticipated depreciation (appreciation) of the currency.

## More Active Use of Foreign Currency Derivatives

One important way firms may have cut the exposure to currency risk has been the growing reliance on financial derivatives to hedge currency risk. Over the past decade, transactions costs in forward-currency markets have come down sharply, falling by half or more in Brazil, Chile, and Mexico. Also, the number of firms participating in currency-derivative markets has skyrocketed, rising roughly fivefold in Colombia and Chile in the last six years. In Brazil, on the other hand, 60 percent of the publicly-traded firms in 2006 used some form of currency derivative. In Brazil, Chile, and Colombia, the trend towards increased use of foreign exchange derivatives became most noticeable after 1999, when these countries floated their currencies.

### Bid-Ask Spreads in Forward Markets

	1998	2004–07 1/
Brazil	0.45	0.13
Chile	0.21	0.09
Mexico	0.21	0.11

Sources: Bloomberg; Jadresic and Selaive (2005).

1/ Average within period, in percentage.

In Colombia, almost 90 percent of currency-derivative transactions are done through forward contracts. This is consistent with the fact that trade credits make up the bulk of foreign currency liabilities of Colombian firms (Echeverry and others, 2003). In contrast, the most commonly used instruments to manage foreign currency exposures in Brazil are currency swaps and options. This is consistent with the observation

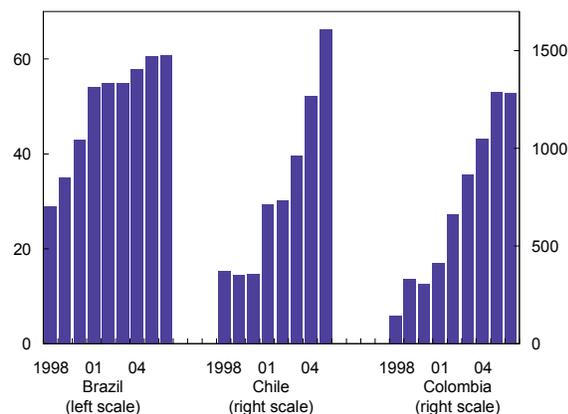
<sup>33</sup> In unreported analysis, we confirmed that this result is not driven by changes across periods in the number or sectoral composition of firms quoting in the stock market.

<sup>34</sup> The changes in the nature of exposure across firms with different sizes could also be the result—at least in part—of stronger export growth in the transition to more flexible exchange rate regimes, leading to a greater export coverage and the buildup of foreign assets. The fact that smaller firms are left with large (negative) exposure could support this view, to the extent that smaller firms tend to operate only domestically while exporting firms tend to be large firms operating globally.

<sup>35</sup> This magnitude is consistent with Chue and Cook (2007) in a similar study covering 15 emerging-market countries. In general, average exchange rate exposure elasticities for Latin American firms are similar in magnitude to that of Turkey, but significantly higher (in absolute terms) than those of East Asian countries.

### Participation of Firms in Currency Derivatives Markets in Brazil, Chile, and Colombia

(Number of firms)<sup>1/</sup>



Sources: National authorities; and IMF staff calculations.

<sup>1/</sup> For Colombia and Chile, corresponds to the total number of firms either publicly traded or private. For Brazil, corresponds to the share of publicly traded firms.

that corporate foreign exchange rate exposure in Brazil is primarily driven by firms that issue dollar-denominated or dollar-linked financial debt.

Evidence for Colombia indicates that derivatives transactions have been used to effectively offset the foreign-currency risk created by on-balance-sheet mismatches (Kamil, Maiguashca, and Perez, 2008) rather than for speculative purposes. Yet evidence on whether derivatives in Brazil and Mexico have been used for hedging purposes rather than for speculation is more sparse. There is the possibility that off-balance-sheet activities increase the risk exposure, when not used to hedge but to speculate. Very recently, some firms in Brazil and Mexico have incurred significant losses on foreign currency derivative positions when the exchange rate depreciated in October. More information disclosure is needed to understand the impact of off-balance-sheet transactions on the foreign exchange exposure of firms, especially foreign currency options.

## Conclusions

Our empirical analysis provides evidence that the corporate sector has been proactive in reducing its vulnerability to exchange rate risk since the financial crises in the 1990s and early this decade. Three “buffering” forces appear to be at

work. First, firms rely less on foreign currency liabilities and now depend more on domestic sources of local currency funding. Second, firms have been more actively using “natural” currency hedges to offset the dollar risk arising from their debt portfolios. Third, many firms have been making extensive use of foreign-currency derivatives to protect themselves from unexpected movements of exchange rates. With effectively managed currency exposure, firms can reduce their cost of capital or sustain more financial leverage without incurring financial risk—a key pillar for sustained economic growth.

The reduced exposures of firms to foreign exchange risks are not only the direct result of firm actions, but also the improved macro-economic policies and institutional reforms that have increased financial depth and opportunities for risk diversification in these economies. For example, low and stable inflation has increased the availability of long-term domestic currency funding. The high demand by local institutional investors (partly due to regulatory incentives) has helped develop this market segment. Also, the transition to more flexible exchange rates has been accompanied by new legislation governing the role of pension funds in financial markets, which has helped spur the development of currency derivative markets. At the same time, changes in bank regulations have forced banks to care more about the credit risk arising from currency mismatches of borrowers.

Market-based estimates of exchange rate exposure provide additional insights on changes in both the magnitude and direction of exchange rate exposure. The fraction of firms exposed to changes in currency movements decreased significantly in 2004–07 compared with 1995–98. A similar story holds for the average sensitivity of firms’ stock prices to exchange rate developments, which has also fallen in the most recent period. Moreover, the direction of exposure has also changed over time. During the first period, we find that the response of stock prices to exchange rate depreciations was overwhelmingly negative.

By contrast, between 2004 and 2007, among those Latin American firms that remained exposed, a higher fraction (35 percent) now benefit from a depreciation of the domestic currency.

Yet the results presented in this chapter give no room for complacency. We find that significant currency exposures have become concentrated among smaller firms, which could be vulnerable to a sharp currency depreciation. Also, more work is needed to understand the effect of off-balance-sheet transactions on foreign exchange exposure of firms, especially in countries like Brazil and Mexico, where markets have become more sophisticated and off-balance-sheet activities can substantially alter the overall risk exposure.

The empirical results presented in this chapter have important implications for exchange rate policy and financial stability. A plausible interpretation of our results is that the trend in the region to adopt flexible exchange rates has given firms sufficient incentives to manage currency risk and be better prepared for external shocks. In turn, the development of currency derivatives markets has been endogenous to the risks and the incentives corporations have faced; improved corporate governance and institutional infrastructure may have helped as well. As financial derivatives become more sophisticated and complex, it is important for regulatory frameworks to adapt to market developments, along with reinforcing prudential supervisory practices.

## Appendix 5.1

### Description of Data Set

The empirical analysis in this chapter draws on a new database with annual accounting and stock market information for over 1,200 financial and nonfinancial companies in Latin America. It covers all firms that are listed—or have been listed—in the six countries' stock exchanges between 1995 and 2007. A major difference between this data set and the ones used in prior

cross-country work is that it contains detailed information on three key drivers of exchange rate exposure for nonfinancial firms: the currency composition of assets and liabilities, the share of foreign currency revenues in total sales, and firms' access to international debt and equity markets

The data for this paper were assembled from four different sources. Balance sheet and general company information were obtained from annual financial statements drawn from local stock markets or regulatory agencies in each country. This information was complemented and cross-checked with data obtained from commercial provider Economatca. Data on foreign currency liabilities and assets was hand-collected from the financial explanatory notes of firms' balance sheets. This data set was augmented with information on firms' involvement in international trade, using the countries' customs office records to match data on exports for each firm in the sample using their fiscal code identifier and/or name. Finally, Economatca was used to obtain stock market information for each firm.<sup>36</sup> Below we present the main summary statistics of the data set used.

### Methodology

The empirical model used to estimate stock market exchange rate exposure is given by

$$R_{it} = \beta_{0,i} + \beta_{1,i} \hat{S}_t + \beta_{2,i} R_t^W + \sum_{m=1}^{m=5} \delta_{m,i} P_{m,t}^C + e_{it}, \quad (1)$$

where  $R_{it}$  is the stock return of firm  $i$  at time  $t$ ,

$\hat{S}_t$  measures the change in the country-specific trade-weighted exchange rate,  $R_t^W$  is the return on a world stock market index measured in U.S. dollars, and  $P_{m,t}^C$  denotes the percentage change in

<sup>36</sup> Further details on the data construction and variable definitions are provided in Kamil (2008).

prices for five key commodities relevant for Latin America (oil, corn, soybeans, coffee, and copper). We measure the exchange rate as the domestic currency price of foreign currency (so that an increase in  $\hat{S}_t$  is equivalent to a depreciation). We find that the nominal exchange rates follows a random walk, implying that percentage changes in the nominal exchange rate are basically unanticipated.

To measure exposure at the firm level, it is necessary to distinguish between the direct effects of exchange rate movements on firm value, and the effects of other macroeconomic factors that simultaneously affect both firm value and exchange rates. Following Chue and Cook (2007) an instrumental-variable approach is used that identifies the total exposure of a company to exchange rate movements, yet abstracts from the influence of confounding macroeconomic shocks. For these purposes, world financial variables (the yen-dollar, and euro-dollar exchange rates and the federal funds interest rate) are used as instruments to identify that part of exchange rate movements that is exogenous to the market's local conditions.

Even though we can assume that world financial variables are exogenous, they can still be correlated with global shocks that affect Latin American stock markets. This possibility implies

that the correlation between the world instruments and the error term can be nonzero, violating our identification assumptions. We include the term  $R_t^W$  and world commodity prices to absorb any remaining correlation between world instruments and the error term.

Under this specification, the coefficient  $\beta_1$  (the “exchange rate beta”) reflects the change in stock returns that can be explained by movements in the exchange rate after conditioning on the world market return and changes in international commodity prices. For each country and period, we estimate equation (1) separately for each firm and compute  $\beta_1$ , the exchange rate beta, and its statistical significance.

One limitation of this stock-market approach to measuring exchange rate exposure is that some traded stocks may be illiquid, and thus prices changes may not accurately reflect the market's current assessment of firms' values. To reduce these concerns, we excluded from estimation firms with fewer than two months of data over the period 1995 to 2007. We also excluded outlier estimates of exchange rate betas in the lower and upper 2 percent of their distribution in each country.

### Summary Statistics of the Firm-Level Data Set (average values across firms, except where noted)

Firm-level Averages:	Balance Sheet Variables			Stock Market Variables		
	Dollarization of Liabilities (%) 1/	Dollarization of Assets (%) 1/	Exports to Sales (%)	Market Capitalization (mil. of dollars) 2/	Stock Liquidity (%) 3/	International Listing (%) 4/
Argentina	57.6	4.7	9.5	70	1.4	9
Brazil	17.4	1.6	11.7	146	2.4	14
Chile	22.4	8.4	8.8	137	1.6	8
Colombia	6.9	1.2	6.1	87	2.8	2
Mexico	37.8	7.5	14.3	179	2.0	19
Peru	62.1	15.6	17.9	35	1.6	3

Sources: Economática; and IMF staff calculations.

1/ Liabilities (assets) denominated or indexed to foreign currency (typically the dollar), issued domestically or abroad.

2/ Median values.

3/ Monthly value traded of the stock, relative to its month-end market capitalization (period average for each firm).

4/ Fraction of firms that have cross-listed shares in the U.S. stock market .