Depositary Receipts, Country Funds, and the Peso Crash: The Intraday Evidence

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Abstract

We study the intraday impact of exchange rate news on emerging market American Depositary Receipts (ADRs) and closed-end country funds during the 1994 Mexican peso crisis. Peso exchange rate changes affect prices and trading volumes of Latin American equities, and some closed-end fund behavior is consistent with "noise trader" theories of small investors. However, there is no evidence that peso depreciation triggers a significant sell-off of non-Mexican securities or that other non-Mexican trading patterns change at times of high peso news flow. Thus, the "Tequila Effect" is largely confined to price changes.

The recent economic crises in Mexico, Asia, Russia, and Brazil demonstrate that currency devaluation can be associated with severe downturns in equity markets. In the case of Mexico, the value of the currency declined from 3.4 pesos per dollar at the end of September 1994 to almost 7 pesos per dollar at the end of March 1995. A stock price drop from $63 to $28 over the same period for Telefonos de Mexico typifies the behavior of Mexican equities. The depreciation of the Mexican peso was also thought to trigger price declines in other Latin American stock, currency, and sovereign debt markets, a phenomenon known as "spillover", "contagion", or the "Tequila Effect". Shares of Telefonica de Argentina, for example, dropped from $35 to $24 during the same period. IMF First Deputy Managing Director Stanley Fischer describes such spillover as "excessive", suggesting that "a way should be found to moderate it."[1]

Spillover is consistent with increased economic and financial linkages across national borders and portfolio rebalancing by investors.[2] If global investors reassess the risk and required return for emerging markets upward because of Mexican developments, they may liquidate their holdings of equities, bonds, and currencies from emerging markets beyond Mexico, thereby causing a decline in prices. Spillover can also arise from contagion. A stampede out of a currency, banking system, or equity market can be "self-fulfilling", that is, it can occur even if the economic fundamentals of a country are not fatally weak [Obstfeld (1986)]. Given uncertainty, imperfect information, or irrational investors, a currency attack, bank run, or equity sell-off can touch off a contagious chain reaction of panic trading which spreads from one market to another. Costly bailouts of troubled economies have, in part, been justified as needed to stave off such contagion [Eichengreen, Rose, and Wyplosz (1996)]. Given the apparent susceptibility of the global financial system to such crises, there is renewed interest in capital barriers which, for

example, Chile has imposed for a number of years and which Malaysia adopted in 1998.[3]

While notions of hot money and contagion abound, there is little empirical evidence. The purpose of our paper is to examine the impact of intraday peso-dollar exchange rate changes and the arrival of exchange rate news on Mexican and other developing country equities listed on the New York Stock Exchange (NYSE).[4] We aim to answer three questions. First, how does exchange rate information affect markets for Mexican and other emerging economy equities, and, in particular, is there any evidence of a "Tequilla Effect"? Second, do we observe any evidence of destabilization due to panic selling by investors? Third, did the ADR market dominated by large investors behave differently from the closed-end fund market dominated by individual investors? [5]

Our data and methodology offer several advantages. While other papers have documented the impact of exchange rates on monthly stock returns[6] or looked for spillovers using daily data, our intraday data allows us to measure precisely the immediate impact of exchange rate information. Second, we look at trading activity and liquidity in addition to returns. By distinguishing buyer-initiated trades versus seller-initiated trades, we measure the extent to which panic selling or other destabilizing behavior was induced by the arrival of exchange rate information. Third, we measure the presence and amount of qualitative peso news. and, therefore, condition our tests on the degree of news intensity. Barberis, Shleifer, and Vishny (1998) suggest that one-time strong news events like the peso crisis should generate an overreaction. By conditioning our tests on the degree of news intensity, we could see whether the arrival of more news led to overreaction. Finally, we study both ADRs and closed-end country funds. Much trading of emerging-market equities occurs on the NYSE in the form of ADRs and

funds,[7] and closed-end funds are believed to attract small investors who have less access to information and professional management skills. If small investors make decisions using very limited information (Gompers and Metrick (1998), Grinblatt and Keloharju (1999)), the closed-end fund market may be dominated by small investor "sentiment" or "noise trading" (Bodurtha, Kim, and Lee (1995)). Contrasting the ADR and closed-end fund markets reveals whether contagion, panic, or overreaction differed across investor clienteles.

Our results indicate that peso information does indeed have a significant impact on the pricing and trading volume of emerging market ADRs and closed-end country funds. However, there is no evidence that the pattern of buy versus sell volume for non-Mexican stocks is immediately affected by peso-dollar exchange rate changes. In other words, NYSE traders do not dump non-Mexican equities in a panic as a response to Mexican exchange rate developments. Furthermore, there is no evidence of a Tequila Effect for Asian securities and only modest evidence of "positive feedback" trading in which investors place orders based on price changes. Finally, some evidence suggests that closed-end fund market dominated by small investors is more sensitive to Mexican news than the ADR market dominated by institutional investors.

The paper is organized as follows. Section I describes our data while Section II presents a graphical overview. Section III presents and discusses our primary intraday results. Section IV searches for a more gradual "Tequila Effect" in lower-frequency data and discusses other issues. Section V is a summary and conclusion.

I. The Data

We base our tests on three types of stock market data. Price indicators are returns and absolute values of returns. Trade indicators are the balance of trades initiated by buyers versus

sellers, and the volume of shares traded. Liquidity indicators are the bid-ask spread and quoted depth. These series are, in turn, related to measures of the change in the Mexican pesos per U.S. dollar exchange rate and the amount of other qualitative news stories about peso fluctuations and their impact.

We collect data from three sources for the period from October 1, 1994 to April 30, 1995.[8] The Trade and Quote (TAQ) database of the NYSE contains time-stamped data on all trades and quotes on the NYSE. We extract time-stamped transactions prices, volumes, and quoted bid and ask prices and depths for stocks selected as follows. First, we take data for all Mexican and other Latin American ADRs which the New York Stock Exchange Fact Book indicates were listed as of the end of 1993. Countries represented (number of ADRs) are Argentina (4), Brazil (1), Chile (7), Colombia (1), Mexico (14), Panama (2), and Venezuela (1). Second, we add ADRs for Hong Kong Telecom, Indosat (Indonesia), Korea Electric Power, Pohang Iron and Steel (Korea), and Philippine Long Distance Telephone to represent emerging markets outside Latin America. Third, we select closed-end country funds for the Latin American countries which have listed ADRs and, where possible, for the Asian countries whose ADRs we added to the sample. We also include several Latin American regional closed-end funds, and, finally, the Thailand Fund to proxy for that notable Southeast Asian market.[9] Appendix A identifies the 36 ADRs and 15 closed-end funds we select. Note that ADRs and closed-end funds are not perfect substitutes. Although both trade under the same NYSE specialist system, less sophisticated investors may prefer to hold convenient closed-end country funds rather than constructing portfolios of ADRs. For example, Value Line and other sources indicate that U.S. institutional investors held 35.8 percent of the $11 billion total capitalization of Telefonos de Mexico in

the fourth quarter of 1994. They held only 9.1 percent of the $475 million capitalization of the Mexico Fund during the same period. Thus, ADR and closed-end fund markets may contrast significantly in terms of the trading costs, access to information, or information processing ability of their investor clienteles.

The Bloomberg Information Service is our source of intraday exchange rate changes. We collect all stories from October 1994 to April 1995 with headlines that quote the peso-dollar exchange rate. The headlines of these stories quote both the bid and ask exchange rates, and we process the bid-ask midpoints into half-hour percent changes to serve as the exchange rate change variable in our regressions.

The Dow Jones News Retrieval system serves as the source of *qualitative* news stories about the peso-dollar exchange rate.[10] We measure the flow of qualitative peso news with the number of stories about the origins, impact, or future course of fluctuations in the peso-dollar exchange rate. Appendix B details how we collect news stories from Dow Jones and how we screen them to produce a record of qualitative news suitable for our purposes. Note that both our exchange rate revisions from Bloomberg and our qualitative news stories from Dow Jones are not private information, although less sophisticated individual investors are not likely to have access to these electronic news services.

We divide the sample period into half-hour intervals and exclude intervals that span close to open. Half-hour intervals capture the intraday flavor of market behavior while allowing us a sufficiently large interval in which to detect substantial variation in the amount of information arriving. We can, for example, observe many half-hour periods with no news flow along with many half-hour periods during which multiple news stories arrive. For each ADR and closed-end

fund in the sample, we compute the half-hourly bid-ask midpoint return, trading volume, and two measures of liquidity, spread and depth. Bid-ask midpoint returns eliminate the bid-ask bounce noise in transactions returns (Roll (1984)) and can reflect information more rapidly as market participants update quotes even when there are no trades (Jones, Kaul, and Lipson (1994)) or information is insufficient to move prices by a tick (Chan, Chung, and Johnson (1993)). We also compare the transactions prices with the prevailing quotes and classify each as buyer-initiated or seller-initiated.[11] A trade is classified as buyer (seller) initiated if it occurs at the ask (bid) price. If the trade price lies within the spread, we record the trade as buyer (seller) initiated if the trade is closer to the ask (bid) price. We then compute NETBUY, the volume of stock trading initiated by buyers minus the volume of stock trading initiated by sellers for each half-hour interval.[12] Blume, MacKinlay, and Terker (1989) use a similar measure, dollar volume at ask minus dollar volume at bid, to study order imbalances during the October 1987 stock market crash. Harris (1989) studies the behavior of the proportion of trades at the bid versus at the ask towards the end of the trading day.

Most of our tests are based on pooled time-series cross-sectional data so as to maximize the number of observations in each test. We stack all the observations of equities within a particular category together and estimate pooled time series cross-sectional regressions. The specification assumes that the errors have a first-order moving-average structure, contemporaneous correlation, and group-wise heteroskedasticity.[13] Because NETBUY, volume, and depth differ significantly in scale across ADRs and closed-end funds, we apply cohort-specific standardization to these variables.

II. Overview

Figure 1 plots the weekly high, low, and close for the pesos per dollar exchange rate, dollar prices for ADR shares of a major Mexican corporation, Telefonos de Mexico (TMX), and dollar prices for shares of the most prominent Mexican closed-end fund, the Mexico Fund (MXF). It is evident that there was a dramatic shift in the level and volatility of the peso/dollar exchange rate beginning in late December 1994. Dollar losses of 50 percent or more for TMX and MXF typify the behavior of our sample of Mexican ADR and fund prices during this period. Note again that ADRs and closed-end country funds trade in dollars. The large dollar losses clearly represent the point-of-view of U.S. investors but may also be relevant for Mexican investors who perceive the dollar rather than the peso as their numeraire.

We have also produced summary statistics (available on request) on the trade and quote data of the ADRs and closed-end funds listed in Appendix A. Percent bid-ask spreads and quoted depths typically rise through our sample period while trading volumes and frequencies typically peak at the height of the peso crisis in January 1995. ADRs have higher depth, trading volume, trading frequency, and order size. This is consistent with large institutional investors concentrating their trades in the ADR market rather than in closed-end country funds.

III. Empirical Results

We subject our price, trade, and quote series to several types of tests. First, we regress stock returns and NETBUY on current and lagged peso-dollar exchange rate changes to assess the impact of peso depreciation on equity returns and the pattern of equity trading. Interactive terms are included to permit slope coefficients to vary with the degree of news intensity as measured by QNEWS, the number of peso-related news stories arriving during the interval. Second, we regress the absolute value of stock returns, the trading volume, and the two liquidity

measures on ABSFX, the absolute value of the peso-dollar exchange rate return across the half-hour interval, DNEWS, a dummy variable which equals one if there is at least one qualitative news story within the half-hour interval and equals zero otherwise, and QNEWS. Next, we examine persistence with autoregressions of returns and NETBUY, again including interactive terms to see if autocorrelation varies with news intensity. We also test for positive feedback trading by regressing NETBUY on leads and lags of individual equity returns. Finally, we examine whether the reaction of stock returns to peso exchange rate changes occurred gradually during the day, rather than almost immediately. To save space in our tables, we do not include the number of data observations. Given the number of days in our sample period and the number of half hour periods in a trading day, we have 1,157 observations (13 periods per day times 89 days) for each individual ADR and closed-end fund series in our sample. In any given regression, the number of observations is equal to 1,157 times the number of individual securities in the particular category, minus the small number of observations lost due to any lagging of explanatory variables.

A. The Impact of Peso Information on Equity Prices and Trading Patterns

The left-hand panel of Table I reports estimates of regressions of half-hourly ADR and closed-end fund returns on contemporaneous and lagged changes in the peso-dollar exchange rate. The returns are pooled across different groups of ADRs and closed-end funds.

The regression coefficients on the contemporaneous peso-dollar exchange rate change, FXRATE, are significant for all but the Asian categories. The negative signs indicate that increases in the peso-dollar exchange rate are associated with significant declines in dollar prices of Mexican and other Latin American equities traded on the NYSE. More specifically, a one

percent increase in the peso-dollar exchange rate is associated with a contemporaneous 0.13 percent decline in Mexican ADR prices and a 0.12 percent decline in Mexican closed-end fund prices, and cumulative declines approaching 0.30 percent. Significant negative slope coefficients also result for non-Mexican Latin American equities, although they are smaller than for Mexican equity returns themselves. For example, a one percent increase in the peso-dollar exchange rate is associated with a 0.02 percent contemporaneous drop in non-Mexican Latin American ADR prices and a 0.04 percent drop in non-Mexican Latin American closed-end fund prices.

The significance of slope coefficients on lagged exchange rate changes suggests persistence or a delayed impact of exchange rate changes on equity prices. This relates to the results of other authors. In the model of De Long, Shleifer, Summers, and Waldmann (1990), rational speculators follow and amplify the "positive feedback trading' of noise traders to produce persistence or momentum. The empirical results of Jegadeesh and Titman (1993) suggest momentum exists in U.S. equity returns. In the model of Brennan and Cao (1997), foreign investors have limited information and rely on past asset performance to guide their investment decisions. Therefore, the significant delayed response of equity prices to exchange rate changes that we find may be rational if NYSE investors have limited information with which to assess equity values, although Table I shows that this delayed impact does not extend beyond Latin America. Unreported equality of coefficient tests indicate no significant difference between return reactions in the ADR and closed-end fund markets.

Two issues arise in considering the slope coefficients on FXRATE. First, dollar values of Mexican companies are invariant to changes in the pesos per dollar exchange rate only if purchasing power parity holds perfectly and, therefore, all fluctuations in the exchange rate are

purely nominal. Otherwise, the association between stock returns and exchange rates will reflect a variety of export competitiveness, monetary (Jorion (1991)), and political factors (Bailey and Chung (1995)). Second, we might imagine that a general loss of confidence in Mexico would lead to equally large declines in the value of the peso and Mexican stock values. However, the slope coefficents we report are less than one, suggesting that investors retain much of their faith in the long-run value of Mexican stocks even as the currency loses value. Finally, we have not attempted to classify peso exchange rate changes or news stories as "good" or "bad". It is plausible that the scale and speed of the equity market response depends on the sign of the exchange rate change. McQueen, Pinegar, and Thorley (1996) find that small stocks tend to have delayed reaction to good news but not to bad news. Therefore, the delayed reactions we report could potentially come from good news. We therefore also create a dummy variable equal to one when the peso-dollar exchange rate decreases (good news) and zero otherwise. However, we do not find any evidence of additional delayed reaction under good news.

The left-hand panel of Table I also includes estimates of slope coefficients on interactive terms constructed from the product of the news intensity variable, QNEWS, and the change in the peso-dollar exchange rate, FXRATE. Slope coefficients on the contemporaneous interaction terms test whether equity price reactions to changes in the peso-dollar exchange rate are heightened, dampened, or unchanged at times when qualitative news arrives. Slope coefficients on lagged interaction terms test whether these reactions persist or reverse at times of high information flow. We find that negative contemporaneous and lagged associations between Mexican equity returns and peso-dollar exchange rate changes are accentuated by qualitative news arrival. That is, exchange rate changes seem to affect Mexican equity prices particularly

strongly during times when there is relatively high qualitative news flow about the Mexican currency. A significant negative association also crops up at those times of high news intensity between non-Mexican Latin American equity returns and changes in the peso-dollar exchange rate. The negative slopes on lagged interactive terms for both Mexican and non-Mexican Latin American equities indicate persistence, rather than reversal, of the negative impact of peso depreciation on these equity values.

The right-hand panel of Table I reports tests for changes in the pattern of trading at times when exchange rates change. NETBUY, buyer-initiated volume minus seller-initiated volume, is regressed on the same contemporaneous and lagged exchange rate changes and interactive terms. We find a significant negative relationship between Mexican equity NETBUY and the peso-dollar exchange rate change. This suggests that investors sold Mexican ADRs and closed-end country funds at times of peso depreciation. Thus, adverse exchange rate movements not only have an impact on Mexican equity prices but appear to lead many investors to rebalance their holdings away from Mexico. However, there is no evidence of a "Tequila Effect" rebalancing for non-Mexican Latin American or Asian vehicles. The insignificant slope coefficients indicate that investors did not sell off non-Mexican equities when the Mexican peso depreciated, nor did they appear to divert their capital from Mexican to non-Mexican investments. There is some evidence that NETBUY reacts more strongly for Mexican closed-end funds relative to Mexican ADRs, which could be consistent with overreaction or "noise trading" by small investors.

B. The Impact on Return Volatility and Trading Volume

Table II presents evidence on whether equity return volatility or trading volume are affected by the flow of peso news or the volatility of changes in the peso-dollar exchange rate.

Volatility is measured with the absolute value of the return or change series. The left-hand panel of the table reports regressions of volatilities of ADR and closed-end fund returns on ABSFX, DNEWS, and QNEWS. We find that increases in exchange rate volatility, ABSFX, or the intensity, QNEWS, of qualitative peso news flow are associated with increases in ADR and fund return volatility for all series except Asian ADRs. This is evidence of volatility spillover into the non-Mexican Latin American markets.

The right-hand panel of Table II presents similar test results for trading volume. Half-hourly trading volume is regressed on ABSFX, DNEWS, and QNEWS. ABSFX and QNEWS are significant for all but the Asian vehicles, and DNEWS is often significant as well. Significant slopes are uniformly positive and, therefore, indicate that peso volatility and news flow are associated with increased trading volume. Unreported equality of coefficient tests suggest that the impact of peso news and peso-dollar exchange rate volatility on volume is broadly similar for closed-end funds and ADRs.

When Table II is considered along with Table I, it is evident that Mexican peso fluctuations and related news supply useful information to traders of Mexican and non-Mexican equities. As the Mexican peso depreciates, the market revalues Mexican and non-Mexican Latin American equities downward, particularly at times of high qualitative peso news flow. However, there is little evidence of any instantaneous stampede out of non-Mexican securities induced by Mexican peso fluctuations and related news. We return to the question of whether there is a more gradual reaction to Mexican peso news in Section IV.

C. The Impact on Liquidity

Next, we look at associations between exchange rate information and the liquidity of the

ADR and closed-end country fund markets. Following Lee, Mucklow, and Ready (1993), we construct two liquidity measures, the quoted bid-ask spread and quoted depth (the sum of depth at the bid and ask) at the end of each half-hour interval. The left-hand panel of Table III presents regressions of quoted spread on ABSFX, DNEWS, and QNEWS. High values of these indicators are associated with increases in the spread for most non-Asian categories. This indicates that the spread dimension of liquidity contracted at times of high peso news flow or volatility. Unreported equality of coefficient tests suggest that this effect does not differ significantly when comparing ADRs and closed-end funds

The right-hand panel of Table III presents regressions with quoted depth as the dependent variable. DNEWS is significant for Mexican ADRs, Asian ADRs, and Mexican closed-end funds. The number of stories, QNEWS, is significantly negative for Mexican closed-end funds while exchange rate volatility, ABSFX, is important for the Mexican series. Interestingly, increases in ABSFX appear to decrease Mexican ADR depth while increasing Mexican closed-end fund depth. That is, peso volatility tends to cause closed-end fund investors to submit more limit orders, in contrast to the behavior of ADR investors. Thus, peso information contracts the depth dimension of liquidity for ADRs but expands it for closed-end funds. Unreported equality of coefficient tests confirm that the associations between depth and these explanatory variables differs substantially in comparing ADRs to closed-end funds.

Overall, Table III shows no uniform “Tequila Effect” on liquidity at times of Mexican exchange rate changes or exchange rate related news. The depth dimension of liquidity behaves differently in the ADR and closed-end fund markets at times when exchange rate volatility is high or exchange rate news is arriving. The expansion of closed-end fund liquidity at times of peso

information flow contrasts with the earnings announcement results of Lee, Mucklow, and Ready (1993). They found some tendency for liquidity to recede around periods of news arrival. Although there is a considerable contrast in that our peso news represents public, presumably unanticipated news released at unscheduled times, our finding is nonetheless interesting. It also suggests significantly different behavior in the closed-end fund market that is thought to be dominated by small individual investors.

To follow through on this evidence, we also conducted an additional test to examine how Mexican bid and ask depths respond to peso fluctuations separately. Details are not reported here but are available on request. We find that, while ADR ask depth decreases with peso devaluation, closed-end fund ask depth *increases* significantly. That is, when the dollar value of the peso drops, closed-end fund investors seem eager to submit additional limit orders to sell Mexican closed-end funds. There is also evidence that ADR liquidity shrinks significantly on the bid side when the peso declines. This does not happen to bid depth in the closed-end fund market. Thus, both ADR buyers and sellers seem to exhibit less desire to trade on peso depreciation while Mexican closed-end fund owners appear anxious to submit sell orders under such circumstances.[14]

D. Persistence in Returns and Trading Patterns

Our evidence thus far suggests that exchange rate information is useful to market participants in determining Mexican and non-Mexican equity prices but is not consistent with panic selling in the non-Mexican markets. It appears that the markets digest this public information in an orderly manner, although some additional price volatility and trading volume is experienced. In this subsection, we take a closer look at the behavior of returns and trading patterns to understand more fully the potentially destabilizing behavior of the markets during this

crisis.

We first regress equity returns and NETBUY on their own first two lags and lagged interactive terms equal to their own value times QNEWS. If prices initially overreact to information and a correction takes place within an hour, the serial correlation of equity returns will be negative for the first two lags. For example, investors could overreact if they overweight recent news (such as an unusually large currency depreciation) as suggested by Barberis, Shleifer, and Vishny (1998). Furthermore, the panic selling behavior of investors may cause them to herd so that the serial dependence of NETBUY is positive. The inclusion of the interaction terms allows us to test whether serial correlation in stock returns or NETBUY is affected by whether or not there is qualitative news about the peso. More specifically, we expect to find different signs on slopes for contemporaneous versus lagged interaction terms if price and trade behavior tend to reverse and "correct" their previous behavior during periods when there is peso news flow.

The left-hand panel of Table IV reports results for returns. Both Mexican ADRs and Mexican closed-end funds show strong negative serial correlation at the first lag. Mexican equity returns appear to reverse or correct to some degree from one half-hour period to the next. The Mexican closed-end funds show no significant serial correlation at the second lag, but the significant positive slopes on the first lags of the interactive term suggest that autoregressive behavior is significantly reversed by relatively intense qualitative news flow. Almost all the non-Mexican vehicles show insignificant serial correlation. Unreported equality of coefficient tests suggest that the responses of ADRs and closed-end funds are not statistically significantly different.

The right-hand panel of Table IV presents results for NETBUY. There is much evidence

of positive serial correlation at the first and second lags for NETBUY. Put another way, the pattern of buys versus sells in these markets is strongly persistent. However, we also examined NETBUY for a control sample of ordinary U.S. firms during the same time period. Although Mexican ADRs have higher NETBUY serial correlation than ordinary U.S. firms, NETBUY for the other ADRs and closed-end funds has serial correlation similar to the control sample of ordinary U.S. firms. Therefore, we cannot interpret the serial correlation of the non-Mexican NETBUY as herding. The positive serial correlation of Multicountry Latin closed-end fund NETBUY seems to strengthen when the flow of qualitative peso news is relatively high while Non-Mexican Latin American ADRs and Asian ADRs appear to demonstrate reversal or correction. Finally, unreported equality of coefficient tests confirm that NETBUY is more persistent for ADRs than for closed-end funds. Persistence in NETBUY could reflect "working an order" to trade a large block of shares gradually,[15] and we would expect this to be more prevalent for the ADRs rather than for the closed-end funds which appeal to smaller investors.

E. Evidence on Positive Feedback Trading and Destabilization

This subsection presents an additional test for persistence in trading patterns. Several authors have modeled or tested for momentum in prices and trading patterns. The model of De Long, Shleifer, Summers, and Waldmann (1990) combines noise traders and rational speculators who follow them to yield persistence, bubbles, and other potentially destabilizing behavior which drives asset prices away from their rational levels. In the context of our intraday experiments, we cannot measure the long-run behavior of our ADR and closed-end fund markets, but we can check for evidence which is consistent with "destabilizing" behavior.[16]

In Table V, we investigate the strong positive persistence of NETBUY in greater detail.

NETBUY is regressed on three leads and lags of own equity returns. "Positive feedback trading" occurs when traders follow a "momentum" strategy: They place buy orders when prices are going up and place sell orders when prices are declining. An asset market bubble can be thought of as an extreme outcome of such trading. Significant positive slope coefficients on lagged returns are consistent with positive feedback trading. There is indeed some evidence of significant positive slopes on lags of the equity return but only for a few cases, and mostly for ADRs. There is also a strong contemporaneous positive correlation between NETBUY and return for all non-Asian vehicles. This suggests a "market impact" of trades on prices, and the marginally stronger effect for closed-end funds is consistent with the lighter trading activity in those markets.

Significance slope coefficients in Table V are more frequent and strong for *subsequent* equity returns. All ADR and closed-end fund series show that NETBUY has a strong positive impact on the current and next period's equity return, and four series show a positive impact two or three half-hour periods ahead. Blume, MacKinlay, and Terker (1989) report similar results in comparing order imbalances and stock returns during the crash of October 1987. Choe, Kho, and Stulz (1999) find some delayed impact of large foreign trades on Korean stock returns, including some tendency for the impact of large sales to reverse within a few minutes. This delayed impact could represent public or private information, anticipation of subsequent returns, front-running by brokers, or "cascades" as described by Blume, MacKinlay, and Terker (1989). In our case, unreported equality of coefficient tests confirm that the impact of order imbalances on returns is statistically significantly stronger for closed-end funds than for ADRs, which suggests illiquidity or small investor sentiment in the closed-end fund market.[17]

We also find that these associations documented in Table V are similar in the pre-crisis

period, again implying that the lead/lag relationship between NETBUY and return is not accentuated by the crisis. Therefore, we cannot attribute the patterns documented in Table V to the currency crisis. When combined with the results in Table IV, we conclude that there is little evidence of crisis-related herding, positive feedback, or other potentially disruptive trading patterns for non-Mexican equities.

IV. Is There a Gradual Tequila Effect?

Our previous results suggest a significant response of Mexican and non-Mexican Latin American equity returns to peso-dollar exchange rate movements. There is also some evidence of a small delayed reaction. Does our use of high-frequency data obscure more substantial delayed responses to peso developments?

Panel A of Table VI follows Table I in regressing equity returns on the change in the exchange rate and the interactive QNEWS term, but uses daily (that is, open-to-close) rather than half-hourly data. The slope coefficients seem substantially larger than those produced by intraday regressions. The coefficient for Mexican ADR returns is about -0.4 in the daily regression while the sum of contemporaneous and first lagged coefficients from the intraday regression in Table I is only about -0.3. Mexican closed-end fund returns display a similar gap between intraday and daily coefficients while daily coefficients for non-Mexican Latin American equities are double or triple the size of the intraday responses.

The seemingly larger coefficients in daily regressions deserve further explanation. One possibility is that a gradual intraday response to exchange rate changes is not completely captured with only one 30-minute lag as in Table I. Therefore, we add additional lags to the intraday regressions. In regressions with 12 lags, we find that the sum of contemporaneous and lagged

coefficients is, with the exception of non-Mexican Latin American ADRs, not statistically different from the point estimates of daily slopes in Panel A of Table VI. Put another way, the intraday responses "add up" to the daily responses. However, the bulk of the explanatory power comes at contemporaneous or low lags. Panel B of Table VI presents the sums of slope coefficients from intraday regressions with 1, 3, 6, 9, and 12 lags.[18] Only in the case of non-Mexican closed-end funds does convergence of the sum of the intraday coefficients to the daily coefficient appear to take more than a few lags. We also estimate VAR impulse response functions for selected individual ADRs and funds. The results (available on request) confirm that the impact of an exchange rate shock dies off after two or three lags.

The daily regression results illustrate a principal advantage of using high frequency data. Although there may be some delayed reaction to peso news, the higher frequency data can detect the immediate reaction of equity returns to exchange rate changes. We also find that the impact of peso developments on non-Mexican NETBUY (results available upon request) is small at daily horizons as it is at intraday horizons: Once again, peso exchange rate changes cannot be shown to cause large sell-offs of non-Mexican equities.

Can the degree of gradual response we find be attributed to quote staleness or infrequent trading of the stocks that comprise our portfolios? The average ADR in our sample has 318 quotes per day and 178 trades per day while the average closed-end fund has 212 quotes per day and 100 trades. Two aspects of the summary statistics (unreported but available from the authors on request) suggest that infrequent trading cannot explain the gradual reaction. First, the gap between daily and summed intraday slope coefficients is evident even if we estimate a regression individually for Telmex, a stock with over 2000 average quotes and trades per day, or for other

heavily-traded individual equities in the sample. Second, the frequency of quotes and trades for our sample increases dramatically during the crisis period. For example, the average daily number of trades for an ADR is 270 in January 1995 compared to only 102 in November 1994. Thus, we must assume that the delayed reactions of returns we observe are due to gradual actions of market participants, rather than thin trading. Note, however, that this merely reinforces our conclusion that the markets did not immediately panic or overreact at times of Mexican shocks. If anything, the markets took some time to digest this information. This is consistent with our evidence that NETBUY for non-Mexican stocks did not change appreciably with peso information.

V. Summary and Conclusions

We investigate the impact of exchange rate changes and exchange rate news arrival on emerging market equity prices, trading activity, and liquidity during a currency crisis. Intraday changes in peso-dollar exchange rates are correlated with Mexican and non-Mexican Latin American equity returns. The balance of buy versus sell volume of Mexican equities is affected by peso information, suggesting that investors rebalance their Mexican holdings at times of significant peso news. However, there is no evidence that peso depreciation triggers a significant sell-off of non-Mexican securities, nor do their trading patterns change when peso news intensity is high. In other words, investors revise prices for non-Mexican securities at times of Mexican currency depreciation but do not panic and dump their holdings of non-Mexican securities. The only potentially problematic behavior we report is that the closed-end fund market often reacts more strongly to peso information than the ADR market. While this is consistent with noise trader theories of small investors and closed end funds, the evidence is not pervasive.

Theoretical models of equity market behavior suggest that information asymmetry can

cause herding or contagion by foreign investors (Brennan and Cao (1997), Calvo and Mendoza (1999)). Merely selling off shares to meet a margin call can, in theory, trigger a stampede that spills across markets (Calvo (1999)). However, our results suggest that the listing of emerging market equities on the NYSE is beneficial. We find no evidence of panic selling or other destabilizing trading of non-Mexican securities during Mexico's currency crisis. The Tequila Effect is evidently a very limited phenomenon.

Our conclusions may be strengthened by subsequent research that compares and contrasts the peso crash episode with more recent crises in Korea, Southeast Asia, Russia, and Brazil. It is also worth noting that, as of the end of 1999, 31 equity securities from Mexico, 25 from Brazil, 25 from Chile, and 24 from other Latin American countries are listed as ADRs on the NYSE. The continual flow of new and seasoned issues of Mexican and other Latin American firms to the U.S. market is perhaps the most compelling evidence of the value created by trading emerging market securities in the U.S.

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Appendix A: Sample of American Depositary Receipts and Closed End Funds

Intraday transactions prices, volumes, bid and ask quotes, and depths are extracted from the Trade and Quote (TAQ) database of the New York Stock Exchange. Company names are shortened, excluding prefixes such as "Compania", "Grupo", and "Sociedad". Some Mexican companies have multiple classes of stock with different voting rights.

***Mexico ADRs**:* Casa Autrey (ATY), Dina (DIN), Bufete (GBI), Desarollo "L" (GMD), Desarollo "B" (GMDB), Tribasa (GTR), ICA (ICA), Coca Cola FEMSA (KOF), Radio Centro (RC), Serfin (SFN), Transportacion Maritima "L" (TMM), Transportacion Maritima (TMMA), Telefonos de Mexico (TMX), Televisa (TV), Vitro (VTO)

***Mexico Closed End Funds**:* Emerging Mexico (MEF), Mexico Equity and Income (MXE), Mexico (MXF)

***Argentina ADRs**:* Buenos Aires Embotelladora (BAE), Banco Frances del Rio de la Plata (BFR), Telefonica de Argentina (TAR), YPF (YPF)

Argentina Closed End Funds: Argentina (AF)

***Brazil ADRs**:* Aracruz Celulose (ARA)

***Brazil Closed End Funds**:* Brazil (BZF), Brazillian Equity (BZL)

Chile ADRs: Telefonos de Chile (CTC), Enersis (ENI), Madeco (MAD), Maderas Y Sinteticos (MYS), Quimica Y Minera de Chile (SQM), Telex Chile (TL), Vina Concha Y Toro (VCO)

***Chile Closed End Funds**:* Chile (CH)

***Colombia ADRs**:* Banco Ganadero (BGA)

***Panama ADRs**:* Banco Latinamer Export (BLX), Pan American Beverages (PB)

***Venezuela ADRs**:* Corimon (CRM)

***Latin American Region Closed End Funds**:* Latin America Investment (LAM), Latin America Equity (LAQ), Latin America Dollar Income (LBF), Latin America Discovery (LDF)

***Hong Kong ADRs**:* Hong Kong Telecom (HKT)

***Indonesia ADRs**:* Indosat (IIT)

***Indonesia Closed End Funds**:* Indonesia (IF)

***Korea ADRs**:* Kepco (KEP), POSCO (PKX)

***Korea Closed End Funds**:* Korea (KF)

***Philippines ADRs**:* Philippine Long Distance Telephone (PHI)

***Philippines Closed End Funds**:* First Philippine (FPF)

***Thailand Closed End Funds**:* Thai (TTF)

Appendix B: Qualitative news stories from Dow Jones News Retrieval

We searched for stories with "Mexico", "Mexican", or "peso" in the headline or lead paragraph, excluding stories with words like "close" or "open" (indicating solely a revision of exchange rate quotes), and searching the category of "All Dow Jones News Wires". The following example indicates how we processed the resulting stories. Dummy variable "IN" is set to 1 for stories that appear to contain qualitative discussions of peso-dollar movements and their significance. Zeros in the example indicate stories that only relate stock prices or which relate to another country. Dummy variable "DUP" singles out stories that have the same headline and time-stamp as the previous story. It does not screen out stories which are repeated some minutes later, or stories which Dow Jones supplies in several parts which may be transmitted a few minutes apart.

Date	Time	Headline	IN	DUP
01/26/95	16:20	Greenspan/Mexico -2: Guarantees Won't Drive Up U.S. Rates	1	0
01/26/95	16:22	Clinton/Mexico/Cuts -2: Says 750,000 U.S. Jobs At Risk	1	0
01/26/95	16:32	Clinton/Mexico/Cuts -3: Seeks Cooperation On Wage Boost	1	0
01/26/95	16:38	Mexican Stocks -2: Telmex Off 3.6%, Cemex Rises 0.5%	0	0
01/26/95	16:42	Crisis Roundup: IMF Mulls About $7.7 Bln In Credits	1	0
01/26/95	16:43	*Rubin Says Passing Mexico Aid Of Grave Interest To U.S.	1	0
01/26/95	16:43	*Rubin Says Passing Mexico Aid 'Of Grave Interest' To U.S.	1	1
01/26/95	16:44	*Christopher Says Mexico Pkg Beginning To 'Come Into View'	1	0
01/26/95	16:44	*Christopher Says Mexico Pkg Beginning To 'Come Into view'	1	1
01/26/95	16:45	*Rubin Says Passing Mexico Aid Of Grave Interest To U.S.	1	0
01/26/95	16:47	Mexican Stocks -2-: Telmex Off 3.6%, Cemex Rises 0.5%	0	0
01/26/95	16:52	Clinton Admin. Continues Pressing Congress On Mexico	1	0
01/26/95	16:57	Dlr Mixed; Gains Vs DEM On IMF Credit To Mexico: World Forex	1	0
01/26/95	17:12	Clinton Admin./Mexico-2: IMF Credit Well Timed	1	0
01/26/95	17:19	IMF-Mexico Credit -5-: 1996 GDP Growth Of 4% Seen	1	0
01/26/95	17:29	Clinton Admin./Mexico -3: Draft Legislation Closer	1	0
01/26/95	17:30	US-Mexico Ambassador Says Aid Plan Still Can Pass Congress	1	0
01/26/95	17:36	Clinton Says Mexico Loan Plan "In Our Interest";	1	0
01/26/95	17:38	Clinton Says Mexico Loan Plan "In Our Interest";	1	0
01/26/95	17:44	Clinton Admin./Mexico -4: Scrubbing Legal Language	1	0
01/26/95	17:51	Mexico Stocks Closing Prices: IPC Index Dn 37.98 Or 1.85 Pc	0	0
01/26/95	18:01	Clinton Says Mexico Loan Plan "In Our Interest";	1	0
01/26/95	18:04	*Mexico IPC Stock Index: 2018.61 Dn 37.98 Pts, Or 1.85%	0	0
01/26/95	18:05	Mexico Closing Stocks	0	0
01/26/95	18:24	World Stocks -12: U.S. Mixed, Canada And Mexico Down	0	0

Table I.
The Impact of Exchange Rate Changes and News on Equity Returns and Net Buy Volume

$$DEPEND_{i,t} = \beta_0 + \beta_1 DNEWS_t + \beta_2 QNEWS_t + \beta_3 ABSFX_t + \varepsilon_t$$

For each category, individual ADR or closed-end fund data are pooled into one time-series cross-sectional regression. $DEPEND_{i,t}$ is the dependent variable for security i at 30-minute interval t, which is either $RET_{i,t}$, the 30-minute midpoint return of security i at interval t, or $NETBUY_{i,t}$, the buyer-initiated volume minus seller-initiated volume of security i in interval t. NETBUY is standardized by subtracting the average and dividing by the standard deviation for all observations of the same security . $FXRATE_t$ is the pesos per dollar exchange rate change in interval t. $QNEWS_t$ is the number of news items in interval t. t-ratios are reported in parentheses. Sample period is Dec 21, 1994 to April 30, 1995.

	A. Dependent variable is $RET_{i,t}$					B. Dependent variable is $NETBUY_{i,t}$				
Category	$FXRATE_{t-1}$	$FXRATE_t$	$FXRATE_{t-1}$* $QNEWS_{t-1}$	$FXRATE_t$* $QNEWS_t$	R^2	$FXRATE_{t-1}$	$FXRATE_t$	$FXRATE_{t-1}$ *$QNEWS_{t-1}$	$FXRATE_t$ *$QNEWS_t$	R^2
Mexican ADRs	-0.149	-0.131	-0.006	-0.006	0.015	-2.402	-6.724	-0.004	-0.276	0.004
	(-6.39)	(-4.92)	(-3.51)	(-3.52)		(-1.69)	(-4.17)	(-0.04)	(-0.28)	
Non-Mexican Latin American ADRs	-0.020	-0.021	-0.004	-0.002	0.007	-1.218	0.579	-0.034	-0.064	0.000
	(-2.22)	(-2.05)	(-5.51)	(-2.48)		(-1.25)	(0.52)	(-0.50)	(-0.92)	
Asian ADRs	-0.004	0.001	0.000	-0.000	0.001	-0.961	-0.724	0.041	-0.012	0.000
	(-1.01)	(0.10)	(0.09)	(-0.84)		(-.072)	(-0.48)	(0.44)	(-0.13)	
Mexican Closed End Funds	-0.165	-0.122	-0.005	-0.005	0.070	-4.855	-11.970	0.328	-0.558	0.016
	(-7.09)	(-4.63)	(-3.32)	(-3.06)		(-1.65)	(-3.59)	(1.61)	(-2.64)	
Non-Mexican Single Country Latin Closed End Funds	-0.017	-0.038	-0.007	-0.002	0.031	-1.170	3.039	0.222	-0.413	0.002
	(-1.12)	(-2.17)	(-6.83)	(-2.08)		(-0.57)	(1.31)	(1.57)	(-2.80)	
Multicountry Latin Closed End Funds	-0.044	-0.049	-0.006	-0.006	0.056	-3.525	-0.958	-0.212	-0.22	0.007
	(-3.06)	(-2.98)	(-5.60)	(-5.92)		(-2.05)	(-0.49)	(-1.78)	(-1.78)	
Asian Closed End Funds	-0.007	-0.004	-0.001	0.000	0.002	2.010	2.290	-0.052	-0.231	0.001
	(-1.14)	(-0.56)	(-1.63)	(0.37)		(1.20)	(1.20)	(-0.45)	(-1.92)	

Table II.
Volume, Volatility, and Exchange Rate Changes and News

$$DEPEND_{i,t} = \beta_0 + \beta_1 DNEWS_t + \beta_2 QNEWS_t + \beta_3 ABSFX_t + \varepsilon_t$$

For each category, individual ADR or closed-end fund data are pooled into one time-series cross-sectional regression. $DEPEND_{i,t}$ is the dependent variable for security i at 30-minute interval t, which is either the absolute value of the midpoint return or the total trading volume (number of shares traded). Volume is standardized by subtracting the average and dividing by the standard deviation for all observations of the same security. $DNEWS_t$ is a dummy variable that equals one if there is at least one news items in that interval and zero otherwise, $QNEWS_t$ is the number of news items in the interval, and $ABSFX_t$ is the absolute value of the rate of change of the pesos-per-dollar exchange rate. t-ratios are reported in parentheses. Sample period is Dec 21, 1994 to April 30, 1995.

	A. Dependent variable is Absolute Return				B. Dependent variable is Total Volume			
Category	$DNEWS_t$ ($\times 10^{-2}$)	$QNEWS_t$ ($\times 10^{-2}$)	$ABSFX_t$	R^2	$DNEWS_t$ ($\times 10^{-2}$)	$QNEWS_t$ ($\times 10^{-2}$)	$ABSFX_t$	R^2
Mexican ADRs	0.095	0.026	0.158	0.009	8.020	4.207	11.532	0.013
	(2.15)	(4.63)	(8.26)		(2.00)	(8.17)	(6.66)	
Non-Mexican Latin American	0.014	0.006	0.054	0.005	0.393	0.789	2.769	0.001
ADRs	(0.79)	(2.48)	(7.05)		(0.15)	(2.32)	(2.42)	
Asian ADRs	0.004	0.002	-0.002	0.001	6.130	0.190	-0.277	0.000
	(0.46)	(1.49)	(-0.47)		(2.49)	(0.60)	(-0.26)	
Mexican Closed End Funds	0.016	0.030	0.148	0.041	13.481	4.346	16.241	0.041
	(0.35)	(5.27)	(7.68)		(2.26)	(5.66)	(6.29)	
Non-Mexican Single Country	0.024	0.012	0.063	0.011	3.820	1.649	4.316	0.005
Latin Closed End Funds	(0.75)	(2.94)	(4.44)		(0.79)	(2.66)	(2.07)	
Multicountry Latin Closed	0.017	0.024	0.104	0.040	12.600	1.818	8.471	0.016
End Funds	(0.60)	(6.39)	(8.38)		(2.89)	(3.24)	(4.49)	
Asian Closed End Funds	-0.003	-0.001	0.014	0.002	4.633	0.083	1.027	0.001
	(-0.21)	(-0.36)	(2.40)		(1.65)	(0.23)	(0.85)	

Table III.
The Impact of Exchange Rate Changes and News on Liquidity

$$DEPEND_{i,t} = \beta_0 + \beta_1 DNEWS_t + \beta_2 QNEWS_t + \beta_3 ABSFX_t + \varepsilon_t$$

For each category, individual ADR or closed-end fund data are pooled into one time-series cross-sectional regression. $DEPEND_{i,t}$ is the dependent variable for security i at 30-minute interval t, which is either the quoted spread or the quoted depth. Quoted depth is standardized by subtracting the average and dividing by the standard deviation for all observations of the same security. $DNEWS_t$ is a dummy variable that equals one if there is at least one news items in that interval and zero otherwise, $QNEWS_t$ is the number of news items in the interval, and $ABSFX_t$ is the absolute value of the rate of change of the pesos-per-dollar exchange rate. t-ratios are reported in parentheses. Sample period is Dec 21, 1994 to April 30, 1995.

	A. Dependent variable is Quoted Spread				B. Dependent variable is Quoted Depth			
Category	$DNEWS_t$ ($\times 10^{-2}$)	$QNEWS_t$ ($\times 10^{-2}$)	$ABSFX_t$	R^2	$DNEWS_t$ ($\times 10^{-2}$)	$QNEWS_t$ ($\times 10^{-2}$)	$ABSFX_t$	R^2
Mexican ADRs	1.241 (4.99)	0.057 (1.80)	0.347 (3.23)	0.004	-8.226 (-2.42)	0.372 (0.85)	-5.753 (-3.92)	0.001
Non-Mexican Latin American ADRs	0.547 (1.75)	0.041 (1.03)	0.483 (3.56)	0.001	-1.411 (-0.65)	3.640 (1.30)	-0.775 (-0.83)	0.000
Asian ADRs	0.440 (1.13)	-0.017 (-0.35)	-0.188 (-1.11)	0.001	10.213 (2.97)	-0.348 (-0.79)	-2.378 (-1.60)	0.003
Mexican Closed End Funds	0.146 (0.48)	0.101 (2.60)	0.194 (1.48)	0.005	21.818 (3.49)	-1.886 (-2.34)	6.929 (2.56)	0.006
Non-Mexican Single Country Latin Closed End Funds	0.768 (1.82)	0.047 (0.87)	0.331 (1.81)	0.003	-1.750 (-0.37)	-0.207 (-0.37)	-0.769 (-0.37)	0.000
Multicountry Latin Closed End Funds	0.684 (1.56)	0.093 (1.65)	0.579 (3.05)	0.006	-4.496 (-1.19)	-0.467 (-0.96)	1.656 (1.01)	0.001
Asian Closed End Funds	0.072 (0.17)	-0.072 (-1.34)	0.186 (1.03)	0.001	5.153 (1.35)	-0.240 (-0.49)	-1.185 (-0.72)	0.001

Table IV.
Tests for Overreaction of Equity Returns and Net Buy Volume

For each category, individual ADR or closed-end fund data are pooled into one time-series cross-sectional regression. $RET_{i,t}$ is the 30-minute midpoint return of security i at interval t and $NETBUY_{i,t}$ is buyer-initiated volume minus seller-initiated volume of security i in interval t. NETBUY is standardized by subtracting the average and dividing by the standard deviation for all observations of the same security. Series are regressed on their own lags plus interactive terms constructed with $QNEWS_t$, the number of news items in the interval t. t-ratios are reported in parentheses. Sample period is Dec 21, 1994 to April 30, 1995.

	A. Dependent variable is $RET_{I,t}$					B. Dependent variable is $NETBUY_{i,t}$				
Category	$RET_{i,t-1}$	$RET_{i,t-2}$	$RET_{i,t-1}$* $QNEWS_{t-1}$	$RET_{i,t-2}$* $QNEWS_{t-2}$	R^2	$NETBUY_{i,t-1}$	$NETBUY_{i,t-2}$	$NETBUY_{i,t-1}$ *$QNEWS_{t-1}$	$NETBUY_{i,t-2}$ *$QNEWS_{t-2}$	R^2
Mexican ADRs	-0.106	-0.020	0.002	-0.003	0.013	0.319	0.240	-0.004	-0.001	0.224
	(-12.07)	(-2.18)	(1.18)	(-1.95)		(35.83)	(27.86)	(-1.95)	(-0.62)	
Non-Mexican Latin American ADRs	0.011	0.002	0.007	0.005	0.004	0.234	-0.011	-0.011	0.015	0.045
	(1.33)	(0.21)	(4.18)	(3.31)		(23.84)	(-1.07)	(-3.21)	(4.37)	
Asian ADRs	0.060	0.013	0.006	0.001	0.008	0.019	0.063	0.009	-0.012	0.005
	(3.93)	(0.83)	(1.64)	(0.19)		(0.94)	(3.22)	(2.06)	(-2.76)	
Mexican Closed End Funds	-0.090	-0.007	0.007	0.002	0.008	0.078	0.031	0.002	-0.002	0.010
	(-4.80)	(-0.35)	(2.75)	(0.64)		(3.77)	(1.67)	(0.95)	(-0.82)	
Non-Mexican Single Country Latin Closed End Funds	-0.006	-0.005	0.006	-0.000	0.002	0.158	0.028	-0.001	0.004	0.031
	(-0.38)	(-0.31)	(2.44)	(-0.05)		(8.92)	(1.72)	(-0.30)	(1.15)	
Multicountry Latin Closed End Funds	-0.004	-0.033	-0.000	-0.001	0.002	0.044	0.045	0.012	0.003	0.010
	(-0.21)	(-1.91)	(-0.08)	(-0.29)		(1.80)	(2.07)	(2.90)	(0.64)	
Asian Closed End Funds	0.010	0.006	-0.002	0.005	0.001	0.089	0.005	-0.004	0.001	0.007
	(0.58)	(0.37)	(-0.40)	(1.11)		(4.85)	(0.30)	(-1.16)	(0.27)	

Table V.
Tests for Positive Feedback and Momentum

NETBUY is regressed on lagged, contemporaneous, and leading values of equity returns. For each category, individual ADR or closed-end fund data are pooled into one time-series cross-sectional regression. NETBUY is defined as buyer-initiated volume minus seller-initiated volume, and is standardized by subtracting the average and dividing by the standard deviation for all observations of the same security. RET_t is the 30-minute midpoint return at interval t. t-ratios are reported in parentheses. Sample period is Dec 21, 1994 to April 30, 1995.

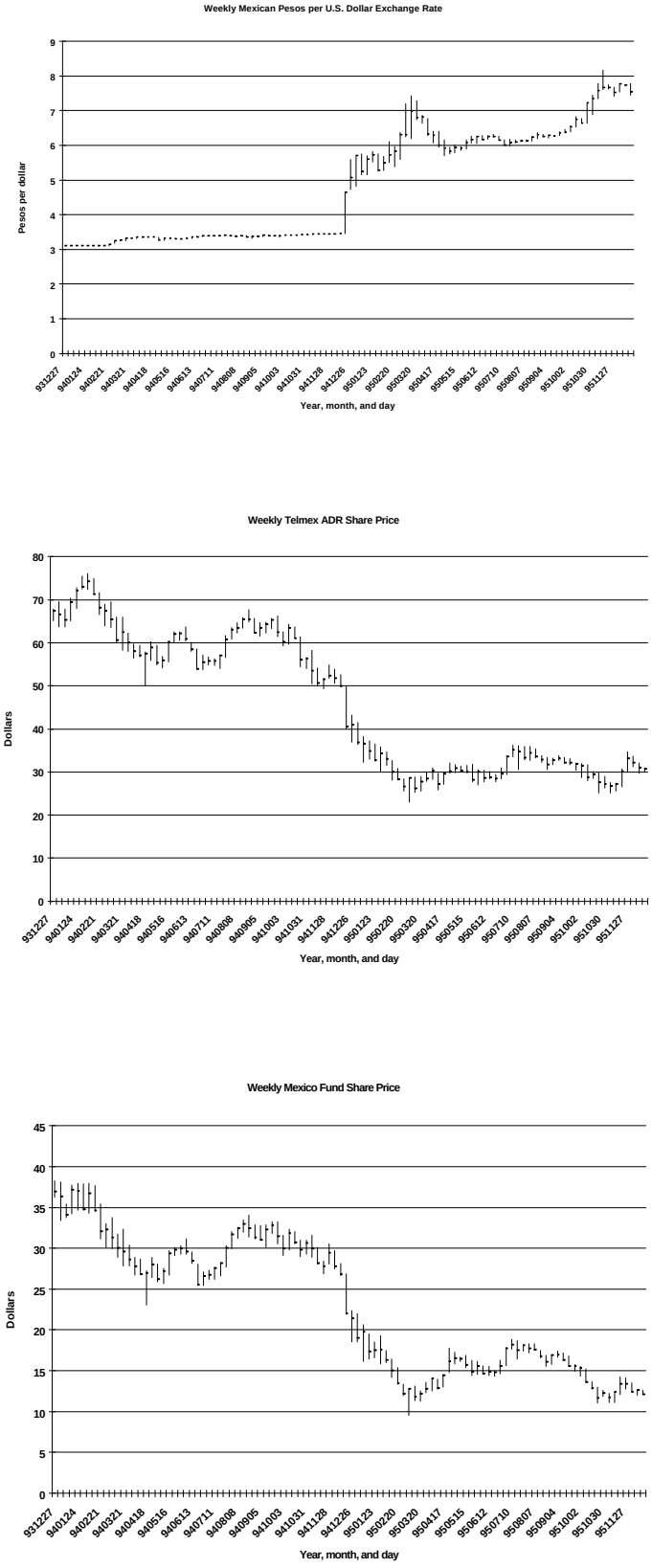
Category	RET_{t-3}	RET_{t-2}	RET_{t-1}	RET_t	RET_{t+1}	RET_{t+2}	RET_{t+3}	R^2
Mexican ADRs	1.207	2.141	2.323	3.415	22.000	3.874	-0.260	0.069
	(1.76)	(2.69)	(2.74)	(3.93)	(24.12)	(4.06)	(-0.27)	
Non-Mexican Latin American ADRs	2.848	1.265	1.690	4.865	28.970	1.426	2.018	0.034
	(2.44)	(0.89)	(1.07)	(2.95)	(16.57)	(0.79)	(1.12)	
Asian ADRs	12.039	2.791	-5.925	8.174	50.886	6.223	-12.227	0.024
	(2.45)	(0.46)	(-0.88)	(1.16)	(6.96)	(0.83)	(-1.69)	
Mexican Closed End Funds	-3.803	2.633	1.170	9.282	61.868	6.521	-3.301	0.199
	(-1.71)	(1.22)	(0.45)	(3.31)	(20.90)	(2.08)	(-1.04)	
Non-Mexican Single Country Latin Closed End Funds	2.143	2.367	7.016	6.664	31.598	7.041	6.329	0.060
	(1.05)	(1.19)	(2.98)	(2.60)	(11.76)	(2.39)	(2.09)	
Multicountry Latin Closed End Funds	-1.562	1.932	-0.752	3.396	38.547	16.624	-1.046	0.067
	(-0.72)	(0.91)	(-0.27)	(1.09)	(11.77)	(4.80)	(-0.30)	
Asian Closed End Funds	3.527	2.036	-2.104	-5.393	45.536	4.308	6.682	0.026
	(0.867)	(0.518)	(-0.431)	(-0.998)	(7.920)	(0.743)	(1.147)	

Table VI.
Tests for Gradual Response of Equity Returns to Exchange Rate Changes and News

For each category, individual ADR or closed-end fund data are pooled into one time-series cross-sectional regression. $RET_{i,t}$ is the midpoint return of security i at day t. $FXRATE_t$ is the pesos per dollar exchange rate change at day t. $QNEWS_t$ is the number of news items at day t. t-ratios are reported in parentheses. Sample period is Dec 21, 1994 to April 30, 1995.

	A. Daily regressions			B. Sum of contemporaneous and lagged slopes on $FXRATE_t$ from half-hourly regressions				
Category	$FXRATE_t$	$FXRATE_t$* $QNEWS_t$	R^2	1 Lag	3 Lags	6 Lags	9 Lags	12 Lags
Mexican ADRs	-0.412 (-2.94)	-0.002 (-2.49)	0.042	-0.296	-0.358	-0.450	-0.442	-0.442
Non-Mexican Latin American ADRs	-0.087 (-1.03)	-0.001 (-2.39)	0.016	-0.041	-0.073	-0.088	-0.110	-0.105
Asian ADRs	-0.039 (-1.24)	-0.000 (-0.68)	0.017	-0.013	-0.030	-0.038	-0.045	-0.055
Mexican Closed End Funds	-0.535 (-3.51)	-0.002 (-1.85)	0.182	-0.304	-0.427	-0.517	-0.470	-0.480
Non-Mexican Single Country Latin Closed End Funds	-0.173 (-1.37)	-0.002 (-2.35)	0.074	-0.049	-0.107	-0.141	-0.182	-0.198
Multicountry Latin Closed End Funds	-0.188 (-1.84)	-0.002 (-3.47)	0.140	-0.090	-0.111	-0.227	-0.226	-0.216
Asian Closed End Funds	-0.049 (-1.08)	-0.000 (-0.81)	0.020	-0.020	-0.027	-0.043	-0.057	-0.051

Figure 1. Weekly high, low, and close for the pesos per dollar exchange rate, dollar price of Telmex, and dollar price of Mexico Fund from January 3rd 1994 to December 18 1995. Source is Bridge Information System.



Endnotes

[1] "Lessons from a Crisis", *The Economist*, 3 October 1998, p. 23-27.

[2] Hamao, Masulis, and Ng (1990), Lin, Engle, and Ito (1994), and King and Wadhwani (1990), for example, have documented volatility spillovers across major developed markets. As foreign investors rebalance their portfolios, foreign economic developments can be rapidly transmitted to developing economies that are open to capital flows. Bekaert and Harvey (2000), for example, report that correlations between developed and developing markets increase after foreign access is liberalized.

[3] On September 1st 1998, the Malaysian government pegged the exchange rate, banned offshore trading of the Malaysian currency, and temporarily blocked repatriation of proceeds from currency and securities transactions by foreigners.

[4] Previous studies of Mexican equity markets include the following. Bailey and Chung (1995) find that Mexican equity returns are sensitive to exchange rate, credit, and political risk. Domowitz, Glen, and Madhavan (1998) show that listing a Mexican ADR in New York reduces liquidity and increases volatility in the home market. Bhattacharya, Daouk, Jorgenson, and Kehr (2000) suggest that insider trading on corporate news is significant. Frankel and Schmukler (1996) find that domestic Mexican investors anticipate the peso crisis prior to foreign closed-end fund investors.

[5] Choe, Kho, and Stulz (1999) address this question for Korea.

[6] Jorion (1990), for example, finds that the exchange rate exposure of U.S. stock prices varies with the degree of foreign business and foreign currency transactions of the firm. Bailey and Chung (1995) report that stock returns for certain Mexican industries are significantly exposed to changes in the black market value of the peso.

[7] Hargis, McDonald, and Ramanlal (1997), for example, report that about three-quarters of all trading in cross-listed Mexican stocks occurs in the U.S. markets rather than in Mexico.

[8] Most of our results are, however, based on the period beginning December 21, 1994. Prior to that time, there was virtually no movement in the peso-dollar exchange rate and, therefore, no news stories that announce exchange rate revisions and can be used to compute half-hour changes in the exchange rate.

[9] There were no exchange-listed ADRs from Thailand during the period we study.

[10] The Dow Jones service covers a broader variety of electronic news sources and provides very useful software for searching, screening, and downloading qualitative news stories. Bloomberg supplies more frequent news items featuring bid and ask exchange rate quotes.

[11] Following Lee and Ready (1991), we recognize that trades and quotes could be recorded out of sequence so we discard quotes which are less than five seconds before a trade. This compensates for the speedier reporting of quotes relative to trades.

[12] Since our classification scheme misses those trades that fall exactly at the midpoint of the quoted spread, NETBUY is likely to be measured with some error. Nevertheless, there is no apparent reason that this error biases our tests.

[13] See Greene (1993) for details of estimation and Bekaert and Harvey (1997) for an application. Our reported R-squared coeffcients exclude fixed effects. Group or cohort refers to specific ADRs or closed-end funds.

[14] Madhavan and Sofianos (1998) report that specialist participation in closed-end fund trades is significantly lower than in other listed equities, again suggesting that the behavior of atypical investors may be particularly prevalent in the closed-end fund markets.

[15] See Keim and Madhavan (1995) for some empirical evidence.

[16] See Choe, Kho, and Stulz (1999).

[17] Additional tests (unreported) show that dependence of returns on lagged NETBUY does not disappear if we include leads and lags of NETBUY as additional explanatory variables, which implies that the associations are not a statistical artifact of the serial

correlation of the two series. We also add interactive terms equal to the news intensity, QNEWS, times the return and find that slope coefficients on those terms are insignificant. This implies that the associations between NETBUY and return do not depend on the flow of peso information.

[18] The slopes for regressions with one lag reported in Panel B, Table VI do not sum exactly to the sum of slopes in Table I because overnight lags are included in the Table VII regressions.