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A Panic-Prone Pack? The Behavior of Emerging Market Mutual Funds

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A Panic-Prone Pack?
The Behavior of Emerging Market Mutual Funds

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Abstract

This paper explores the behavior of emerging market mutual funds using a novel database covering the holdings of individual funds over the period January 1996 to March 1999. An examination of individual crises shows that, on average, funds withdrew money one month prior to the events. The degree of herding among funds is statistically significant, but moderate. Herding is more widespread among open-ended funds than among closed-end funds, but not more prevalent during crises than during tranquil times. Funds tend to follow momentum strategies, selling past losers and buying past winners, but their overall behavior is more complex than often suggested.

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I. Introduction

Episodes of high volatility in international capital flows and currency crises in the 1990s have put international investors in the limelight. Frequently, international investors are considered the culprits of the bouts of instability and crises,[2] and casual observation does suggest the presence of episodes of panic and contagion. Yet the question remains as to whether there is a tendency for certain market participants to disregard fundamental economic conditions in emerging markets, responding only to what other investors are doing, or are expected to do. The presence of such herding behavior, to the extent it dominates international capital flows, would help in explaining periods of seemingly excessive volatility of capital flows and asset prices in emerging markets and have important policy implications.

Assessing the behavior of international investors in a systematic way, however, poses difficult challenges. Most of the available financial information consists of data on prices. It is nearly hopeless to attempt to control for all "fundamental" news driving changes in asset prices, making it impossible to convincingly establish that a specific change in asset prices was due to herding behavior by certain groups of investors. Moreover, herding behavior by international investors may have adverse balance-of-payments consequences for countries even in the absence of a large immediate impact on stock prices.

For these reasons, researchers have begun to examine investor behavior in emerging markets directly using data on investors' portfolios and transactions. However, the availability of such data is scarce, and the evidence presented so far for emerging markets is limited. The most comprehensive data set used so far is probably the daily data from State Street Bank & Trust examined by Froot, O'Connell and Seasholes (1998). The authors find evidence for persistence and trend-following in portfolio flows. In addition, the data indicate that inflows have forecasting power for future returns in emerging markets, but not mature markets. While their data set is very detailed on transactions, it does not allow the researcher to differentiate between different classes of investors. Other studies have had a regional or country-specific focus.

This paper contributes to this literature by exploring a novel data set that covers around 400 emerging market equity funds on a monthly basis over the period January 1996–March 1999; it is the first one to document the behavior of mutual funds on a global scale. While the period is relatively short, it encompasses the Asian, Czech, Russian, and Brazilian crises, allowing us to examine each of these episodes in detail. While not intending to cover these issues exhaustively, the aim of the paper is to provide some tentative answers to the following questions. How do emerging market funds behave before, during, and after crises? Is there evidence for herding among these funds during tranquil and during turbulent times? Are there meaningful differences in the behavior of different types of funds? Do funds systematically buy past winners and sell past losers?[3]

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[2] See, for example, Aitken (1996) and Richards (1996) for analyses of stock prices in emerging markets.

[3] We do not examine the impact of funds' behavior on their performance here, but intend to take up the issue in another paper.

Note that it only makes sense to search for evidence of herding within a subset of investors, since the whole market cannot move in the same direction (overall, for every seller, there must be a buyer). In this regard, our database has the advantage of covering a well-specified subclass of investors, for which it is meaningful and interesting to pose these questions.

We find that, overall, the behavior of funds is complex and cannot be explained by simplistic rules. While during tranquil and turbulent times, inflows coexist with outflows, on a net basis, these funds tend to withdraw money one month prior to crises. Interestingly, funds did not withdraw indiscriminately from emerging markets: in many cases, the same funds that left a crisis country invested in other markets that at the time were seen as suffering from contagion. Using a VAR methodology, we investigate whether specific types of funds systematically move first, finding that in- or outflows by regional or single-country funds Granger-cause flows of global/international funds into the same country. The results also show that open-ended funds' flows Granger-cause closed-end funds investments.

Statistical measures of the degree of herding, as proposed by Lakonishok, Shleifer and Vishny (1992) are found to be significantly different from zero, but lower than what one might have expected. Herding is less pronounced among closed-end funds, suggesting that herding behavior might be to a significant extent traceable to individual investors', rather than managers' behavior. Across countries and over time, we find a correlation between the degree of herding and stock market volatility. Various statistical measures provide some evidence that emerging market funds follow momentum strategies, and more so when selling than when buying.

II. Contagion, Herding, and Institutional Investors

In the discussion about recent financial crises, attention has largely focused on the behavior of international investors. It has been argued that some of these—mainly institutional—investors engage in herding strategies, i.e. have a tendency to "follow the pack", mimicking trades by other market participants, without paying due attention to fundamentals. Such behavior could potentially destabilize prices, and, if widespread, would constitute an argument in favor of limiting the free movement of capital flows.

Herding might or might not be consistent with traditional models of rational, utility-maximizing investors. Explanations that at least partly depart from the rationality paradigm are based on panics or sudden contagious changes in investor sentiment. These types of changes in investor sentiment may in turn induce a switch from a "good" to a "bad" equilibrium for a country and induce a crisis.[4] Herding-like behavior may for example occur if a single event that per se does not convey much information about fundamentals suddenly acts as a wake-up call, reviving faded memories of similar previous events.[5] Note that once

[4] See Masson (1998).

[5] See Mullainathan (1998).

there is a widespread "change in sentiment" in the markets, in many conceivable scenarios it is still fully rational from the individual investor's perspective to "follow the pack".

However, one does not need to introduce elements of irrationality to explain herding behavior. Rationalizations include informational learning (cascades), principal-agent problems or other externalities.[6] Informational cascades occur when actions are observable, but information is partly private. In such a situation, agents' actions provide valuable information to others, and in some cases it may be optimal to rely exclusively on others' actions. This is particularly relevant if there are fixed costs of acquiring information about a company, or in the case of interest here, a country.[7]

Since institutional investors are more informed about each other's trades than individual investors, they can be expected to herd more.[8] Herding that results from informational cascades constitutes a case for more "transparency", i.e. governments and international institutions providing markets with more and more timely information.[9] An example of a principal-agent explanation of herding, on the other hand, is given by the possibility that fund managers are evaluated based on relative instead of absolute performance, which provides an incentive to mimic the actions of other managers.[10]

A related behavior of investors is given by "momentum strategies". In the finance literature, it has been documented that domestic U.S. mutual funds engage in "positive feedback trading",[11] buying those assets whose prices have been rising and selling assets whose prices have been falling. This behavior can be the result of extrapolative price expectations, collateral or margin calls, dynamic hedging, or other strategies that prescribe automatic selling or buying in reaction to price movements.[12]

Lastly, international investors may appear to herd if they react simultaneously to the same fundamentals. In this case, their behavior speeds up the adjustment of prices and is not destabilizing.[13] However, in an efficient market, speedy price adjustment should occur without many actual trades having to take place. Moreover, the question remains why international investors react differently to these news than domestic investors. Here, Brennan

[6] See Devenow and Welch (1996) for a overview of rational herding models and Bikhchandani and Sharma (2000) for a more recent survey of the theoretical and empirical literature.
[7] For an example, see Calvo and Mendoza (1997).
[8] See Lakonishok, Shleifer and Vishny (1992) (henceforth LSV).
[9] See Eichengreen et al. (1998), p. 23.
[10] See Scharfstein and Stein (1990) or Calvo and Mendoza (1997).
[11] See DeLong et al. (1990).
[12] See Eichengreen et al. (1998) and Kim and Wei (1999b). Professional investment managers occasionally recommend this strategy to their clients. For example, the Los Angeles Times quotes Templeton Developing Markets manager Mark Mobius suggesting with respect to holdings of emerging-market funds: "You say, 'If the fund goes down this much, I'm out'." See Lim (1999).
[13] See LSV.

and Cao (1997) argue that, since foreign investors have a "cumulative informational disadvantage", positive news about a country will result in a reallocation of asset holdings toward foreigners. Similarly, foreign investors in emerging markets may hold more diversified portfolios than domestic investors, so that they react differently to news about, say, the correlation of an emerging market's stock index with U.S. stock indices.

The empirical literature examining directly the behavior of international investors is still sparse. Apart from the aforementioned study by Froot, O'Connell and Seasholes (1998), a few researchers have looked at specific regions and time frames. Kim and Wei (1999a) examine the transactions of different types of portfolio investors in Korea before and during the Asian crisis, finding that non-resident institutional investors were always positive feedback traders, while resident investors were contrarian traders before the crisis but became positive feedback traders during the crisis. Herding appears to be more widespread among individual and nonresident investors than among institutional and resident investors. In another study, Kim and Wei (1999b) compare trading behavior in Korea by offshore investment funds with that of funds registered in the U.S. and the UK, finding herding behavior less prevalent among offshore funds. Choe, Kho and Stulz (1998) also study transaction data from the Korean stock market during the crisis and find evidence for return-chasing and herding among foreign investors before the crisis period, but no evidence for a destabilizing effect of foreign investors over the entire sample period. While their data is of high frequency, they are not able to trace trades originating from the same investor.[14] Kaminsky, Lyons and Schmukler (1999) investigate trading strategies for 13 U.S. funds investing in Latin America, reporting evidence for momentum strategies. The present paper examines these issues on a global scale.

III. DATA

The data used in this paper are from a comprehensive database purchased from Emerging Market Funds Research, Inc. It covers, on a monthly basis, the geographic asset allocation of hundreds of equity funds with a focus on emerging markets for the period 1996:1-1999:3. While this period is not very long, the frequency of the data is higher than the typical quarterly reporting. Moreover, the sample is particularly interesting, given the number of emerging market crises that occurred over the period.

At the beginning of the sample, the database contains 382 funds with assets totaling US$ 116.5 billion; at the end of the period, the number of funds covered is 467, managing US$ 118.7 billion of assets. Note that, while the total number of funds increased over the period, some funds were dropped from the database if their managers did not wish to

[14] Some other studies have used more aggregate data on international portfolio flows. See Bohn and Tesar (1996), Brennan and Cao (1997), and Tesar and Werner (1995). A few studies have investigated the behavior of U.S. mutual and pension funds. See Lakonishok, Shleifer, and Vishny (1992), Grinblatt, Titman and Wermers (1995), and Wermers (1999). Another study of international, but not emerging, financial markets is Kodres and Pritsker (1996). They analyze herd behavior by large institutional futures participants using daily position data.

continue providing monthly information on their holdings. 309 funds are in the sample throughout the period.

Slightly more than half of the funds covered are international, global emerging markets, or regional funds, the rest being single-country funds (mainly Asian). In February, 1999, the sample consisted of 9 global funds (not focusing on emerging markets), 53 global emerging market funds, 125 Asian regional funds (18 of which included equity holdings in Japan), 170 Asian single-country funds, 13 Latin American single-country funds, 52 regional Latin American funds, and 51 funds focusing on other geographic areas (12 of which were single-country funds). Approximately one quarter of the funds are closed-end funds. The funds are domiciled mostly in advanced economies and offshore banking centers.

Table 1 provides an overview of the different types of funds and their holdings by region. The first interesting observation that can be made is that, while the total holdings of these mutual funds in Latin America, Europe, Middle East and Africa increased, their holdings in Asia decreased. An examination of the time series shows that, not surprisingly, the major drop in the value of the Asian assets occurred during the Asian crisis of 1997. Nevertheless, after the crisis total holdings in Asia were still more than twice as large as those in Latin America and significantly exceeded those in Europe. Asia is also the region with by far the largest number of single-country funds.

Table 1. Total Holdings and Number of Funds by Region

	Asia		**Latin America**		**Europe**		**ME/Africa**	
	Number	Holdings	Number	Holdings	Number	Holdings	Number	Holdings
Single-country								
Feb 1996	167	$15.2	10	$1.9	9	$0.4	3	$0.3
March 1999	174	$7.7	12	$1.9	7	$0.3	4	$0.3
Regional								
Feb 1996	109	$31.4	30	$4.2	7	$0.5	3	$0.3
March 1999	125	$12.5	53	$3.5	24	$1.4	7	$0.2
Global Em. Mkts.								
Feb 1996	38*	$9.4	38*	$6.8	36*	$2.6	37*	$1.3
March 1999	56*	$8.4	56*	$10.3	56*	$4.2	56*	$2.7
International								
Feb 1996	9*	$8.2	9*	$2.2	9*	$15.1	6*	$0.2
March 1999	9*	$15.0	9*	$5.4	9*	$27.7	7*	$0.8
Total								
Feb 1996	323	$64.2	87	$15.0	66	$18.7	49	$2.0
March 1999	363	$43.7	130	$21.1	104	$33.5	74	$4.0

Note: Holdings in billions of US$ at the beginning of the month. * indicates that the number provided includes all global emerging markets and international funds with assets in the respective region.

How important are these funds as investors in emerging equity markets? In many cases, the assets of these funds represent modest, but not insignificant fraction of the total market capitalization. For example, in the case of Argentina, the funds held approximately 6.5 percent of the total stock market capitalization in August of 1998, while the share was around 4.5 percent in Hungary and Korea. It should be pointed out, though, that in many emerging markets, turnover is much lower than in mature markets, partly because ownership is often less dispersed. Therefore, the trading of these funds might actually play a much larger role than suggested by these aforementioned figures.

One limitation of the data set is that it provides asset positions in each country, while we are mainly interested in the *flows* to individual countries. However, we calculate implied flows from the asset position data under some assumptions concerning the stock valuation changes. In particular, we assume that funds hold a portfolio of stocks that is well proxied by the IFC US$ total return investable index.[15] In other words, for each country c and fund i in month t we calculate the flow in the following way:

$$\text{Flow}_{c,i,t} = \text{Total assets}_{i,c,t} - \text{Total assets}_{i,c,t-1} - \text{Index return}_{ct}\,\text{Total assets}_{i,c,t-1} \qquad (1)$$

This obviously represents an approximation, and in certain cases, we might be introducing substantial errors through this procedure. If individual fund managers were able to beat the index, we would overstate the flow of funds into a country. However, consistency checks for closed-end funds show that our approximation is quite good.[16] Moreover, for many of the statistics discussed later, it is essentially the sign of the change in the position that matters. It is unlikely that this method alters the sign of a fund's transaction, in which case we would erroneously classify net buyers as a net sellers or vice versa.

IV. FLOWS OVER TIME, ACROSS FUNDS, AND REGIONS

In a first attempt to examine the extent to which funds tend to move in tandem, we compute simple correlations of the aggregate flows into individual countries for the whole period. Appendix I shows the flow correlation matrix for all countries, with larger correlation values shaded darker.

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[15] In cases for which the IFC does not compute an investable index, we used the global index. For countries not covered by the IFC, we employed MSCI US$ index data or national indices converted into US dollars.

[16] For closed-end funds, we can compute the growth in total assets calculated on the basis of the IFC return series with the actual growth in assets. (This comparison is not possible with open-end funds, since they are subject to redemptions). Without taking into account returns on fixed income, the correlation between imputed and actual asset growth rates was 0.78.

Correlations are higher within regions, partly reflecting the fact that the data include many regional funds. For example, the correlation between flows to Hong Kong and other East Asian markets is very high, similarly to those between Mexico and other Latin American countries.[17] To a lesser extent, this is also true for flows to Europe, the Middle East, and Africa. This evidence is in line with that presented by Froot, O'Connell, and Seasholes (1998), and consistent with a redemption-based explanation. If regional funds face redemptions by individual investors, they may be forced to sell assets in other countries.[18]

A different way of examining whether all funds move together is to look at gross flows in- and out of regions. Figure 1 displays flows into the four major geographical regions for the whole period, with net flows broken down into gross positive and negative flows. In order to eliminate effects arising from the addition or deletion of funds from the sample, we focus on a balanced subsample of 309 funds.

The pictures indicate that, except for the case of Middle East and Africa, inflows contemporaneously coexist with outflows. Gross flows into and out of Asia are much higher than for other regions. For Asia, we observe sizeable net outflows starting one month before the collapse of the Thai baht in early July, and ending in November of that year. In the case of Europe, there is a substantial drop in net inflows at the outset of the Russian crisis in July and lasting until November. For Latin America, the figures show a sharp outflow one month before the Brazilian devaluation, in December of 1998.

This first look at aggregate figures therefore suggests that, while not all funds always move in the same direction, on a net basis, they tend to pull out together prior to crises. This issue is investigated more closely in the next section, where we examine the behavior of funds around specific events.

V. Flows During Crisis Periods

In this section, we characterize the salient features of flows around individual currency crises. In particular, our data allow us to examine the following episodes in more detail: (i) the Czech crisis of May 1997, (ii) the Asian crisis in the second half of 1997, (iii) the Russian ruble collapse of August 1998, and (iv) the Brazilian devaluation of January 1999. For each of these episodes, we present flows to- and out of the affected countries and other regions, as well as statistics on changes in the allocation of assets within funds. These statistics provide a first insight into whether funds anticipated or possibly caused these crises, whether funds moved simultaneously out of the countries affected, and whether they

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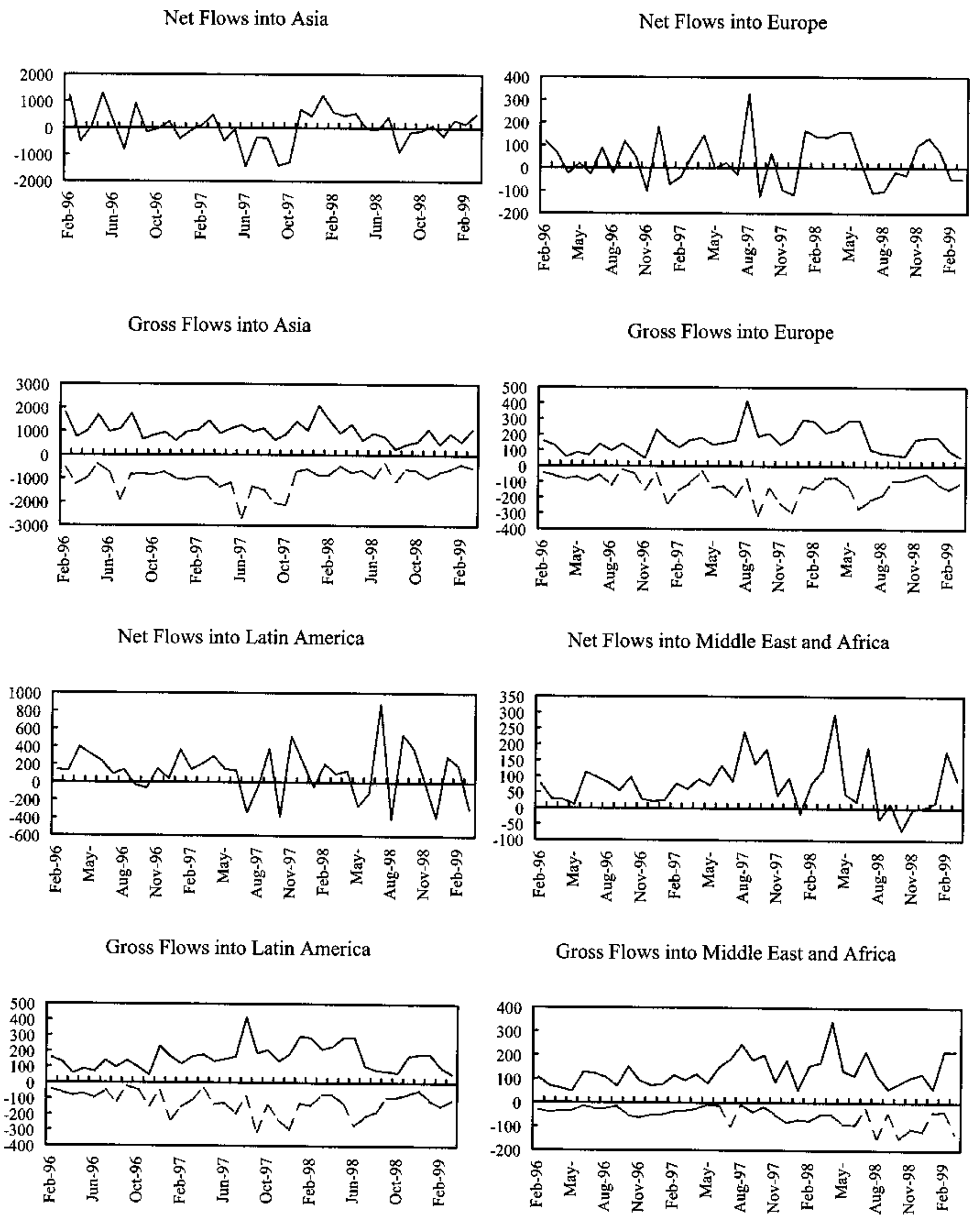
[17] Hong Kong is typically classified as a mature market. Given than many emerging market funds hold positions in Hong Kong, we include this market in all our calculations.

[18] See Masson (1999).

Figure 1. Gross and Net Flows by Region
(Balanced Panel)



Source: Authors' calculation based on data from Emergin Market Funds Research, Inc.
Note: All numbers are in millions of US$.

contemporaneously reduced or increased holdings in other countries in and outside the region. For example, did the Asian crisis lead to a reduction or increase of holdings in Latin America? The predictions from portfolio theory in this regard are ambiguous.[19]

The findings can be roughly summarized in the following way. Strikingly, in all crises considered here, emerging market mutual funds in our sample tended to withdraw funds from the affected country in the month prior to the crisis. This is particularly visible in the cases of Brazil and Russia, and less marked for the Thai and Czech crises (Figure 2). To some extent, this is not surprising, since a withdrawal of investors is exactly what brings about a crisis. This evidence documents, however, that mutual funds were not laggards or contrarian investors at the onset of these events. The flows to non-crisis countries and regions at times of crises show no coherent pattern, but there are more comovements within than across regions. Interestingly, funds did not withdraw indiscriminately from emerging markets: in many cases, the same funds that left a crisis country invested in other markets that were generally seen as suffering from contagion. For example, while it is true that during the Russian crisis, in the aggregate funds withdrew on a massive scale from Latin America and Asia, *those funds in the sample that reduced their exposure in Russia, actually invested in Latin America.*[20]

In the Czech case, after growing pressures on the exchange market in early 1997, the authorities were forced to abandon the target band for the Czech koruna on May 27. Figure 2 shows that substantial outflows began to take place in April, continuing until July. According to Appendix II, Table A2, these movements are not mirrored in other transition economies. For example, inflows to Poland and Russia increased between April and June.

How did the allocation of assets within funds change? One way of examining this issue is to compute the flows into other countries during the crisis *for those funds that withdrew money from the Czech Republic.* The results show that these funds reshuffled portfolios, increasing their assets in other economies in and outside the region (Appendix II, Table A3). This evidence is consistent with the view that there were hardly any "contagion" effects surrounding the Czech crisis.[21]

The abandonment of the exchange-rate peg by the Thai authorities on July 2, 1997 marked the beginning of the Asian crisis. After a dip in May 1997, there was a renewal in inflows from emerging market funds (Figure 2). From May onwards, outflows actually diminished in size and only intensified again in January 1998. The regional picture is mixed (Appendix II, Table A4). It is noteworthy that net outflows from Malaysia and Taiwan Province of China were already very large in April 1997, and in the case of Malaysia these outflows continued until October of that year. Moreover, it is apparent that funds reduced

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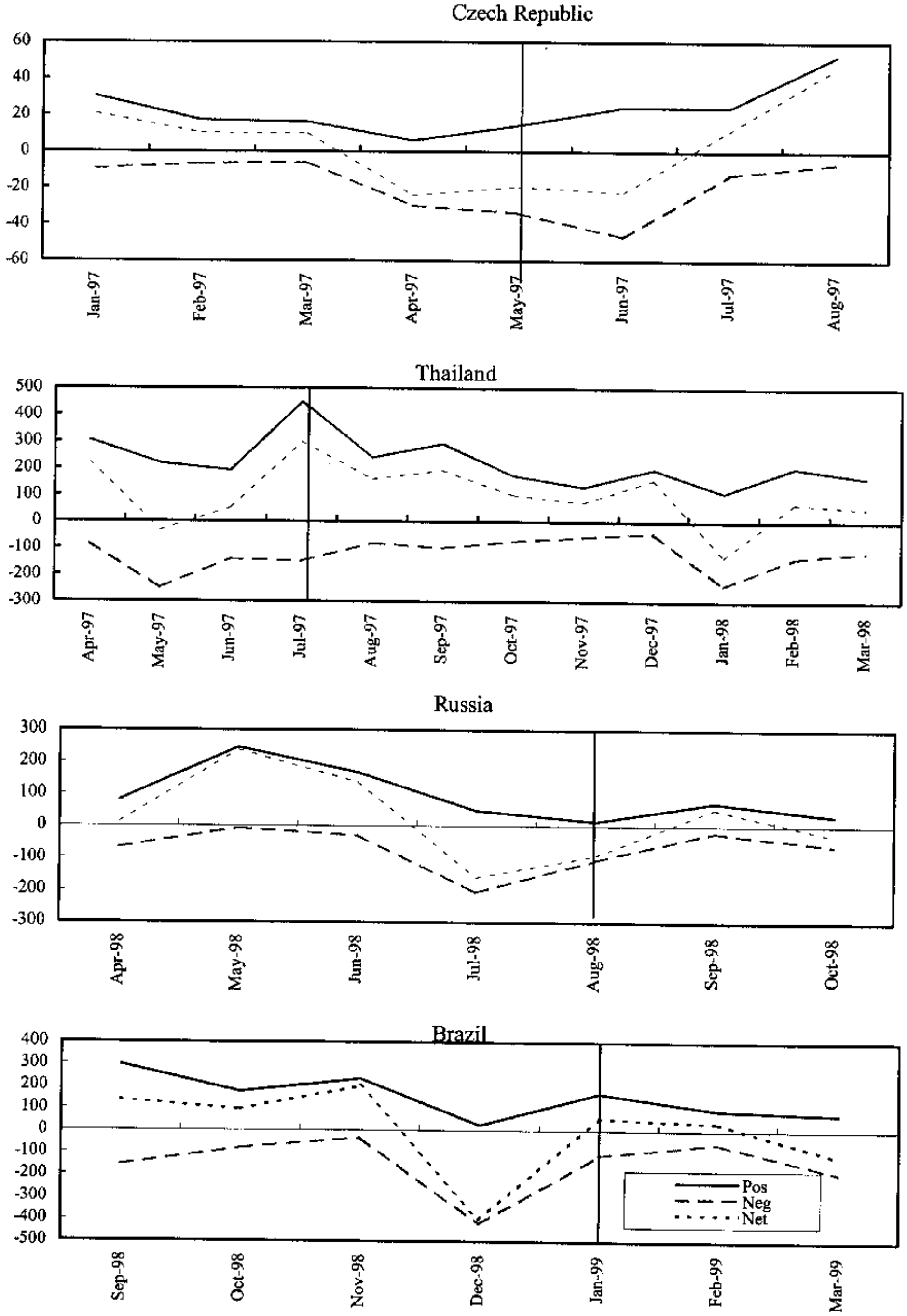
[19] See Schinasi and Smith (1999). When discussing portfolio allocations, one should bear in mind that funds are typically constrained to invest a certain fraction of their assets in certain groups of countries.
[20] Note however, that the number of funds in our sample investing in Russia is quite small, as can be seen in Table A7.
[21] See Gelos and Sahay (2000).

Figure 2. In- and Outflows Around Crises



Source: Authors' calculations based on data from Emerging Markets Funds Research, Inc. Numbers are in millions of US$ and based on a sample of funds that were in the database throughout the period. Vertical lines mark the months in which the peg of the domestic currency was abandonded.

their holdings in nearly all Asian countries in October 1997. That month also saw withdrawals from all other regions except Middle East and Africa.

The within-fund statistics show that those funds that withdrew from Thailand also withdrew from other markets in- and outside the region, with the exception of China. This is also true when looking at those funds that reduced their assets in the other Asian crisis countries: while reducing their assets across the board, funds slightly increased their exposure to China (Appendix II, Table A5).

The Russian crisis broke out on August 17 of 1998, when the authorities devalued the currency. Markets were not calmed by the devaluation, and on September 2, the ruble was allowed to float. Figure 2 shows that mutual funds withdrew on a large scale from Russia in July, the month preceding the devaluation. The outflow continued in August, diminishing in September, when a mild positive net inflow was registered. An examination of flows to other countries and regions in the same period reveals that, in the aggregate, funds did not reduce their holdings in other European transition economies nor in other regions in July. Interestingly, however, after the crisis erupted in August, there were not only withdrawals from other countries in the region, but also very large net outflows from Asia and Latin America. This is consistent with the widespread perception of "contagion" around the Russian crisis.[22]

While this is broadly supported by a look at changes in flows within funds, it is noteworthy that on average, during the Russian crisis, funds that withdrew from Russia, *invested* in Hungary, Poland and Latin America (Appendix II, Table A7). It therefore seems that the large drops experienced in these stock markets around the Russian crisis may have been due to funds that were not themselves exposed to the Russian market, a fact that contradicts conventional wisdom.

On January 14, 1999, the Brazilian authorities were forced to let the currency float. Funds anticipated this event to some extent, withdrawing funds on a large scale in December. In that month, gross positive flows dipped to nearly zero, and net outflows reached US$ 400 million. However, January again saw net positive, albeit small, inflows. Table 5 shows that net flows to other countries in Latin America were also mostly negative in December 1998, although of much smaller magnitude. Similarly, Asia experienced a net outflow in that month. Again, however, a look at more disaggregated data tells a more subtle story: funds that withdrew from Brazil around the crisis, on average also withdrew from Argentina and Mexico, but invested in Chile (see Appendix II).

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[22] Note, however, that some of the "contagion" effects witnessed at the time may have been related to the LCTM collapse.

VI. LEADERS AND FOLLOWERS

After a first assessment of the overall behavior of funds, an interesting question to pose is whether there are leaders and followers within the industry. For example, one could imagine regional or single-country funds to be more familiar with the specific economic situation in the countries they invest in than funds investing globally. This may lead global/international funds to imitate the behavior of single or regional funds. Similarly, if the acquisition of country-specific information involves fixed costs, smaller funds may be at a disadvantage relative to larger funds and may be induced to follow the strategies of the big companies. Lastly, open-ended funds may be subject to redemptions by nervous individual investors and be forced to reduce exposure to certain countries before closed-end funds. If these open-ended funds are important enough to potentially ignite a crisis, closed-end funds may be induced to follow them. It is therefore conceivable that a small fraction of mutual funds may regularly be the originator of large stampedes into or out of a country.

While the frequency of our data limits the scope for investigating this question, we make an attempt to examine whether some funds systematically precede others in their trades. For this purpose, we divide funds into four pairs: single-country funds and non-single-country funds, global/international and regional/single country funds, large and small funds, and closed-end and open-ended funds. For each of these categories, we compute the sum of total flows into each country and explore whether, controlling for returns, flows of one category Granger-cause that of others. In order to limit problems of heteroskedasticity, we scale flows by the lagged total assets in the respective country.

In the context of a panel VAR, some issues need to be addressed. It is well known that fixed effects estimates of dynamic panel model estimates will be biased for finite T.[23] In our case, these problems are not likely to be severe. First, our time dimension is quite large (38 months). Second, since we want to investigate Granger causality, we are not primarily interested in the coefficients of the lagged dependent variable, but in the coefficient on the other variable's lags, and as shown by Judson and Owen (1999), the bias of these coefficients is typically very small. Moreover, estimation methods designed to overcome this problem, such as the one proposed by Arellano and Bond (1991), suffer from their own drawbacks, since the instruments used in the estimations (lagged levels for the differenced explanatory variables) are typically very weak. We therefore first regress the variables on country dummies, and then estimate the VAR's with pooled OLS using the residuals of those regressions. All variables included in the regressions are stationary. We use the Akaike criterion to select the appropriate lag length.

The results for regional and single-country funds vs. global and international funds reveal an interesting pattern: inflows or outflows by regional or single-country funds Granger-cause flows of global/international funds into the same country (Table 2). However, Granger causality runs both ways since regional/single funds tend to react with an *outflow* to inflows of global/international funds. Consistent with the reasoning above, the

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[23] See Nickell (1981).

Table 2. Vector Autoregressions with Pairs of Fund Classes

	Regional/ Single	Global/ Intern.	Closed-End	Open-Ended	Small	Large
Own t-1	0.01	-0.09	0.02	-0.18	-0.02	-0.05
	(0.27)	(-2.76)	(0.51)	(-6.34)	(-0.86)	(-1.85)
Own t-2	0.04	-0.08	0.02	-0.06	-	-
	(1.23)	(-2.58)	(0.70)	(-1.97)	-	-
Own t-3	0.02	-0.09	0.06	-0.07	-	-
	(0.63)	(-3.19)	(2.06)	(-2.41)	-	-
Own t-4	-0.01	-0.08	0.00	-0.02	-	-
	(-0.38)	(-2.63)	(0.09)	(-0.65)	-	-
Own t-5	0.21	-0.03	0.02	0.01	-	-
	(7.14)	(-0.94)	(0.79)	(0.19)	-	-
Own t-6	0.05	0.28	0.13	-0.03	-	-
	(1.82)	(8.77)	(4.03)	(-1.09)	-	-
Own t-7	-0.06	0.03	0.03	-0.15	-	-
	(2.24)	(0.75)	(1.23)	(-3.25)	-	-
Other t-1	-0.05	0.14	0.02	0.01	0.20	0.00
	(-1.93)	(4.22)	(2.18)	(0.09)	(0.54)	(1.17)
Other t-2	-0.03	-0.03	0.01	0.02	-	-
	(-1.25)	(-0.89)	(1.03)	(0.28)	-	-
Other t-3	-0.00	0.08	0.03	0.19	-	-
	(-0.16)	(2.33)	(2.80)	(2.40)	-	-
Other t-4	-0.04	0.19	0.03	0.08	-	-
	(-1.73)	(5.78)	(2.40)	(0.97)	-	-
Other t-5	-0.08	0.21	-0.00	0.06	-	-
	(-2.97)	(6.25)	(-0.39)	(0.70)	-	-
Other t-6	0.03	-0.02	0.00	0.06	-	-
	(0.99)	(-0.76)	(0.00)	(0.79)	-	-
Other t-7	0.01	0.00	-0.03	0.04	-	-
	(0.29)	(0.12)	(-1.84)	(0.69)	-	-
R^2	0.05	0.14	0.04	0.05	0.01	0.02
Granger-causality	R⇒G?	Y(p=0.00)	C⇒O?	N(p=0.27)	S⇒L?	No(p=0.24)
	G⇒R?	Y(p=0.02)	O⇒C?	Y(p=0.01)	L⇒S?	No(p=0.59)
# of obs.	1155	1155	1138	1138	1149	1149

Note: "Own t-x" denotes values of the lagged dependent variable, lagged x periods. "Other t-x" denotes values of the other endogenous variable included in the VAR, lagged x periods. T-statistics are shown in parentheses. Small and large funds are defined as funds in the lower and upper size quintiles. P-values for Granger causality tests are based on F-tests of joint significance of all lagged "Other".

results also show that open-ended funds' flows Granger-cause closed-end funds investments. The results are robust to the inclusion of time dummies and lagged returns.

This observation raises the question as to whether there are systematic performance differences between single/regional and global funds and between open-ended and closed-end funds. Unfortunately, our data do not allow us to investigate this issue in detail.

VII. Testing for Herding

In this section, we compute and discuss a quantitative measure for the degree of herding among funds. This measure, originally introduced by LSV, allows an assessment of whether funds move in the same direction more often than one would expect if they traded independently and randomly. The indicator, denoted HM (for herding measure), is given by:

$$HM_{it} = |p_{it}-E[p_{it}]| - E|p_{it}-E[p_{it}]|, \qquad (2)$$

where p_{it} is the proportion of all funds active in country i in month t that are buyers,[24] and $E[p_{it}]$ is its expected value. $E[p_{it}]$ may vary over time, and we approximate it by the total number of net buyers across all countries divided by the total number of active funds in that year.[25] Since the distribution of the absolute value of the first expression is not centered around zero, we need to subtract its expected value. Under the null hypothesis of no herding, this expected value is calculated assuming that the number of buyers follows a binomial distribution.

In order to restrict our attention to a meaningful notion of a "herd", we calculate the herding measure only for those cases in which N_{it} exceeds five.[26] Moreover, in order to limit the impact of errors introduced by our calculation of flows, we classify a fund as buyer or seller only if the absolute value of the calculated (out-) flow into (or from) a country is larger than one percent of the fund's assets in that country.[27] HM_{it} can be calculated for different subgroups of funds, different types of emerging markets, and different time periods. Note that our data do not allow us to differentiate between herding at the manager or individual investor level; however, we are able to obtain some indirect evidence on the issue, which will be discussed below.

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[24] We adopt the same notation as Wermers (1999).

[25] Using yearly estimates for p_{it} reflects a compromise between an attempt to control for variations in overall capital flows to emerging markets (in order not to overestimate herding) and, on the other hand, not underestimate herd behavior by overcorrecting for such general trends. However, we also experimented with a monthly estimate for p_{it}, obtaining slightly lower, but qualitatively similar results for our herding measure.

[26] We repeated the computations considering only cases with a minimum of 15 transactions. The results were very similar.

[27] We also carried out the calculation using five percent as the error margin, without significantly altering the results.

The results indicate the presence of significant, but not dramatic herding behavior. Table 3 reports average values for HM for the four major regions and three subperiods. The overall mean is 7.2 percent. In other words, this implies that for a given country, the number of funds moving in the same direction was approximately 7 percent larger than one would have expected if they acted independently and randomly. This number is approximately twice as large as the values found by Wermers (1999) for U.S. mutual funds, and more than twice the value reported by LSV for U.S. pension funds. Interestingly, the value is very similar to the one reported by Kim and Wei (1999) for nonresident institutional investors investing in Korea around the Korea crisis. However, it is not as large a figure as conventional wisdom may have led one to expect. There is little variation in this average across regions and over time. The numbers for Europe are initially lower, but they increased over time. We also looked more specifically at the results for Asia, Latin America and Europe around crisis episodes, without finding evidence for higher herding. Nevertheless, specific months, including some of large outflows documented earlier, are characterized by large herding measures (for example, the herding measure for Brazil one month prior to the crisis is 16 percent). What we do not observe is that herding increases systematically across countries during crisis times.

In contrast to herding at the country level, herding might be greater at the regional level; for example, at a particular time, everybody may want to move into Latin America, but not necessarily into the same markets. We investigated this possibility by treating whole regions as individual assets, finding somewhat weaker evidence for herding (not shown).[28]

Table 3. Mean Herding Measures by Region

(In percent)

	All	Asia	Latin America	Europe	Middle East/Africa
1996	7.4	7.1	9.2	5.0	9.1
	(0.5)	(0.7)	(1.2)	(1.1)	(1.4)
1997	7.4	6.7	5.9	7.1	10.8
	(0.5)	(0.7)	(0.9)	(1.1)	(1.5)
1998-99	6.9	8.0	7.0	7.5	3.4
	(0.4)	(0.6)	(0.9)	(0.9)	(1.0)
Whole period	7.2	7.3	7.3	6.7	7.5
	(0.3)	(0.4)	(0.6)	(0.6)	(0.8)

Source: Authors' calculations based on data from Emerging Market Fund Research, Inc. The standard error of the mean is given in parentheses. All results are significant at the 1 percent level.

[28] See LSV for an analogous exercise using industries instead of individual stocks.

Nevertheless, there might still be important differences across different types of funds or different countries. For example, the inclusion of single-country funds may tend to lower the overall herding measure if these funds are required to hold a specific fraction of their assets in a particular country and if they are limited in their ability to hold cash instead. Similarly, offshore investment funds may display different investment patterns due to the lower regulatory constraints they face. Closed-end funds are not subject to redemptions and are therefore less likely to herd, as explained earlier.[29] Table 4 shows the herding measures for different types of funds.[30]

Table 4. Mean Herding Measures by Types of Funds

	Smallest 20%	Largest 20%	Closed-End	Intern. & Global Emerg.	Single-country	Offshore
1996	1.6* (0.8)	7.0 (0.6)	4.3 (0.7)	7.4 (0.6)	5.6 (1.0)	4.9 (1.0)
1997	4.3 (0.9)	7.0 (0.5)	4.7 (0.7)	7.4 (0.6)	8.4 (1.1)	8.0 (0.9)
1998-99	4.4 (0.6)	6.8 (0.5)	4.7 (0.6)	6.4 (0.5)	8.0 (0.9)	6.3 (0.9)
Whole period	3.8 (0.5)	6.9 (0.3)	4.6 (0.4)	7.0 (0.3)	7.4 (0.6)	6.5 (0.5)

Source: Authors' calculations based on data from Emerging Market Fund Research, Inc.
Based on average size of all funds over time. Note: Standard error in parenthesis. *All results are significant at the one percent level except in the case of smallest 20 percent funds in 1996 where the result is significant only at the 10 percent level. The smallest funds are exclusively Asian funds.

The results show that, contrary to our presumption, but in line with the results of Kim and Wei (1999b), offshore funds tend to herd less than other funds. Confirming our expectations, there is also less herding among small country funds.[31] Large, global and

[29] See Kaminsky, Lyons, and Schmukler (1999) for an attempt to distinguish between herding at the manager and at the individual investor level.
[30] Offshore funds are defined as those having their domicile in tax heavens. An alternative definition would have classified all those funds as "offshore" if they did not invest primarily in the country they were located. However, there are few single-country funds focusing on the stock market of the country in which they have their domicile (Korean funds are among the exceptions). Excluding those "onshore" funds did not affect the main results.
[31] Note however, that the smaller figure for small funds may reflect the fact that these funds experienced a lower-than-average growth of inflows.

international funds do not differ strongly in their herding behavior from the average. In line with our a-priori reasoning, herding is also less pronounced among closed-end funds, suggesting that the observed tendency for herding might to a significant extent be traceable to the behavior at the individual investor's level.[32]

How important are these results quantitatively? In order to answer this question, we follow Wermers (1999) in comparing the distributions of the actual monthly herding measures to a simulated distribution obtained under the assumption that funds make their buying decisions independently.[33] The distributions differ sharply: in contrast to the actual distribution, the simulated distribution is nearly symmetric around zero (Figure 3).

One could argue that, despite controlling for time-varying propensities to buy, the herding measure might overstate the extent of actual herding if there are many funds entering our sample, since these funds will naturally tend to grow and therefore buy frequently. We therefore carried out the calculations with a balanced subsample, i.e. only with funds that stayed within the sample throughout the 39 months, obtaining very similar results (the mean herding measure was 7.1)

There might be sizeable differences in the degree of herding depending on market size. For smaller markets, it may be more difficult or at least relatively more costly to obtain accurate information about fundamentals. If that is true, fund managers may be more inclined to imitate the behavior of other funds.[34] One the other hand, when they are subject to large inflows or outflows, fund managers may go first to the most liquid markets, and gradually to the less liquid ones. Table 5 displays the herding measures for the smallest and largest ten stock markets that are covered by the IFC.[35] There is more herding in the case of the largest stock markets than for the lowest, suggesting that the liquidity story is more relevant than the informational explanation.[36]

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[32] This of course raises questions regarding the incentives for individual investors to herd; such incentives would appear to be more difficult to explain than those at the fund manager level.

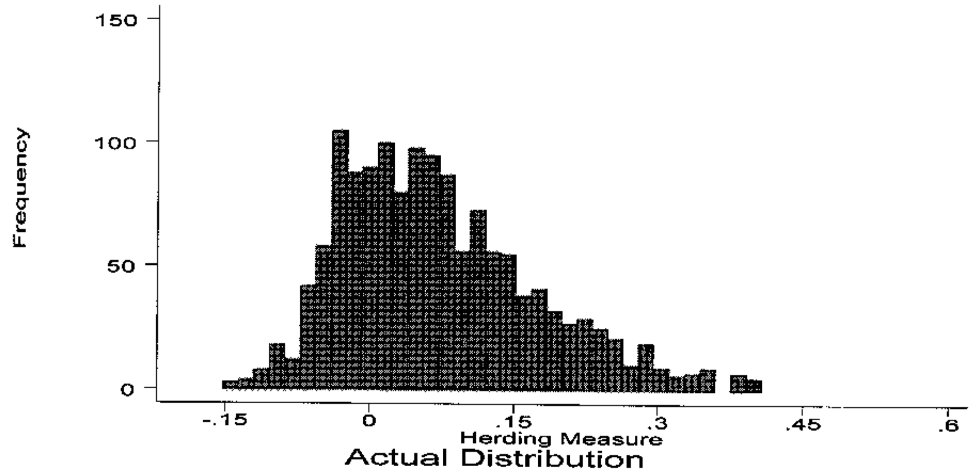
[33] Details of the Monte Carlo simulation are given in Appendix III.

[34] See Banerjee (1992) and Calvo and Mendoza (1997) for models illustrating similar arguments.

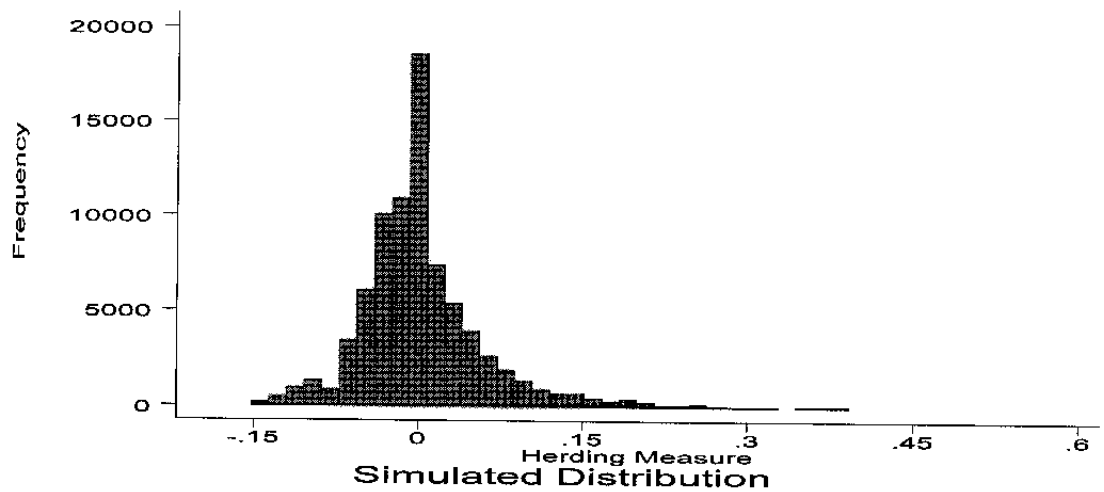
[35] While we have even smaller markets in our sample, comparability of market capitalization figures, and more importantly, the often very small number of transactions in these other markets led us to focus on stock markets covered by the IFC for this comparison.

[36] The fact that crises occurred in countries with large market capitalization may also contribute to this result, despite the fact that, as noted above, herding was not found to be higher during crises.

Figure 3. Actual and Simulated Herding Measure Distributions



No. of obs.: 1413
Mean: 0.072
Median: 0.056



No. of obs.: 79800
Mean: 0.0036
Median: 0.00

Source: Authors' calculations based on data from Emerging Market Fund Research, Inc.

Table 5. Mean Herding Measures by Stock Market Capitalization

	Smallest Ten	Largest Ten
1996	6.7	6.4
	(1.0)	(0.8)
1997	5.5	8.3
	(0.9)	(0.8)
1998-99	4.8	8.7
	(0.8)	(0.8)
Whole period	5.6	7.9
	(0.5)	(0.5)

Source: Authors' calculations based on data from Emerging Market Fund Research, Inc. Standard errors in parentheses. All results are significant at the one percent level.

Finally, we also calculated the herding measure aggregating all funds that belong to the same firm. This would be appropriate in the extreme case in which there was only one fund manager managing all the mutual funds of a firm. After aggregation, we are left with an average of only 74 funds per month. The mean herding measure obtained in this way is somewhat lower, namely 5.4 percent. The lowest value was obtained for Europe (4.2 percent) and the highest for Asia (6.3 percent).

What is the impact of herding on stock return behavior? If the amount of herding that we detected among our group of investors had important effects on stock markets, we would expect to observe a positive correlation between the degree of herding and stock return volatility. In order to investigate this issue, we regressed the variance of stock-index returns (computed for each country over the whole period) on the country-mean of the computed herding measures. The result from an OLS regression using 41 countries, reveals a statistically significant relationship between the two variables. The coefficient on the mean herding variable is 0.44, with a t-statistic of 11.6. The R^2 is quite high, namely 0.08. This means that we can explain eight percent of the variability in stock return variance by differences in herding among our investors. Note however, that this result should not be overinterpreted, given that we made no attempt to control for other factors, such as business cycle volatility (which itself may be endogenous). Moreover, reverse causality might be present.

Overall, the data shows evidence for herding behavior, although the results are weaker than what conventional wisdom might have led one to believe. There is no indication that herding is more prevalent during crisis than during tranquil times. However, herding is strongly associated with volatility.

VIII. Testing for Positive Feedback Trading

Another way of looking at these funds' investment strategies is to examine the extent to which they follow "positive feedback" or "momentum" strategies. For this purpose, we first examine whether the degree of herding can be related to past returns. If funds follow momentum strategies, we should observe herding to be more pronounced for extreme prior-month returns.

We also compute two measures of excess demand proposed by LSV and examine their correlation with prior returns. The first measure, defined by LSV as the Numbers Ratio (NR) is given for every given month t and country i by the total number of buyers divided by the total number of funds active in that country:

$$NR(i,t) = \#buyers(i,t)/\#active(i,t), \tag{4}$$

The second measure, called the Dollar Ratio (DR), is the difference between in-and outflows divided by the sum of in- and outflows to a country:

$$DR = (inflows(i,t)-outflows(i,t))/(inflows(i,t)+outflows(i,t)) \tag{5}$$

Note that, in principle, both methods of measuring excess demand can yield opposite results; in any given period, the majority of funds may be sellers, but a few large buyers may dominate the picture.

The results are mixed. There is no clear relation between the herding measures and past-month returns. If anything, there seems to be more herding for the average past performers. While there is no visible relation between the country's prior stock performance and the subsequent number of funds buying in that market, the imbalance measured in dollars (by DR) indicates that funds tended to buy past winners. This can be seen in Tables 6 and 7 which present simple averages for NR and DR by past-month performance. The findings for DR are in line with findings by Kaminsky, Lyons, and Schmukler (1999). Interestingly, the figures indicate that positive-feedback trading is less pronounced in the case of single-country funds. Moreover, there is no evidence that this behavior is accentuated during crisis periods.

A different methodology to assess the importance of momentum strategies has been proposed by Grinblatt, Titman, and Wermers (1995). Their momentum measure is given by:

$$M = \frac{1}{T}\sum_{t=1}^{T}\sum_{j=1}^{N}(w_{j,t} - w_{j,t-1})R_{j,t-1}\,, \tag{6}$$

where $w_{j,t}$ and $R_{j,t}$ denote portfolio weights and returns of country j at time t. This is a momentum measure based on changes in portfolio weights in reaction to returns in the previous period. It is positive if there is momentum trading.

Table 6. Past-Month Performance, Herding Measures, and Numbers Ratio (NR) by Fund Type and Market Size

Past-Month Performance Quintiles	Herding Measure	NR All Funds	NR Single-Country Funds	NR Large Funds (largest 20%)	NR Small Funds (Smallest 20%)	NR Largest 10 Markets	NR Smallest 10 Markets	NR All Funds During Crises*
1 (worst)	6.6	0.49	0.40	0.50	0.50	0.45	0.47	0.46
2	7.4	0.50	0.42	0.53	0.48	0.49	0.46	0.47
3	8.8	0.51	0.52	0.52	0.50	0.51	0.46	0.47
4	6.2	0.49	0.41	0.50	0.52	0.50	0.48	0.46
5 (best)	7.8	0.50	0.47	0.51	0.47	0.49	0.48	0.46

* Periods include 1997:08-1997:12, 1998:06-1998:10 and 1998:11-1999:02, which correspond to crises in Asia, Russia, and Brazil, respectively. The classification by fund size is based on the average size of all funds over time. Performance Quintiles refer to quintiles of the total return of the IFC stock market index across all countries and dates except for the column referring to crises.

Table 7. Past-Month Performance and Dollar Ratio by Fund Type and Market Size

Past-Month Performance Quintiles	All Funds	Single-Country Funds	Large Funds (Largest 20%)	Small Funds (Smallest 20%)	Largest 10 Markets	Smallest 10 Markets	All Funds During Crises*
1 (worst)	-0.03	-0.38	-0.02	-0.21	-0.06	-0.13	-0.04
2	-0.01	-0.34	0.01	-0.25	0.04	-0.15	-0.10
3	-0.06	-0.26	-0.05	-0.25	0.11	-0.20	-0.08
4	-0.01	-0.43	-0.01	-0.16	0.08	-0.05	-0.09
5 (best)	0.05	-0.25	0.06	-0.12	0.07	-0.05	-0.00

Performance Quintiles refer to quintiles of the total return of the IFC stock market index across all countries and dates except for the column referring to crises. The classification by fund size is based on the average size of all funds over time. * Periods include 1997:08-1997:12, 1998:06-1998:10 and 1998:11-1999:02, which correspond to crises in Asia, Russia, and Brazil, respectively.

Compared to NR and DR, this measure has advantages and drawbacks. Since it is based on portfolio weights, and not on flows, the measure is likely to be more accurate in our case. It focuses on strategies pursued by managers rather than individual investors, since a withdrawal by individual investors would not per se result in a change of weights. On the other hand, it also captures "passive" momentum strategies since portfolio weights might change as a result of price movements without any trades taking place – but allowing for such shifts in weights to happen is also a conscious decision of the portfolio manager, and therefore of interest in this context. To complement the results from DR and NR, we therefore follow Grinblatt et al. in documenting correlations between past returns and changes in weights. However, we adopt a slightly different (and in our view more intuitive) approach by reporting the coefficients of regressions from (w_{jt}-w_{jt-1}) on $R_{i,t-1}$.[37]

According to these regressions, momentum strategies are more prevalent on the Sell- than on the Buy side (Table 8). Except for the case of the smallest ten stock markets, the coefficients on past returns are much higher for cases in which portfolio weights decreased compared to those in which weights increased. In fact, for the whole set of funds there is no statistically significant relationship between prior-month returns and changes in weights for "Buys." Interestingly, while the overall propensity to follow momentum strategies does not change markedly during crises, the difference between the Buy- and Sell-side shrinks.[38]

Table 8. Changes in Portfolio Weights in Response to Changes in Lagged Returns

	All Funds	Single-Country Funds	Large Funds (Largest 20%)	Small Funds (Smallest 20%)	Largest 10 Markets	Smallest 10 Markets	All Funds During Crises*
Overall	0.20	0.17	0.16	0.32	0.40	0.18	0.16
	(13.55)	(6.42)	(8.24)	(7.20)	(9.87)	(7.57)	(5.77)
Buy	0.05	-0.08	0.12	0.91	0.17	0.19	0.08
	(0.40)	(-0.10)	(1.29)	(1.83)	(4.51)	(7.38)	(2.04)
Sell	0.98	3.38	0.35	1.90	0.38	0.19	0.18
	(7.35)	(3.70)	(3.67)	(3.08)	(9.05)	(7.32)	(4.18)

The figures show the coefficients from regressions of (w_{jt}-w_{jt-1}) on $R_{i,t-1}$ and a constant, where w_{jt} denotes the portfolio weight of country i at time t and $R_{i,t-1}$ stands for the prior-month return in country i. The results reported in the Buy (Sell-) row are those from regression restricted to observations where (w_{jt}-w_{jt-1})> 0 (<0). T-statistics are given in parenthesis. The R^2's of the regressions (not shown) were very low, and mostly below 0.01. *Periods include 1997:08-1997:12, 1998:06-1998:10 and 1998:11-1999:02, which correspond to crises in Asia, Russia, and Brazil, respectively.

[37] See Kaminsky, Lyons, and Schmukler (1999) for similar regressions.
[38] Kaminsky, Lyons, and Schmukler (1999) find that the propensity to buy past winners and sell past losers is stronger during non-crisis periods.

IX. Conclusions

Having presented a variety of different results, it is useful to summarize the main ones briefly. A first examination of flows yielded the following main findings:

- Inflows contemporaneously coexist with outflows of similar magnitude.
- The correlation of flows within regions is higher than across regions.
- In all four crises examined, emerging market mutual funds withdrew large sums from the affected country in the month prior to the crisis. This is particularly visible in the cases of Brazil and Russia.
- The investment behavior of emerging market funds is more complex than often suggested: in many cases, funds that withdrew money from a crisis country invested in other countries that were seen as suffering from contagion effects.
- Inflows of regional and single-country funds tended to precede those of global and international funds. Similarly, open-ended funds' investments Granger-cause closed-end funds.

The tests of herding and feedback trading gave the following results:

- There is only moderate evidence of herding behavior. There are no dominant patterns across funds and over time, although herding is more prevalent in large emerging markets. Herding is less pronounced among closed-end funds, suggesting that herding behavior might to a significant extent be traceable to individual investors' behavior. Differences in the degree of herding across countries are correlated with stock return volatility.
- Emerging market funds tend to sell past losers and buy past winners, but this behavior was less visible in the case of the Asian countries during the crisis.

While herding and positive feedback trading appear to be relevant phenomena within this class of investors, these results do not support the view that their behavior is mainly determined by panics and mere imitating behavior.

Table A1. Correlation of Aggregate Flows Across Countries

	banglad	china	hongkong	india	indones	korea	malays	pakistan	philipp	singap	sri lanka	taiwan	thailand	vietnam	argent.	brazil	chile	colombia
banglad																		
china	0.00																	
hongkong	0.00	0.04																
india	0.01	-0.02	-0.01															
indones	0.00	-0.05	[illegible]	-0.03														
korea	0.00	-0.02	0.05	0.06	0.11													
malays	0.00	-0.02	[illegible]	0.07	[illegible]	-0.27												
pakistan	0.00	-0.01	-0.04	0.04	0.06	0.04	-0.01											
philipp	0.01	0.04	[illegible]	0.08	0.30	0.06	[illegible]	-0.01										
singap	0.00	0.00	[illegible]	0.02	[illegible]	0.09	[illegible]	-0.02	0.26									
sri lanka	0.00	0.00	0.00	0.01	0.01	-0.01	0.00	0.03	0.00	-0.12								
taiwan	0.00	0.00	0.05	0.09	0.07	0.16	0.05	0.01	0.00	0.03	0.00							
thailand	0.00	-0.01	0.20	0.07	0.26	0.13	0.18	0.03	0.20	0.21	0.01	0.01						
vietnam	0.00	0.03	0.00	0.03	0.08	-0.01	-0.02	0.21	0.09	0.01	0.01	0.01	0.00					
argent.	0.00	0.02	0.10	0.13	0.12	0.11	-0.01	0.00	0.16	0.06	-0.01	-0.03	0.01	0.01				
brazil	0.00	0.05	0.04	0.10	0.13	0.13	0.01	-0.05	0.11	0.03	-0.01	0.04	0.04	0.02	[illegible]			
chile	0.00	0.02	0.03	0.03	0.09	0.11	0.02	0.06	0.04	0.04	0.00	0.17	0.01	0.10	0.12	0.05		
colombia	0.00	0.02	0.02	0.06	-0.02	0.00	-0.02	0.03	-0.03	0.02	0.01	-0.02	0.10	0.03	0.03	0.05	-0.02	
mexico	0.00	0.02	0.05	0.16	0.07	0.14	0.02	0.06	0.08	0.03	-0.01	0.00	0.04	0.02	0.28	[illegible]	0.28	0.06
peru	0.00	0.04	0.05	0.05	0.04	0.10	0.02	-0.07	0.09	0.05	0.01	0.03	0.09	0.03	0.04	0.11	0.14	0.01
venezuela	0.00	0.06	0.02	0.00	0.08	-0.01	-0.01	0.12	0.08	0.04	0.01	0.05	0.02	0.12	0.14	0.07	0.15	0.12
ecuador	0.00	-0.03	-0.03	0.02	-0.02	0.04	0.03	0.02	-0.05	0.01	0.00	-0.07	0.04	-0.01	-0.05	-0.04	-0.05	0.07
panama	0.00	-0.01	0.00	0.00	0.02	0.00	-0.01	-0.02	0.00	0.00	0.01	0.00	0.00	0.04	-0.02	-0.01	-0.02	0.02
croatia	0.00	-0.02	0.00	-0.02	0.06	0.10	0.00	-0.05	-0.02	0.01	-0.01	-0.02	0.01	-0.01	-0.04	0.00	0.19	-0.02
czechrep	0.00	0.05	0.01	0.08	0.02	0.04	0.02	0.03	-0.01	0.00	0.01	0.06	0.03	0.00	0.08	0.05	0.08	0.10
greece	0.00	0.07	0.03	-0.01	0.01	-0.02	-0.02	0.07	0.04	0.02	0.00	0.05	0.00	0.00	0.09	0.05	0.02	0.07
hungary	0.00	0.02	0.00	0.11	0.03	0.04	0.04	0.00	0.05	0.00	0.00	0.09	0.01	0.03	0.15	0.09	0.13	0.01
poland	0.00	0.05	0.00	0.11	0.06	0.10	0.05	0.02	0.04	0.04	0.00	0.13	0.02	0.03	0.13	0.04	0.10	0.04
portugal	0.00	0.04	0.03	0.03	0.02	-0.05	0.00	0.03	0.02	0.01	0.00	-0.07	0.02	0.05	0.03	-0.05	-0.17	0.05
romania	0.00	0.00	0.01	0.02	0.00	0.00	0.01	-0.01	0.01	0.00	0.00	0.01	0.00	0.00	-0.01	-0.01	-0.01	0.00
russia	0.00	-0.05	0.05	0.04	0.13	0.04	0.01	-0.02	-0.01	-0.02	0.02	0.20	0.02	0.02	-0.13	-0.10	0.07	0.00
slovakrep	0.00	0.01	-0.01	0.07	0.06	0.04	0.02	0.04	0.03	0.02	0.00	0.05	0.03	-0.01	0.05	0.04	0.02	0.02
turkey	0.00	0.02	0.00	0.13	0.10	-0.01	0.03	-0.01	0.09	0.03	0.00	0.04	0.04	-0.01	0.29	0.12	0.10	0.00
botswana	0.00	0.02	0.00	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.07	0.00	0.00	0.00	0.00
egypt	0.00	-0.05	0.01	0.02	0.03	0.02	0.04	-0.03	0.02	-0.01	-0.02	-0.03	0.04	-0.02	-0.01	0.03	0.05	-0.13
ghana	0.00	0.03	-0.03	0.06	-0.01	0.07	0.02	0.02	-0.07	0.03	0.00	0.00	0.06	-0.02	-0.08	-0.01	-0.01	0.09
israel	0.00	-0.08	0.00	0.11	0.07	0.05	0.04	0.04	0.04	0.00	0.01	0.07	0.03	0.06	0.06	-0.01	0.09	0.02
jordan	0.00	0.00	-0.03	0.00	-0.02	0.00	0.00	0.00	0.01	-0.03	-0.01	0.00	-0.02	0.00	0.00	-0.03	0.02	0.03
kenya	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.02	0.00	0.00	0.00	0.00	0.01	-0.03	0.05	0.02	-0.02	0.02
mauriti	0.00	-0.02	0.01	0.02	0.01	-0.03	0.00	0.00	0.03	0.00	-0.01	0.03	0.00	0.00	0.05	0.08	0.02	0.01
morocco	0.00	0.03	0.00	0.01	0.00	0.00	0.05	0.03	0.03	0.03	0.00	0.05	0.00	0.00	0.02	-0.02	-0.15	0.00
s.africa	0.00	-0.05	0.05	0.18	0.14	0.07	0.07	-0.02	0.13	0.09	0.01	0.01	0.14	0.02	0.28	0.09	0.16	-0.01
zimbabwe	0.00	0.00	0.00	0.03	0.00	0.01	0.02	0.03	-0.02	0.00	0.01	0.00	0.02	0.02	0.00	-0.01	0.00	-0.05

	venezue	ecuadr	panama	croatia	czechrep	greece	hungary	poland	portugal	romania	russia	slovakrep	turkey	botswana	egypt	ghana	israel	jord
ecuadr	-0.09																	
panama	0.02	0.03																
croatia	0.00	0.07	0.00															
czechrep	0.09	0.02	-0.03	0.02														
greece	0.12	0.01	0.00	-0.02	-0.03													
hungary	0.07	-0.07	-0.01	0.02	0.16	-0.22												
poland	0.02	0.02	-0.01	0.07	0.28	-0.03	[illegible]											
portugal	0.02	0.07	0.00	-0.05	-0.01	[illegible]	-0.08	-0.01										
romania	0.00	-0.03	0.00	0.01	0.03	0.02	0.00	0.00	-0.04									
russia	0.05	-0.04	0.00	0.02	0.07	0.02	0.00	-0.03	0.03	0.01								
slovakrep	-0.01	0.05	0.00	-0.02	-0.27	0.00	0.03	0.00	-0.02	0.00	0.04							
turkey	0.06	0.05	-0.01	0.07	0.08	0.22	0.07	0.21	0.13	0.00	0.01	0.06						
botswana	0.00	0.01	0.04	-0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	-0.01					
egypt	-0.04	0.01	0.02	0.04	0.04	-0.07	0.06	-0.01	-0.04	-0.01	-0.06	0.02	0.05	0.06				
ghana	-0.03	0.15	0.00	0.06	0.05	-0.02	-0.03	0.01	0.03	-0.01	0.01	0.01	-0.04	0.03	-0.01			
israel	0.02	-0.04	0.01	0.02	0.14	-0.31	[illegible]	[illegible]	-0.06	0.00	-0.03	0.01	0.03	0.00	0.15	-0.02		
jordan	0.01	0.04	0.00	0.00	0.01	-0.11	-0.02	0.00	-0.03	-0.01	-0.01	-0.02	-0.07	0.00	0.07	0.01	-0.05	
kenya	0.01	0.01	0.00	0.01	0.00	0.08	-0.01	0.02	-0.06	0.00	0.00	0.00	0.06	-0.03	-0.08	0.02	-0.10	
mauriti	0.07	-0.02	0.00	-0.07	-0.01	0.05	0.04	0.00	-0.02	0.00	-0.03	0.00	-0.03	0.05	0.10	0.00	0.01	
morocco	-0.03	-0.02	0.00	-0.14	-0.04	0.01	-0.01	-0.01	0.03	-0.01	-0.01	0.02	0.08	0.01	-0.01	-0.04	-0.04	
s.africa	0.06	0.05	-0.01	0.06	0.08	-0.06	0.14	0.16	-0.01	0.05	0.02	0.03	0.25	-0.02	0.07	-0.03	0.23	
zimbabwe	-0.05	0.01	0.01	0.00	0.02	0.01	0.02	0.00	0.01	0.00	0.01	0.01	0.02	0.04	0.05	0.02	0.00	

Source: Authors' calculations based on data from Emerging Markets Funds Research, Inc.

THE BEHAVIOR OF FUNDS AROUND CRISES

Table A2. Aggregate flows to different countries and regions around Czech crisis

	Jan-97	Feb-97	Mar-97	Apr-97	May-97	Jun-97
Czech Stock Mkt. Return %	4.2	4.1	-10.0	-7.5	-10.9	4.0
Net Flows						
Czech Rep.	20	10	10	-24	-20	-23
Hungary	-9	-6	4	1	-40	-6
Poland	-32	-18	-2	6	31	37
Russia	-58	-83	60	154	113	-38
Slovakia	0	1	5	2	2	-1
Europe	-114	-83	-19	181	53	30
Asia	-170	175	619	-559	-84	-1313
Latin America	335	148	217	278	86	214
Middle East & Africa	41	72	107	107	115	179

Source: Authors' calculation based on data from IFC and Emerging Market Funds Research, Inc.
Note: Based on balanced sample of funds. Flows are in millions of dollars

Table A3. Mean Investment of Funds that Withdrew Money from the Czech Republic around the Czech Crisis, by Country, 1997:04-1997:06
(In millions of US$)

Country	Observation	Mean	Standard Deviation	Minimum	Maximum
Czech Rep.	57	-2.0	2.9	-12.3	-.0
Hungary	57	0.5	2.3	-5.1	11.5
Poland	57	0.7	4.2	-6.6	27.6
Russia	57	2.7	13.3	-11.6	82.6
Slovak Rep.	57	0.0	0.3	-1.1	1.4
Latin America	57	5.1	19.2	-15.3	87.8
Europe	57	2.4	16.1	-16.9	93.1
Asia	57	14.6	55.1	-54.2	334.5

Table A4. Aggregate Flows to Different Countries and Regions around Asian Crisis

	Apr-97	May-97	Jun-97	Jul-97	Aug-97	Sep-97	Oct-97	Nov-97	Dec-97	Jan-98	Feb-98	Mar-98
Thai Mkt Return %	-5.3	-12.9	-9.7	6.7	-33.1	5.9	-32.5	-12.7	-22.2	35.8	28.2	-6.5
Hong Kong Mkt Ret. %	3.0	14.3	3.0	7.8	-13.7	6.6	-29.3	-0.9	1.6	-13.6	24.0	0.3
Korea Mkt Return %	3.1	7.9	1.7	-3.6	-3.8	-9.6	-29.7	-26.9	-33.0	69.8	-7.6	0.7
Net Flows												
Thailand	221	-33	50	298	159	191	101	73	156	-131	68	51
Indonesia	25	-88	-57	-38	77	-66	89	125	149	75	-27	-10
Korea	27	312	345	131	-40	92	-600	87	133	209	357	-78
Malaysia	-435	-398	-369	-128	-399	-364	-25	13	131	-14	8	97
Philippines	-44	-102	-110	18	-34	46	47	-1	18	31	-63	120
Hong Kong	123	-216	-908	-361	35	-808	-344	152	-6	324	291	27
China	-19	147	64	-105	177	96	19	173	-81	147	-51	142
Taiwan	-232	37	151	12	-98	-598	-658	86	-61	255	210	222
Singapore	-73	118	-274	129	-215	-40	-47	-79	-46	182	73	-4
Europe	164	38	47	-70	348	-198	-11	-189	-258	122	179	84
Middle East & Africa	103	111	177	126	283	202	220	-30	46	-45	44	109
Asia	-539	-30	-1300	-23	-306	-1287	-1404	554	413	1047	785	531
Latin America	272	89	204	-279	81	395	-479	305	218	-158	156	106

Source: Authors' calculation based on data from IFC and Emerging Market Funds Research, Inc.
Note: Based balanced sample of funds.

Table A5. Mean Investment of Funds that Withdrew Money from Thailand around the Asian Crisis, by Country, 1997:04-1998:03

(In millions of US$)

Country	Observation	Mean	Standard Deviation	Minimum	Maximum
Thailand7	874	-1.8	4.1	-68.3	0.0
Indonesia	874	-0.4	3.5	-66.4	38.1
Koreas	874	0.2	7.0	-67.7	105.1
Malaysia	874	-1.7	7.6	-161.4	17.1
Philippines	874	-0.3	3.1	-41.4	32.8
Hong Kong	874	-1.6	37.6	-991.0	322.9
China	874	0.3	4.3	-49.0	68.9
Taiwan	874	0.5	9.8	-39.7	172.0
Singapore	874	-0.7	11.5	-317.5	53.2
Europe	874	-0.1	8.1	-74.0	100.7
M.E. & N.A.	874	0.2	5.5	-32.6	85.7
Latin America	874	-0.0	14.1	-134.3	166.9

Table A6. Aggregate Flows to Different Countries and Regions Around Russian Crisis

	Apr-98	May-98	Jun-98	Jul-98	Aug-98	Sep-98	Oct-98
Russia Stock Mtk. Return %	-3.1	-39.9	-20.5	0.6	-58.7	-41.9	48.4
Net Flows							
Russia	11	236	137	-159	-92	53	-30
Czech Republic	6	13	3	9	-5	-5	-22
Poland	-15	-5	-7	31	16	-8	17
Hungary	-2	-34	-3	18	-29	-3	21
Slovakia	-2	-3	2	5	-2	-2	-4
Europe	148	202	36	-130	-118	-4	-47
M.E. & Africa	280	39	19	181	-37	2	-74
Asia	546	-72	-184	317	-1003	-167	-95
Latin America	124	-301	-142	867	-427	529	385

Source: Authors' calculation based on data from IFC and Emerging Market Funds Research, Inc.
Note: Based on balanced sample of funds. Flows are given in millions of U.S. dollars.

Table A7. Mean investment of Funds that Withdrew Money from Russia Around the Russian Crisis, by Country--1998:04-1998:10

(In millions of US$)

Country	Observation	Mean	Standard Deviation	Minimum	Maximum
Russia	120	-3.3	9.4	-0.2	0.0
Czech Rep.	120	-0.2	2.4	-14.4	9.3
Hungary	120	0.2	3.9	-10.3	31.8
Poland	120	0.6	2.9	-5.4	13.9
Slovak Rep.	120	-0.0	0.4	-1.9	3.1
Europe	120	-3.6	9.4	-57.2	16.6
Latin America	120	10.2	60.3	-41.4	588.9
M.E. & N.A.	120	0.8	9.5	-46.0	65.0

Table A8. Aggregate Flows to Different Countries and Regions Around Brazilian Crisis

	Sep-98	Oct-98	Nov-98	Dec-98	Jan-99	Feb-99	Mar-99
Brazil Stock Mtk. Return %	-0.5	5.0	19.8	-18.8	-28.1	5.9	40.3
Net Flows							
Brazil	136	94	198	-400	56	33	-119
Argentina	63	-65	-72	-61	92	-37	-104
Chile	75	22	-93	80	42	-3	-40
Colombia	-3	-2	-2	2	-2	0	-1
Mexico	176	308	45	-89	74	219	33
Venezuela	11	-22	-3	-7	-4	-7	5
Europe	-21	-24	98	132	74	-49	-54
M.E. & Africa	14	-68	-2	1	17	179	88
Asia	-148	-106	145	-319	261	132	491
Latin America	536	380	-4	-396	292	186	-298

Source: Authors' calculation based on data from IFC and Emerging Market Funds Research, Inc.
Note: Based on balanced sample of funds. Flows are given in millions of U.S. dollars.

Table A9. Mean Investment of Funds that withdrew Money from Brazil Around the Asian Crisis, by Country (1998:11-1999:02)

(In millions of US$)

Country	Observation	Mean	Standard Deviation	Minimum	Maximum
Brazil	214	-3.3	10.9	-121.4	0.0
Argentina	214	-1.0	8.1	-103.5	16.3
Chile	214	0.4	3.3	-3.7	36.8
Colombia	214	0.0	0.3	-1.8	3.0
Mexico	214	-0.4	4.7	-24.2	41.6
Venezuela	214	0.0	0.6	-5.1	3.5
Europe	214	0.7	9.3	-21.3	116.8
M.E. & N.A.	214	0.2	6.9	-44.4	74.4
Asia	214	0.5	27.0	-139.3	312.0

Simulating the Herding Measure Distribution

Following Wermers (1999), we use a Monte Carlo simulation procedure to generate a simulated distribution of herding measures under the null hypothesis of independent trading. For each month t, the number of funds investing in a given country *i* in month *t*, is generated as a draw from a binomial distribution. More precisely, if n_{it} is the number of actual trades in a country, (if n_{it} is greater or equal than five), we produce n_{it} draws from a *U(0,1)* distribution with a random number generator. Each draw is rounded up to one if it is greater than 1- $E[p_{it}]$ (where $E[p_{it}]$ is the actual proportion of funds buying in that year, as explained in Section VII); other wise it is rounded down to zero. These outcomes are summed up, yielding a draw from a binomial distribution $b(n_{it}, E[p_{it}])$. Based on this simulated data, we calculate the simulated herding measures. We repeat this procedure 50 times, obtaining a sample of 79800 simulated herding measures.

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