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# Crises, Contagion, and the Closed-End Country Fund Puzzle

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## Abstract

This paper analyzes the behavior of closed-end country fund discounts, including evidence from the Mexican and East Asian crises. We find that the ratio of fund prices to their fundamental value increases dramatically during a crisis, an anomaly that we denote the "closed-end country fund puzzle." Our results show that the puzzle relates directly to the fact that international investors are less (more) sensitive to changes in local (global) market conditions than domestic investors. This asymmetry implies that foreign participation in local markets can both help dampen a crisis in the originating country, and amplify the contagion to noncrisis countries.

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## SUMMARY

Contrary to the efficient market hypothesis, closed-end fund prices do not converge to the market value of the underlying portfolio. This puzzle has been attributed to the fact that limitations to arbitrage, derived from capital account restrictions and transaction costs, preserve the differences in investor behavior in the local (NAV) and foreign (fund) markets. Under this premise, the evolution of fund discounts can be used to shed light on the differential response of domestic and international investors to unexpected events.

In this paper, we review the main stylized facts on closed-end country funds in light of an updated data set that includes the Mexican and the Asian crisis periods. We find that the price-to-NAV ratio increased sharply during the initial phase of all the recent financial crises. Our analysis suggests that this striking regularity, which we denote as the "closed-end country fund puzzle," can be attributed to the fact that international investors are less (more) sensitive to changes in local (global) market conditions than domestic investors. Moreover, we find that this behavior tends to be highly persistent and hence cannot be explained as a consequence of temporary information asymmetries.

This has important policy implications. While this asymmetric response suggests that foreign investors can amplify the contagion to noncrisis countries, it also implies that foreign participation in the local market can help dampen the effects of a financial crisis in the originating country. In particular, the excessive exposure of local investors to local market risk makes them more sensitive to changes in local market conditions. Moreover, the liquidity crunch associated with the crisis is likely to induce fire sales of local assets. Therefore, countries that restrict foreign portfolio investment by preventing liquid international investors from operating in the local equity markets may exacerbate the impact of a financial crisis on asset values.

## I. INTRODUCTION

The efficient market hypothesis states that assets ought to sell for their fundamental values. The fundamental value of a closed-end fund is the market value of its portfolio, the Net Asset Value (NAV). Hence, in theory, the price of closed-end funds should converge to the NAV. However, it is a well-documented fact that closed-end funds trade at significant discounts or premia. One of the prevalent explanations for this puzzle argues that, as the scope for arbitrage is limited due to capital account restrictions and transaction costs, the lack of convergence of fund prices to their fundamental value simply reflects the fact that investors in the local (NAV) and foreign (fund) markets differ.[2]

In this paper, we review the main stylized facts on closed-end country funds in light of an updated data set that includes the Asian crisis period. This allows us to provide a comprehensive characterization of the determination of discounts in crisis periods, to study the dynamics of discounts in the aftermath of the Tequila crisis, and to compare their behavior during both crises. We present evidence that indicates that investors' behavior indeed differs for both assets. By accepting this premise, the evolution of fund discounts can be used to shed light on the differential response of domestic and international investors to episodes of financial distress.

We find that the particular pattern displayed by Mexican funds during the 1994 crisis is common to other recent crisis episodes: the price to NAV ratio increases sharply during the initial phases of financial distress. We present evidence that this striking regularity, which we denote as the "closed-end country fund puzzle," can be attributed to the fact that, in general, international investors are less (more) sensitive to changes in local (global) market conditions than domestic investors. We show that, while the Asian crisis led to significant contagion across all emerging markets, channeled to a large extent through the behavior of international investors, the response from local investors differed: whereas in Asia stock prices declined by more than fund prices (increasing fund premia), Latin American stocks reflected the impact only partially, and hence Latin American fund discounts widened. Hence, substantial declines in local markets in crisis periods exert a less than proportional effect on fund prices, accounting for the sharp decrease in fund discounts. Conversely, a decline in international markets as a result of crises abroad affects fund prices relatively more than local share prices, widening the discount. Moreover, we find that this assymetric response tends to be highly persistent and hence cannot be explained as a consequence of temporary information asymmetries.

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[2]The way in which they differ has been subject to some debate. Several explanations have been put forward with mixed results, including the presence of noise traders in the market for closed-end funds, the existence of asymmetric information across the two types of investors, and the higher loss aversion of foreign investors. See, among others, Lee, Shleifer and Thaler (1991), Hardouvelis, La Porta and Wizman (1993), Bodurtha, Kim and Lee (1995) and Kramer and Smith (1995).

The first policy implication that can be drawn from these results is that less responsive foreign investors may play a stabilizing role in a crisis country, while the opposite is true in contagion countries, where foreign investors are likely to amplify the negative cross effects from crisis economies. A second implication can be derived, according to whether we interpret the asymmetric response as an indication of foreign underreaction or local overreaction. In the first case, and assuming that local investors possess privileged information about local conditions, an increase in the discount may be understood as a signal of the deterioration of local fundamentals.

Instead, we tend to favor the view that crisis premia reflect local overreaction. On the one hand, the excessive exposure of local investors to domestic market risk may make them more sensitive to changes in domestic fundamentals. On the other hand, the liquidity crunch that usually follows the unraveling of a financial crisis is likely to have a greater impact on investors in the host country, forcing them to liquidate their local positions at prices below their fundamental value. Therefore, countries that restrict foreign portfolio investment by preventing liquid international investors from operating in the local market may exacerbate the short-term impact of a financial crisis on asset values.

The remainder of the paper is organized as follows. Section 2 provides a description and explanation of closed-end fund puzzles. Section 3 examines the empirical evidence on the "closed-end country fund puzzle" in light of the existing literature, and introduces and tests an alternative characterization. Section 4 discusses the results and concludes.

## II. Definitions, Facts, and Puzzles

### A. The Closed-End Fund Puzzle

Country funds are investment companies whose shares trade on organized stock exchanges and which hold and manage portfolios concentrating in the equity markets of particular foreign "host" countries. Among country funds, closed-end country funds (hereinafter "country funds") are a special type of funds that issue a fixed number of shares domestically, and thus ownership of the fund's shares after the initial public offering (IPO) can only be gained through the secondary market. Each fund provides two distinct market-determined prices: the country fund's share price quoted on the market where it trades, and its NAV determined by the prices of the underlying shares traded in the "host" market.

Throughout the 1980s and 1990s, country funds experienced an impressive growth: in December 1984, only four country funds were listed on American stock exchanges, compared to more than 60 in 1998, in addition to over 40 regional funds specializing in the equity markets of Asia, Europe, Latin America or Africa. Over the same period, London and Hong Kong also emerged as important centers for country fund trading.

Country funds are popular among U.S.-based investors because they allow participation in foreign markets by providing a managed diversified portfolio at a low transaction cost and without the need to use foreign exchange for settlement purposes. They also avoid testing the liquidity of the, normally thin, host market by avoiding the redemption of shares. In fact, country funds were the original vehicle for foreign investment in emerging markets. For example, until the late 1980s the closed-end Mexico Fund was the only instrument available for U.S. investors to invest in the Mexican market. Similarly, the Korea Fund partially opened the Korean market to foreign investors in 1984, long before the process of capital market liberalization was initiated in 1991.

From the point of view of the host country, country funds can help promote the efficiency of pricing in the emerging capital market, and can enhance capital mobilization by local firms and reduce the cost of capital. Diwan, Errunza and Senbet (1993a, 1993b) examine these issues both theoretically and empirically, and show that these results hold despite the small size of the country fund compared with the market capitalization of the host market.

According to Stulz (1981), if capital markets were integrated internationally, assets of equal risk located in different countries would yield equal expected returns in some common currency. Hence, prices of country funds should converge to the net asset value of the component assets if both were traded in an integrated market, and no premia/discounts should be observed in the long run. However, it is a distinguishing feature of country funds that fund share prices generally deviate from their portfolio value or NAV and, as a result, the returns on fund shares may differ from those on the portfolio in which the fund invests. These premia and discounts can be of significant size (for example, the Thai Fund traded at a premium of 160 percent in February 1998), and vary over time (the same fund traded at a discount of 20 percent in November 1994).

The significant discount that characterizes U.S. closed-end funds is what Lee, Shleifer and Thaler (LST) (1991) denote as the "closed-end fund puzzle." Indeed, LST (1991) present empirical evidence demonstrating that: (1) U.S. closed-end funds start at a premium of about 10 percent; (2) after some time this premium turns into a discount; (3) the discount fluctuates widely over time; and (4) discounts shrink when funds are terminated through either liquidation or open-ending. Empirical studies on closed-end country funds, including Hardouvelis, La Porta and Wizman (HLW) (1993) and Bodurtha, Kim and Lee (BKL) (1995), have found that these funds largely follow the same pattern as U.S. closed-end funds. In particular, they found that, after controlling for restrictions to capital flows, closed-end country funds carry a significant discount on average.

### B. Explanations to the Puzzle

The closed-end fund puzzle has generated an important amount of literature that tries to explain the size and time variation of fund discounts. Two main explanations have been put forward. The first one refers to the existence of market frictions and segmentation, while the second emphasizes the presence of nonrational agents and the role of market sentiment.

**Market frictions and segmentation**

This first line of thought includes issues related to agency costs, differential tax treatment, barriers to cross-border capital flows, the impossibility of perfect arbitrage, and the diverse diversification needs and possibilities available to investors in the context of segmented markets.

- **Agency costs** could create discounts if management fees were too high or if future portfolio management was expected to be below average since managers do not need to attract new investors. There is evidence, however, that funds with higher transaction costs do not sell at a higher discount (Malkile 1977). But even if these arguments were true, they would only explain a small fraction of discounts, and none of these arguments would be able to account for the wide fluctuations in discounts, nor could they explain the existence of premia. Average management fees are about 1.5 percent (Patro 1997), and do not fluctuate over time.[3] Moreover, the evidence shows that country funds do not perform worse than a world market index (Patro 1997), and that they overperform the host market (Caparelli and Casutto 1993), even after adjusting for risk.

- Expected **tax liabilities** from unrealized capital gains under price appreciation may explain the existence of discounts, and an expected capital loss, deductible against gross income, may explain the existence of premia. Differential taxation of income from the fund and from the underlying stocks may also justify a discount. But in all of these cases the fraction of the discount that would be accounted for is very small, and would certainly not vary over time with such a high frequency. Empirical evidence shows that prices of closed end funds rise on the announcement of open ending or liquidation.[4] This statement, however, contradicts the previous argument, because discounts should widen as the tax payment cannot be deferred any longer.

- The existence of **barriers** to international investment may raise a country fund's price to NAV ratio above the level that would prevail in the absence of restrictions by the amount that the marginal investor would pay to avoid the restrictions. A priori, high premia could be expected for countries with high capital flows restrictions. In fact, funds investing in countries such as Korea or Turkey trade at an average premium, whereas funds investing in less restricted countries such as the United Kingdom or Germany trade at a discount. Bonser-Neal et al (1990) find that changes in foreign investment restrictions are significant in explaining changes in discounts in funds

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[3]Although one could argue that the present value of management fees could fluctuate with variations in interest rates, these fluctuations would be minor.

[4]See Brauer (1984) and Brickely and Schallheim (1985).

investing in France, Japan, Korea, and Mexico.[5] However, changes in restrictions cannot account for the frequency and order of magnitude of changes in discount in recent years.

- **Imperfect arbitrage.** An important related issue is why arbitrage does not eliminate country fund discounts entirely.[6] Arbitrage strategies with country funds are not without risk or cost for several reasons.[7] First, timely duplication of the underlying portfolio may be difficult to accomplish, owing to the reporting procedures of funds, normally quarterly or semiannually. Second, since investors do not receive the full proceeds of a short sale, and there are direct transaction costs, such as brokerage fees and spreads, a hedge is not costless. Also, short selling may be forbidden in some countries, time differences may create long delays, and illiquid host markets may make this operation very difficult. Third, a hedge needs an infinite horizon to be effective. If the arbitrageur is forced to undo his position before the open-ending or the liquidation of the fund, variations in the discount and the exchange rate may result in a loss for the arbitrageur. Finally, if the investment horizon is shorter than the expected life of the fund, arbitrage between funds and NAVs may not necessarily lead to price convergence.[8]

If any or all of these barriers were actually in place, then the resulting market segmentation would imply that the price of a U.S.-based country fund is determined by the **diversification needs** of U.S. investors, whereas the valuation of its NAV is determined by the diversification

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[5]However, they do not find significant evidence for Taiwan.

[6]An obvious way to take advantage of the arbitrage opportunity implicit in a closed-end fund discount involves the takeover of the fund followed by its liquidation or open ending. However, there is evidence that fund managers fiercely resist takeovers by raising the bidder's cost, and that in many cases funds include explicit anti-takeover provisions. Herzfeld (1980), for example, reports that by 1980 the two largest domestic closed-end funds had resisted four takeover attempts.

[7]See LST (1991), BKL (1995) and Frankel and Schmukler (1996a).

[8]Pontiff (1996) presents some evidence showing that discounts are wider for funds whose portfolio is more difficult to replicate, for those funds whose market value is lower, and in cases in which interest rates are high.

needs of investors in the host country.[9] In other words, the pricing of both assets will differ inasmuch as investors in either market use different benchmark portfolios to measure systematic risk.[10]

**The noise trader hypothesis**

The competing literature considers the mechanism of public trading as the main source of discounts. De Long, Shleifer, Summers and Waldmann (DSSW) (1990) emphasizes the role of *noise traders*, irrational investors that interact in the market with fully rational investors, and whose unpredictable beliefs create a risk in the pricing of assets that deters rational arbitrageurs from aggressively betting against them. They assume that variations in the demand from noise traders are caused by shifts in "sentiment" or "misperceptions" of the fundamental value of assets.[11] LST (1991) argue, using a sample of U.S. equity closed-end funds, that the behavior of these funds is consistent with individual investors' systematic and persistent swings in sentiment, reflected in "common" changes of mood, and can be explained by DSSW (1990) noise traders. In this context, discounts are likely to arise because noise traders add excess volatility to the market and make it riskier to invest in the fund than to hold the underlying portfolio. Hence, the discount would reflect the differential risk, and would vary over time along with the stochastic changes in the mood of noise traders. HLW (1993) claim that the noise-traded hypothesis is likely to be a more adequate explanation for country fund discounts than for domestic closed-end fund discounts because country fund discounts would clearly reflect differences in sentiment between U.S. and host country investors, while different types of U.S. investors may be difficult to associate to particular types of assets. The implicit assumption of this approach is that the share of noise traders in the fund market is larger than in the host market.

The noise trader hypothesis has further implications. Since the same sentiment drives discounts on all funds, there should be a common component in the evolution of the discounts of all funds traded in the same market. And since this sentiment is specific to the noise trader, it should affect other assets in the noise trader's portfolio. In the context of U.S. closed-end funds, LST (1991) present evidence that sustains these claims, and conclude that the discounts on closed-end funds are a sentiment index.[12]

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[9]On this, see Diwan, Errunza and Senbet (1993a).

[10]In all of the cases listed above, time variation of the discounts may arise from the evolution of any of these divergences, (e.g., changes in restrictions of cross border capital flows).

[11]Examples of noise traders are retail investors that follow the advice of financial gurus, or traders that follow positive feedback strategies or technical analysis.

[12]LST (1991) argue that small investors, usually associated with noise trading, have a

(continued...)

HLW (1993) and BKL (1995) test the noise trader hypothesis for country funds, and provide evidence suggesting that the mean reverting sentiment is an important component of the price of country funds and that there is a common component of sentiment across funds that accounts for a significant fraction of the variance in country fund discounts. The authors also provide another important piece of evidence: country fund prices are sticky, that is, they do not respond as much as NAVs to movements in host stock markets, while they are oversensitive to movements in world and domestic (U.S.) returns. Finally, BKL (1995) argues in favor of the noise trader hypothesis against the market segmentation view by showing that: (1) discounts behave similarly across countries after controlling for different restrictions to capital flows; (2) discounts are stationary, with a gradual long-run adjustment of the price toward the NAV; and (3) fund prices overreact to important news and underreact to unimportant news.

### C. Crisis, Contagion, and the "Closed-End Country Fund Puzzle"

All of the explanations listed above are based on analysis of country fund behavior in periods of relative tranquillity.[13] However, the Mexican devaluation in December 1994 and the subsequent Tequila crisis added a new aspect to the picture. After the devaluation of the Mexican peso, country funds that invested in Mexico and other Latin American economies that were trading normally at a discount, developed large premia that were sustained for as long as four months, introducing what we refer to in this paper as the "closed-end country fund puzzle"(Figure 1).[14] How can this be explained by the theories advanced thus far? The market frictions hypothesis could only explain this wide shift by a sudden change in regulatory issues in these economies, nothing of which happened at the time. Kramer and Smith (1995) suggest that the noise traders hypothesis encounters two fatal difficulties in explaining the Mexican episode: first, it would imply that U.S. investors became relatively *optimistic* after the devaluation about Mexican stocks; second, for this hypothesis to be true, swings in sentiment would then be common to all funds. However, after the Mexican devaluation, only Mexico and a few Latin American country funds experienced these swings. Hence, sentiment changes were not systematic, but rather country-specific, contradicting the standard noise trader argument.

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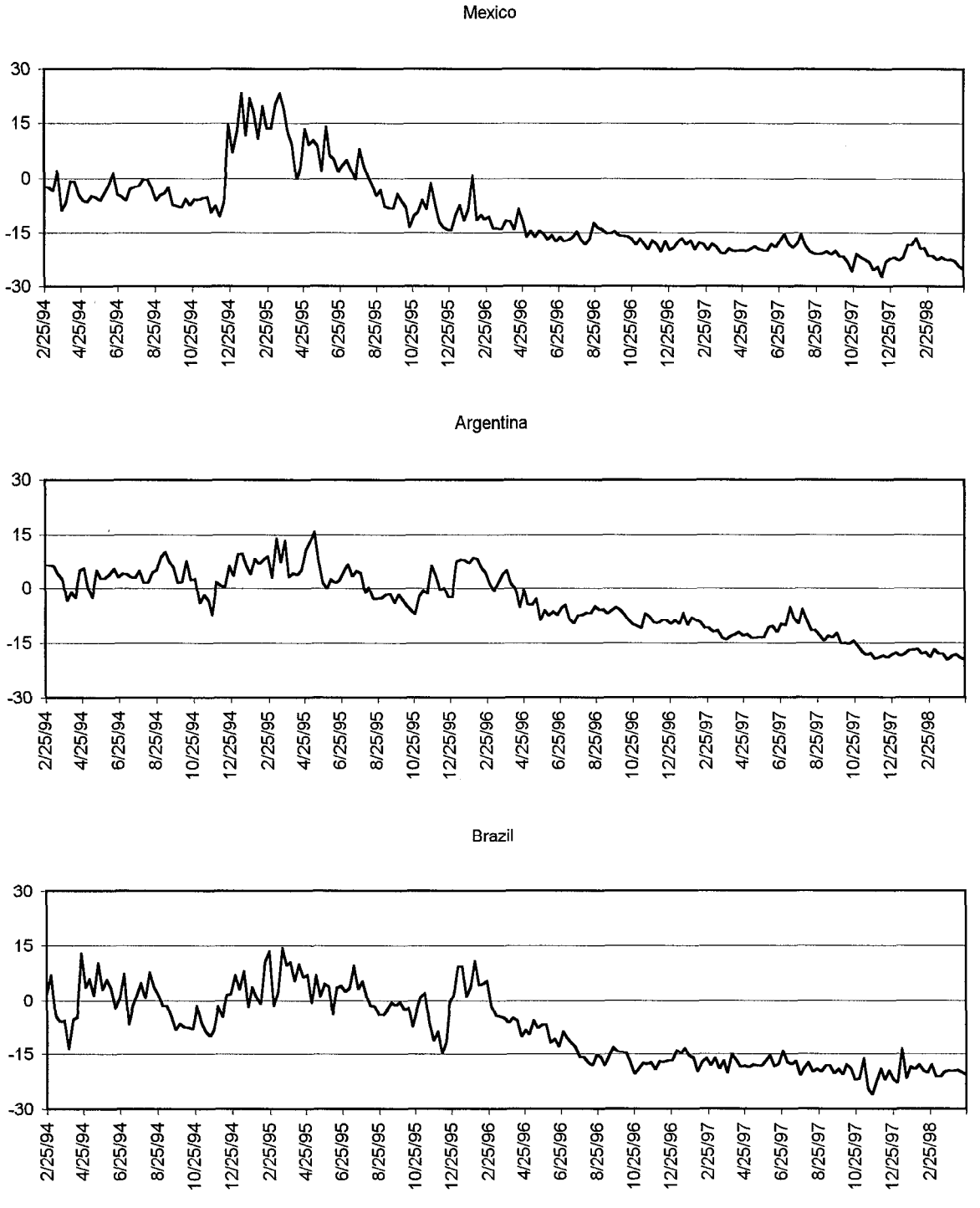
[12](...continued)
relatively larger participation in both fund and small cap stock markets. In turn, they show that the evolution of discounts is significantly correlated with the evolution of small caps *vis à vis* blue chip stocks. Chen, Kan and Miller (1993) strongly criticize this results, claiming that, at best, the noise trader hypothesis can account for only a minor part of the difference between fund prices and NAVs. This paper, as well as the response in Chopra, Lee, Shleifer and Thaler (1993), proves that the debate on the closed-end fund puzzle is far from being closed.

[13]Their sample does not include any major crisis in emerging markets.

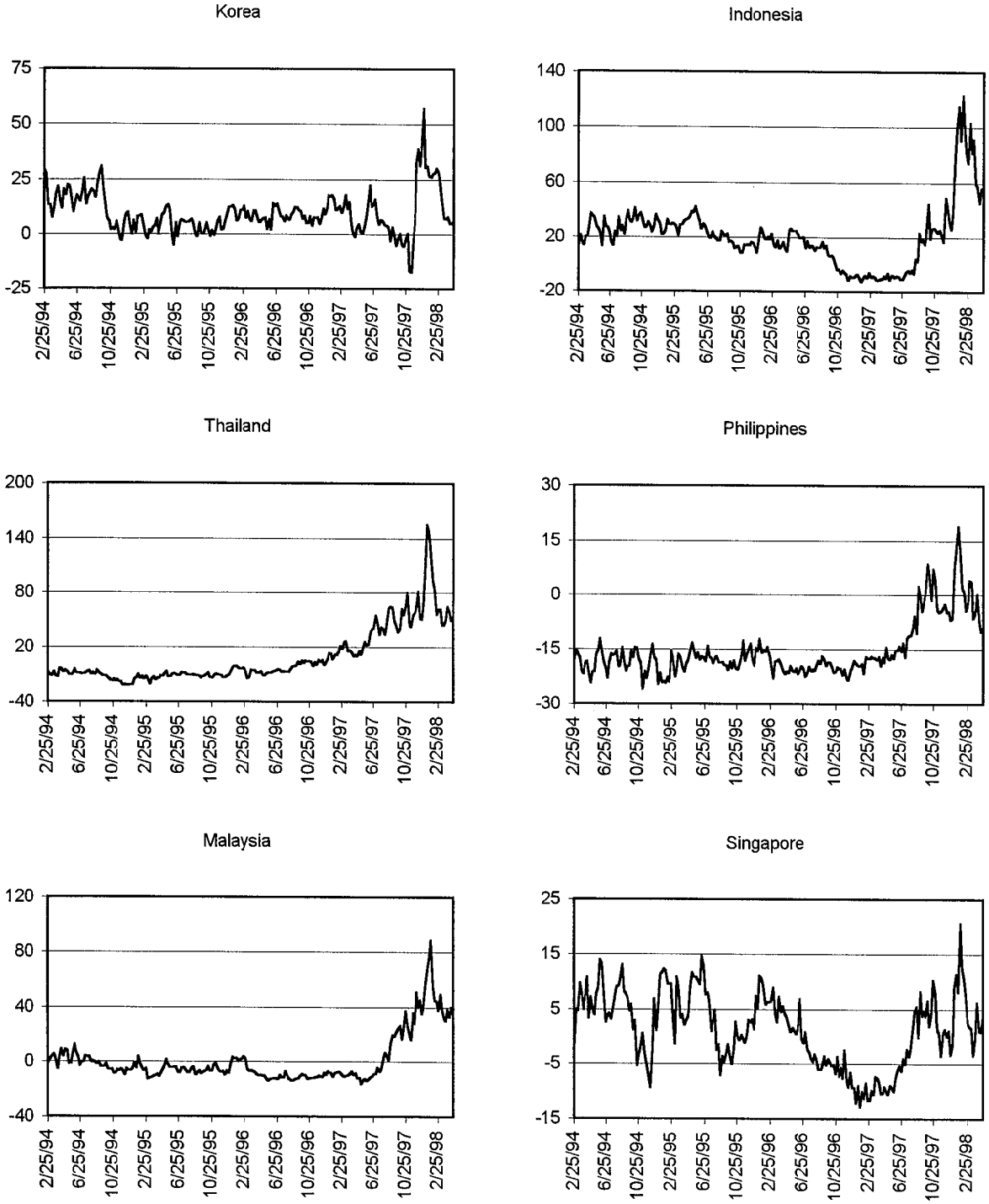
[14]As the figure shows, this pattern also appeared in Asian country funds during the 1997 crisis.

Figure 1.a. Latin America: Evolution of Discounts



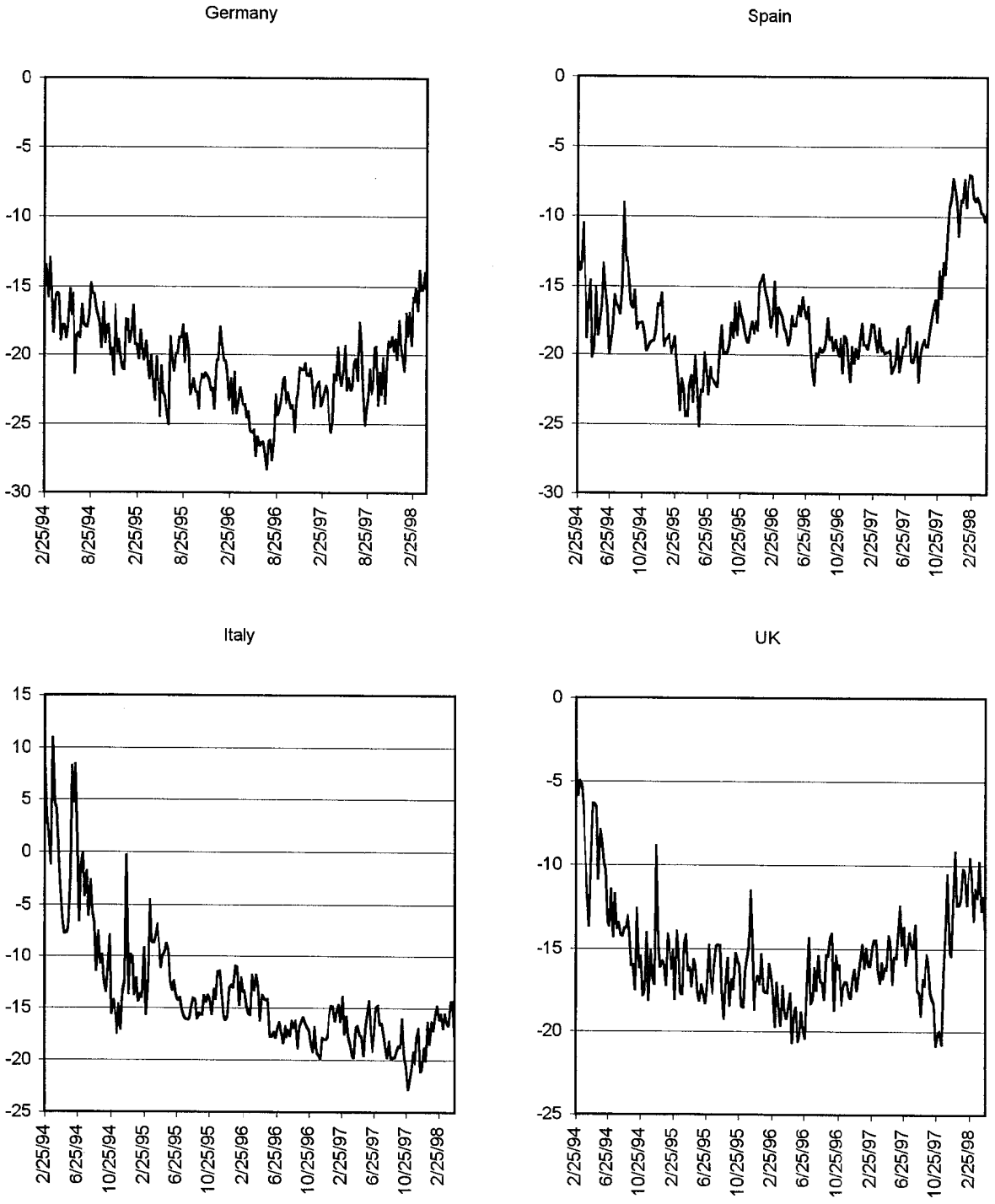

Sources: Bloomberg.

Figure 1.b. Asia: Evolution of Discounts




Sources: Bloomberg.

Figure 1.c. Europe: Evolution of Discounts




Sources: Bloomberg

Kramer and Smith (KS) (1995) advance an alternative explanation for this behavior based on loss aversion by American investors. Borrowing from the model by Benarzti and Thaler (1995), they argue that movements in the NAV should be followed by asymmetric effects in discounts with upswings showing smaller changes in prices relative to NAV than downswings. In particular, loss averse shareholders should be reluctant to sell on downswings to avoid realizing losses. Hence, in the Mexican case, American shareholders would have been unwilling to sell after the decline in NAVs that followed the devaluation of the peso, hoping for a market turnaround, thus giving rise to large premia.[15]

Frankel and Schmukler (FS) (1996a) try to reconcile the closed-end country fund puzzle with the noise trader hypothesis by arguing that the developments that followed the Mexican crisis were consistent with swings in market sentiment provided that local investors turned pessimistic earlier than U.S. investors. Their argument relies on the assumption that Mexican investors had access to privileged information about the local market, and thus were the first ones to foresee the crisis. Relatively uninformed American investors lagged behind, inducing an increase in the premium.

In a companion paper, Frankel and Schmuckler (1996b) use this association between country funds and the U.S. market to test whether contagion after the devaluation of the Mexican peso took place through the local markets or through the behavior of American investors. They use a variety of Granger-causality tests and find that the decline in the Mexican NAVs affected Latin American countries directly, whereas the effects of the Mexican peso crisis spread to Asian countries through the New York investor community. This is again consistent with the market sentiment theory inasmuch as crisis in an emerging market leads to a change in foreign investor mood that should affect all other emerging countries equally, regardless of their fundamentals.

Several aspects of this explanation are difficult to reconcile with the recent evidence. First, temporary information asymmetries like the ones assumed in FS (1996a) cannot account for long-lasting premia. In particular, it is difficult to understand why U.S. investors remained uninformed of the seriousness of the Mexican crisis until as late as March 1995, when the Mexican Fund still posted a premium of over 20 percent. Second, both the standard market sentiment and the asymmetric information hypotheses imply that discounts are stationary, i.e., the premium during the crisis period would eventually revert to a discount of the same order prevalent before the crisis.[16] However, already in mid-1995 the Mexican fund traded at a discount significantly larger than its pre-crisis average, reaching values above -20 percent by

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[15]Naturally, the underlying assumption is that Mexican investors are at least less loss averse than U.S. investors.

[16]The former, because noise traders' misperception of the fundamental value are assumed to be mean reverting; the latter because foreign investors will ultimately determine the correct investment scenario and will cease to lag behind local insiders.

end-97.[17] Finally, while it can be shown that changes in Mexican country fund prices propagated to funds in Asian emerging markets, the degree of contagion was relatively minor as compared with the impact of the Asian crisis on Latin American funds and, in both occasions, virtually null in relation to country funds in mature markets. Thus, if sentiment is indeed driving the behavior of discounts, it certainly discriminates between regions and does not resemble an overall mood of a particular type of investor with regard to all assets in his portfolio. This will become clear in the next section, where we revisit some of the ideas discussed above in light of the empirical evidence from recent years.

## III. Empirical Evidence

In this section we focus on the behavior of country funds in periods of crisis. We distinguish three types of emerging markets, according to their situation during the Asian crisis: (1) crisis markets (the group Asia I, comprising Indonesia, Korea and Thailand); (2) near-crisis markets, which are subject to contagion from a crisis in a neighboring country (the group Asia II, which includes Malaysia, the Philippines, and Singapore); and (3) noncrisis markets (the Latin American group: Argentina, Brazil, Chile, and Mexico). For countries in the first group, the deterioration of local market conditions is apparent[18] and should be part of the information set of both local and foreign investors. The second group of Asian countries have fundamental links with crisis countries, and thus are likely to suffer negative spillovers. Contagion in these cases is expected and may be consistent with the evolution of fundamentals (fundamental contagion). Finally, fundamentals in Latin American countries (and in general, non-Asian emerging markets) are less affected by the collapse of Asian economies, and contagion, if there is any, is likely to respond to non-fundamental factors and, in particular, to swings in investor sentiment towards emerging markets as a whole. In addition, in some cases we use as a benchmark a fourth group of European countries (including Germany, Ireland, Italy, Spain, and the United Kingdom). As will be shown below, the behavior of country fund prices vis-à-vis the price of the underlying stock varies substantially across each of these groups. Finally, in some cases, we divide the sample period (1994:2-1998:4) into two subsamples, corresponding broadly to the Tequila (1994:2-1996:7) and the Asian crises (1996:8-1998:4).[19]

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[17]As the evidence presented in the next section shows, this was also the case for other Latin American country funds.

[18]Among other things, the implementation of an IMF program in these three countries entailed the disclosure of a substantial amount of previously private information.

[19]We chose as the cut-off point the beginning of August 1996, when the Thai fund discount turned into premium.

## A. The Data

The full sample used in our empirical analysis comprise 24 single-country funds traded on the New York Stock Exchange. Table 1 lists the names and IPO the funds in our sample. The data covers weekly prices, NAVs and discounts for the period February 1994 to April 1998, and was obtained from the Bloomberg database. Prices and NAVs are generally reported on Friday. The funds compute the NAVs by translating the local currency price of the assets of the portfolio at the local market close into U.S. dollars. This currency conversion, however, is not uniform, because some funds use the market exchange rate at closing in the local market while others use the afternoon rate in New York. Moreover, since foreign markets close at different hours prior to the close in New York, prices and NAVs are only approximately synchronous.

## B. A First Glance at the Main Statistics

Table 2 presents summary statistics on fund discounts for the entire sample.[20] Several results stand out. First, country funds trade at an average discount, -5.7 percent, this discount varies importantly over time and across countries. The average standard deviation is 9 percent, from a low of 3 percent for Germany to a high of 30 percent for Thailand. On the other hand, the values for Thailand range from -22 percent to 155 percent. Third, discounts are very persistent, with first order autocorrelation coefficients of about 0.9. Finally, the behavior across regions shows important idiosyncracies. On the one hand, OECD countries trade on average at a larger discount, and some of them have never traded at a premium (Germany, Ireland, Spain, and the United Kindgom). These countries also display the lowest volatility, with an average standard deviation of 5 percent. On the other hand, Asian countries have traded on average at a premium. This reflects in part the behavior of some of these funds during the recent crisis.[21] In order to control for this fact, in Tables 3 we present the same statistics for the Tequila crisis and the Asian crisis subsamples.

During the Tequila crisis, Latin American funds traded on average at a small discount of less than -4 percent, with Mexico reaching a maximum premium of 43 percent, while in the Asian crisis subsample, the average discount for the region increases to -17.4. Asian funds showed the opposite behavior. While they traded at an average discount of close to -2 percent during

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[20]Throughout the paper, discounts are computed as the ratio of fund prices to NAVs.

[21]Note, for example, the excess skewness and kurtosis for countries such as Indonesia, Korea, Malaysia, Mexico, and Thailand.

Table 1. Sample of Country Funds

| Country | Date of IPO |
|---|---|
| Argentina (AF) | 11-11-91 |
| First Australia (FAX) | 12-12-85 |
| Brazil(BZF) | 3-31-88 |
| Chile (CH) | 9-26-89 |
| New Germany (GF) | 1-30-90 |
| Indonesia Fund (IF) | 3-1-90 |
| Irish Investment (IRL) | 3-1-90 |
| First Israel (ISL) | 2-1-90 |
| Italy Fund (ITA) | 2-2-86 |
| Japan OTC (JOF) | 3-14-90 |
| Korea Fund (KF) | 8-22-84 |
| Malaysia Fund (MF) | 5-8-87 |
| Mexican Fund (MXF) | 6-3-81 |
| First Philippine (FPF) | 11-8-89 |
| Portugal Fund (PGF) | 11-3-89 |
| Singapore Fund (SGF) | 7-24-90 |
| New South Africa (SOA) | 1-1-91 |
| Growth Fund of Spain (GSP) | 2-14-90 |
| Taiwan Fund (TWN) | 12-16-83 |
| Thai Fund (TTF) | 2-17-88 |
| Turkish Investment (TKF) | 12-1-89 |
| United Kingdom Fund (UKM) | 9-5-87 |

Source: Bloomberg.

# Table 2. Discounts: Summary Statistics - Whole Sample

| | Levels | | | | | | | Changes | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | STD | Skewness | Kurtosis | Min | Max | Autocorr | Mean | STD | Skewness | Kurtosis | Min | Max | Autocorr |
| Argentina | -4.04 | 8.60 | -0.06 | -1.01 | -19.55 | 15.72 | 0.94 | -0.12 | 2.87 | 0.43 | 2.45 | -10.24 | 10.97 | -0.29 |
| | 1.48 | 1.86 | 0.51 | 0.97 | | | | 0.12 | 0.78 | 0.16 | 0.33 | | | |
| Brazil | -8.06 | 10.12 | 0.27 | -1.23 | -25.87 | 14.17 | 0.91 | -0.11 | 4.25 | 0.11 | 1.98 | -14.91 | 17.20 | -0.36 |
| | 1.71 | 1.41 | 0.48 | 0.91 | | | | 0.17 | 1.10 | 0.16 | 0.34 | | | |
| Chile | -11.16 | 5.80 | 0.84 | 0.74 | -21.57 | 7.75 | 0.93 | -0.12 | 2.22 | 0.06 | 0.29 | -6.08 | 6.23 | -0.23 |
| | 0.98 | 2.08 | 0.47 | 0.87 | | | | 0.11 | 0.35 | 0.16 | 0.33 | | | |
| Mexico | -6.67 | 15.44 | 1.07 | 0.32 | -25.03 | 43.12 | 0.97 | -0.11 | 4.16 | 0.95 | 6.67 | -16.52 | 20.82 | -0.22 |
| | 2.70 | 5.61 | 0.54 | 1.05 | | | | 0.17 | 1.46 | 0.16 | 0.34 | | | |
| Mexico | -10.13 | 11.24 | 0.93 | 0.30 | -30.04 | 23.09 | 0.94 | -0.11 | 3.79 | 0.32 | 3.47 | -15.05 | 16.33 | -0.32 |
| | 1.92 | 3.91 | 0.50 | 0.96 | | | | 0.20 | 1.68 | 0.16 | 0.33 | | | |
| LAC | -8.01 | 10.24 | 0.61 | -0.18 | -24.41 | 20.77 | 0.94 | -0.11 | 3.46 | 0.37 | 2.97 | -12.56 | 14.31 | -0.28 |
| Indonesia | 6.25 | 20.89 | 2.47 | 6.53 | -15.01 | 102.85 | 0.94 | 0.22 | 6.41 | 1.63 | 10.32 | -20.81 | 43.21 | |
| | 3.58 | 13.30 | 0.50 | 0.95 | | | | 0.37 | 3.07 | 0.16 | 0.33 | 0.00 | 0.00 | |
| Korea | 9.70 | 9.47 | 1.06 | 3.00 | -17.69 | 56.96 | 0.84 | -0.11 | 5.34 | 0.09 | 5.60 | -26.36 | 27.41 | -0.03 |
| | 1.40 | 3.82 | 0.31 | 0.55 | | | | 0.31 | 1.73 | 0.17 | 0.33 | | | |
| Malaysia | 1.09 | 17.95 | 2.16 | 4.69 | -16.23 | 88.60 | 0.96 | 0.17 | 5.22 | -0.40 | 9.59 | -33.42 | 22.76 | -0.15 |
| | 3.10 | 10.38 | 0.52 | 0.99 | | | | 0.26 | 2.69 | 0.17 | 0.33 | | | |
| Phillipines | -15.37 | 7.63 | 1.85 | 3.41 | -25.80 | 18.90 | 0.91 | 0.04 | 3.21 | 0.40 | 2.40 | -10.05 | 13.38 | -0.12 |
| | 1.27 | 3.69 | 0.45 | 0.83 | | | | 0.14 | 0.92 | 0.17 | 0.33 | | | |
| Singapore | 1.32 | 6.78 | -0.07 | -0.78 | -12.83 | 20.55 | 0.87 | 0.03 | 3.43 | 0.44 | 1.15 | -8.43 | 12.50 | -0.23 |
| | 1.09 | 1.32 | 0.40 | 0.72 | | | | 0.17 | 0.61 | 0.16 | 0.33 | | | |
| Taiwan | -2.31 | 14.57 | 0.11 | -1.26 | -29.18 | 24.50 | 0.96 | -0.14 | 4.21 | 0.60 | 3.47 | -14.85 | 20.78 | -0.20 |
| | 2.51 | 2.71 | 0.52 | 0.98 | | | | 0.23 | 0.98 | 0.16 | 0.33 | | | |
| Thailand | 8.88 | 30.99 | 1.89 | 3.98 | -21.78 | 155.42 | 0.97 | 0.28 | 8.05 | 0.69 | 12.20 | -34.82 | 49.09 | -0.19 |
| | 5.32 | 15.02 | 0.51 | 0.96 | | | | 0.45 | 4.94 | 0.16 | 0.34 | | | |
| Asia | 1.37 | 15.47 | 1.35 | 2.80 | -19.79 | 66.83 | 0.92 | 0.07 | 5.58 | 0.31 | 6.22 | -25.80 | 27.89 | -0.16 |
| Australia | -2.57 | 6.53 | 0.81 | 0.15 | -15.23 | 15.94 | 0.94 | -0.05 | 2.21 | -0.49 | 1.30 | -8.07 | 6.92 | -0.13 |
| | 1.11 | 2.39 | 0.48 | 0.91 | | | | 0.13 | 0.40 | 0.17 | 0.33 | | | |
| Germany | -20.68 | 3.10 | 0.13 | -0.39 | -28.30 | -12.97 | 0.83 | -0.01 | 1.82 | 0.29 | 0.42 | -5.84 | 6.35 | -0.42 |
| | 0.50 | 0.71 | 0.40 | 0.72 | | | | 0.07 | 0.22 | 0.15 | 0.34 | | | |
| Ireland | -13.53 | 4.20 | 0.63 | -0.11 | -23.24 | -1.72 | 0.8 | -0.01 | 2.67 | 0.48 | 1.34 | -7.64 | 10.14 | -0.24 |
| | 0.63 | 0.81 | 0.33 | 0.57 | | | | 0.12 | 0.55 | 0.16 | 0.33 | | | |
| Italy | -13.47 | 6.09 | 1.73 | 3.13 | -22.76 | 10.92 | 0.89 | -0.12 | 2.80 | 0.26 | 5.33 | -13.34 | 12.14 | -0.33 |
| | 1.01 | 2.82 | 0.45 | 0.82 | | | | 0.11 | 0.98 | 0.16 | 0.34 | | | |
| Japan | 5.95 | 8.76 | 0.47 | -0.31 | -9.81 | 33.30 | 0.86 | -0.03 | 4.65 | -0.09 | 1.83 | -18.37 | 15.96 | -0.36 |
| | 1.42 | 1.71 | 0.42 | 0.76 | | | | 0.18 | 0.73 | 0.16 | 0.34 | | | |
| Portugal | -13.33 | 7.18 | 1.08 | 0.72 | -24.53 | 8.52 | 0.92 | -0.06 | 2.82 | 0.55 | 1.91 | -8.03 | 11.50 | -0.21 |
| | 1.21 | 2.57 | 0.47 | 0.88 | | | | 0.12 | 0.51 | 0.16 | 0.33 | | | |
| Spain | -18.14 | 3.74 | 1.30 | 1.57 | -25.13 | -7.04 | 0.91 | 0.03 | 1.63 | -0.85 | 4.76 | -9.67 | 3.72 | -0.32 |
| | 0.62 | 1.71 | 0.46 | 0.84 | | | | 0.08 | 0.24 | 0.16 | 0.34 | | | |
| United Kingdom | -15.28 | 3.19 | 1.11 | 1.40 | -20.83 | -3.92 | 0.8 | -0.05 | 2.00 | 0.22 | 0.85 | -5.84 | 8.31 | -0.30 |
| | 0.50 | 1.13 | 0.37 | 0.64 | | | | 0.07 | 0.32 | 0.16 | 0.34 | | | |
| OECD | -11.38 | 5.35 | 0.91 | 0.77 | -21.23 | 5.38 | 0.87 | -0.04 | 2.58 | 0.05 | 2.22 | -9.60 | 9.38 | -0.29 |
| Israel | -6.80 | 13.00 | 0.95 | -0.36 | -24.91 | 26.35 | 0.97 | -0.10 | 1.98 | -0.34 | 2.91 | -10.12 | 6.22 | -0.31 |
| | 2.28 | 4.58 | 0.55 | 1.08 | | | | 0.09 | 0.49 | 0.16 | 0.34 | | | |
| South Africa | -17.91 | 4.48 | 2.60 | 9.09 | -24.22 | 6.34 | 0.9 | -0.34 | 7.60 | 0.16 | 8.45 | -39.25 | 41.94 | -0.32 |
| | 0.75 | 2.79 | 0.46 | 0.84 | | | | 0.32 | 3.76 | 0.16 | 0.34 | | | |
| Turkey | 9.01 | 22.86 | 1.32 | 1.62 | -19.68 | 100.26 | 0.94 | -0.18 | 2.99 | -0.03 | 0.42 | -9.05 | 9.05 | -0.19 |
| | 3.95 | 9.61 | 0.52 | 1.00 | | | | 0.14 | 0.60 | 0.17 | 0.33 | | | |
| EM | -6.92 | 9.03 | 1.36 | 3.24 | -24.57 | 16.35 | 0.94 | -0.21 | 4.19 | -0.07 | 3.93 | -19.47 | 19.07 | -0.27 |
| Average | -5.74 | 10.63 | 0.99 | 1.32 | -21.92 | 31.51 | 0.91 | -0.03 | 4.48 | 0.15 | 4.65 | -20.17 | 21.06 | -0.22 |

Source:Bloomberg.
Note: Newey-West Standard Errors in parenthesis.
Period: 1994:2 to 1998:4.

# Table 3. Discounts: Summary Statistics - Subsamples

| | Tequila Crisis (1994:2 - 1996:8) | | | | | | Asian Crisis (1996:8 - 1998:4) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | STD | Skewness | Kurtosis | Min | Max | Mean | STD | Skewness | Kurtosis | Min | Max |
| Argentina | 0.54 | 5.94 | 0.02 | -0.76 | -10.92 | 15.72 | -13.91 | 3.78 | 0.24 | -1.00 | -19.55 | -5.28 |
| | 1.06 | 1.24 | 0.43 | 0.77 | | | 0.97 | 0.47 | 0.74 | 1.41 | | |
| Brazil | -3.15 | 8.41 | -0.17 | -0.85 | -20.44 | 14.17 | -18.67 | 2.44 | -0.14 | 0.32 | -25.87 | -13.28 |
| | 1.51 | 2.09 | 0.45 | 0.80 | | | 0.46 | 0.58 | 0.35 | 0.64 | | |
| Chile | -9.61 | 5.83 | 0.81 | 0.51 | -19.69 | 7.75 | -14.49 | 4.10 | 0.38 | -1.09 | -21.57 | -6.09 |
| | 1.09 | 2.23 | 0.52 | 0.96 | | | 1.05 | 1.11 | 0.73 | 1.36 | | |
| Mexico | -0.76 | 15.37 | 0.67 | -0.24 | -21.88 | 43.12 | -19.45 | 2.23 | -0.07 | -0.26 | -25.03 | -14.52 |
| | 2.99 | 5.43 | 0.59 | 1.13 | | | 0.51 | 0.75 | 0.49 | 0.87 | | |
| Mexico | -5.33 | 10.45 | 0.76 | 0.16 | -30.04 | 23.09 | -20.50 | 2.43 | -0.32 | 0.09 | -27.33 | -15.21 |
| | 1.95 | 3.70 | 0.51 | 0.95 | | | 0.55 | 0.44 | 0.50 | 0.88 | | |
| LAC | -3.66 | 9.20 | 0.42 | -0.24 | -20.59 | 20.77 | -17.40 | 3.00 | 0.02 | -0.39 | -23.87 | -10.88 |
| Indonesia | 2.24 | 7.03 | -0.03 | -0.36 | -14.38 | 20.97 | 14.89 | 34.26 | 1.04 | -0.29 | -15.01 | 102.85 |
| | 1.27 | 1.87 | 0.46 | 0.82 | | | 8.97 | 14.19 | 0.79 | 1.53 | | |
| Korea | 8.98 | 6.90 | 0.78 | 0.58 | -5.15 | 30.80 | 11.26 | 13.38 | 0.70 | 0.85 | -17.69 | 56.96 |
| | 1.17 | 2.08 | 0.37 | 0.65 | | | 3.16 | 6.22 | 0.55 | 1.00 | | |
| Malaysia | -5.30 | 5.68 | 0.67 | -0.17 | -13.95 | 12.80 | 14.90 | 25.99 | 0.62 | -0.57 | -16.23 | 88.60 |
| | 1.02 | 1.64 | 0.44 | 0.79 | | | 6.76 | 6.74 | 0.77 | 1.48 | | |
| Phillipines | -18.76 | 2.74 | 0.07 | -0.31 | -25.80 | -12.09 | -8.05 | 9.48 | 0.60 | -0.44 | -21.60 | 18.90 |
| | 0.37 | 0.45 | 0.25 | 0.45 | | | 2.35 | 1.65 | 0.65 | 1.20 | | |
| Singapore | 2.68 | 5.98 | -0.10 | -1.01 | -9.41 | 14.55 | -1.61 | 7.49 | 0.42 | -0.51 | -12.83 | 20.55 |
| | 1.06 | 1.04 | 0.43 | 0.76 | | | 1.87 | 1.36 | 0.66 | 1.22 | | |
| Taiwan | 5.11 | 11.18 | -0.19 | -1.03 | -20.74 | 24.50 | -18.33 | 4.89 | 0.21 | -0.05 | -29.18 | -6.28 |
| | 2.08 | 1.73 | 0.50 | 0.92 | | | 1.19 | 0.82 | 0.61 | 1.11 | | |
| Thailand | -8.31 | 6.02 | 0.34 | 0.17 | -21.78 | 6.10 | 46.00 | 30.64 | 1.33 | 2.40 | 6.70 | 155.42 |
| | 1.12 | 2.22 | 0.50 | 0.93 | | | 7.42 | 11.46 | 0.60 | 1.09 | | |
| Asia | -1.91 | 7.15 | 0.30 | -0.29 | -14.21 | 17.75 | 8.44 | 18.02 | 0.70 | 0.20 | -15.12 | 62.43 |
| Australia | -1.62 | 7.49 | 0.47 | -0.71 | -15.23 | 15.94 | -4.61 | 2.81 | 0.21 | -1.01 | -9.38 | 1.44 |
| | 1.44 | 2.38 | 0.56 | 1.07 | | | 0.64 | 0.68 | 0.50 | 0.88 | | |
| Germany | -20.75 | 3.23 | 0.02 | -0.51 | -28.30 | -12.97 | -20.52 | 2.80 | 0.58 | -0.35 | -25.61 | -13.81 |
| | 0.59 | 0.86 | 0.49 | 0.89 | | | 0.66 | 0.95 | 0.57 | 1.00 | | |
| Ireland | -13.23 | 4.43 | 0.66 | -0.38 | -23.24 | -1.72 | -14.16 | 3.61 | 0.22 | -0.05 | -21.64 | -5.49 |
| | 0.79 | 0.88 | 0.44 | 0.79 | | | 0.72 | 1.00 | 0.38 | 0.68 | | |
| Italy | -11.60 | 6.43 | 1.48 | 1.80 | -19.84 | 10.92 | -17.52 | 2.07 | -0.29 | -0.74 | -22.76 | -13.92 |
| | 1.18 | 2.88 | 0.49 | 0.89 | | | 0.43 | 0.33 | 0.41 | 0.73 | | |
| Japan | 5.23 | 8.98 | 0.56 | -0.13 | -9.81 | 33.30 | 7.48 | 8.10 | 0.38 | -0.80 | -7.84 | 27.26 |
| | 1.67 | 2.15 | 0.50 | 0.93 | | | 1.96 | 1.80 | 0.61 | 1.10 | | |
| Portugal | -10.78 | 7.28 | 0.71 | 0.12 | -23.18 | 8.52 | -18.84 | 2.00 | -0.20 | -0.29 | -24.53 | -14.84 |
| | 1.36 | 2.56 | 0.51 | 0.94 | | | 0.37 | 0.27 | 0.33 | 0.62 | | |
| Spain | -18.01 | 3.49 | 1.48 | 2.21 | -25.13 | -7.04 | -18.41 | 4.25 | 1.09 | 0.60 | -25.13 | -7.11 |
| | 0.66 | 1.84 | 0.54 | 1.00 | | | 1.07 | 2.01 | 0.68 | 1.26 | | |
| United Kingdom | -15.49 | 3.38 | 1.43 | 1.92 | -20.66 | -3.92 | -14.84 | 2.72 | 0.04 | -0.42 | -20.83 | -9.18 |
| | 0.60 | 1.58 | 0.44 | 0.78 | | | 0.63 | 1.01 | 0.53 | 0.93 | | |
| OECD | -10.78 | 5.59 | 0.85 | 0.54 | -20.67 | 5.38 | -12.68 | 3.55 | 0.25 | -0.38 | -19.72 | -4.46 |
| Israel | -1.59 | 12.57 | 0.62 | -1.06 | -18.60 | 26.35 | -18.06 | 2.72 | 0.57 | 1.67 | -24.91 | -8.54 |
| | 2.46 | 3.75 | 0.61 | 1.18 | | | 0.56 | 0.58 | 0.41 | 0.73 | | |
| South Africa | -17.86 | 5.35 | 2.21 | 5.63 | -24.22 | 6.34 | -18.02 | 1.34 | 0.04 | -0.58 | -20.93 | -14.54 |
| | 1.02 | 3.29 | 0.54 | 1.02 | | | 0.24 | 0.19 | 0.33 | 0.61 | | |
| Turkey | 17.84 | 22.46 | 1.15 | 1.14 | -11.43 | 100.26 | -10.05 | 5.50 | 0.10 | -0.89 | -19.68 | 2.80 |
| | 4.30 | 9.37 | 0.56 | 1.05 | | | 1.34 | 0.72 | 0.63 | 1.15 | | |
| EM | -0.54 | 13.46 | 1.33 | 1.90 | -18.08 | 44.32 | -15.38 | 3.19 | 0.23 | 0.07 | -21.84 | -6.76 |
| Average | -4.56 | 7.75 | 0.57 | 0.20 | -18.62 | 16.71 | -8.31 | 7.51 | 0.33 | -0.18 | -19.89 | 12.61 |

Source: Bloomberg.
Note: Newey-West Standard Errors in parenthesis.

the earlier period,[22] the average discount turned into an average premium of 8.5 percent during the Asian crisis, with maximums of over 100 percent for Indonesia and Thailand. Hence, the evidence confirms an important stylized fact: regardless of its behavior in periods of tranquility, fund discounts in countries directly affected by a major financial crisis decrease dramatically and even turn to premia for long periods of time.

Table 4 presents the main statistics for the first differences of prices and NAVs. Consistent with standard findings in the literature,[23] returns on prices are more volatile than returns on NAVs over the entire sample. As is common in high frequency asset data, returns on prices are negatively autocorrelated.[24]

### C. Are Crisis Premia an Indication of Causality?

As was said in the Introduction, country fund discounts have been used to support the hypothesis that local investors initiated the downward spiral in stock market prices during the Mexican crisis, based on evidence suggesting that NAVs may have started to decline earlier than fund prices. Before testing this hypothesis in the context of the Asian crisis, we revisit the evidence from the Mexican crisis in light of what have been discussed so far in the paper. More precisely, we look at the movement of the price and the NAV of the Mexican Fund vis-à-vis the behavior of the Mexican stock market index through a window that covers five weeks before and after the crisis, and we then proceed to compute Granger causality tests between prices, NAVs and other relevant variables.[25] As Figure 2 shows, there seems to be little indication of an anticipating behavior from local investors: in the two weeks leading up to the devaluation, all three variables, expressed in dollars, fluctuated erratically up to the devaluation week, to decline pari passu with the exchange rate thereafter.[26] Thus, the decline in NAVs could be accounted for entirely by the decline in dollar values brought about by the December 20 devaluation.

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[22]Funds in Indonesia, Korea, Singapore,Taiwan Province of China traded at a an average premium, probably reflecting the existence of barriers to foreign investment that made these funds particularly attractive.

[23]See Shiller (1981).

[24]See Campbell, Lo and MacKinlay (1997).

[25]In the remaining section, we focus our analysis on the older country fund per country. The Mexican Fund (MFX) is the older and larger of the three Mexican closed-end country funds in operation, and have been shown to lead the behavior of the other two (FS (1996)). A similar picture is obtained, however, from either the observation of the performance of, or the application of Granger causality tests to, the other two Mexican funds.

[26]Indeed, local currency stock prices increased during the devaluation week.

# Table 4. Returns on Prices and NAVs: Summary Statistics - Whole Sample

| | Return on NAV | | | | | | | Return on Prices | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | Std | Skewness | Kurtosis | Min | Max | Autocorr | Mean | Std | Skewness | Kurtosis | Min | Max | Autocorr |
| Argentina | 0.000 | 0.033 | -0.773 | 3.563 | -0.140 | 0.111 | 0.031 | -0.001 | 0.045 | 0.081 | 1.901 | -0.171 | 0.170 | -0.088 |
| | 0.002 | 0.008 | 0.166 | 0.333 | | | | 0.003 | 0.008 | 0.166 | 0.333 | | | |
| Brazil | 0.000 | 0.049 | -1.009 | 6.120 | -0.257 | 0.191 | 0.196 | -0.001 | 0.055 | 0.101 | 5.044 | -0.216 | 0.299 | -0.091 |
| | 0.003 | 0.014 | 0.166 | 0.333 | | | | 0.003 | 0.014 | 0.165 | 0.333 | | | |
| Chile | -0.001 | 0.026 | -0.594 | 2.895 | -0.128 | 0.080 | -0.023 | -0.002 | 0.036 | -0.076 | 0.890 | -0.120 | 0.104 | -0.042 |
| | 0.002 | 0.006 | 0.170 | 0.334 | | | | 0.002 | 0.006 | 0.166 | 0.333 | | | |
| Mexico | -0.002 | 0.050 | -2.686 | 11.660 | -0.287 | 0.108 | 0.000 | -0.003 | 0.054 | -0.554 | 4.366 | -0.273 | 0.194 | 0.000 |
| | 0.004 | 0.019 | 0.169 | 0.334 | | | | 0.003 | 0.014 | 0.166 | 0.333 | | | |
| Mexico | -0.001 | 0.055 | -2.187 | 12.563 | -0.396 | 0.157 | 0.000 | -0.003 | 0.054 | 0.087 | 1.433 | -0.196 | 0.195 | 0.000 |
| | 0.005 | 0.020 | 0.167 | 0.333 | | | | 0.004 | 0.011 | 0.166 | 0.333 | | | |
| LAC | -0.001 | 0.043 | -1.450 | 7.360 | -0.241 | 0.129 | 0.041 | -0.002 | 0.049 | -0.072 | 2.727 | -0.195 | 0.192 | -0.044 |
| Indonesia | -0.006 | 0.062 | -1.207 | 9.183 | -0.374 | 0.239 | -0.045 | -0.004 | 0.062 | 0.271 | 7.037 | -0.294 | 0.292 | -0.144 |
| | 0.004 | 0.033 | 0.165 | 0.335 | | | | 0.003 | 0.027 | 0.164 | 0.335 | | | |
| Korea | -0.004 | 0.055 | -2.130 | 21.366 | -0.442 | 0.246 | 0.000 | -0.005 | 0.061 | -0.684 | 9.914 | -0.399 | 0.253 | 0.000 |
| | 0.004 | 0.031 | 0.171 | 0.336 | | | | 0.003 | 0.026 | 0.165 | 0.334 | | | |
| Malaysia | -0.007 | 0.052 | -1.168 | 9.273 | -0.295 | 0.252 | 0.000 | -0.005 | 0.049 | 0.354 | 3.137 | -0.178 | 0.197 | 0.000 |
| | 0.004 | 0.023 | 0.167 | 0.333 | | | | 0.003 | 0.015 | 0.167 | 0.333 | | | |
| Phillipines | -0.005 | 0.041 | -1.205 | 8.790 | -0.260 | 0.158 | 0.019 | -0.004 | 0.041 | 0.238 | 2.388 | -0.131 | 0.197 | -0.105 |
| | 0.003 | 0.016 | 0.167 | 0.333 | | | | 0.003 | 0.008 | 0.166 | 0.333 | | | |
| Singapore | -0.004 | 0.028 | -0.862 | 4.075 | -0.126 | 0.099 | 0.000 | -0.003 | 0.036 | 0.167 | 1.041 | -0.126 | 0.115 | 0.000 |
| | 0.002 | 0.007 | 0.167 | 0.333 | | | | 0.002 | 0.005 | 0.166 | 0.333 | | | |
| Taiwan | -0.001 | 0.038 | -1.726 | 7.066 | -0.219 | 0.109 | 0.000 | -0.002 | 0.052 | -0.585 | 2.403 | -0.223 | 0.169 | 0.000 |
| | 0.003 | 0.011 | 0.166 | 0.333 | | | | 0.003 | 0.012 | 0.165 | 0.333 | | | |
| Thailand | -0.008 | 0.055 | -0.082 | 3.843 | -0.251 | 0.187 | 0.000 | -0.006 | 0.055 | 1.276 | 7.324 | -0.141 | 0.351 | 0.000 |
| | 0.004 | 0.023 | 0.168 | 0.333 | | | | 0.004 | 0.016 | 0.166 | 0.333 | | | |
| Asia | -0.005 | 0.047 | -1.197 | 9.085 | -0.281 | 0.184 | -0.004 | -0.004 | 0.051 | 0.148 | 4.749 | -0.213 | 0.225 | -0.036 |
| Australia | -0.001 | 0.016 | -0.399 | 1.076 | -0.059 | 0.042 | 0.072 | -0.002 | 0.019 | -0.851 | 2.328 | -0.085 | 0.051 | 0.046 |
| | 0.001 | 0.002 | 0.166 | 0.333 | | | | 0.001 | 0.003 | 0.166 | 0.333 | | | |
| Germany | 0.002 | 0.018 | -0.683 | 1.887 | -0.069 | 0.053 | 0.004 | 0.002 | 0.028 | -0.039 | 1.745 | -0.118 | 0.092 | -0.049 |
| | 0.001 | 0.003 | 0.166 | 0.333 | | | | 0.002 | 0.005 | 0.165 | 0.333 | | | |
| Ireland | 0.004 | 0.017 | 0.113 | 1.088 | -0.052 | 0.075 | 0.131 | 0.004 | 0.031 | 0.478 | 2.438 | -0.108 | 0.132 | -0.002 |
| | 0.001 | 0.002 | 0.166 | 0.333 | | | | 0.002 | 0.007 | 0.166 | 0.333 | | | |
| Italy | 0.003 | 0.029 | -0.178 | 0.221 | -0.072 | 0.092 | -0.018 | 0.001 | 0.035 | 0.260 | 3.358 | -0.129 | 0.160 | -0.021 |
| | 0.002 | 0.003 | 0.166 | 0.333 | | | | 0.002 | 0.007 | 0.166 | 0.333 | | | |
| Japan | -0.004 | 0.026 | 0.114 | 0.820 | -0.090 | 0.082 | 0.000 | -0.004 | 0.043 | 0.199 | 0.967 | -0.140 | 0.143 | 0.000 |
| | 0.002 | 0.005 | 0.167 | 0.334 | | | | 0.002 | 0.007 | 0.162 | 0.335 | | | |
| Portugal | 0.003 | 0.023 | -1.617 | 12.403 | -0.168 | 0.066 | 0.000 | 0.002 | 0.035 | -0.217 | 5.421 | -0.198 | 0.138 | 0.000 |
| | 0.002 | 0.007 | 0.166 | 0.333 | | | | 0.002 | 0.008 | 0.166 | 0.333 | | | |
| Spain | 0.001 | 0.048 | -0.956 | 1.212 | -0.619 | 0.065 | 0.111 | 0.001 | 0.057 | -1.025 | 1.275 | -0.732 | 0.067 | -0.272 |
| | 0.004 | 0.035 | 0.166 | 0.333 | | | | 0.004 | 0.041 | 0.166 | 0.333 | | | |
| United Kingdom | 0.001 | 0.018 | -1.073 | 3.450 | -0.084 | 0.048 | 0.000 | 0.001 | 0.027 | -0.287 | 1.049 | -0.102 | 0.077 | 0.000 |
| | 0.001 | 0.002 | 0.166 | 0.333 | | | | 0.001 | 0.003 | 0.165 | 0.333 | | | |
| OECD | 0.001 | 0.025 | -0.585 | 2.770 | -0.152 | 0.065 | 0.038 | 0.001 | 0.034 | -0.185 | 2.323 | -0.202 | 0.108 | -0.037 |
| Israel | 0.001 | 0.026 | -0.112 | -0.205 | -0.075 | 0.072 | 0.125 | -0.001 | 0.037 | 0.142 | 0.548 | -0.105 | 0.112 | -0.129 |
| | 0.002 | 0.002 | 0.167 | 0.333 | | | | 0.002 | 0.006 | 0.166 | 0.333 | | | |
| South Africa | 0.002 | 0.030 | -0.651 | 9.542 | -0.172 | 0.150 | 0.000 | 0.001 | 0.035 | -0.698 | 4.150 | -0.174 | 0.125 | 0.000 |
| | 0.002 | 0.010 | 0.167 | 0.333 | | | | 0.002 | 0.009 | 0.166 | 0.333 | | | |
| Turkey | 0.001 | 0.063 | -0.545 | 2.905 | -0.313 | 0.179 | 0.000 | -0.002 | 0.053 | 0.004 | 0.646 | -0.174 | 0.156 | 0.000 |
| | 0.004 | 0.014 | 0.166 | 0.333 | | | | 0.004 | 0.008 | 0.166 | 0.333 | | | |
| EM | 0.002 | 0.023 | -0.199 | 3.223 | -0.123 | 0.111 | 0.062 | 0.001 | 0.027 | -0.130 | 1.677 | -0.140 | 0.119 | -0.064 |
| Average | -0.001 | 0.036 | -0.860 | 5.254 | -0.205 | 0.121 | 0.027 | -0.001 | 0.042 | -0.091 | 3.031 | -0.201 | 0.162 | -0.036 |

Source: Bloomberg.
Note: Newey-West Standard Errors in parenthesis

Figure 2. The Mexican Fund (MFX)


Source: Bloomberg.

This impression is confirmed by the results of two versions of Granger causality tests: a standard pairwise test, and a test controlling for past changes in all the explanatory variables using the following equation:

$$X = \alpha + \Sigma_i^2 \beta_{1,i} P_{t-i} + \Sigma_i^2 \beta_{2,i} NAV_{t-i} + \Sigma_i^2 \beta_{3,i} STR_{t-i} + \Sigma_i^2 \beta_{4,i} ER_{t-i} + \beta_5 DIS_{t-1}$$

where *P*, *STR*, *ER* and *DIS*, represent respectively returns on fund shares and on the local stock market index, changes in the exchange rate, and the fund discount, and *X* stands alternative for the variables *P*, *NAV*, and *STR*.[27] Thus, if as we expect, crisis-driven changes are channeled primarily through the local stock market, causality should run directly from *STR*, rather than NAVs, to fund prices. More importantly, by including exchange rate movements we test the hypothesis that movements in the local stock market anticipated the devaluation.

A rapid inspection of the results, presented in Table 5, suggests that: (1) the behavior of fund and stock prices responded to a large extent to movements in the exchange rate, contradicting the hypothesis of local anticipation; and (2) this response was chanelled through the local stock market before reflecting completely in both fund prices and NAVs.

In principle, the last point is consistent with the claim in FS (1996a) that local investors reacted earlier than foreigners, as changes in the stock market index seemed to have preceded changes in fund prices. However, this link between causality and the evolution of discounts does not carry on to the Asian crisis, as we show next.

We conducted two versions of the causality test using data from the Asian crisis period. We ran pairwise Granger causality tests of fund prices, NAVs, local stock market indices and the Morgan Standby Capital Index (MSCI), to proxy for a global common component driving

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[27]In all cases, as well as in the causality tests reported below, with the exception of discounts, log differences of the variables were always used. In the paper, we only report results of two-lag tests. However, tests with a larger number of lags were run without any substantial variation in the findings.

Table 5. The Mexican Fund During the Tequila Crisis - Causality Tests

| | |
|---|---|
| NAV does not Granger-cause price | 4.61** |
| Price does not Granger-cause NAV | 3.70** |
| | |
| STR does not Granger-cause NAV | 9.15*** |
| NAV does not Granger-cause STR | 1.19 |
| | |
| STR does not Granger-cause price | 7.57*** |
| Price does not Granger-cause STR | 0.54 |
| | |
| ER does not Granger-cause STR | 4.55** |
| STR does not Granger-cause ER | 1.79 |
| $P = \alpha + \Sigma_i^2 \beta_{1,i} P_{t-i} + \Sigma_i^2 \beta_{2,i} NAV_{t-i} + \Sigma_i^2 \beta_{3,i} STR_{t-i} + \Sigma_i^2 \beta_{4,i} ER_{t-i} + \beta_5 DIS_{t-1}$ | |
| $\beta_{2,i} = 0$ | 7.07** |
| $\beta_{3,i} = 0$ | 11.23*** |
| $NAV = \alpha + \Sigma_i^2 \beta_{1,i} P_{t-i} + \Sigma_i^2 \beta_{2,i} NAV_{t-i} + \Sigma_i^2 \beta_{3,i} STR_{t-i} + \Sigma_i^2 \beta_{4,i} ER_{t-i} + \beta_5 DIS_{t-1}$ | |
| $\beta_{3,i} = 0$ | 13.43*** |
| $STR = \alpha + \Sigma_i^2 \beta_{1,i} P_{t-i} + \Sigma_i^2 \beta_{2,i} NAV_{t-i} + \Sigma_i^2 \beta_{3,i} STR_{t-i} + \Sigma_i^2 \beta_{4,i} ER_{t-i} + \beta_5 DIS_{t-1}$ | |
| $\beta_{4,i} = 0$ | 9.59*** |

Source: Bloomberg.

contagion through the international financial markets.[28] In addition, to test for the existence of a regional component, for the Asian II and the Latin American subsamples we estimated the following SUR model:

$$X = \alpha + \Sigma_i^2 \beta_{1,i} P_{t-i} + \Sigma_i^2 \beta_{2,i} NAV_{t-i} + \Sigma_i^2 \beta_{3,i} STR_{t-i} + \Sigma_i^2 \beta_{4,i} MSCI_{t-i} + \Sigma_i^2 \beta_{5,i} CFIW_{t-i} + \beta_6 DIS_{t-1}$$

for $i = 1,2$, where, as before, $X$ represents, in turn, variables $P$, $NAV$, and $STR$, while $CFIW$ is a country fund price index.[29] Finally, for each individual crisis country (Asia I sample), we ran the following regression:

$$X = \alpha + \Sigma_i^2 \beta_{1,i} P_{t-i} + \Sigma_i^2 \beta_{2,i} NAV_{t-i} + \Sigma_i^2 \beta_{3,i} STR_{t-i} + \Sigma_i^2 \beta_{4,i} MSCI_{t-i} + \Sigma_i^2 \beta_{5,i} ER_{t-i} + \beta_6 DIS_{t-1}$$

The results are summarized in Tables 6 and 7.[30] Contrary to what appears to have been the case in Mexico in December 1994, in Asian II countries changes in funds prices seem to have led the behavior of the local stock market. Thus, causation runs from fund prices to NAVs, and from them to STR. In addition, there appears to be a significant contagion factor, chanelled through the international markets and reflected in the impact from MSCI on fund prices. This evidence seems to support the view that Asian crises were induced to a large extent by the spillover from crises in neighboring countries, a chain reaction ignited by the devaluation of the Thai baht.[31]

In contrast, causality in most Latin American countries, and for the region as a whole, goes from world markets to local stock indices and NAVs, and from there to fund prices,

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[28]Several other variables were tested in this role, among them a global index and regional subindices of country fund prices, as well as U.S. sentiment indices such as the SP500 and the Dow Jones Average (DJ). The level of significance varied in each case, without affecting the general pattern reported in the paper. The results, omitted here, are available from the authors upon request.

[29]The index was constructed as the sum of country fund prices in all three subsamples, plus funds from a group of European countries (Germany, Italy, Spain, and the U.K.), and was included as an alternative proxy of global sentiment, particularly in cases in which local stocks represented in MSCI are not fully accessible to foreign investors, as in many Asian countries.

[30]Only statistically significant results are shown.

[31]As we discuss later in the paper, this does not imply that international investors actually fueled the crisis, only that they were the first to withdraw from these markets.

suggesting that contagion may have been initiated by local investors as a response to developments in Asia. Finally, Asian I countries do not exhibit any significant pattern of causality.[32]

In short, while in Asian countries, independently of the direction of propagation, crises were associated with the build up of substantial premia, in Latin American countries, where the order of causality resembled the one found in the Mexican case, country fund discounts deepened as a result of the Asian crisis. Hence, we conclude that the closed-end country fund puzzle is not related to *when* fund prices react relative to local shares, but rather to *how*.

Table 6. Causality During the Asian Crisis

$$X = \alpha + \Sigma_i^2 \beta_{1,i} P_{t-i} + \Sigma_i^2 \beta_{2,i} NAV_{t-i} + \Sigma_i^2 \beta_{3,i} STR_{t-i} + \Sigma_i^2 \beta_{4,i} MSCI_{t-i} + \Sigma_i^2 \beta_{5,i} CFIW_{t-i} + \beta_6 DIS_{t-1}$$

| X= | Hypothesis | Latam | Asia II |
|---|---|---|---|
| Price | $\beta_{2,i} = 0$ | 19.46*** | |
| | $\beta_{4,i} = 0$ | | 7.97** |
| | $\beta_{5,i} = 0$ | 9.17** | 5.17** |
| NAV | $\beta_{3,i} = 0$ | | 4.74* |
| | $\beta_{4,i} = 0$ | 6.55** | 5.34* |
| | $\beta_{5,i} = 0$ | 8.01** | |
| STR | $\beta_{4,i} = 0$ | 9.82*** | |
| | $\beta_{5,i} = 0$ | 6.41** | |

Source: Bloomberg.
(1) Negative coefficient.

[32]While evidence from Thailand may suggest that foreign investors led the decline of stock prices, the link is not found in Korea and Indonesia. However, fund prices in Korea and Indonesia lagged developments in the world market, a sign of contagion that does not seem to have propagated to the local stock market. The absence of clear cut results should not be surprising given the complexity of the crisis dynamics in these countries and the cross effects between them. The results, omitted here, are available from the authors upon request.

Table 7. Pairwise Granger Causality Test

| Country | | Asian crisis |
|---|---|---|
| ***Argentina*** | NAV does not Granger-cause price | 2.38* |
| | STR does not Granger-cause NAV | 2.48* |
| | NAV does not Granger-cause STR | 5.18*** |
| | MSCI does not Granger-cause STR | 3.97** |
| | MSCI does not Granger-cause prices | 2.60* |
| ***Brazil*** | NAV does not Granger-cause price | 7.89*** |
| | NAV does not Granger-cause STR | 2.43* |
| | STR does not Granger-cause prices | 4.17** |
| | MSIC does not Granger-cause prices | 4.73** |
| | MSCI does not Granger-cause STR | 2.53* |
| ***Chile*** | NAV does not Granger-cause price | 9.38*** |
| | STR does not Granger-cause NAV | 3.42** |
| | NAV does not Granger-cause STR | 6.75*** |
| | MSCI does not Granger-cause NAV | 5.61*** |
| | MSCI does not Granger-cause STR | 3.85** |
| ***Mexico*** | Price does not Granger-cause NAV | 2.61* |
| | STR does not Granger-cause price | 7.09** |
| | STR does not Granger-cause NAV | 20.42*** |
| | NAV does not Granger-cause STR | 5.78** |
| | MSCI does not Granger-cause NAV | 3.66* |
| | NAV does not Granger-cause MSCI | 6.25*** |
| ***Indonesia*** | Price does not Granger-cause NAV | 2.96* |
| | STR does not Granger-cause prices | 2.90* |
| | NAV does not Granger-cause STR | 5.09*** (1) |

Table 7. Pairwise Granger Causality Test (concluded)

| Country | | Asian crisis |
|---|---|---|
| ***Korea*** | NAV does not Granger-cause STR | 3.00* |
| | Price does not Granger-cause NAV | 14.44*** (1) |
| | STR does not Granger-cause NAV | 4.27** |
| | NAV does not Granger-cause STR | 75.29*** |
| | STR does not Granger-cause prices | 4.17** |
| | Price does not Granger-cause STR | 38.98*** |
| ***Thailand*** | Price does not Granger-cause NAV | 3.98* |
| ***Malaysia*** | NAV does not Granger-cause price | 3.69** |
| | Price does not Granger-cause NAV | 2.62* |
| | NAV does not Granger-cause STR | 3.37** |
| | MSCI does not Granger-cause NAV | 3.12** |
| | MSCI does nor Granger cause prices | 6.58*** |
| ***Philipines*** | Price does not Granger-cause NAV | 6.83*** |
| | Price does not Granger-cause STR | 5.54*** |
| ***Singapore*** | Price does not Granger-cause NAV | 2.72* |
| | MSCI does not Granger-cause prices | 5.66*** |
| | MSCI does not Granger-cause NAV | 2.58* |
| | STR does not Granger-cause NAV | 3.55** |
| | NAV does not Granger-cause STR | 2.42* |

Source: Bloomberg.
(1) Negative coefficient.

### D. Are Discounts Stationary?

If funds are to be ultimately liquidated, discounts should be stationary in the long run. However, several factors can affect their behavior in the short run so as to make them nonstationary. For example, under the segmented markets hypothesis, changes in cross border investment restrictions can break the stationarity of certain discounts. Furthermore, highly persistent changes in the perception of risk of the different agents that operate in both markets can also justify the rejection of stationarity over a limited sample.[33]

We test for stationarity using the Augmented Dickey Fuller (ADF) and the Phillips-Perron (PP) tests, with two specifications for each of them (with and without a time trend).[34] The results appear in Table 8. The evidence is mixed, although we find a majority of cases for which the null of nonstationarity cannot be rejected at the 5 percent level. In particular, all countries that have gone through, or suffered contagion from, a major financial crisis show evidence of nonstationarity. In addition, as in HLW (1993), we fail to find any specific pattern regarding countries with and without major investment restrictions. For example, the Growth Fund of Spain rejects stationarity while the South Africa Fund appears to be stationary.

This lack of stationarily of fund discounts is at odds with the standard interpretation of "investor sentiment." More important, it contradicts the view that crisis premia are the result of *temporary* information asymmetries. However, investors may display a significant degree of hysteresis, as changes in investor sentiment may be highly persistent or even subject to permanent revisions. For example, changes in the perception by foreign investors of the risk associated with Latin American stocks as a result of the Tequila crisis may still need a long time of stability to reverse themselves.[35]

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[33]This could have been the case, for example, after the Mexican crisis.

[34]Notice that stationarity around a time trend would in principle invalidate the investor sentiment hypothesis. However, it could also be the case that the time trend is due to structural issues unrelated to investor sentiment, such as the gradual liberalization of the capital account, and hence the investor sentiment hypothesis would still be valid.

[35]It could be the case that the true risk involved in Latin American markets was fully understood by investors only after the Tequila episode. The same would apply to East Asian markets after the 1997 crisis.

## Table 8. Discounts: Unit Root Tests

| | | Whole Sample | | | Tequila | | | Asia | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | t-statistic | CV | Lags | t-statistic | CV | Lags | t-statistic | CV | Lags |
| AZ | ADFt | -3.96 | -3.43 | 1 | -4.08 | -3.46 | 0 | -3.68 | -3.46 | 0 |
| | ADFk | -1.64 | -2.87 * | 1 | -4.02 | -2.89 | 0 | -0.98 | -2.89 * | 1 |
| | PPt | -5.52 | -3.43 | 13 | -4.11 | -3.46 | 3 | -3.97 | -3.46 | 8 |
| | PPk | -5.52 | -3.43 | 13 | -4.01 | -2.89 | 3 | -1.05 | -2.89 * | 3 |
| BZF | ADFt | -2.56 | -3.43 * | 8 | -3.52 | -3.46 | 1 | -7.77 | -3.46 | 0 |
| | ADFk | -1.13 | -2.87 * | 8 | -3.48 | -2.89 | 1 | -2.46 | -2.89 * | 2 |
| | PPt | -6.25 | -3.43 | 11 | -5.54 | -3.46 | 8 | -7.94 | -3.46 | 3 |
| | PPk | -6.25 | -3.43 | 11 | -5.50 | -2.89 | 8 | -6.88 | -2.89 | 11 |
| CH | ADFt | -3.36 | -3.43 * | 1 | -3.11 | -3.46 * | 0 | -3.61 | -3.46 | 0 |
| | ADFk | -3.14 | -2.87 | 1 | -2.25 | -2.89 * | 1 | -1.45 | -2.89 * | 1 |
| | PPt | -3.76 | -3.43 | 8 | -2.95 | -3.46 * | 2 | -3.51 | -3.46 | 1 |
| | PPk | -3.76 | -3.43 | 8 | -2.40 | -2.89 * | 5 | -1.52 | -2.89 * | 6 |
| FAX | ADFt | -3.04 | -3.43 * | 0 | -2.08 | -3.46 * | 0 | -2.67 | -3.46 * | 0 |
| | ADFk | -2.60 | -2.87 * | 0 | -1.72 | -2.89 * | 0 | -2.39 | -2.89 * | 0 |
| | PPt | -2.88 | -3.43 * | 5 | -2.24 | -3.46 * | 9 | -2.58 | -3.46 * | 5 |
| | PPk | -2.88 | -3.43 * | 5 | -1.76 | -2.89 * | 9 | -2.22 | -2.89 * | 4 |
| FPF | ADFt | -4.01 | -3.43 | 0 | -5.16 | -3.46 | 0 | -3.07 | -3.46 * | 0 |
| | ADFk | -3.12 | -2.87 | 0 | -5.19 | -2.89 | 0 | -2.03 | -2.89 * | 0 |
| | PPt | -4.14 | -3.43 | 16 | -4.87 | -3.46 | 10 | -3.19 | -3.46 * | 1 |
| | PPk | -4.14 | -3.43 | 16 | -4.88 | -2.89 | 10 | -1.85 | -2.89 * | 4 |
| GF | ADFt | -1.96 | -3.43 * | 3 | -6.57 | -3.46 | 0 | -4.94 | -3.46 | 0 |
| | ADFk | -3.20 | -2.87 | 1 | -2.23 | -2.89 * | 2 | -0.79 | -2.89 * | 3 |
| | PPt | -5.38 | -3.43 | 18 | -6.89 | -3.46 | 5 | -5.27 | -3.46 | 8 |
| | PPk | -5.38 | -3.43 | 18 | -4.48 | -2.89 | 8 | -2.94 | -2.89 | 9 |
| GSP | ADFt | -2.41 | -3.43 * | 1 | -2.40 | -3.46 * | 1 | -2.19 | -3.46 * | 0 |
| | ADFk | -2.41 | -2.87 * | 1 | -2.52 | -2.89 * | 1 | -1.76 | -2.89 * | 0 |
| | PPt | -3.43 | -3.43 * | 16 | -3.71 | -3.46 | 9 | -2.01 | -3.46 * | 2 |
| | PPk | -3.43 | -3.43 * | 16 | -3.64 | -2.89 | 8 | -1.58 | -2.89 * | 1 |
| IF | ADFt | -2.03 | -3.43 * | 1 | -3.89 | -3.46 | 0 | -2.27 | -3.46 * | 1 |
| | ADFk | -2.04 | -2.87 * | 1 | -3.59 | -2.89 | 0 | -1.13 | -2.89 * | 1 |
| | PPt | -2.81 | -3.43 * | 16 | -3.78 | -3.46 | 5 | -2.67 | -3.46 * | 6 |
| | PPk | -2.81 | -3.43 * | 16 | -3.58 | -2.89 | 6 | -1.41 | -2.89 * | 6 |
| IRL | ADFt | -4.14 | -3.43 | 1 | -3.06 | -3.46 * | 1 | -4.30 | -3.46 | 0 |
| | ADFk | -4.19 | -2.87 | 1 | -2.55 | -2.89 * | 1 | -4.16 | -2.89 | 0 |
| | PPt | -5.19 | -3.43 | 10 | -4.44 | -3.46 | 5 | -4.35 | -3.46 | 5 |
| | PPk | -5.19 | -3.43 | 10 | -3.20 | -2.89 | 6 | -4.15 | -2.89 | 5 |
| ISL | ADFt | -3.81 | -3.43 | 0 | -3.51 | -3.46 | 0 | -4.42 | -3.46 | 0 |
| | ADFk | -1.71 | -2.87 * | 1 | -1.40 | -2.89 * | 0 | -3.44 | -2.89 | 0 |
| | PPt | -3.44 | -3.43 * | 3 | -3.61 | -3.46 | 12 | -4.36 | -3.46 | 9 |
| | PPk | -3.44 | -3.43 * | 3 | -1.09 | -2.89 * | 12 | -3.30 | -2.89 | 7 |
| ITA | ADFt | -3.97 | -3.43 | 15 | -4.66 | -3.46 | 0 | -4.54 | -3.46 | 0 |
| | ADFk | -3.32 | -2.87 | 14 | -2.55 | -2.89 * | 1 | -4.54 | -2.89 | 0 |
| | PPt | -5.98 | -3.43 | 4 | -4.65 | -3.46 | 2 | -4.72 | -3.46 | 6 |
| | PPk | -5.98 | -3.43 | 4 | -3.28 | -2.89 | 1 | -4.68 | -2.89 | 6 |
| JOF | ADFt | -1.73 | -3.43 * | 5 | -1.78 | -3.46 * | 5 | -3.24 | -3.46 * | 1 |
| | ADFk | -1.74 | -2.87 * | 5 | -1.65 | -2.89 * | 5 | -1.41 | -2.89 * | 1 |
| | PPt | -4.43 | -3.43 | 16 | -3.03 | -3.46 * | 8 | -6.19 | -3.46 | 9 |
| | PPk | -4.43 | -3.43 | 16 | -3.15 | -2.89 | 9 | -2.01 | -2.89 * | 7 |
| KF | ADFt | -4.58 | -3.43 | 0 | -4.24 | -3.46 | 0 | -2.63 | -3.46 * | 0 |
| | ADFk | -4.59 | -2.87 | 0 | -3.22 | -2.89 | 0 | -2.62 | -2.89 * | 0 |
| | PPt | -4.73 | -3.43 | 6 | -4.37 | -3.46 | 3 | -2.77 | -3.46 * | 1 |
| | PPk | -4.73 | -3.43 | 6 | -3.24 | -2.89 | 2 | -2.74 | -2.89 * | 1 |

Table 8. Discounts: Unit Root Tests (concluded)

| | | Whole Sample | | | Tequila | | | Asia | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | t-statistic | CV | Lags | t-statistic | CV | Lags | t-statistic | CV | Lags |
| MF | Adft | -2.30 | -3.43 * | 0 | -4.25 | -3.46 | 0 | -2.66 | -3.46 * | 0 |
| | ADFk | -1.74 | -2.87 * | 0 | -2.97 | -2.89 | 14 | -1.24 | -2.89 * | 0 |
| | PPt | -2.09 | -3.43 * | 17 | -4.57 | -3.46 | 10 | -2.56 | -3.46 * | 6 |
| | PPk | -2.09 | -3.43 * | 17 | -3.39 | -2.89 | 12 | -1.14 | -2.89 * | 2 |
| MXE | ADFt | -2.37 | -3.43 * | 1 | -1.98 | -3.46 * | 0 | -3.09 | -3.46 * | 1 |
| | ADFk | -1.39 | -2.87 * | 1 | -2.01 | -2.89 * | 0 | -3.69 | -2.89 | 0 |
| | PPt | -3.03 | -3.43 * | 13 | -1.96 | -3.46 * | 7 | -4.17 | -3.46 | 7 |
| | PPk | -3.03 | -3.43 * | 13 | -2.00 | -2.89 * | 7 | -3.94 | -2.89 | 7 |
| MXF | ADFt | -2.50 | -3.43 * | 4 | -2.95 | -3.46 * | 0 | -4.44 | -3.46 | 0 |
| | ADFk | -1.07 | -2.87 * | 4 | -2.98 | -2.89 * | 0 | -1.91 | -2.89 * | 3 |
| | PPt | -4.85 | -3.43 | 17 | -3.12 | -3.46 * | 9 | -4.67 | -3.46 | 6 |
| | PPk | -4.85 | -3.43 | 17 | -3.11 | -2.89 | 9 | -2.46 | -2.89 * | 6 |
| PGF | ADFt | -3.96 | -3.43 | 1 | -2.96 | -3.46 * | 0 | -6.31 | -3.46 | 0 |
| | ADFk | -1.47 | -2.87 * | 6 | -2.52 | -2.89 * | 0 | -5.80 | -2.89 | 0 |
| | PPt | -4.96 | -3.43 | 12 | -2.89 | -3.46 * | 8 | -6.98 | -3.46 | 8 |
| | PPk | -4.96 | -3.43 | 12 | -2.38 | -2.89 * | 8 | -6.74 | -2.89 | 10 |
| SGF | ADFt | -3.25 | -3.43 * | 1 | -3.65 | -3.46 | 0 | -3.47 | -3.46 * | 0 |
| | ADFk | -3.06 | -2.87 | 1 | -3.33 | -2.89 | 0 | -1.68 | -2.89 * | 1 |
| | PPt | -4.13 | -3.43 | 6 | -3.93 | -3.46 | 7 | -3.46 | -3.46 * | 5 |
| | PPk | -4.13 | -3.43 | 6 | -3.61 | -2.89 | 7 | -2.13 | -2.89 * | 5 |
| SOA | ADFt | -5.48 | -3.43 | 7 | -3.97 | -3.46 | 7 | -6.84 | -3.46 | 0 |
| | ADFk | -5.58 | -2.87 | 7 | -3.11 | -2.89 | 2 | -4.28 | -2.89 | 1 |
| | PPt | -4.99 | -3.43 | 3 | -3.37 | -3.46 | 8 | -7.27 | -3.46 | 6 |
| | PPk | -4.99 | -3.43 | 3 | -3.39 | -2.89 | 6 | -7.19 | -2.89 | 6 |
| TKF | ADFt | -3.87 | -3.43 | 12 | -1.93 | -3.46 * | 9 | -6.29 | -3.46 | 0 |
| | ADFk | -3.86 | -2.87 | 12 | -2.28 | -2.89 * | 9 | -1.41 | -2.89 * | 2 |
| | PPt | -4.61 | -3.43 | 10 | -5.24 | -3.46 | 9 | -6.92 | -3.46 | 7 |
| | PPk | -4.61 | -3.43 | 10 | -1.83 | -2.89 * | 12 | -2.34 | -2.89 * | 4 |
| TTF | ADFt | -2.53 | -3.43 * | 4 | -3.21 | -3.46 * | 0 | -4.23 | -3.46 | 1 |
| | ADFk | -1.05 | -2.87 * | 4 | -3.25 | -2.89 | 0 | -2.41 | -2.89 * | 1 |
| | PPt | -3.13 | -3.43 * | 7 | -3.15 | -3.46 * | 5 | -3.06 | -3.46 * | 7 |
| | PPk | -3.13 | -3.43 * | 7 | -3.17 | -2.89 | 5 | -1.82 | -2.89 * | 9 |
| TWN | ADFt | -2.20 | -3.43 * | 1 | -2.36 | -3.46 * | 0 | -2.08 | -3.46 * | 0 |
| | ADFk | -1.60 | -2.87 * | 1 | -2.35 | -2.89 * | 0 | -2.26 | -2.89 * | 0 |
| | PPt | -2.50 | -3.43 * | 7 | -2.33 | -3.46 * | 4 | -1.90 | -3.46 * | 6 |
| | PPk | -2.50 | -3.43 * | 7 | -2.32 | -2.89 * | 4 | -2.20 | -2.89 * | 8 |
| UKM | ADFt | -3.37 | -3.43 * | 4 | -5.40 | -3.46 | 0 | -4.06 | -3.46 | 0 |
| | ADFk | -3.69 | -2.87 | 4 | -3.08 | -2.89 | 4 | -3.44 | -2.89 | 0 |
| | PPt | -5.86 | -3.43 | 14 | -5.72 | -3.46 | 10 | -4.24 | -3.46 | 7 |
| | PPk | -5.86 | -3.43 | 14 | -3.58 | -2.89 | 10 | -3.47 | -2.89 | 7 |

Source: Bloomberg.
Note: An asterisk means that the hypothesis of a unit root cannot be rejected at the 5 percent confidence level.
The number of lags has been selected with a general to specific approach.

## E. Are Fund Returns Too Volatile?

Several researchers, including Pontiff (1991) and HLW(1993) have found that the unconditional variance of the median fund return is significantly larger than the variance of returns on its NAV. For example, Pontiff (1991) computes the log variance ratio of U.S. fund returns over returns on NAVs. This ratio should be zero if both variances are similar. Pontiff reports that the volatility of fund returns is 73 percent greater than the variance of the fund's underlying assets. HLW conduct the same exercise for closed-end country funds, and find the mean log variance ratio to be 1.17, for a sample of 35 funds during the period 1986-1993, which implies that country fund returns are about three times as volatile as NAV returns. This result supports the noise trader hypothesis: country funds command a discount due to the excess volatility that results from the behavior of small investors. From this argument, it follows that crisis premia may be explained by an increase on the relative volatility of the underlying asset returns.

We repeated this exercise for our sample, and found a mean value of the log variance ratio of 0.2 , significantly lower than in HLW (1993). Moreover, the distribution across regions is not uniform: the ratio for Asia is 0.07, not significantly different from zero, whereas Latin America has a ratio of 0.14 and OECD has a ratio of 0.31. Within the regions, countries such as Indonesia, Korea, Malaysia, Mexico, Thailand, and Turkey have ratios that are zero or even negative.

Data on the entire sample may mask interesting dynamics that illuminate the behavior of funds during crisis periods. Estimates of excess volatility for the Tequila and Asian crises subsamples reveal the different regional behavior: the log-variance ratio is lower for crisis countries (Latin America in the first period; Asia in the second) and higher in contagion countries (Asia in the first period; Latin America in the second). In other words, local market volatility seems to increase relative to fund market volatility in the wake of financial crises. The last column of Table 9 shows the correlation between the log-variance ratio and the discount for the whole sample period (see also Figure 3). As expected, it is negative, as riskier assets are penalized in the form of larger discounts.[36]

Next, we compute the correlation of the changes in discounts with changes in NAVs and Fund prices.[37] If discount variability is driven primarily by changes in NAVs, we should observe a large negative correlation between them. Conversely, if changes in discounts are largely explained by variations in fund prices, the correlation coefficient between them will be positive, and higher than that between discounts and NAVs. The results in Table 10 show

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[36]Since discounts are measured in the paper as the price to NAV ratio, higher excess volatility is associated with a larger discount, resulting in a negative volatility-discount correlation.

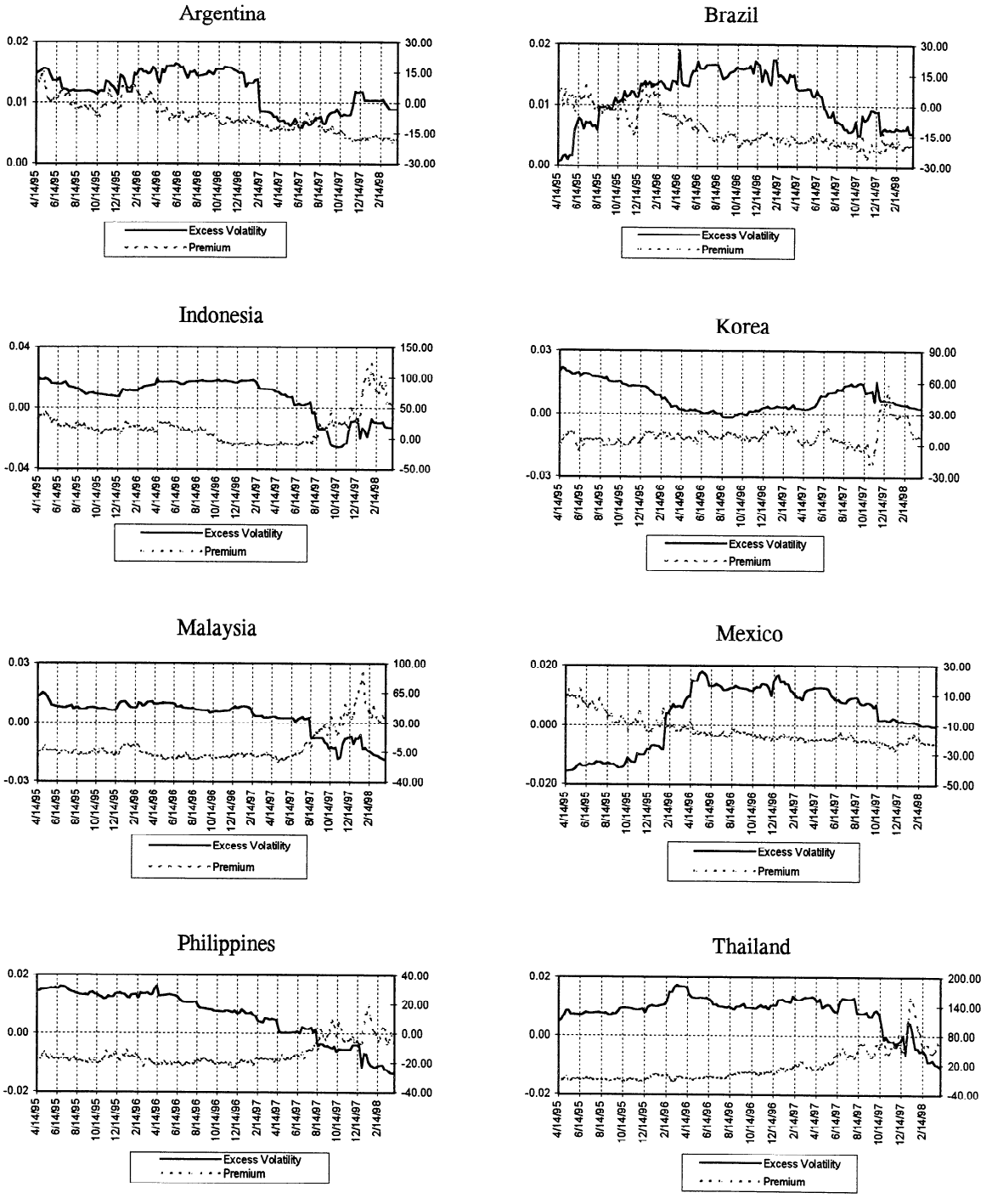
[37]For comparable values of price and NAV volatility, we would expect the first to be positive and the second to be negative.

Table 9. Log Variance Ratio

| | Whole | Tequila | Asia | Corr(LV, Discount) |
|---|---|---|---|---|
| AZ | 0.27 | 0.12 | 0.21 | -0.30 |
| BZF | 0.09 | 0.03 | 0.12 | -0.18 |
| CH | 0.28 | 0.26 | 0.22 | -0.22 |
| MXE | 0.08 | 0.02 | 0.07 | -0.22 |
| MXF | -0.02 | -0.12 | 0.06 | -0.30 |
| LAC | 0.14 | 0.06 | 0.14 | -0.25 |
| FPF | 0.01 | 0.32 | -0.18 | -0.23 |
| IF | 0.00 | 0.34 | -0.10 | -0.63 |
| KF | 0.09 | 0.40 | 0.04 | -0.09 |
| MF | -0.06 | 0.27 | -0.19 | -0.18 |
| SGF | 0.21 | 0.31 | 0.06 | -0.02 |
| TTF | 0.00 | 0.19 | -0.07 | -0.70 |
| TWN | 0.26 | 0.33 | 0.20 | 0.22 |
| Asia | 0.07 | 0.31 | -0.03 | -0.31 |
| FAX | 0.17 | 0.20 | 0.06 | 0.12 |
| GF | 0.35 | 0.38 | 0.30 | -0.42 |
| GSP | 0.14 | 0.16 | 0.14 | 0.65 |
| IRL | 0.51 | 0.47 | 0.52 | 0.17 |
| ITA | 0.17 | 0.23 | 0.12 | -0.07 |
| JOF | 0.44 | 0.40 | 0.44 | 0.21 |
| PGF | 0.36 | 0.63 | 0.19 | -0.72 |
| UKM | 0.34 | 0.47 | 0.29 | 0.01 |
| OECD | 0.29 | 0.40 | 0.23 | -0.01 |
| SOA | 0.13 | 0.13 | 0.06 | -0.19 |
| TKF | -0.15 | -0.19 | -0.16 | -0.56 |
| ISL | 0.31 | 0.46 | 0.17 | -0.66 |
| EM | 0.10 | 0.14 | 0.03 | -0.47 |
| | | | | |
| Average | 0.15 | 0.23 | 0.09 | -0.26 |

Source: Bloomberg.

Figure 3. Excess Volatility and Discounts




Source: Bloomberg.

Table 10. Correlations of Changes in Discounts with Changes in Prices and NAVs

| | Whole Sample | | Tequila | | Asia | |
|---|---|---|---|---|---|---|
| | Corr(DIS,P) | Corr(DIS,NAV) | Corr(DIS,P) | Corr(DIS,NAV) | Corr(DIS,P) | Corr(DIS,NAV) |
| AZ | 0.65 | 0.03 | 0.66 | -0.06 | 0.50 | 0.08 |
| BZF | 0.50 | -0.29 | 0.43 | -0.36 | 0.51 | -0.20 |
| CH | 0.70 | -0.02 | 0.67 | -0.10 | 0.61 | -0.01 |
| MXE | 0.35 | -0.23 | 0.39 | -0.34 | 0.39 | -0.03 |
| MXF | 0.26 | -0.43 | 0.27 | -0.57 | 0.40 | -0.14 |
| LAC | 0.49 | -0.19 | 0.49 | -0.29 | 0.48 | -0.06 |
| FPF | 0.47 | -0.35 | 0.73 | -0.17 | 0.16 | -0.61 |
| IF | 0.42 | -0.33 | 0.78 | -0.36 | 0.28 | -0.41 |
| KF | 0.57 | -0.30 | 0.79 | -0.27 | 0.39 | -0.29 |
| MF | 0.32 | -0.33 | 0.67 | -0.17 | 0.14 | -0.58 |
| SGF | 0.65 | -0.32 | 0.70 | -0.34 | 0.53 | -0.45 |
| TTF | 0.32 | -0.21 | 0.61 | -0.20 | 0.41 | -0.53 |
| TWN | 0.66 | -0.22 | 0.72 | -0.32 | 0.57 | 0.01 |
| Asia | 0.49 | -0.29 | 0.71 | -0.26 | 0.36 | 0.41 |
| FAX | 0.72 | -0.57 | 0.76 | -0.59 | 0.55 | -0.52 |
| GF | 0.67 | -0.20 | 0.77 | -0.18 | 0.56 | -0.24 |
| GSP | 0.54 | 0.28 | 0.59 | -0.19 | 0.64 | 0.44 |
| IRL | 0.81 | -0.25 | 0.80 | -0.16 | 0.86 | -0.33 |
| ITA | 0.60 | -0.26 | 0.71 | -0.38 | 0.51 | -0.16 |
| JOF | 0.81 | -0.31 | 0.82 | -0.40 | 0.81 | -0.21 |
| PGF | 0.71 | -0.16 | 0.89 | -0.23 | 0.61 | -0.15 |
| UKM | 0.69 | -0.24 | 0.75 | -0.29 | 0.69 | -0.10 |
| OECD | 0.68 | -0.22 | 0.77 | -0.27 | 0.64 | -0.17 |
| SOA | 0.48 | -0.20 | 0.40 | -0.34 | 0.41 | -0.19 |
| TKF | 0.31 | -0.49 | 0.40 | -0.67 | 0.12 | -0.56 |
| ISL | 0.69 | -0.20 | 0.76 | -0.08 | 0.59 | -0.34 |
| EM | 0.50 | -0.30 | 0.52 | -0.36 | 0.37 | -0.36 |

Source: Bloomberg.

that, in general, prices are more correlated with discounts than NAVs, supporting the noise trader hypothesis. However, the correlation with NAVs increases sharply in absolute value for crisis countries, dominating the correlation between discounts and prices.

Therefore, this evidence suggests that the emergence of large premia during crisis is associated with a temporary decline in the excess volatility of fund prices, as well as an increase in the importance of changes in NAVs as an explanatory factor of variations in discounts.

### F. Is There a Common Component Across Country Fund Discounts?

The noise trader hypothesis suggests a common systematic source of risk as the main reason behind the behavior of discounts across funds. As was mentioned in the previous section, this implies that discounts originate in the behavior of a particular type of investor, and that it affects all assets in his portfolio similarly, suggesting the existence of an important common component in discounts across countries.

The most immediate way of analyzing commonalities is to compute correlations across fund discounts. Tables 11 and 12 present the correlation matrix of discount levels and first differences, respectively. Several points are important. First, correlations in levels are higher than in first differences. Second, discount levels display substantial positive correlation: about 75 percent of the correlations are positive and significantly different from zero, with a maximum of 0.88 between Brazil and Argentina and an average of 0.61. However, about 23 percent of the correlations are negative, with values as high as -0.76 between Thailand and Argentina. In fact, the average correlation between Argentina, Brazil, and Mexico is 0.83, and between Indonesia, Malaysia, Philippines, and Thailand is 0.75. However, the correlation between discounts in these two regions is highly negative. This seems to indicate the presence of common *regional* components in the behavior of discounts, rather than a global common factor as found in previous studies.

We explore this issue further by estimating a parametric version of the "single index" model of Sargent and Sims (1977) as developed by Stock and Watson (1988). The estimation of an unobserved components model is a more sophisticated technology to capture the presence of common components across economic time series. The empirical model is as follows:

$$Y_t = \alpha Z_t + U_t$$

*where*

$$Z_t = \rho_z Z_{t-1} + \epsilon_t$$

$$U_t = \rho_u U_{t-1} + \mu_t$$

Table 11. Discounts: Correlation Matrix

| Arg | Bra | Chi | Aus | Phi | Ger | Spa | Ind | Ire | Isr | Ita | Ind | Jap | Kor | Mal | Mex | Mex | Por | Sin | SA | Tur | Tha | Taiw | UK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.00 | 0.88 | 0.46 | 0.41 | -0.56 | 0.18 | -0.10 | -0.03 | 0.29 | 0.69 | 0.61 | -0.28 | -0.02 | -0.07 | -0.48 | 0.79 | 0.83 | 0.65 | 0.43 | 0.10 | 0.66 | -0.76 | 0.60 | 0.04 |
| | 1.00 | 0.39 | 0.39 | -0.45 | 0.22 | -0.18 | 0.11 | 0.22 | 0.65 | 0.59 | -0.13 | 0.15 | -0.04 | -0.33 | 0.81 | 0.82 | 0.64 | 0.50 | 0.07 | 0.61 | -0.66 | 0.61 | 0.07 |
| | | 1.00 | 0.48 | -0.44 | 0.18 | -0.10 | -0.22 | 0.41 | 0.52 | 0.62 | -0.29 | 0.15 | 0.28 | -0.32 | 0.18 | 0.19 | 0.28 | 0.13 | 0.56 | 0.73 | -0.43 | 0.52 | 0.37 |
| | | | 1.00 | -0.07 | 0.52 | -0.39 | 0.14 | 0.43 | 0.69 | 0.59 | 0.10 | 0.28 | 0.30 | 0.04 | 0.31 | 0.26 | 0.58 | 0.37 | 0.31 | 0.63 | -0.18 | 0.29 | 0.44 |
| | | | | 1.00 | 0.21 | -0.26 | 0.53 | -0.12 | -0.36 | -0.28 | 0.69 | 0.39 | 0.17 | 0.86 | -0.36 | -0.43 | -0.28 | 0.24 | -0.01 | -0.42 | 0.87 | -0.45 | 0.16 |
| | | | | | 1.00 | -0.16 | 0.44 | 0.37 | 0.48 | 0.50 | 0.47 | 0.53 | 0.33 | 0.41 | 0.35 | 0.26 | 0.48 | 0.35 | 0.47 | 0.40 | 0.10 | -0.02 | 0.66 |
| | | | | | | 1.00 | -0.20 | -0.18 | -0.13 | -0.24 | -0.15 | -0.35 | 0.03 | -0.21 | -0.11 | -0.09 | -0.15 | -0.45 | -0.16 | -0.20 | -0.10 | -0.17 | -0.16 |
| | | | | | | | 1.00 | 0.05 | 0.16 | 0.14 | 0.91 | 0.44 | 0.32 | 0.72 | 0.21 | 0.13 | 0.26 | 0.57 | 0.07 | 0.04 | 0.36 | 0.05 | 0.32 |
| | | | | | | | | 1.00 | 0.33 | 0.33 | 0.05 | 0.29 | 0.25 | -0.03 | 0.09 | 0.10 | 0.41 | 0.19 | 0.26 | 0.40 | -0.17 | 0.19 | 0.25 |
| | | | | | | | | | 1.00 | 0.81 | -0.02 | 0.12 | 0.21 | -0.19 | 0.66 | 0.61 | 0.80 | 0.42 | 0.42 | 0.83 | -0.53 | 0.38 | 0.43 |
| | | | | | | | | | | 1.00 | 0.02 | 0.26 | 0.25 | -0.11 | 0.59 | 0.53 | 0.58 | 0.43 | 0.58 | 0.77 | -0.42 | 0.41 | 0.56 |
| | | | | | | | | | | | 1.00 | 0.50 | 0.36 | 0.86 | -0.02 | -0.11 | 0.07 | 0.47 | 0.09 | -0.12 | 0.59 | -0.12 | 0.37 |
| | | | | | | | | | | | | 1.00 | 0.21 | 0.52 | 0.02 | -0.02 | 0.12 | 0.35 | 0.30 | 0.12 | 0.25 | 0.22 | 0.45 |
| | | | | | | | | | | | | | 1.00 | 0.38 | -0.05 | -0.11 | 0.08 | 0.15 | 0.33 | 0.20 | 0.27 | 0.03 | 0.53 |
| | | | | | | | | | | | | | | 1.00 | -0.23 | -0.32 | -0.15 | 0.38 | 0.14 | -0.24 | 0.81 | -0.28 | 0.36 |
| | | | | | | | | | | | | | | | 1.00 | 0.95 | 0.63 | 0.51 | 0.14 | 0.53 | -0.54 | 0.31 | 0.18 |
| | | | | | | | | | | | | | | | | 1.00 | 0.60 | 0.48 | 0.09 | 0.49 | -0.60 | 0.40 | 0.08 |
| | | | | | | | | | | | | | | | | | 1.00 | 0.38 | 0.15 | 0.67 | -0.49 | 0.32 | 0.26 |
| | | | | | | | | | | | | | | | | | | 1.00 | 0.20 | 0.37 | 0.02 | 0.35 | 0.20 |
| | | | | | | | | | | | | | | | | | | | 1.00 | 0.52 | 0.03 | 0.03 | 0.66 |
| | | | | | | | | | | | | | | | | | | | | 1.00 | -0.54 | 0.50 | 0.45 |
| | | | | | | | | | | | | | | | | | | | | | 1.00 | -0.59 | 0.16 |
| | | | | | | | | | | | | | | | | | | | | | | 1.00 | 0.00 |
| | | | | | | | | | | | | | | | | | | | | | | | 1.00 |

Source: Bloomberg.

Table 12. Changes in Discounts-Correlation Matrix

| Arg | Bra | Chi | Aus | Phi | Ger | Spa | Ind | Ire | Isr | Ita | Ind | Jap | Kor | Mal | Mex | Mex | Por | Sin | SA | Tur | Tha | Taiw | UK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.00 | 0.19 | 0.06 | 0.07 | 0.00 | 0.22 | 0.09 | 0.04 | 0.10 | -0.12 | 0.12 | 0.01 | 0.20 | -0.01 | 0.13 | 0.06 | 0.29 | 0.15 | 0.04 | 0.08 | 0.14 | 0.03 | 0.03 | 0.23 |
| | 1.00 | 0.21 | 0.00 | 0.04 | 0.06 | 0.04 | 0.12 | 0.01 | 0.02 | 0.00 | -0.06 | 0.10 | -0.01 | 0.10 | 0.32 | 0.21 | 0.16 | 0.10 | 0.05 | 0.09 | -0.01 | 0.03 | -0.07 |
| | | 1.00 | -0.07 | 0.04 | 0.07 | 0.01 | 0.05 | 0.09 | 0.09 | -0.02 | 0.12 | 0.12 | 0.07 | 0.02 | 0.17 | 0.05 | 0.03 | 0.11 | -0.05 | 0.18 | 0.10 | 0.15 | 0.07 |
| | | | 1.00 | 0.10 | 0.05 | -0.03 | 0.07 | 0.02 | -0.10 | 0.08 | -0.01 | -0.07 | -0.04 | 0.15 | -0.12 | 0.03 | -0.05 | 0.14 | 0.09 | -0.05 | 0.07 | 0.02 | 0.02 |
| | | | | 1.00 | 0.16 | 0.02 | 0.28 | -0.12 | 0.02 | -0.03 | 0.31 | 0.15 | 0.01 | 0.41 | -0.03 | 0.01 | 0.13 | 0.25 | 0.04 | 0.00 | 0.42 | 0.00 | -0.05 |
| | | | | | 1.00 | -0.08 | -0.11 | 0.27 | 0.16 | 0.05 | 0.06 | 0.29 | 0.21 | 0.19 | 0.07 | 0.20 | 0.23 | 0.15 | 0.12 | -0.06 | 0.07 | 0.09 | 0.26 |
| | | | | | | 1.00 | 0.14 | -0.03 | 0.00 | -0.05 | 0.12 | 0.06 | -0.04 | 0.03 | -0.05 | -0.07 | 0.02 | -0.06 | 0.04 | -0.05 | -0.05 | 0.05 | -0.06 |
| | | | | | | | 1.00 | 0.00 | 0.04 | 0.08 | 0.57 | 0.04 | -0.10 | 0.30 | 0.08 | -0.01 | 0.16 | 0.04 | 0.12 | -0.07 | 0.09 | 0.15 | -0.05 |
| | | | | | | | | 1.00 | 0.05 | -0.01 | 0.07 | 0.13 | 0.07 | 0.07 | 0.00 | 0.03 | 0.24 | 0.03 | 0.09 | -0.05 | -0.09 | 0.14 | 0.12 |
| | | | | | | | | | 1.00 | 0.07 | 0.15 | 0.11 | -0.01 | 0.05 | 0.15 | 0.07 | 0.20 | 0.12 | 0.04 | -0.02 | 0.04 | 0.05 | 0.11 |
| | | | | | | | | | | 1.00 | 0.18 | -0.09 | 0.05 | 0.09 | 0.10 | 0.14 | 0.03 | 0.16 | 0.07 | -0.05 | 0.08 | 0.07 | 0.20 |
| | | | | | | | | | | | 1.00 | 0.16 | 0.13 | 0.37 | 0.06 | 0.06 | 0.10 | 0.15 | 0.12 | 0.01 | 0.31 | 0.14 | 0.09 |
| | | | | | | | | | | | | 1.00 | 0.09 | 0.16 | -0.07 | 0.06 | 0.22 | 0.09 | 0.14 | 0.16 | 0.10 | 0.12 | 0.14 |
| | | | | | | | | | | | | | 1.00 | 0.06 | 0.09 | 0.04 | 0.01 | 0.05 | 0.06 | 0.03 | 0.10 | 0.04 | 0.18 |
| | | | | | | | | | | | | | | 1.00 | 0.08 | 0.11 | 0.16 | 0.37 | 0.05 | -0.04 | 0.32 | 0.16 | 0.08 |
| | | | | | | | | | | | | | | | 1.00 | 0.49 | 0.06 | 0.11 | -0.10 | 0.00 | 0.03 | 0.05 | -0.02 |
| | | | | | | | | | | | | | | | | 1.00 | 0.09 | 0.19 | 0.04 | 0.07 | 0.05 | 0.21 | 0.11 |
| | | | | | | | | | | | | | | | | | 1.00 | 0.17 | 0.09 | 0.08 | 0.03 | 0.12 | 0.11 |
| | | | | | | | | | | | | | | | | | | 1.00 | 0.12 | 0.13 | 0.23 | 0.17 | 0.09 |
| | | | | | | | | | | | | | | | | | | | 1.00 | -0.06 | -0.02 | 0.11 | 0.08 |
| | | | | | | | | | | | | | | | | | | | | 1.00 | 0.06 | 0.18 | 0.08 |
| | | | | | | | | | | | | | | | | | | | | | 1.00 | 0.03 | -0.07 |
| | | | | | | | | | | | | | | | | | | | | | | 1.00 | 0.00 |
| | | | | | | | | | | | | | | | | | | | | | | | 1.00 |

Source: Bloomberg.

Each discount is assumed to move contemporaneously with an unobserved scalar time series variable, $Z_t$, common to all funds, and a component $U_{it}$ that comprises idiosyncratic elements plus measurement errors; both components are assumed to be stochastic. The unobserved component $Z_t$ enters the model only contemporaneously, whereas the idiosyncratic component follows a first order autorregresive process. $Y_t$ is the vector containing all the discounts and $\epsilon_t$ and $\mu_t$ are white noise errors. The main identifying assumption expresses the core notion that all the commonalities in the discounts arise from a single source, $Z_t$. This is achieved by assuming that $Z_t$ and $U_t$ are mutually uncorrelated at all leads and lags.

The estimation is performed by first casting the model into a state space form and then extracting the unobserved component with the Kalman filter by maximum likelihood. Given the suspected lack of stationarity but also lack of cointegration among the variables, the model is estimated in differences. We first tried to extract the common component of the 24 funds over the whole period, but it was impossible to obtain convergence in the optimization process. The failure to find a common component casts doubt on the existence of a common investor sentiment driving the behavior of all country fund discounts. To test for regional sentiment, we estimated the common component model for Europe (Germany, Ireland, Italy, Portugal, Spain, and the United Kingdom), LAC (Argentina, Brazil, and Mexico), Asia II (Malaysia, Philippines, and Singapore) and other Emerging Markets (EM) (Israel, South Africa, and Turkey).[38] Given the suspected change in investor confidence toward emerging markets after the Tequila crisis, we estimate the model for the whole sample and for the two subsamples, the Tequila and Asian crises. In all the cases, the estimation was performed in first differences, and then the series in levels was reconstructed by taking as a starting point the average value of the series included in the group. Several points stood out. First, all groups had significant common components, although for Asia II and EM the common component was significant only for the Asian crisis period. This common component explains on average about 20 percent of the variance of the discounts, and ranges from 35 percent for LAC during the Asian crisis to 10 percent for Asia II, also during the Asian crisis. Second, the common components displayed a high degree of persistence: first order autocorrelations ranged from 0.89 to 0.97, showing a persistence considerably greater than that estimated for the idiosyncratic (country-specific) components. Third, and more important, as Figure 4 shows, an important declining trend in the LAC component contrasts with the upward trend in the Asian component during the period corresponding to the Asian crisis. Note also that the common component captures the important peak of the recent Asian crisis, as well as the effect of major events and announcements.

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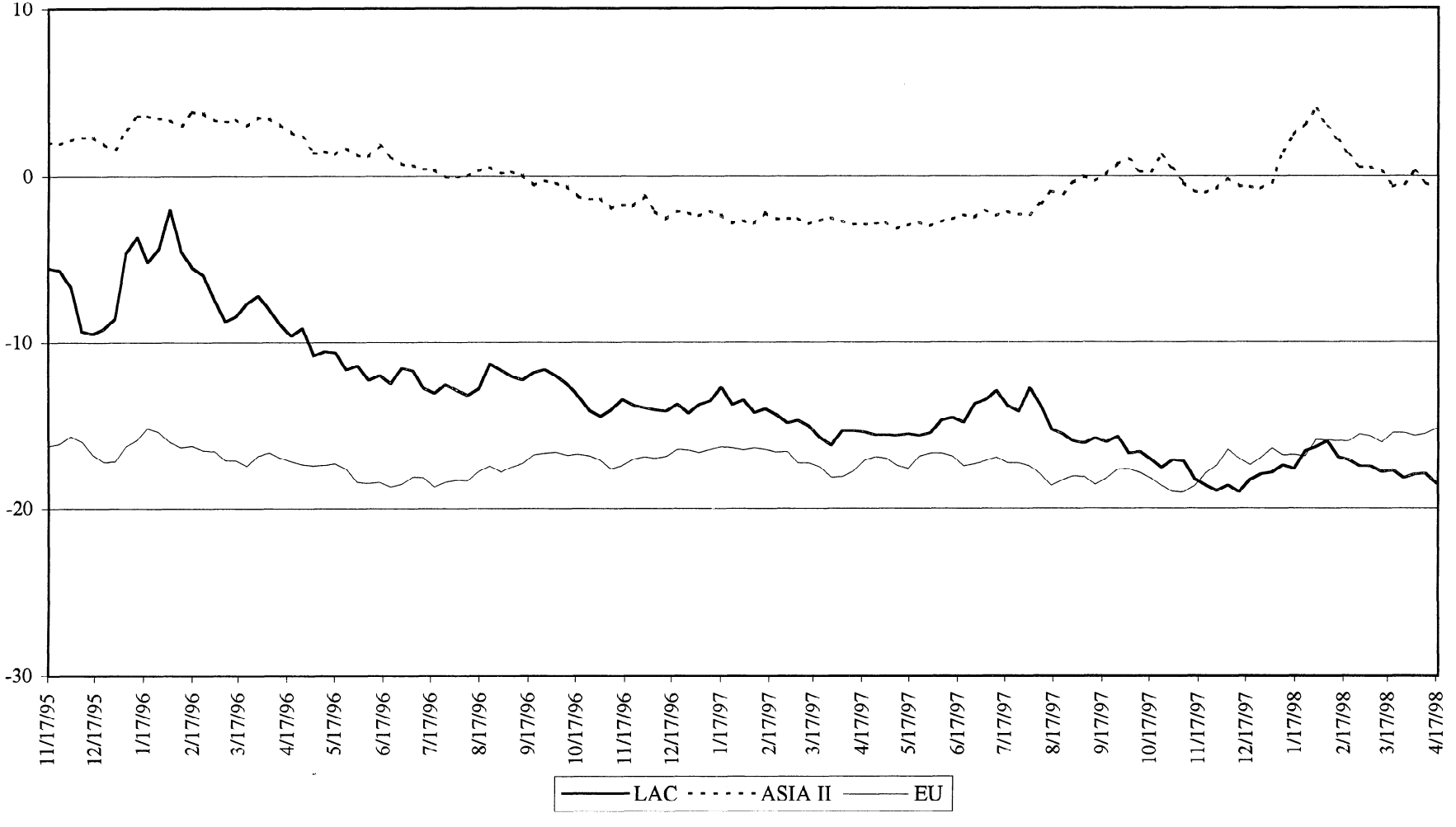
[38]We failed to find a common component in discounts for Asia I countries.

Figure 4: Discounts: Common Component




Source: Bloomberg.

Even in the presence of a common market sentiment driving the evolution of fund prices, the test of common component on discounts would fail if fund prices moved differently vis-à-vis local markets for countries in different groups.[39] To determine whether market sentiment is region-specific or whether the common component of discounts captures similarities in the local response, we repeat the estimation of the model substituting fund prices for discounts, for the Asian crisis period. As Figure 5 shows, the Asian crisis manifests itself with different intensity across groups, being as expected strongest in Asia I and weakest in Latin America. However, this time the common component displayed a similar pattern across regions, showing a flat trend during the pre-crisis period, and a decline from July 1997 on.[40] This similarity, and the fact that the three components are highly correlated with each other, are confirmed by the existence of a weaker, but still significant, common component across groups.

These results have three important implications. First, there is indeed evidence that the behavior of country fund prices is driven, in part, by investor sentiment. Second, this sentiment discriminates to some extent between emerging markets in different regions. Third, a comparison of common components in prices and in discounts strongly suggests that the different patterns displayed by discounts in crisis and non-crisis countries can only be explained by differences in the *relative* behavior of fund and stock prices or, alternatively, of foreign and local investors. This hypothesis is explored in the following section.

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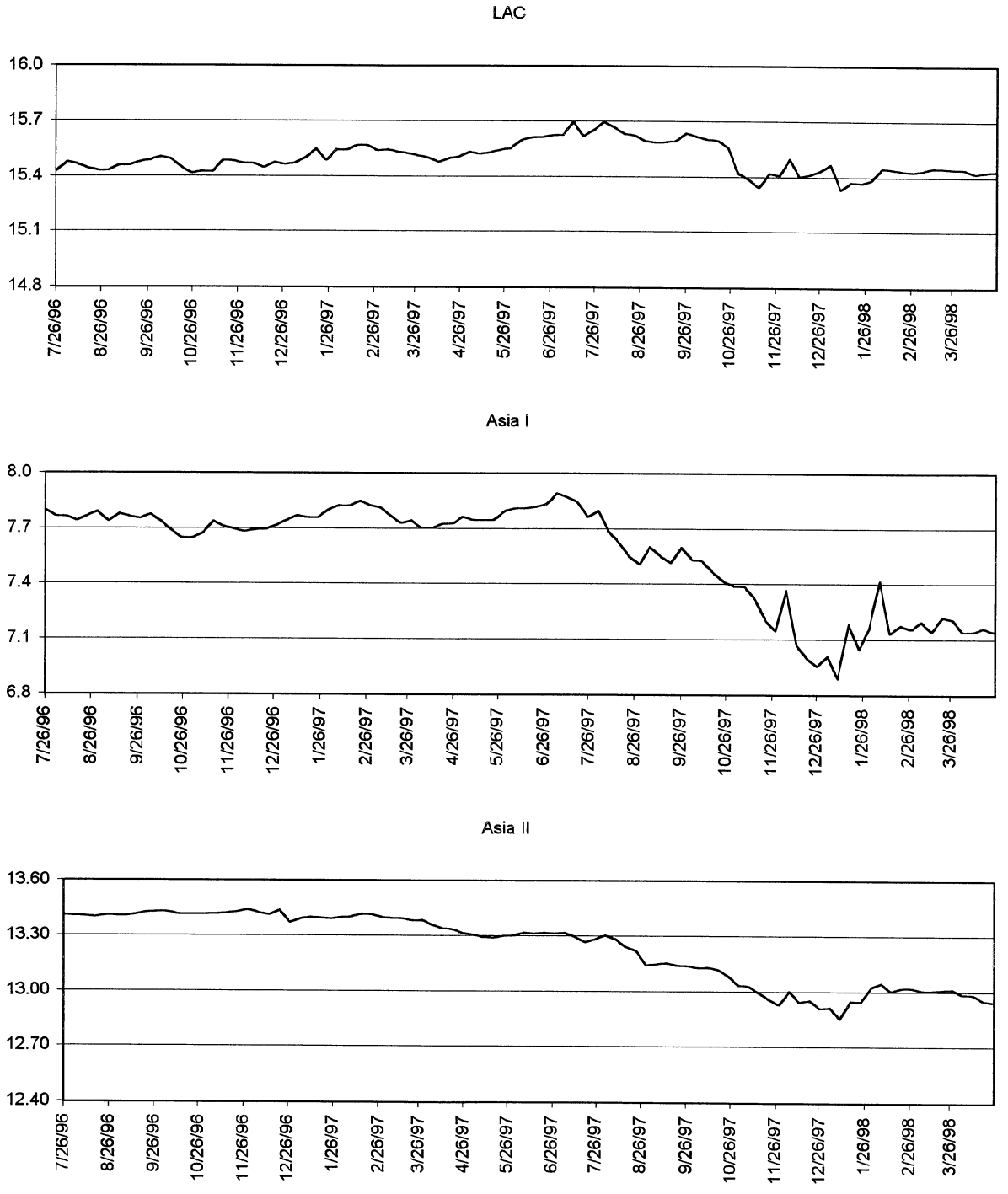
[39]It is easy to see that, if the common price component moves in the same direction irrespective of whether host market values increase or fall, discounts will widen in the first case and decline in the second.

[40]It is interesting to note that this market sentiment index starts to reflect the imminence of the Asian crisis almost one year after the Thai fund discount turned into a premium, as a result of the first indications of financial distress in July 1996 (Figure 2).

Figure 5.a. Prices: Common Component




Sources: Bloomberg.

Figure 5.b. Prices: Common Component
Whole Sample


Source: Bloomberg.

## IV. The "Stickiness" of Country Fund Prices

One aspect of the behavior of country funds that has been reported in the existing literature is the fact that fund prices tend to underreact to local factors and to overreact to external (global) factors. Although no convincing theoretical explanation has been proposed, this empirical regularity by itself could help explain why funds build up premia during stock market crashes in crisis countries. Indeed, one could think of a simple reduced-form characterization of the behavior of fund prices and NAVs in the following way:

$$P = p(L, X) \tag{1}$$

$$NAV = n(L, X) \tag{2}$$

where $L$ and $X$ are local and external factors, and

$$p'_1 < n'_1,$$

$$p'_2 > n'_2.$$

Thus, a collapse in the local stock market, through its effect on $L$, would affect NAVs more strongly than fund prices. If changes in external conditions are comparatively minor, the price to NAV ratio would increase. Alternatively, if country specific fundamentals are in good shape, a foreign crisis would influence prices relatively more, deepening the fund discount.[41]

From equations (1) and (2), it follows that changes in world market conditions would primarily affect fund prices, whereas changes in local markets would be reflected relatively more in NAVs. More precisely, a crisis abroad that propagates through the international markets inducing a decline in the world market index would lead to an increase in discounts in non-crisis country funds, as fund prices fall more than local stocks. Conversely, a local crisis would depressed local share prices relatively more. Therefore, we should be able to observe a positive correlation between the world market index and country fund discounts and a negative correlation between discounts and the local stock index.[42] A regression of changes in

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[41]According to this hypothesis, crisis countries with more open capital markets are likely to benefit from the stabilizing influence of foreign investors. This may explain why the crisis-premia in the fairly open Latin American markets were significantly below the levels reached in the closed Asian economies.

[42]Using STR and MSCI as proxies for local and external factors in equations (1) and (2), one can readily see that

$$dDIS/dSTR = p'_1 - n'_1 < 0$$

(continued...)

fund discounts on changes in STR and MSCI, and lagged discounts, confirms this prediction. Thable 13 present the coefficients and associated t-values. Variations in the world market index are always significantly negatively correlated with fund discounts, as fund prices react stronger to external factors than local stocks. On the other hand, the coefficient corresponding to the local market is always negative, and significant except for the period of the Mexican crisis.

Table 13. Discounts as a Function of Local and External Factors

$$DIS_t = \alpha + \beta_1 STR_t + \beta_2 MSCI_t + \beta_3 DIS_{t-1}$$

| Sample | | Period | STR | MSCI | $DIS_{-1}$ |
|---|---|---|---|---|---|
| Whole | (1) | Whole | -0.002*** | 0.081*** | -0.111*** |
| | | | -3.04 | 4.04 | -13.56 |
| | (2) | Tequila | -0.002 | 0.119*** | -0.212*** |
| | | | -1.54 | 3.08 | -14.91 |
| | (3) | Asian crisis | -0.001* | 0.080*** | -0.147*** |
| | | | -1.72 | 5.02 | -10.13 |
| Emerging markets | (4) | Whole | -0.002*** | 0.139*** | -0.092*** |
| | | | -3.15 | 4.17 | -10.20 |
| | (5) | Tequila | -0.002 | 0.326*** | -0.197*** |
| | | | -1.59 | 5.03 | -12.00 |
| | (6) | Asian crisis | -0.001** | 0.080*** | -0.133*** |
| | | | -2.16 | 3.23 | -8.00 |

Source: Bloomberg.

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[42](...continued)

$$dDIS/dMSCI = p'_2 - n'_2 > 0.$$

Further support for the stickiness hypothesis is provided by examining the behavior of country fund prices and NAVs *vis à vis* local and external factors. To do so, we first regress country fund premia on changes in NAVs and a measure of foreign investor sentiment (MSCI). As was mentioned before, a broad definition of market sentiment can allow for some degree of discrimination across countries, as suggested by the evidence on common components discussed above. More precisely, in the context of the Asian crisis, foreign investors may have become relatively more pessimistic with respect to neighboring Asian countries than to emerging markets as a whole.[43] Hence, we conducted the same test including both MSCI and the NAV of the Korea Fund.[44] We estimated the equation using SUR with different constant terms and similar coefficients across countries, for the Asian I, Asian II and Latin American subsamples, and for a European subsample (Germany, Italy, Spain, and U.K.) that we use as control group.[45]

As Tables 14 and 15 show, the results for the whole sample confirm previous evidence presented in the literature indicating that fund prices respond significantly to changes in world market conditions, after controlling for changes in the local market, as reflected by the large and highly significant coefficient on MSCI. Some interesting differences are uncovered by dividing the sample. First, the fraction of fund prices accounted for by variations in NAVs is substantially larger in the European group than in emergimg markets (Table 14). Conversely, the influence of the world market index is subtantially stronger in these countries, revealing the impact of foreign factors, and in particular, the extent of the contagion from crisis countries (Table 15). This effect is not evenly distributed across countries. While European

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[43]Note that, although it was reasonable to expect Asian II countries to suffer spillovers on fundamentals (e.g., a deterioration of the current account), these fundamental changes should have had the same effect on fund prices and NAV, with no impact on discounts. Our conjecture here, on the other hand, is that imperfectly informed foreign investors would tend to correlate non-fundamental changes in Asia I countries with changes in regional emerging markets more than with changes in other emerging markets.

[44]Several tests were conducted using proxies for market conditions in all three Asian crisis countries. Due to the high correlation between these proxies during the period under analysis, only the Korean NAV was found to be consistently significant. This result does not imply that Korea was the only regional factor behind the behavior of country fund prices. We prefer to interpret the Korean index as an imperfect measure of the overall macroeconomic conditions in Asian crisis countries.

[45]These European funds were not subject to either episodes of financial distress at home, or contagion from crisis abroad. In addition, they are considered to have open capital markets. Thus, they can be taken as representative of the "steady state" behavior in the absence of barriers.

Table 14. The Stickiness of Country Fund Prices

$$P = \alpha + \Sigma_i^2 \beta_{1,i} NAV_{t-i} + \beta_2 DIS_{t-1}$$

| | Sample | Period | NAV | $NAV_{-1}$ | $NAV_{-2}$ | DIS |
|---|---|---|---|---|---|---|
| (1) | Whole | Asian crisis | 0.804*** | | | |
| | | | 41.24 | | | |
| (2) | | | 0.808*** | 0.056*** | 0.016 | |
| | | | 41.4 | 2.89 | 0.81 | |
| (3) | | | 0.828*** | 0.053*** | 0.021 | -0.0007*** |
| | | | 42.89 | 2.75 | 1.09 | -6.66 |
| (4) | Emerging | | 0.649*** | 0.020 | -0.012 | -0.0005*** |
| | | | 27.07 | 0.85 | -0.45 | -4.45 |
| (5) | Europe | | 1.049*** | 0.041 | 0.045 | -0.0019*** |
| | | | 38.14 | 1.49 | 1.64 | -5.371 |

Source: Bloomberg.

Table 15. Determinants of Country Fund Prices

$$DIS_t = \alpha + \beta_1 DIS_{t-1} + \beta_2 NAV_t + \beta_3 MSCI_t + \beta_3 KORNAV_t$$

| Sample | | Period | DIS | NAV | MSCI | KORNAV |
|---|---|---|---|---|---|---|
| Whole | (1) | Asian crisis | -0.0007*** | 0.782*** | 0.351*** | |
| | | | -6.73 | 39.14 | 7.28 | |
| Latam | (2) | | -0.0017*** | 0.852*** | 0.34*** | |
| | | | -4.67 | 20.19 | 3.84 | |
| | (3) | | -0.0016*** | 0.857*** | 0.286*** | 0.038** |
| | | | -4.68 | 20.43 | 3.12 | 2.05 |
| Asia II | (4) | | -0.0003** | 0.515*** | 0.486*** | |
| | | | -1.97 | 11.39 | 3.34 | |
| | (5) | | -0.0003* | 0.493*** | 0.389*** | 0.107*** |
| | | | -1.88 | 11.44 | 2.73 | 3.53 |
| Asia I | (6) | | -.0004*** | 0.544*** | 1.128*** | |
| | | | -2.67 | 11.75 | 4.51 | |
| Europe | (7) | | -0.0021*** | 1.020*** | 0.283*** | |
| | | | -5.89 | 35.10 | 4.50 | |

Source: Bloomberg.

funds are the least affected by foreign factors, in Latin America funds were influenced both by developments in world markets in general, and in Asian markets in particular. Finally, the impact of Asian regional factors on Asian markets was, as expected, more important.[46]

To examine this in more detail, we regress changes in both prices and NAVs on local market conditions, proxied by local currency stock market returns returns (STR), changes in the exchange rate (ER), returns on a world market indicator (MSCI), and the lagged discount.[47]

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[46]This finding is consistent with the view that foreign investor sentiment discriminates between mature and emerging markets and, in turn, between crisis and non-crisis regions.

[47]Several other specifications were tested, including the DJ and the SP 500 indices of the

(continued...)

The results, presented in Table 16 confirms that country fund prices can be explained more by world market conditions and less by local factors than their NAVs, as indicated by lower STR coefficients and higher MSCI coefficients in the price equations.[48] As expected, a lower sensitivity to external factors is usually accompanied by a higher one to local factors.

Table 16. Differential Effect of Local and External Factors

$$X_t = \alpha + \beta_1 NAV_t + \beta_2 MSCI_t + \beta_3 DIS_{t-1} + \beta_4 ER_{t-1}$$

| Price | | Sample | Period | DIS | STR | ER | MSCI |
|---|---|---|---|---|---|---|---|
| | (1) | Latam | Asian Crisis | | 0.637*** | | 0.436*** |
| | | | | | 15.60 | | 4.19 |
| | (2) | Asia I | | | 0.525*** | | 1.290*** |
| | | | | | 7.67 | | 4.58 |
| | (3) | Asia II | | -0.0004* | 0.428*** | 0.292*** | 0.546*** |
| | | | | -1.97 | 7.29 | 2.84 | 3.38 |
| NAV | (4) | Latam | | 0.0005* | 0.572*** | -0.286* | 0.198*** |
| | | | | 1.77 | 18.79 | -1.78 | 2.60 |
| | (5) | Asia I | | | 0.802*** | | 0.949*** |
| | | | | | 12.87 | | 3.43 |
| | (6) | Asia II | | | 0.893*** | | |
| | | | | | 22.96 | | |

Source: Bloomberg.

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[47](...continued)
NYSE, the Morgan Stanley Emerging Market Index, and stock market indices of the crisis countries. The model presented here, selected using a "general to specific" approach, follows the criterion that a particular regressor be significant at least for one country sample. The devaluation rate was included separately due to the fact, reported in HLW (1993) and confirmed in this paper, that country prices are highly inelastic to exchange rate changes.

[48]The fact that in crisis countries NAVs are strongly linked to the world index probably reflects the inverse causality, that is, the effect of the evolution of local market returns on the MSCI.

## V. Discussion and Conclusions

This paper showed that closed-end country funds display a striking regularity: their price to NAV ratio increases sharply during financial crisis, regardless of whether the crisis is originated by foreign or local investors. Moreover, the opposite is true for countries most directly affected by contagion. In them, the relation between fund prices and underlying assets deteriorates. We argued that traditional explanations of the closed-end fund puzzle cannot account for this behavior, and proposed an alternative interpretation.

KS (1995) base their criticism of the noise trader hypothesis on the fact that country fund behavior differs across regions, arguing that the original market sentiment argument only makes sense if it influences all comparable assets in the same way. However, as was said previously, the intuition would still be valid if we assume that investors discriminate between assets in different regions, and interpret sentiment as a random non-fundamental component that influences investors' valuation of a particular type of assets.[49] The paper presented evidence that a common (market sentiment) component can indeed be identified for both Asian and Latin American markets during the Asian crisis period, and that stronger commonalities are found when we restrict our attention to specific regions, suggesting a certain degree of discrimination of foreign investors. However, we found that discounts do not reflect the behavior of foreign investors per se, but in relation with local investors. Precisely, we showed that the evolution of fund discounts over time is due to the fact that foreign investors respond less than local investors to changes in local market conditions. In other words, it is not the direction of causality but the relative strength of the response that drives the empirical results. This is not a trivial point: if foreigners are less sensitive to disturbances originated in the home country, it follows that they play a stabilizing role during crisis episodes. The converse is true for healthy economies that happen to be in the same asset group as the crisis country, for which the presence of foreign investors would increase the probability and the extent of the contagion.

Several rationales can justify this asymmetric response. For example, asymmetric information may induce foreign investors to (a) partially mimic the behavior of local investors; and (b) use information from one emerging market as a proxy for others. If we are ready to accept that locals react to privileged, not readily observable, information on local markets, a premium could be interpreted as a warning signal of imminent disaster.[50] However, the price to NAV

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[49]For example, the Mexican crisis may have changed the mood of U.S. investors with respect to Latin American assets in general, without affecting their view of the Asian market.

[50]The fact that we set the initiation of the Asian crisis period in mid-1996, the time at which the Thai fund started to build up a premium, is only consistent with this view.

ratio should revert to the initial level within a relatively short period of time, as previously private information is revealed. Contradicting this intuition, we showed that discounts exhibit high persistence, and in many cases nonstationarity cannot be rejected.[51]

The evidence discussed in the paper is consistent with the view that while the foreign investor reaction to the 1997 crisis was relatively homogeneous in Asian and Latin American countries, differences in the *local* response were the main factor underlying both the dynamic behavior of fund prices and its cross-country variation.[52] This point favors the following alternative explanation:[53] Local investors are more exposed to variations in local market conditions than foreign investors (as reflected in the home bias puzzle, see Tesar and Werner (1995) and references therein); hence, a change in the local distribution of returns exerts a sharper response from less diversified local investors, while foreign investors play a stabilizing role.

Moreover, the liquidity crunch that usually follows a financial crisis is likely to burden local investors more heavily, inducing a firesale of local assets at below their fundamental value.[54] If this is the case, fund premia could be interpreted as a measure of local *overreaction* rather than foreign underreaction as the asymmetric information story. Interestingly, in this case, the size of the premium would reflect in part the relative share of the cost of the crisis paid by local investors.

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[51]Indeed, it looks like sentiment in relation to Latin American markets was subject to a permanent downward revision, as indicated by the appearance, in the aftermath of the Tequila crisis, of discounts that were larger than their pre-crisis averages.

[52]For example, we showed that NAVs, whose behavior largely mirrors that of local shares, substantially increased their volatility relative to fund prices in Asian countries during the crisis episode, while the opposite was true for Latin America in the same period. In addition, in the premium increases, discounts become increasingly more correlated with NAVs than with fund prices, indicating that local trading may have been the main driving force behind their evolution.

[53]See Levy-Yeyati and Ubide (1998).

[54]This liquidity crunch could be due to two separate reasons. First, a generalized decrease in the asset prices would decrease the value of collateral available in the economy and lead to a decrease in lending by banks, a process similar to the one described in Kiyotaki and Moore (1997). Second, a decrease in asset prices and the worsening of the economic situation would decrease the capitalization of domestic banks which, because of the unavailability of fresh capital in the economy, would lead to credit rationing and generate a generalized credit crunch. The existence of barriers to capital inflows would exacerbate this process by preventing foreing investors from filling the banks' capital gap. These two elements, compounded by the presence of home bias in domestic portfolios, can explain the overreaction of local investors.

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