DO HERDING BEHAVIOR AND POSITIVE FEEDBACK EFFECTS INFLUENCE CAPITAL INFLOWS? EVIDENCE FROM ASIA AND LATIN AMERICA

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ABSTRACT

A considerable amount of research has focused on herding behavior vis-à-vis international capital, either by focusing on theory or by applying simple statistical analyses, but most studies have ignored factors that trigger international capital inflows. In essence, any connection between theory and empirical evidence has not been validated. In this paper, we test two primary drivers of capital inflows to emerging markets, namely herding behavior and positive feedback effects. Data from Asia and Latin America are used for our empirical study. There is significant evidence of positive feedback and herding behavior in both stable and highly volatile countries.

JEL: F21, G11, G15

INTRODUCTION

Global capital flows play a very important role in international integration and global financial management. A series of financial crises in Mexico, Asia, Russia, and Argentina, which revealed the volatility of international capital flows, especially to emerging markets, was blamed as a trigger. This motivated an academic literature on contagion effects (propagation of crises), "contagion," and the international transmission of crises, the "financial contagion," a phenomenon associated with dependencies among countries that allow market shocks in one country to affect other countries, often on a regional basis.

Most studies on capital flows emphasize the effects of changes at the macroeconomic level. Some studies, for example, have explored the effects of capital inflows on exchange rates and stock prices, while others have investigated their causes and other consequences.[1]

In the wake of both the 1994 Mexican and the 1997 Asian financial crises, there was a surge in the number of researchers attempted to find the root causes of these crises in a comprehensive and systematic manner. This was especially the case following the Asian crisis when interest had reached its peak.[2] A general consensus was reached: both financial crises were triggered by capital inflows followed by an abrupt change in confidence in large measure due to capital flights, a view later confirmed by the International Monetary Fund (IMF) in 1998. Interestingly enough, the cornerstone of most studies has been the impact of the shock brought on by the sudden sharp capital reversal in regional economies. This fact had actually been ignored in the early 1990s when substantial inflows of capital arrived through domestic financial channels (Radelet and Sachs, 1998, Rajan et al., 2003, Shen and Hsieh, 2000).

Although it is hard to determine whether co-movements are irrational or excessive, empirical work has been able to document patterns in the vulnerability of countries to volatility and to identify possible channels through which contagion is transmitted. Neither the exact cause of this volatility nor the best international financial architecture for guiding the movement of international capital is yet known. Yet reducing volatility and contagion has been an important stated objective of recent reforms (Dornbusch et al., 2000).

Therefore, analyzing the behavior of investors would become a very crucial issue. In the aftermath of the recent crises in emerging markets, considerable attention has focused on the question of whether herding behavior by international investors leads to excessive volatility in the flow of capital to developing countries.

Regarding the behavior of investors, the 'positive feedback' and herding behavior are usually analyzed. The 'positive feedback' ('positive momentum' or just 'momentum') trading strategy, refers to an investor buys past winners and sells past losers. Herding is the tendency for investors of a particular group to mimic each other's trading.

Even though a considerable amount of research has focused on herding behavior vis-à-vis international capital, either by focusing on theory or by applying simple statistical analyses, most studies have ignored factors that trigger international capital inflows. In essence, any connection between theory and empirical evidence has not been validated.

The purpose of this paper intends to fill this gap. Moreover, the existing literature either focuses on individual economies or examines the determinants of FDI flows. This study adopts aggregate mutual fund data that belong to private capital flows rather than the more stable FDI flows and enables us to extend the sample period from 1996 to 2004 for selected countries in Asia and Latin America. How herding behavior and feedback effects affect capital inflows and how to analyze the causes of these behaviors will be investigated in this study.

The reason for choosing Asia and Latin America is that these two groups of countries account for over 75% of all international capital flows. Rajan et al. (2003) argued that South Asian countries paid higher interest rates before the crisis in order to attract international capital inflows, but their hypothesis has not been investigated for Asia as a whole. Additionally, we wish to examine whether there is a similar pattern in Latin American countries.

It is an interesting observation that a financial crisis in one country may very well cross borders and spread into other countries in the same region. Moreover, should the financial crisis not be harnessed, a regional crisis may even turn into a global one. Second, not only does this research study the behavior of international capital flows but also analyzes the causes of these behaviors. Third, previous studies have either adopted long period and highly accessible data or used high frequent data with short time span. This study takes the mutual fund data sets with the longest time frame possible, and in so doing, is able to capture a more robust analysis.

The remainder of this paper is organized as follows. Section 2 outlines the literature review. Section 3 provides the empirical model. Data description will be in section 4. Section 5 reports and analyzes the empirical results. The final section presents the conclusions.

LITERATURE REVIEW

International capital flows stem from both external (push) and internal (pull) factors. Calvo, Leiderman, and Reihart (1993) found that declines in U.S. interest rates were correlated with foreign reserves accumulation and real exchange rate appreciation that they used as proxies of capital inflows to Latin America in the early 1990s. They reported that external factors were the primary determinants of capital inflows to developing countries in that period. Based on their empirical study on country risk, Fernandez-Arias (1996) studied the determinants and sustainability of widespread capital inflows to middle-income countries after 1989 and confirmed that they were vulnerable to *external factors*, like international interest rate.

Taking a different approach from Fernandez-Arias' methodology, Berg and Pattillo (1998) subsequently found that *domestic factors* may have played a larger role in the 1997 East Asian currency crises. McKinnon (1999) concluded that higher interest premiums were the main reason for huge capital inflows to South Asia. McKinnon (1999) pointed out that these high interest differentials may have been associated with some kind of "Peso problem", i.e. a dramatic devaluation in Asia. Along similar lines, Rajan et al. (2003) recently found that countries in their South Asia group were paying higher interest rates than the London Inter-Bank Offered Rate (LIBOR). For example, in 1992, the interest rate differentials in South Asian countries were 19.83% in Indonesia, 5.11% in Malaysia, 15.28% in the Philippines and 7.97% in Thailand. These substantial capital inflows represented a very high percentage of the Gross Domestic Product (GDP) of Indonesia (8.3%), Malaysia (45.8%), the Philippines (23.1%) and Thailand (51.5%). Once these inflows abruptly reverse into capital flights, those countries suffered extremely grave economic consequences. McKinnon (1999), and Rajan et al. (2003) have reiterated that the main factor inducing capital inflows was high interest differentials in those countries before the crisis.

However, after the crisis -- from 1999 onwards, large sums of global mutual funds have been again injected into Asia, a phenomenon that has only received little attention until now. In another study, De Long et al. (1990) concluded that in the presence of noise traders, even rational investors may want to engage in positive feedback trading, and in the process, destabilize the market.

Much of the research has focused on Korea to shed light on questions relating to the trading strategy of investors, such as Choe et al. (1999), Kim and Wei (2002a) and Kim and Wei (2002b). Choe et al. (1999) find strong evidence of positive feedback trading and herding by foreign investors before the Korea's economic crisis. During the crisis period, herding falls, and positive feedback trading by foreign investors mostly disappears. Kim and Wei (2002a) find that although offshore funds trade more frequently, they do not, as a group, engage in positive feedback trading. Kim and Wei (2002b) find increased herding after the outbreak of the crisis. Froot et al. (2001) also get a similar result, that is, the factors that affect fund flow are based on the previous return, and the price sensitivity of regional stocks has a positive and massive impact on overseas fund inflow.

Instead of focusing on a particular country,[3] Borensztein and Gelos (2003) use a data set collected by Emerging Markets Funds Research, Inc., on the monthly geographic asset allocations of 467 funds active in developing countries over the period January 1996 to March 1999. They find that the degree of herding among funds is statistically significant, but moderate. Herding is not more prevalent during crises than during tranquil times. Funds tend to follow momentum strategies, selling past losers and buying past winners. The authors also present some evidence that suggests that increased herding measures are associated with higher stock return volatility but caution against pushing this conclusion too far.

But Bikhchandani and Sharma (2001) maintained that the herding behavior results from an obvious tendency by investors to copy the behavior of others. Fundamentals-driven spurious herding could arise, for example, if interest rates suddenly rise and stocks become less attractive investments. It can also be argued that herding takes place when investors are reacting to known public information -- that is, a rise in interest rates. Thus, the definitions of positive feedback and herding behavior should not be lumped together. As Bikhchandani and Sharma (2001) noted, however, much of the previous work does not test the validity of specific models of the causes of herding behavior. Also, in Bikhchandani and Sharma (2001), one cannot distinguish among the different causes of herding behavior directly from the analysis of a data set on asset holdings and price changes, as it is difficult, if not impossible, to discern the motive behind trade that is not driven by "fundamentals".

THE EMPIRICAL MODEL

In order to examine how positive effect and herding behavior affect capital flows and the causes behind them, this study constructs three models. Equation (1) intends to find whether the positive feedback effect does exist, in which an investor buys past winners and sells past losers.

$$K l_{i,t} = \alpha_0 + \beta_{i,t-k} Stock_{i,t-k} + \gamma_{i,t-k} Exch_{i,t-k} + \varepsilon_{i,t} \tag{1}$$

KI denotes change in monthly capital flow. *Stock* stands for monthly stock market returns of a given country. A positive coefficient of *Stock* implies that the level of capital inflows tends to move in the same direction with stock return, and the positive feedback effect is confirmed. *Exch* denotes variations in the exchange rate. The exchange rate is quoted in direct quotation, that is, a positive value for *Exch* represents a depreciation of the currency.

Furthermore, we determine whether "herding behavior" takes place. As mentioned in Bikhchandani and Sharma (2001), herding behavior is an obvious intent by investors to copy the behavior of others. Therefore, we construct a feasible model, an autocorrelation model modified from model (1) and represented as model (2).

$$Kl_{i,t} = \alpha_0 + \alpha_{i,t-k} KI_{i,t-k} + \beta_{i,t-k} StockR_{i,t-k} + \gamma_{i,t-k} Exch_{i,t-k} + \varepsilon_{i,t} \tag{2}$$

A positive coefficient of *KI* means that previous high (low) capital flows subsequently induced even higher (lower) flows, indicative of typical herding behavior.

Here, it is important to rule out fundamentals-driven spurious herding, which means capital flows are driven by fundamental issues rather than investors copying the previous strategies of others. This is achieved by adding the control variables, interest rate, real GDP growth rate and foreign reserves and is written as:

$$KI_{i,t} = \alpha_0 + \alpha_{i,t-k} KI_{i,t-k} + \beta_{i,t-k} Stock_{i,t-k} + \gamma_{i,t-k} Exch_{i,t-k} + \omega_{i,t-k} INT_{i,t-k}$$

$$+ \rho_{i,t-k} RGDP_{i,t-k} + \lambda_{i,t-k} FR/IMP_{i,t-k} + \theta_{i,t-k} M2/FR_{t-k} + \varepsilon_{i,t} \tag{3}$$

Different from model (2), *KI* is weighted by the GDP of the specific country. In order to be consistent with the data frequency of the control variables, we adopt quarterly data for model (3). Hence, monthly data is adopted both in model (1) and model (2); but in model (3) turns to be quarterly data. *INT* denotes the interest rate differentials of LIBOR U.S. dollar lending. *RGDP* refers the real GDP growth rate. FR/IMP, foreign reserves divided by value of imports, is a measure of the strength of reserve. $M2/FR$, broad money supply divided by foreign reserves, is a measure of financial liberalization.[4]

In order to account for a possible two-way causality between capital inflow and stock market returns, we perform the augmented Granger causality tests for Equations (2) and (3). Since the only difference between Equations (1) and (2) is the past values of capital inflow, a test for Equation (1) is not needed. Theoretically, when $Z_{t-k}, K = -1, 0, 1, ..., T$, do not affect y_t, then

$$E(y_t / z_{t-k,} y_{t-l}) = E(y_t / y_{t-l}), \ k = -1, 0, 1, ... T; \ l = 1, 2, ... T \ .$$

We regress the *STOCK* on the future, present and past values of *KI*, all other variables, and *STOCK* own lags. Hence, the estimated equation without control variables is

$$STOCK_{i,t} = \alpha_0 + \alpha_{i,t}KI_{i,t-k} + \gamma_{i,t-j}Exch_{i,t-j} + \beta_{i,t-l}Stock_{i,t-l} + \varepsilon_{i,t},$$
$$k = -1,0,1,2,3; \ j = 0,1,2,3; \ l = 1,2,3, \tag{4}$$

and with control variables:

$$STOCK_{i,t} = \alpha_0 + \alpha_{i,t}KI_{i,t-k} + \gamma_{i,t-j}Exch_{i,t-j} + \beta_{i,t-l}Stock_{i,t-l} + \omega_{i,t-j}INT_{i,t-j}$$
$$+ \rho_{i,t-j}RGDP + \lambda_{i,t-j}RFR/IMP_{i,t-j} + \theta_{i,t-j}M2/FR_{i,t-j} + \varepsilon_{i,t},$$
$$k = -1,0,1,2,3; \ j = 0,1,2,3; \ l = 1,2,3 \ (5) \tag{5}$$

If coefficient of $KI_{i,t-k}$ is not statistically significant, then a two-way causality between capital inflows and stock returns is not a concern for our subsequent estimations.

DATA DESCRIPTION

<u>Sample</u>

We use the *Emerging Portfolio Fund Research* (*EPFR*) Global mutual fund database, a leading provider of mutual fund data, research and consulting. The EPFR tracks 10,000 international mutual funds in emerging and the U.S. markets with funds worth $5 trillion in assets, including offshore and U.S.-registered funds. The sample covers the January 1996-October 2004 period. In comparison with previous studies, this time frame provides the most comprehensive data set to our best knowledge. The data set covers selected emerging markets in Asia and Latin America. The Asian group consists of 12 countries, namely Bangladesh, China, Hong Kong, India, Indonesia, Korea, Malaysia, the Philippines, Singapore, Sri Lanka, Taiwan and Thailand. The Latin American group is made up of 7 countries, i.e., Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela. As mentioned earlier, these two groups occupy more than 75% of all international capital flows.

Table 1 presents the descriptive statistics of the variables for Asia and Latin America. It shows that capital flows into Asia is larger than those in Latin America, though the latter yields a higher stock return and interest rate differential. This implies that mutual fund managers have preferences for the relative steady economic environment (RGDP) and a sounder financial environment (M2/FR).

Worthy of mention is that the Korean economy was significantly hit by the Asian financial crisis and led to a nearly 50% decline of real GDP growth rate in the first quarter of year 1998. A similar situation happened in Indonesia, where a significant devaluation of Indonesian peso occurs to the maximum value of 135.50%. In the same period across the Pacific Ocean, Latin America tried to attract international capital to stay through raising interest rate. For example, the lending rate in Peru reached a high level of 424% in the second quarter of 1997.

<u>The Capital Flows Volatility</u>

This study adopts the volatility model, championed by Parkinson, German and Klass (1980) and Kuo and Chi (2000). We find that the volatility threshold of Asia is 7.01 and that of Latin America is 12.11. If the volatility level of one country is higher than its threshold value, it is deemed a volatile country; otherwise, it is considered stable.

In Asia, the volatile countries are China, Hong Kong, Korea, Singapore and Taiwan, and in Latin America, they are Argentina, Brazil and Mexico. According to Table 2, these volatile countries share some 77% of all mutual funds in Asia, and an even higher, 83%, in Latin America.

Table 1: Descriptive Statistics

Region	Variable	Mean	Stdev	Max	Min
Asia	KI (million)	2485	2869	13883	0
	Stock Return rate (%)	1.49	16.54	112.63	-48.86
	Interest Rate Differential (%)	6.67	4.90	29.98	-0.82
	Change Rate of Exchange (%)	1.47	8.59	135.50	-35.45
	Real GDP (%)	-3.10	11.16	25.04	-75.86
	FR/Import (quarters)	1.93	1.06	5.15	0.29
	M2/FR	5.36	13.35	58.33	0.00
Latin American	KI (million)	1517	2129	9046	-7299
	Stock Return rate (%)	4.53	20.93	201.55	-64.25
	Interest Rate Differential (%)	42.21	71.69	424.96	0.00
	Change Rate of Exchange (%)	2.88	9.77	91.00	-14.60
	Real GDP (%)	-32.77	328.94	3669.98	-2448.58
	FR/Import (quarters)	3.00	1.15	6.67	0.71
	M2/FR	1.34	1.35	4.77	0.00

KI denotes capital flows and is collected from EPFR. Stock return rate (%) = [(Stock Index)$_t$ -(Stock Index)$_{t-1}$] / (Stock Index)$_{t-1}$ X 100. Interest Rate Differential is defined as the domestic lending rate minus LIBOR US dollar lending rate. Change rate of exchange (%) = [(Exchange)$_t$ -(Exchange)$_{t-1}$] / (Exchange)$_{t-1}$ X 100. Real GDP stands for the real GDP growth rate and is defined as the nominal GDP growth rate minus CPI rate. FR/Import denotes the foreign reserve divided by the import values on the quarter basis M2/FR denotes the broad money divided by the foreign reserve on the quarter basis.

Interest Differentials, Exchange Rates and Stock Indices

Table 3 presents the interest differentials of the Asian and Latin American countries from 1996 to 2004. In Asia, the highest average interest differential was for Indonesia at 16.8%, more than double that of the Philippines (8.33%) and triples that of Thailand (5.24%). By way of comparison, the Latin American countries had considerably higher average interest differentials, most notably Brazil at 64.28%, and all other countries above 10% with the exception of Chile. On the basis of this finding, it can be argued that interest rate differential is one of the major pulling forces that attract investors.

Thus, it may be considered a key financial indicator linked to capital flows that investors watch over time so that they can make sound investment decisions. This finding also amplifies the point that, before their respective crisis, it was more profitable to invest in most of the selected Latin American countries than in the Asian ones.

It is worth pointing out that crucial monetary reform measures were put into place in 1994 to tighten economic policy and restrain consumption while attempting to fight against inflation. The interest rate differentials reached 7.74% from 6.30% in 1993 and 1994. A series of macroeconomic reforms reduced the interest rate before the crisis. This may have been one of the reasons that China was not a part of the Asian crisis.

Although the interest rate differentials of China did not rise after the 1997 crisis and financial institutions were not independent, bank credit expanded rapidly, culminating in an unsound credit system. With this state of affairs, the potential risk for the Chinese banking system was progressively increasing.

Table 2: Descriptive Statistics of Global Mutual Funds Monthly Inflows to Asian and Latin American Countries (1996/01~2004/11) (%)

Countries	Mean	Maximum	Minimum	Volatility
Asia				
Bangladesh	0.01	0.05	0.00	0.05
China	**6.08**	10.64	1.16	**9.48**
Hong Kong	**25.05**	35.45	16.72	**18.73**
India	3.74	5.19	2.77	2.42
Indonesia	2.32	3.71	1.19	2.52
Korea	**20.06**	28.65	3.76	**24.89**
Malaysia	5.20	8.34	2.43	5.91
Philippines	1.55	4.45	0.57	3.88
Singapore	**11.15**	17.26	8.01	**9.25**
Sri Lanka	0.09	0.25	0.04	0.21
Taiwan	**14.92**	19.65	10.29	**9.36**
Thailand	4.55	6.94	2.82	4.12
Average	7.29	10.83	3.83	**7.01**
Latin America				
Argentina	**6.18**	14.07	0.46	**13.61**
Brazil	**40.33**	50.97	27.43	**23.54**
Chile	7.89	11.34	5.61	5.73
Colombia	0.86	2.75	0.01	2.74
Mexico	**36.54**	52.29	22.22	**30.07**
Peru	2.32	4.80	0.80	4.00
Venezuela	1.55	5.27	0.20	5.07
Average	13.67	20.21	8.10	**12.11**

Volatility was first proposed by Parkinson, German and Klass (1980) and Kuao and Chi (2000) and is defined as (maximum – minimum) / N. The threshold of volatility is 7.01 for Asia and 12.11 for Latin America. In Asia, the volatile countries are China, Hong Kong, Korea, Singapore and Taiwan, and in Latin America, are Argentina, Brazil and Mexico.

Table 3: Interest Rate Differentials in Asian and Latin American Countries (%)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	Average
Asia										
China	4.64	2.98	0.89	0.49	-0.63	2.12	3.55	4.14	4	2.46
Hong Kong	3.06	3.84	3.50	3.14	3.02	1.4	3.24	3.83	3.42	3.16
Indonesia	13.78	**16.16**	**26.65**	22.31	11.97	14.82	17.19	15.76	12.54	**16.80**
Korea	3.4	**6.22**	**9.78**	4.04	2.06	3.98	5.01	5.07	4.32	**4.88**
Malaysia	4.5	**4.97**	**6.63**	3.21	1.19	3.4	4.77	5.13	4.47	**4.25**
Philippines	9.4	**10.62**	**11.28**	6.42	4.42	8.67	7.38	8.3	8.5	**8.33**
Singapore	0.82	0.66	1.94	0.44	-0.65	1.93	3.61	4.14	3.72	1.85
Taiwan	3.11	7.99	8.92	2.67	1.12	3.26	3.77	2.93	1.89	**3.96**
Thailand	7.96	**7.99**	**8.92**	3.62	1.35	3.52	5.12	4.77	3.92	**5.24**
Latin America										
Argentina	5.07	3.58	5.14	4.56	7.36	25.95	50.51	17.57	2.38	13.57
Brazil	na	72.53	80.86	73.96	53.1	55.86	61.71	65.5	50.68	**64.28**
Chile	11.93	10.01	14.67	6.14	11.11	10.13	6.59	4.6	0.73	8.43
Colombia	36.55	28.56	36.74	19.29	15.06	18.96	15.16	13.61	10.68	**21.62**
Mexico	30.95	16.48	20.86	17.26	13.2	11.04	7.03	5.33	2.82	13.89
Peru	20.63	24.3	25.3	24.31	24.18	18.67	13.56	12.63	10.09	**19.30**
Venezuela	33.97	18.03	40.85	25.65	21.47	20.69	35.41	23.61	14.1	**25.98**

The Interest Rate Differential is the spread between the lending rate of a country (IFS line 60p) and the London Eurodollar lending rate (IFS line 60D). The data for Taiwan are retrieved from the Taiwan Economic Journal. The numbers in bold indicate that the value is higher than the level during the respective crisis.

Table 4 presents the results of the exchange rate variations, where a significant variation stands for a large devaluation during the sample period. Based on the exchange rate, the countries that experienced a financial crisis were those that had a large devaluation of currency between 1996 and 2004. These were

Indonesia, Korea, Malaysia, the Philippines and Thailand and most Latin America countries except Peru.

Table 4: The Exchange Rate Variations in Asian and Latin American Countries

	Exchange rate of local currency		Exchange rate of local currency against		Exchange volatility	
	End	Average	End	Average	End	Average
Asia						
China	8.30	8.31	8.28	8.28	-0.24%	-0.36%
Hong Kong	7.74	7.73	7.78	7.79	0.51%	0.77%
Indonesia	2377.75	2342.30	9253.80	8938.85	289.3%	281.7%
Korea	839.02	804.45	1050.80	1145.32	25.1%	42.3%
Malaysia	839.02	804.45	1050.80	1145.32	25.1%	42.3%
Philippines	26.29	26.22	56.18	56.04	113.3%	113.0%
Singapore	1.40	1.41	1.64	1.69	17.3%	19.8%
Taiwan	27.50	27.46	32.23	33.43	17.0%	21.1%
Thailand	25.55	25.34	39.18	40.22	53.6%	58.1%
Latin America						
Argentina	1	1	2.96	2.92	196.0%	192.0%
Brazil	1.04	1.01	2.65	2.93	154.8%	190.9%
Chile	424.97	412.27	559.83	609.37	31.4%	47.8%
Colombia	1005.33	1036.69	2412.1	2628.61	139.1%	153.8%
Mexico	7.85	7.6	11.26	11.29	43.9%	48.3%
Peru	2.6	2.45	3.28	3.41	26.4%	39.4%
Venezuela	476.5	417.33	1918	1891.33	302.8%	353.8%

The data for exchange rate are retrieved from the IMF's IFS, the November 2005 version, Line af. The positive numbers shown in the volatility column represent currency devaluation.

There is no question that the Philippines were the most volatile with a devalued position of 113%. This was followed by depreciation in Thailand (58%) and Singapore (42%). While all the other Asian countries were in a stage of depreciation, China was experiencing the opposite effect. In the Latin American countries, notably Argentina and Brazil, devaluation was much higher than in the Philippines, reaching 190%. In order to avoid the devaluation of invested currency, international capitals were transferred from the Latin American countries to the Asian region during 1999-2004. Figure 1 shows this trend while Fig 2 depicts the trend between capital inflows and the stock indices in Asia and Latin America. Clearly, capital inflows to Asia and Latin America follow a co-integrated pattern with that of the stock markets, but the pattern is more pronounced in Asian than in Latin American countries.

In Asia, this is more apparent in the case of Hong Kong, where capital inflows were also pegged to the Heng Seng Index. By contrast, in Brazil, the pattern is not as significant as that in Hong Kong. On the whole, it is evident that stock markets do have a certain influence on capital flows. This is in line with the theoretical argument that increased stock returns inevitably induce capital inflows. Simply put, the greater stock returns are, the greater are capital inflows.

EMPIRICAL FINDINGS

Tables 5 and 6 provide the results of the random effects regressions on models (1) and (2) for the positive feedback effect and the herding behavior effect, respectively. Table 5 reports the impacts of geographic location. The coefficients of the stock market returns (*Stock*) in different regions are all consistently positive for Asia and Latin America. Especially in Asia, the coefficients remain positive even in the two lagged periods of the stock market returns, implying the existence of a positive feedback effect.
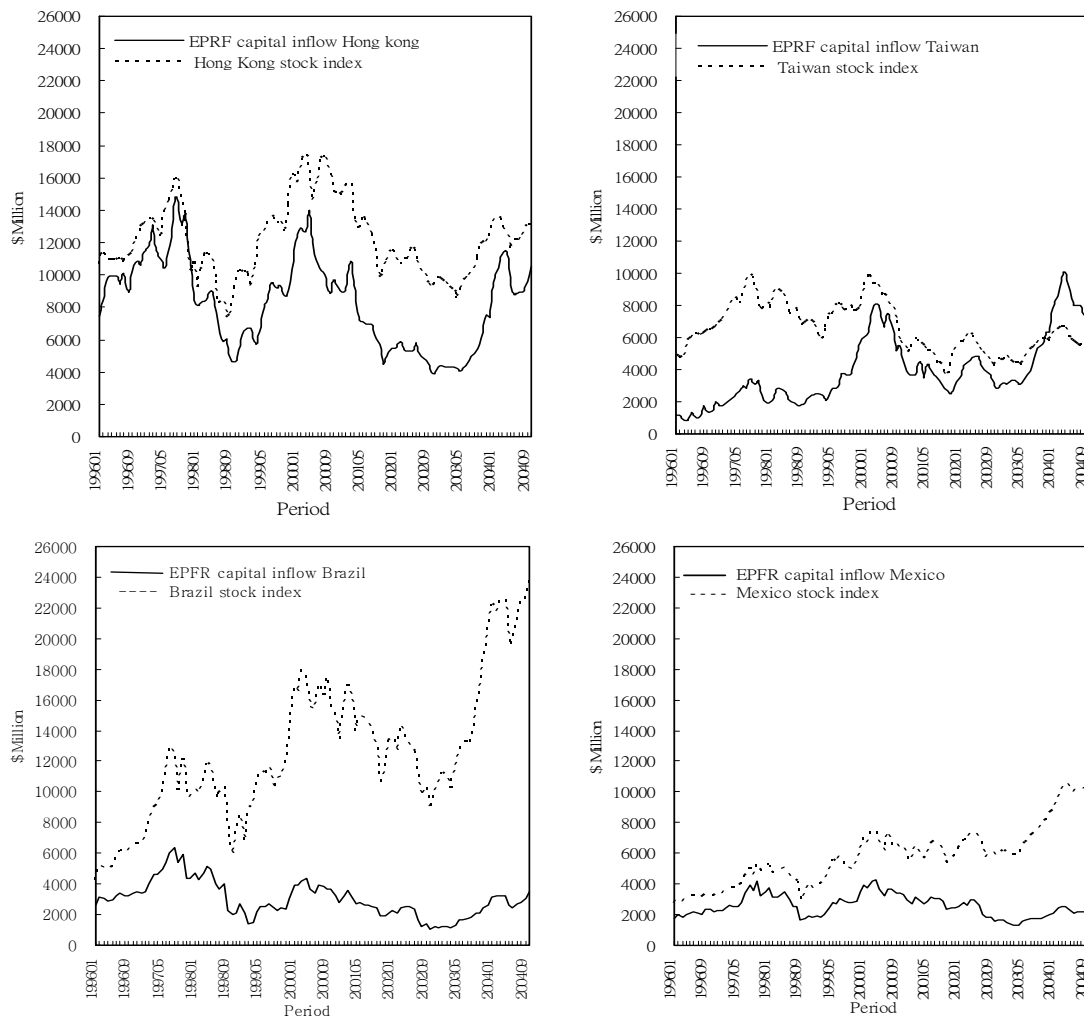
Figure 1: Percentage of Global Mutual Funds invested in Different Regions (1996-2004)
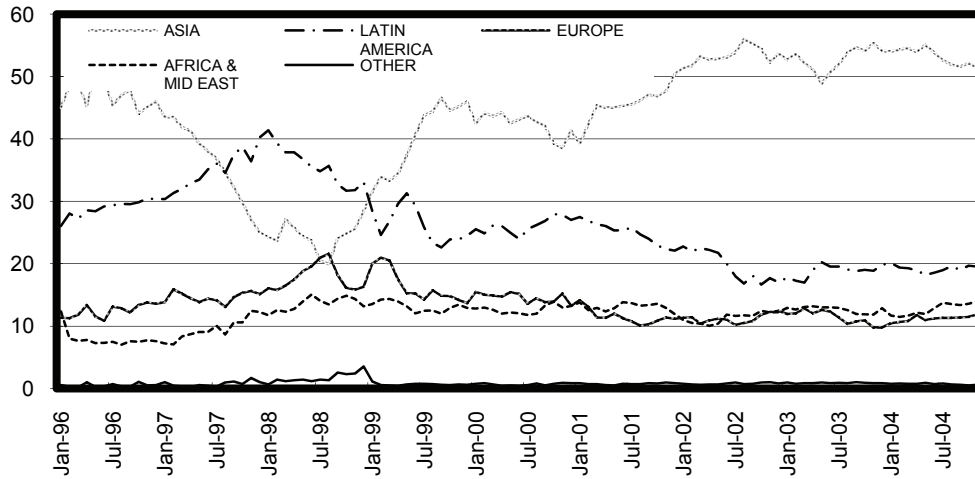
Source: The Emerging Portfolio Fund Research (EPFR) Global mutual fund database

Figure 2: Comparison of the *EPFR* Capital Flows with the Stock Index of Selected Countries in Asia (Hong Kong and Taiwan) and Latin America (Mexico and Brazil)

A positive coefficient for *Stock* means that when stock returns increase (decrease), the level of capital inflows also increases (decreases), which matches the definition of the herding behavior effect is reported in Table 5: the coefficient of capital inflow (*KI*) with one lagged period for Asia is significantly positive, but for Latin America, they are significantly negative. Thus, managers with mutual funds invested in Asiamost probably intend to copy the behavior of other investors, an indication of herding behavior. It

Table 5: The Estimated Results for Models (1) and (2)-- By Geographic Location

	Asia		Latin America			Asia		Latin America	
	A	**b**	**a**	**b**		**a**	**b**	**a**	**b**
Stock	5.0083***	5.0790***	4.6444***	4.6973***	KI$_{t-1}$	0.1692***	0.1682***	0.0489	-0.1632*
	(6.008)	(6.081)	(8.948)	(9.003)		(5.827)	(5.793)	(1.315)	(-1.783)
Stock$_{t-1}$	6.9622***	7.006***	0.4417	0.4934	KI$_{t-2}$	0.0264	0.0276	-0.0231	0.0791
	(8.297)	(8.320)	(0.861)	(0.956)		(0.909)	(0.949)	(-0.620)	(0.854)
Stock$_{t-2}$	5.9856***	5.9056***	-1.3115**	-1.2536**	Stock	4.6808***	4.7468***	4.6437***	19.521***
	(7.232)	(7.110)	(-2.571)	(-2.435)		(5.680)	(5.767)	(8.941)	(9.088)
Exch		0.0159		-0.1259	Stock$_{t-1}$	5.9944***	6.0147***	0.3269	3.5853
		(0.317)		(-0.522)		(7.130)	(7.156)	(0.605)	(1.276)
Exch$_{t-1}$		-0.0577		-0.1312	Stock$_{t-2}$	4.6544***	4.5501***	-1.1806**	-0.5246
		(-1.148)		(-0.512)		(5.515)	(5.393)	(2.210)	(-0.186)
Exch$_{t-2}$		-0.0530		0.0005	Exch		0.0124		2.5889
		(-1.054)		(0.002)			(0.251)		(1.589)
					Exch$_{t-1}$		-0.0605		0.2703
							(-1.220)		(0.132)
					Exch$_{t-2}$		-0.0431		-1.3327
							(-0.869)		(-0.650)
Hausman Test (P-value)	0.950	0.951	0.392	0.328	Hausman Test (*P*-value)	0.930	0.930	0.772	0.829
R^2	0.096	0.095	0.015	0.029	R^2	0.116	0.115	0.026	0.397
Observation	1212	1212	714	714	Observati	1212	1212	714	714

The regressions are estimated using the Generalized Method of Moments (GMM) with random effects for the whole sample of specific countries and for the 1996–2004 period. The dependent variable is capital flow (KI) collected by the EPFR. Stock stands for stock market returns of the specific country. Exch denotes exchange rate variation. The exchange rate is quoted in direct quotations; that is, positive Exch refers to a depreciation of currency. The Hausman test is a test of systematic differences between coefficients of the fixed effects and the random effects regression. We report the p-value of the Hausman test statistic. A constant and year dummies are included but are not reported. T values are between brackets. * Significance at the 10% level. ** Significance at the 5% level. *** Significance at the 1% level.

Implies that capital persistently flows into Asia and has accumulated to a significant level. This is evidence in the coefficients of the stock market returns. All values, even in the two lagged periods, are significantly positive in Asia but are only remained significantly positive in Latin America in the current period. We conclude here, therefore, that the herding behavior effect does exist in Asia but not in Latin America. Herding behavior destabilizes financial markets since international capital tends to buy past winners, sell past losers, i.e. a positive feedback effect and copy others' behavior.

Table 6 shows various capital volatility levels. Interestingly, in the stable Asian and volatile Latin American countries, the coefficients of the exchange rate variations have significantly negative values, meaning the appreciation of the currency induces more capital inflows. Furthermore, capital inflows during the Asian crisis are also considered in this study but not reported. The reason for adopting the Asian crisis as the benchmark is to examine what the reaction is vis-à-vis international capital when one crisis occurs. Also, capital inflows into Asia occupy a greater percentage, over 50% against a mere 20% in Latin America. We find that the positive feedback effect in Asia was not significant before the Asian crisis though it was significant both during and after the crisis. Also, herding behavior only occurred right after the Asian crisis.

Table 6: The Estimated Results for Models (1) and (2)-- By Capital Volatility

	Positive Feedback Effect: Model (1)					Herding Behavior Effect: Model (2)			
	Stable Countries		Volatile Countries			Stable Countries		Volatile Countries	
	Asia	Latin America	Asia	Latin America		Asia	Latin America	Asia	Latin America
Stock	2.7440***	0.3931***	7.2795***	25.0987***	KI_{t-1}	0.2429***	0.0863*	0.1396***	0.0006
	(4.233)	(3.497)	(4.715)	(18.575)		(6.537)	(1.774)	(3.113)	(0.010)
$Stock_{t-1}$	3.1455***	0.02411	10.0757***	3.2899**	KI_{t-2}	-0.0387	0.0762	0.0310	0.0050
	(4.831)	(0.217)	(6.379)	(2.441)		(-1.034)	(1.576)	(0.693)	(0.087)
$Stock_{t-2}$	4.1103***	-0.1291	7.7942***	-0.3892	Stock	2.4970***	0.3897***	6.7936***	22.8966***
	(6.385)	(-1.167)	(5.010)	(-0.288)		(3.999)	(3.554)	(4.437)	(16.459)
Exch	-0.0050	-0.0444	-0.2745	-285.0282***	$Stock_{t-1}$	2.3313***	-0.0100	8.8113***	4.4712**
	(-0.206)	(-0.947)	(-0.232)	(-3.424)		(3.681)	(-0.091)	(5.522)	(2.347)
$Exch_{t-1}$	-0.0574**	-0.0345	-1.1335	-198.9913**	$Stock_{t-2}$	3.1777***	-0.1790*	6.1776***	-0.3913
	(-2.336)	(-0.693)	(-0.797)	(-2.333)		(5.019)	(-1.646)	(3.851)	(-0.202)
$Exch_{t-2}$	-0.0475*	-0.0165	-0.1009	32.5664	Exch	0.0020	-0.0388	-0.2009	0.6547
	(-1.943)	(-0.331)	(-0.070)	(0.384)		(0.088)	(-0.851)	(-0.171)	(0.451)
					$Exch_{t-1}$	-0.0541**	-0.0264	-1.1099	0.5565
						(-2.291)	(-0.543)	(-0.788)	(0.349)
					$Exch_{t-2}$	-0.0389	-0.0094	0.1437	0.2889
						(-1.644)	(-0.193)	(0.101)	(0.179)
Hausman Test (P-value	0.933	0.609	0.965	0.397	Hausman Test (P-value)	0.791	0.838	0.976	0.565
R^2	0.076	-0.096	0.1123	0.5946	R^2	0.106	-0.068	0.1228	0.4770
Obs	702	408	510	302	Obs	720	408	510	302

Same as in Table 5. In Asia, the volatile countries are China, Hong Kong, Korea, Singapore and Taiwan. In Latin America, the volatile countries are Argentina, Brazil and Mexico

Regarding the augmented Granger causality test, the results for the future, present and past values of KI are reported in Table 7. Since simultaneous-equation estimation is only asymptotically consistent, we only use the larger data sets among the ones available for this paper. For Equation (4), we use the two largest sample sizes for the total sample and Asia.

The results show that there is only weak evidence of a two-way causality: although the present value of capital inflow is significant, the past values and the F test for the joint significance of the past values are both insignificant. Additionally, a Ramsey RESET test reveals that this parsimonious model might have omitted variables (the p-values for the F test of the null hypothesis that that there is no omitted variable are 0.0002 for both samples). This problem might cause the t test and F test to become invalid. Hence, we estimate Equation (5) as an alternative test.

We again use the two largest sample sizes for the total sample and Asia from the EPFR. The results using the total sample shows no evidence of a possible two-way causality. The results using the data for Asia show only weak evidence of a possible two-way causality: the present value of capital flow is significant, whereas the past values and the F test for the joint significance of the past values are both insignificant. The Ramsey RESET tests fail to reject the null hypotheses of no omitted variable (p-values for the F test

is from 0.6342 to 0.8351), so the t-test and F test are valid. We therefore conclude that simultaneous-equation estimation is not needed. The above analysis concerning omitted variables implies that the results reported in Tables 5 and 6 are less reliable than those in Tables 8 and 9. As a robust check, we repeat all regressions using the IFS data. The result, which are not reported here, are quite similar to the results using the EPFR data.[5]

Table 7: The Augmented Granger Causality Test —Data for Asia + Latin America

	Asian Volatile	Asian Stable	L.A. Volatile	L.A. Stable
KI_{t-1}	-0.2873***	0.0804	-0.5404***	-0.4867***
	(-3.266)	(1.047)	(-5.375)	(-5.216)
Stock	10827.1208**	1499.2701***	3574.0909***	270.8589**
	(1.980)	(4.487)	(3.226)	(2.505)
$Stock_{t-1}$	-1485.3531	1199.3420***	1639.8361	429.3595***
	(-0.341)	(3.449)	(1.453)	(3.730)
RGDP	8.0703	6.7499	-31.9699*	0.0979
	(0.097)	(1.025)	(-1.696)	(1.561)
$RGDP_{t-1}$	-10.2423	1.5630	-2.8198	0.1917***
	(-0.129)	(0.250)	(-0.150)	(4.170)
INT	2028.3868	10.8909	-45.669**	6.2364***
	(1.607)	(0.203)	(-2.325)	(7.799)
INT_{t-1}	-3007.5987	1.5630	-19.0512	3.8946***
	(-1.592)	(0.250)	(-0.868)	(3.049)
FR/Import	-353.2585	72.9137	-120.7671	1.1823
	(-0.147)	(0.252)	(-0.352)	(0.051)
Exch	0.0434	0.0286	-146.9706	-0.0145
	(0.032)	(0.286)	(-0.224)	(-0.103)
M2/FR	-427.1581	1049.5667**	-487.7206	-7798.2000**
	(-0.245)	(1.990)	(-1.069)	(-2.954)
Hausman Test (P-value)	0.981	0.993	0.781	0.723
R^2	-0.045	0.349	0.351	0.752
Observations	158	216	96	108

Same as in Table 5.

CONCLUSION

The purpose of this paper is to investigate the behavior of international capital flow and its determinants, using the *EPFR* data set. We evidence that international capital has a Positive feed information symmetry does exist in the emerging countries we investigate, and therefore, herding behavior does hold. After the Asian crisis, herding activity is a dominant factor; it could have been an issue that worsened the Asian financial crisis. For this reason, the government, fund managers and even individuals should take these capital characteristics into consideration for policy making or investing decisions.

We believe that the change of regulation will cause further capital movement, even market panic. Taking the Black Tuesday (Feb. 27th , 2007) in China for example, due to widespread rumors of plans by the Chinese government to raise interest rates or institute a capital gains tax, Shanghai and Shenzhen stock markets had been up about 10% for the year before the Tuesday's decline. Also in Thailand, Finance Minister announced the new control on capital which would remain on foreign investments in bonds and commercial paper as part of central bank's measures to stem the surge of speculative investment in the Thai baht. This made investors dump stocks in Hong Kong, India, Indonesia, Malaysia, South Korea and the Philippines amid contagion concerns that the plunge might spread through the region.

Table 8: The Estimated Results for Model (3)—Data for Asia

KI_{t-1}	0.1254**	0.1271**	0.1147**	0.1220**	0.1197**	0.1120**
	(2.495)	(2.513)	(2.262)	(2.399)	(2.350)	(2.180)
Stock	1778.520***	1781.984***	1854.657***	1950.773***	1935.192***	1918.297***
	(7.427)	(7.421)	(7.434)	(7.715)	(7.581)	(7.500)
$Stock_{t-1}$	1140.020***	1124.813***	1190.278***	1243.676***	1238.444***	1240.927***
	(4.954)	(4.731)	(4.911)	(5.131)	(5.080)	(5.091)
RGDP		-0.0938	2.4300	3.0289	2.8340	3.3052
		(-0.026)	(0.619)	(0.751)	(0.645)	(0.734)
$RGDP_{t-1}$		6.7975*	9.2574**	8.2470**	9.1312**	8.7585**
		(1.870)	(2.372)	(2.076)	(2.142)	(2.010)
INT			43.0734	33.9418	26.7783	27.6909
			(0.984)	(0.776)	(0.578)	(0.589)
INT_{t-1}			-14.5016	-6.9677	-2.9473	4.1040
			(-0.186)	(-0.090)	(-0.037)	(0.051)
FR/Import				239.8042	236.9390	212.1334
				(1.583)	(1.557)	(1.362)
Exch					-0.0409	-0.0337
					(-0.420)	(-0.346)
M2/FR						37.4870
						(0.501)
Hausman Test (P-value)	0.813	0.791	0.901	0.948	0.950	0.978
R^2	0.215	0.210	0.226	0.240	0.233	0.232
Observations	380	376	376	376	376	374

Same as in Table 5 The dependent variable is the capital flow (KI) collected by EPFR and IMF's IFS. Stock stands for the stock market return of the specific country. RGDP is real GDP growth rate. INT denotes interest rate differential against LIBOR US dollar lending. FR/Import, foreign reserves divided by import value, is a measure of reserve strength. Exch denotes the exchange rate variation. M2/FR, broad money supply divided by foreign reserves, is a measure of financial liberalization.

Table 9: The Estimated Results for Model (3)—Data for Latin America

KI_{t-1}	-0.3869***	-0.3865***	-0.3976***	-0.4497***	-0.4496***	-0.4723***
	(-5.955)	(-5.921)	(-6.139)	(-6.391)	(-6.356)	(-6.785)
Stock	219.4572	228.8849	404.8820	1791.893***	1806.224***	1897.288***
	(0.679)	(0.682)	(1.191)	(3.012)	(3.023)	(3.225)
$Stock_{t-1}$	-24.7686	-56.5066	-28.3038	638.7563	656.2112	703.9991
	(-0.074)	(-0.155)	(-0.077)	(0.977)	(0.993)	(1.081)
RGDP		0.0027	0.0855	0.4420	0.4445	0.4719
		(0.013)	(0.397)	(1.447)	(1.451)	(1.551)
$RGDP_{t-1}$		-0.0417	-0.0379	0.2333	0.2307	0.2509
		(-0.207)	(-0.175)	(0.757)	(0.746)	(0.809)
INT			6.1034	8.1144	8.1150	8.3570*
			(1.349)	(1.578)	(1.577)	(1.650)
INT_{t-1}			-6.0732	-5.1263	-5.1223	-5.0361
			(-0.980)	(-0.747)	(-0.746)	(-0.757)
FR/Import				54.5753	57.5858	-36.6716
				(0.377)	(0.379)	(-0.226)
Exch					0.0234	0.1588
					(0.379)	(0.115)
M2/FR						-686.8490**
						(-2.482)
Hausman Test (P-value)	0.803	0.800	0.819	0.993	0.992	0.827
R^2	0.107	0.089	0.133	0.218	0.202	0.222
Observations	224	224	224	204	204	204

Same as in Table 5. Dependent variable is the capital flow (KI) collected by the EPFR and IMF's IFS. Stock stands for the stock market return of the specific country. RGDP is real GDP growth rate. INT denotes interest rate differential against LIBOR US dollar lending. FR/Import, foreign reserves divided by import value, is a measure of reserve strength. Exch denotes the exchange rate variation. M2/FR, broad money supply divided by foreign reserves, is a measure of financial liberalization.

Just one after, Thai government lifted controls on foreign investment after market had plunged fifteen percent, rattling regional bourses amid worries about a repeat of the 1997 Asian financial crisis. Thus, regulations do have their impacts on capital movement and deserve for further case study.

Through this study, it is determined that capital flows play a crucial role in the international capital market. Our understanding of the behavior of capital flows and its determinants not only increase our knowledge on returns, but also enable us to manage in such a way that would avoid any potential financial damage.

ENDNOTES

[1] Eichengreen, and Arteta (2000), have provided a significant volume of literature in this area.

[2] Many articles and monographs on the Asian financial crisis are found in the extant literature, such as those by Chang and Velasco (1998), the International Monetary Fund (1998), Goldstein (1998), Kwack (1998, 2000), Letiche (1998), Moreno, Pasadilla and Remolona (1998), Radelet and Sachs (1998), the World Bank (1998) and Corsetti, Pesenti and Roubini (1999a, 1999b).

[3] Existing literature on mutual funds' domestic strategy abounds, such as Grinblatt et al. (1995), Warther (1995) and Wermers (1999) among others that focus on the U.S.; Kim and Wei (2002a, 2002b) study Korean cases.

[4] The Permanent Income Hypothesis implies that portfolio re-allocation should take place instantaneously and lagged information should be irrelevant. However, empirical evidence from existing literature shows that lagged of many variables such as stock prices, interests etc. are relevant.

[5] However, they are available upon request.

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