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Foreign portfolio investors before and during a crisis

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Abstract

Using a unique data set, we study the trading behavior of foreign portfolio investors in Korea before and during the currency crisis. The central message is that investors in different categories have different trading patterns. For example, foreign investors outside Korea are more likely to engage in positive feedback trading strategies and are more likely to engage in herding than the branches/subsidiaries of foreign institutions in Korea or foreign individuals living in Korea. This difference in trading behavior is possibly related to the difference in their information. This paper suggests that it may be worth exploring policies that can encourage foreign investors to acquire more information (e.g. by setting up a branch or a subsidiary in the emerging country).

Keywords: Foreign portfolio investment; Crisis; Feedback trading; Herding

JEL classification: F21; F3; G15

1. Introduction

This paper is about the behavior of international portfolio investors in emerging markets. Such knowledge is highly relevant to the literature on financial/currency

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crises in developing countries and to the debate on the desirability of capital controls. In the context of the recent Asian financial crisis, it has been alleged that foreign portfolio investors may have been positive feedback traders (e.g. rushing to buy when the market is booming and rushing to sell when the market is declining), and eager to mimic each other's behavior while ignoring information about the fundamentals. Behaviors such as these could have exacerbated the crisis to an extent not otherwise warranted by economic fundamentals. The hypothesis can be connected with an emerging literature on behavioral finance, mostly in the domestic finance context. For example, it has been argued that individual investors' trading is often driven by irrational, sentimental shocks (for example, see Lee et al., 1990, 1991, for an explanation of the discounts on the closed-end funds). As another example, again using evidence from domestic market data, it has been argued that institutional investors often exhibit herding behavior, though the tendency is quantitatively small (see Lakonishok et al., 1992). There are also theoretical models in which the existence of noise traders induces rational investors to pursue positive feedback strategies, destabilizing the prices in the process (De Long et al., 1990).

In this paper, we provide an account of the behavior of foreign portfolio investors using a case study of Korea before and during its currency crisis that started in late 1997. Our project is possible due to a unique data set. It details monthly positions of every foreign investor in every stock on the Korean Stock Exchange (both First and Second Sections) from December 1996 to June 1998. We can separate investment made by individuals from those made by institutions. Moreover, we can distinguish subsidiaries or branches of foreign institutions in Korea or individuals living in Korea from those who invest purely from abroad. This distinction is important as one may expect that those who invest from New York and London are informationally disadvantaged relative to those that have a physical presence in the emerging market. Information asymmetry is one of the causes of concern about foreign investors. Differences in information may lead to differences in behavior. Thus, our ability to separate these foreign investors in the data is very useful.

Using data on aggregate US equity investment in foreign markets, Bohn and Tesar (1996) examined the relative importance of return-chasing and portfolio rebalancing motivations. Regressing net purchase in a market on the forecast of the return on the market, they find a positive and significant coefficient, and conclude that return-chasing is important. The paper does not examine firm- or investor level data. Frankel and Schmukler (1996, 1998) have examined an important aspect of portfolio investment in emerging markets, namely, possible informational asymmetry between domestic and international investors. But their data set (prices of closed-end country funds and their corresponding net asset values) does not allow them to distinguish between institutional versus individual investors, or to investigate possible momentum trading or herding behavior. Based on a survey of (mostly manufacturing) firms sponsored by the World Economic Forum, Kaufman et al. (1999) reported evidence that managers of firms appear to have information

on the likelihood of a currency crisis in their countries. Using data on US mutual funds that specialize in Latin American countries, Kaminsky et al. (1999) examined the tendencies that fund managers and fund customers may engage in momentum trading. They also investigated the tendencies that mutual fund's trading behavior is affected by stock movement in another market.

Choe et al. (1999) use transaction data on the Korean stock market (December, 1996 to December, 1997) to examine the effect of foreign investor trading on the Korean stock price. They find evidence of foreign investors engaging in positive feedback trading and herding, but the evidence becomes weaker or insignificant in the last 3 months of their sample. Because our paper also studies the Korean case, it may be useful to highlight some important differences between the two papers. First, while we have dis-aggregated information on positions by different foreign investors, they have aggregate positions by foreign investors as a block. Thus, in their paper, to compute the herding measures, each buy- or sell-trade has to be assumed to originate from a separate investor. As they acknowledged, this assumption could induce upward bias in the computed herding statistics since the same investor could have executed multiple trades (likely in the same direction) in a given period of time. In our sample, as every investor's position is identified by a unique ID number, we do not have to make this assumption, and can presumably obtain more accurate herding statistics. Second, our data allows us to examine possible differences in behavior by different types of investors. Indeed, we find some systematic and important differences between non-resident foreign investors and branches or subsidiaries of foreign institutions in Korea. Third, our data extends to June, 1998, allowing for a better comparison of the trading behavior before and during the crisis. For example, in contrast to their finding, we find fairly strong evidence of continued herding and positive feedback trading during the crisis.

The paper is organized as follows. Section 2 describes our data sets. Sections 3 and 4 examine the two aspects of foreign investor behavior, respectively: feedback trading and herding. Section 5 offers some concluding remarks.

2. Data

We make use of two data sets in this paper. We first describe the data, and then explain how foreign investors are classified into different categories, and how the sample is broken down into different sub-periods.

2.1. Investor position data

For each investor, identified by an ID code, this data set contains among others things, the following information,: (i) month-end share holding for each stock listed in the Korea Stock Exchange (KSE), (ii) nationality, (iii) residence, (iv) type

(e.g. individual or institutional), and (v) whether the investment ceiling is binding or not for that investor in that month. For confidentiality reasons, only the codes but not the names of the investors are available.

The data set was kindly provided by the Korea Securities Computer Corporation (KOSCOM), an affiliate to the Korea Stock Exchange (KSE), under the condition that the dis-aggregated position information will not be revealed to any unauthorized third party. It is generally rare to have detailed data on positions by separate foreign investors and by separate stocks in emerging markets. In our case, the Korean government's restriction on foreign ownership of domestic stocks and its need to enforce the restriction help to make this data available.[1] All foreign investors are required to register in their real names with the Korean Securities Supervisory Board (KSSB), with penalties for violations — violators will have their registration suspended and be barred from investing in Korea for two years.[2]

2.2. Stock data

For each stock, we collect information on (i) month-end price, (ii) month-end number of shares outstanding, (iii) monthly transaction volume (and value), and (iv) whether the investment ceiling is binding or not in that month. In addition, we also collect information on the Korea Composite Stock Price Index (KOSPI) from the KSE and month-end Won/dollar exchange rate from the Federal Reserve Board's website.

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[1] For example, between May and November 1997, foreign investors, in aggregate, could not own more than 23% of the outstanding shares per company and foreign investors, individually, could not own more than 6%. Since May 1998, such generic restrictions on foreign ownership have been removed. However, for shares on two firms, Pohang Iron & Steel Co., or POSCO, and Korea Electric Power Co., or KEPCO, there is a 30% upper limit on foreign ownership on public interest grounds (based on the Securities Transaction Act). Some industry-specific laws may impose limits on foreign ownership on additional firms. The generic restrictions on foreign ownership have evolved over time as follows. The upper ceiling for foreign investors collectively started with 10% (Jan. 1992), and changed to 12% (Dec. 1994)→15% (Jul. 1995)→18% (Apr. 1996)→20% (Oct. 1996)→23% (May 1997)→26% (Nov. 1997)→55% (Dec. 1997), and eventually to 100% (May 1998). As for individual foreign investor, the upper ceiling changed from 3% (Jan. 1992)→4% (Apr. 1996)→5% (Oct. 1996)→6% (May 1997)→7% (Nov. 1997)→50% (Dec. 1997)→100% (May 1998). Source: Financial Supervisory Service (2000), page 1.

[2] An unfortunate omission in our data set is information on ADRs or GDRs on Korean companies. In our sample, there are 24 companies that have issued GDRs and ADRs. The simple sum of the capital raised through ADRs and GDRs by June 98 was approximately US$5 billion, which accounted for less than 5% of the total market capitalization of the Korean market at the time. We are not aware of any data source that would allow us to know the positions on the GDRs/ADRs by individual foreign investors and match up with our data set. This problem is also present in other papers in the literature such as Choe et al. (1999). We would speculate, however, that the holders of the ADRs and GDRs may not be the same set of investors that invest directly in the Korean market. Note also that the firms that have issued ADRs and GDRs tend to be big and are more likely to run up against the foreign ownership limit. All observations (stocks–months) that have reached such a limit are excluded in our subsequent statistical analyses.

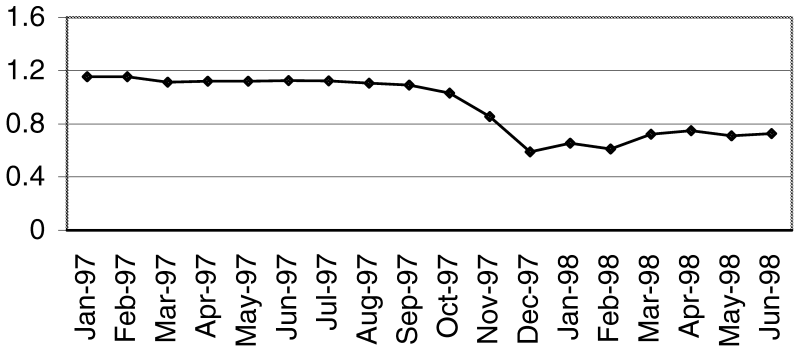

Fig. 1. Exchange rate level (US$ per 1,000 Korean won).

Figs. 1 and 2 plot the exchange rate (US dollar/1000 Won) and the stock market price index (KOSPI), respectively. Combining the two pieces of information, Fig. 3 traces the dollar value of a $100 investment in KOSPI on January 1, 1997 throughout the sample (to June 30, 1998).

2.3. Classification of foreign investors

We classify all foreign investors in our sample into four categories (Table 1):

(a) Resident institutional investors — subsidiaries or branches of foreign institutions that are registered in Korea;[3]
(b) Non-resident institutional investors — foreign institutional investors not in category (a);

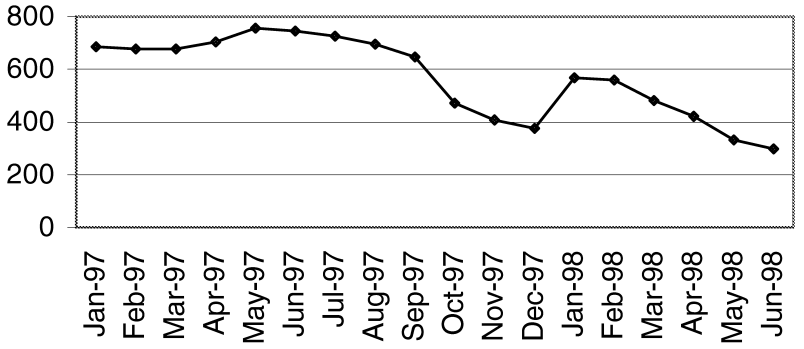

Fig. 2. Stock price index (KOSPI, 1980 = 100).

[3]Note that there is a relatively small number of investors in the category of resident institutions. So it may be more difficult to generalize the inferences based on this group of investors.

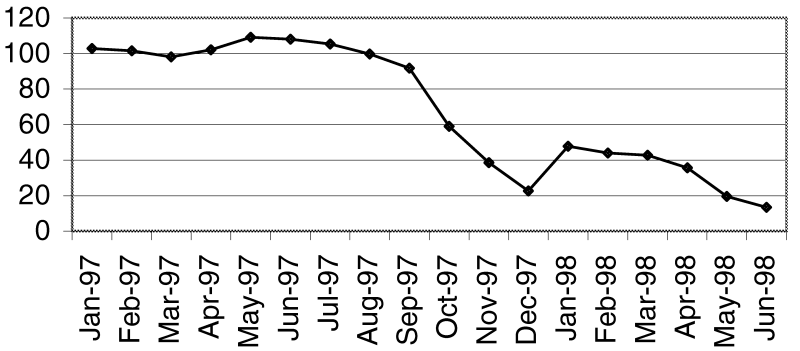

Fig. 3. Current value of US$100 investment in KOSPI made on January 1, 1997.

(c) Resident individual investors — non-Korean nationals who live in Korea; (d) Non-resident individual investors — non-Korean nationals not in category (c).

2.4. Classification of the sub-periods

The data set spans from December 1996 to June 1998. We break our sample into three sub-periods:

Table 1
Summary information on foreign portfolio investors in Korea[a]

		All foreign investors		Residents		Non-residents	
		No. of investors	Average position US$1000	No. of investors	Average position US$1000	No. of investors	Average position US$1000
All foreign investors	Dec. 27, 1996	2,594	5,651	529	272	2,065	7,029
	Nov. 29, 1997	2,202	3,023	527	330	1,675	3,870
Individuals	Dec. 27, 1996	735	116	503	79	232	195
	Nov. 29, 1997	716	51	501	39	215	78
Institutions	Dec. 27, 1996	1,859	7,839	26	4,001	1,833	7,894
	Nov. 29, 1997	1,486	4,455	26	5,928	1,460	4,428

[a] Notes: (1) This table only reflects investors who registered at the Korea Securities Supervisory Board (KSSB) before December 31, 1996 and who are portfolio investors. (2) Resident foreign individual investors are non-Korean nationals who live in Korea. Resident foreign institutional investors are Korean branches or subsidiaries of foreign institutions. Non-resident foreign individual or institutional investors are those who invest from outside Korea. (3) Number of investors calculated by the number of unique investor ID codes. (4) Between the two dates (Dec. 27, 1996 and Nov. 29, 1997), market capitalization fell by 50% in US dollar terms, while average positions of resident individuals, non-resident individuals, and non-resident institutions fell by 51, 60, and 44%, respectively. Contrary to other investors, average position of resident institutions rose by 48%.

(a) December 1996–May 1997, tranquil period. This was the time when Korea was regarded as one of the miracle economies in East Asia, and foreign investors were enthusiastic about investing in Korea.
(b) June 1997–October 1997, pre-currency crisis period. While Korea's own currency crisis would come later in November of that year, the currency of Thailand, Baht (and maybe other currencies in Asia) was under several speculative attacks in June. The Thai Baht collapsed at the beginning of July, marking the beginning of what we now call 'the Asian financial crisis.' The Thai crisis sent repercussions throughout the region. The Korean stock market also started its slide in June and continued more or less during the period.
(c) November 1997–June 1998, in-crisis period. On November 18, the Bank of Korea gave up defending the Korean Won. On November 21, the Korean government asked the IMF for a bail-out. The crisis began in November 1997 and continued beyond the end of our sample. There were also some instances of labor unrest and major bankruptcies during the period.

3. Momentum trading

We now examine whether foreign investors engage in so-called 'positive feedback' ('positive momentum' or just 'momentum') trading strategy. Positive feedback trading strategy is one with which an investor buys past winners and sells past losers. In contrast, a negative feedback (or contrarian) trading strategy does the reverse: buying past losers and selling past winners. Positive feedback trading could destabilize the market by moving asset prices away from the fundamentals.

This trading pattern can result from extrapolative expectations about prices, from stop-loss orders — automatically selling when the price falls below a certain point, from forced liquidations when an investor is unable to meet her margin calls, or from a portfolio insurance investment strategy which calls for selling stocks when the price falls and buying it when the price rises. At least since Friedman (1953), many economists believe that positive feedback traders cannot be important in market equilibrium as they are likely to lose money on average. This view has been challenged in the last decade or so. De Long et al. (1990) argued 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.

To examine whether investors engage in positive feedback trading, we need to measure the connection between their trading on particular stocks and the prior performance of the stocks. Following a metric proposed in Grinblatt et al. (1995) and modified by Kaminsky et al. (1999), we adopt the following measure of momentum trading for investor group k:

$$M(k,j,t) = \left[\frac{Q(k,j,t) - Q(k,j,t-1)}{Q^{*}(k,j,t)} \right] R(j,t-1) \tag{1}$$

where $Q(k,j,t)$ is the number of shares of stock j held by investor (or investor group) k at time t, $Q^*(k,j,t)$ is the average of $Q(k,j,t)$ and $Q(k,j,t-1)$, and $R(j,t-1)$ is the return on stock j from $t-2$ to $t-1$.

The momentum measure for a particular investor (or investor group) k over a given sample period is:

$$M(k) = \frac{1}{JT} \sum_t \sum_j M(k,j,t) \tag{2}$$

where J is the total number of stocks traded by k, and T is the total number of time periods under consideration.

Under the null of no feedback trading (in either direction), the mean value of $M(k)$ is zero. Furthermore, $M(k)$ is asymptotically normal (as J and T approach infinity). If there is systematic positive feedback trading, then $M(k)$ would be positive. On the other hand, if there is systematic negative feedback trading, then $M(k)$ would be negative.[4]

To avoid possible biases in quantifying the trading behavior, we exclude certain observations (investors or stock–month). First, investors who declare their purpose of the stock purchase as direct investment are excluded because they do not engage in active trading. Second, investors who are registered after December 31, 1996 are dropped because their entrance to the market could show up only as a buy. Third, stocks that have reached foreign ownership limit are dropped because any change in the net position of the foreign investors as a whole has to be a sell to Korean investors. Fourth, observations (stock–month) involving stocks not initially owned by any foreign investors are also excluded. Since short-selling was not permitted, any change in positions would have to be a buy. The last three criteria are meant to minimize possible biases in computed momentum.

We report the basic measures of momentum trading for each category of investors in Table 2. There are a few prominent features in the table. First, for resident foreign investors, there is no statistically significant evidence that they engage in either positive or negative feedback trading in any sub-period (except in one case — institutional investors in the pre-crisis period).

Second, in contrast to resident foreign investors in the two sub-periods before the Korean currency crisis, non-resident foreign investors display a significant tendency to engage in positive feedback trading, regardless of whether they are individuals or institutions.

Third, once the currency crisis broke out, the non-resident institutions increased their intensity of positive feedback trading (from a measure of 0.47 during

[4]Our data does not allow us to examine a portfolio rebalancing effect. Portfolio rebalancing normally calls for selling appreciating stocks and buying depreciating stocks, the opposite of positive feedback trading. So the presence of a portfolio rebalancing effect would imply that positive feedback trading may be stronger than our statistic suggests (but negative feedback trading may be weaker).

Table 2
Momentum trading[a]

		(1) Resident	(2) Non-Resident	(3) =(2)−(1)
Tranquil period 96.12–97.5	(1) Individual	−0.039	0.118**	*0.157****
		(0.036)	(0.046)	*(0.058)*
		[5,523]	[3,230]	
	(2) Institution	0.167	0.046**	*−0.120*
		(0.135)	(0.022)	*(0.136)*
		[1,676]	[39,703]	
	(3)=(2)−(1)	*0.206*	*−0.072*	
		(0.139)	*(0.051)*	
Pre-crisis period 97.6–97.10	(4) Individual	0.003	0.168***	*0.165****
		(0.022)	(0.045)	*(0.050)*
		[6,841]	[3,758]	
	(5) Institution	0.303**	0.471***	*0.168*
		(0.128)	(0.021)	*(0.130)*
		[2,845]	[48,084]	
	(6)=(5)−(4)	*0.300***	*0.303****	
		(0.130)	*(0.050)*	
In-crisis period 97.11–98.6	(7) Individual	−0.016	−0.149	*−0.133*
		(0.059)	(0.097)	*(0.113)*
		[10,749]	[5,506]	
	(8) Institution	−0.349	0.884***	*1.232****
		(0.322)	(0.060)	*(0.327)*
		[2,910]	[67,165]	
	(9)=(8)−(7)	*−0.332*	*1.033****	
		(0.327)	*(0.114)*	

[a] Notes: (1) Each cell in columns 1 and 2, and rows 1, 2, 4, 5, 7 and 8, reports the momentum measure measured by $M(k,j,t) = [\{Q(k,j,t) - Q(k,j,t-1)\}/Q^*(k,j,t)] \times R(j,t-1)$ where $Q(k,j,t)$ is number of shares held by investor$k$on stock$j$at month t; $Q^*(k,j,t)$ is an average of $Q(k,j,t)$ and $Q(k,j,t-1)$. Each cell reports momentum measure in percentage terms. (2) $R(j,t-1) \equiv \ln P(j,t-1) - \ln P(j,t-2)$, where$P(j,t)$ is price of stock j at month t (in local currency). (3) Standard errors are in the parentheses and number of observations are in the bracket. ***, **, and * denote significance levels at the 1, 5, and 10% levels, respectively. (4) Tranquil period: December 1996–May 1997; Pre-crisis period: June–October 1997; In-crisis period: November 1997–June 1998.

June–October, 1997, to a measure of 0.88 after November, 1997). On the other hand, individual investors from abroad display some evidence of switching to a negative feedback trading strategy. While their momentum measure takes a negative coefficient, it is not significant at the 10% level (or marginally significant at the 15% level).

The results reported in Table 2 are based on a definition of returns in the local currency (Korean won). One may argue that international investors may care more about returns that take into account the exchange rate movement, which was big during the currency crisis period. The winners in terms of the Korean won could

be losers in terms of the US dollar. However, it is worthwhile to note that for a given foreign investor in a given period, the same exchange rate change would be applied to the returns on all Korean stocks. In any case, we report in Table 3 a different set of momentum measures that take into account exchange rate movement in the return calculation. We can see that Table 3 is qualitatively similar to Table 2, with a few differences.

It is useful to note that economic reforms that generally improve the stock returns in a country can occur simultaneously as the country liberalizes its policies on capital inflows.[5] In this case, in terms of time-series properties, foreign capital inflows can appear to follow a rise in (market-wide) stock returns. It is useful to note that in this paper, we look at trading patterns as a function of the relative

Table 3
Momentum trading (adjusting for exchange rate changes)[a]

		(1) Resident	(2) Non-Resident	*(3) =(2)−(1)*
Tranquil period	(1) Individual	−0.016	0.182***	*0.198****
		(0.037)	(0.052)	*(0.064)*
		[5,523]	[3,230]	
	(2) Institution	0.209	0.089***	*−0.120*
		(0.136)	(0.023)	*(0.138)*
		[1,676]	[39,703]	
	(3)=(2)−(1)	*0.225*	*−0.093**	
		(0.141)	*(0.057)*	
Pre-crisis period	(4) Individual	0.001	0.178***	*0.176****
		(0.023)	(0.047)	*(0.052)*
		[6,841]	[3,758]	
	(5) Institution	0.316**	0.513***	*0.198*
		(0.132)	(0.022)	*(0.134)*
		[2,845]	[48,084]	
	(6)=(5)−(4)	*0.314***	*0.336****	
		(0.134)	*(0.052)*	
In-crisis period	(7) Individual	0.013	−0.211**	*−0.224*
		(0.064)	(0.108)	*(0.125)*
		[10,749]	[5,506]	
	(8) Institution	−0.244	0.702***	*0.945****
		(0.358)	(0.059)	*(0.363)*
		[2,910]	[67,165]	
	(9)=(8)−(7)	*−0.257*	*0.913****	
		(0.363)	*(0.123)*	

[a] Notes: See footnotes to Table 2. The returns are in US dollars.

[5] See Bekaert and Harvey (1998) and Henry (2000) for evidence on an increase in return after liberalization, and Bekaert et al. (2000) for evidence for an increase in foreign portfolio inflows following liberalization.

returns across stocks within a common market. So the correlation between current trading and past returns is unlikely to be generated by market-wide events.

It is also useful to check if the positive-feedback trading strategy in our sample is ex post profitable. We perform this check by comparing the actual performance of the positive and negative feedback trading strategies. We focus on the group of non-resident institutions to reduce the influence of investor type. Using a technique proposed by Grinblatt and Titman (1993), we adjust for risk by comparing the returns of the new and the old portfolios of the investor. In other words, the risk levels on the new and the old portfolios are assumed to be similar so that the return on the new portfolio in excess of the old is naturally adjusted for its risk level.

We proceed in two steps. First, we classify all the investor–month pairs into two categories, positive versus negative feedback traders, depending on whether an investor's momentum measure, *M*, is positive or negative in a given month. Second, for each category, we compute the following risk-adjusted returns, averaged over all traders in the same group:

$$\text{Performance}(n) = \frac{1}{KJT} \sum_k \sum_j \sum_t \left[\frac{Q(k,j,t) - Q(k,j,t-1)}{Q^*(k,j,t)} \right] R(j,t+n) \qquad (3)$$

where *K*, *J*, and *T* are number of investors in the group, number of stocks, and number of months in the period, respectively. Lower case '*n*' in 'Performance(*n*)' and $R(j,t+n)$ denotes 'return horizon.' For example, $R(j,t+1)$ and $R(j,t+3)$ are the returns for stock *j* over 1- and 3-month horizons, respectively. Under the assumption that the systematic risks for the old and new portfolios are (approximately) the same, 'Performance(1)' and 'Performance(3)' measure the risk-adjusted return for the new portfolio over 1 and 3 month horizons, respectively.[6]

Table 4 reports the ex post profitability calculations for the two trading strategies. We find that during both the tranquil and the crisis period, positive feedback trading generates negative risk-adjusted returns whereas contrarian trading generates positive risk-adjusted returns. The differences in the returns between the contrarian and positive feedback trading strategies are significant at both the 1- and 3-month horizons. Moreover, the gap is widened during the crisis period. The exception is the pre-crisis period when the reverse is true: positive feedback trading is profitable but the negative feedback trading loses money. To summarize, except for a 6-month (pre-crisis) period in our 19-month sample, the contrarian trading strategy appears to dominate the positive feedback trading in terms of ex post risk-adjusted profitability.

[6]Grinblatt and Titman (1993) provide some evidence that the betas are the same for the two portfolios in their sample.

Table 4
Ex post profitability of the momentum trading strategies (non-resident institutions)[a]

		(1) Momentum traders	(2) Contrarian traders	*(3) =(2)−(1)*
Tranquil period	Momentum	6.156***	−5.608***	
		(0.233)	(0.251)	
		[9,613]	[2,028]	
	1-Month return	−0.173***	0.792***	*0.965****
		(0.067)	(0.199)	*(0.210)*
		[9,613]	[2,028]	
	3-Month return	−0.224**	0.005	*0.229*
		(0.113)	(0.339)	*(0.357)*
		[9,612]	[2,028]	
Pre-crisis period	Momentum	6.862***	−4.248***	
		(0.127)	(0.106)	
		[6,065]	[4,430]	
	1-Month return	6.485***	−1.408***	*−7.893****
		(0.251)	(0.203)	*(0.323)*
		[6,062]	[4,430]	
	3-Month return	4.606***	−0.361	*−4.967****
		(0.571)	(0.548)	*(0.792)*
		[6,056]	[4,427]	
In-crisis period	Momentum	18.680***	−13.680***	
		(0.318)	(0.398)	
		[7,761]	[6,259]	
	1-Month return	−8.753***	1.010***	*9.763****
		(0.858)	(0.274)	*(0.901)*
		[7,761]	[6,259]	
	3-Month return	−15.873***	1.767***	*17.640****
		(1.021)	(0.545)	*(1.157)*
		[7,761]	[6,259]	

[a] Notes: (1) Note that investors are divided into groups: (Positive) momentum trader group includes those observations with $M>0$; and the contrarian group includes those with $M<0$. (2) N-months ex-post performance is measured by: $PN(k,j,t) = [\{Q(k,j,t) - Q(k,j,t)\}/\bar{Q}(k,j,t)] \times \{\ln P(j,t) - \ln P(j,t)\}$, where $P(j,t+n)$ is a price of stock j at month $t+n$. $n = 1$ *and* 3. Each cell reports ex-post performance measure in percentage terms. (3) Also see footnotes to Table 2.

4. Herding

We now turn to examining another popularly alleged behavior by foreign investors — herding. This is the tendency for investors of a particular group to mimic each other's trading. Informational asymmetry may cause uninformed but rational speculators to choose to trade in the same way as informed traders (Bikhchandani et al., 1992; Banerjee, 1992). Since informational problems may be

more serious when it comes to investing in a foreign market than the domestic one, herding may be correspondingly more severe.

There is an alternative explanation for herding among institutional investors. Unlike individual investors, fund managers face regular reviews (e.g. quarterly for mutual funds, and annually for pension funds) on their performance relative to a benchmark and/or to each other. This may induce them to mimic each other's trading to a greater extent than they otherwise would (see Scharfstein and Stein, 1990).

There have been several empirical papers that quantify herding behavior. Lakonishok et al. (1992), Grinblatt et al. (1995), Wylie (1997), and Wermers (1999) all report evidence of herding among US or UK institutional investors, though not large in magnitude. Using data on foreign investors (or US investors) in Korea as a single group, Choe et al. (1999) find evidence of herding. None of the previous papers that we are aware of compares different herding tendencies by different investor types on data from a single source. None of the papers that we know of differentiates the informational asymmetry versus regular performance review hypotheses.

We believe that heterogeneity among investors in our sample allows us to test for the relative importance of the competing hypotheses by exploring their different implications. The logic of informational asymmetry hypothesis suggests two patterns: (i) Individual investors may herd more than the institutions as the latter has more resources to assemble and process information about a foreign market. (ii) Non-resident investors may herd more than resident foreign investors assuming the latter have more timely information about the country they live in. On the other hand, the logic of regular performance review hypothesis has different predictions: (i) Institutional investors may herd more than individual investors since the latter do not face regular performance reviews. (ii) There may not be any difference between resident and non-resident foreign investors, assuming the two face the same performance reviews. We will interpret our findings in light of these predictions.

We employ the herding indices proposed by LSV (1992) but construct the sample in a way that takes into account the Wylie (1997) correction for possible bias induced by a short-selling constraint. Let $B(i,j,t)$ be the number of investors in group i that have increased the holdings of stock j in month t (i.e. number of net buyers), and $S(i,j,t)$ the number of investors in group i that have decreased the holdings of stock j in month t (number of net sellers). Let $p(i,t)$ be the number of net buyers in group i aggregated across all stocks in month t divided by the total number of active traders (number of net buyers plus number of net sellers) in group i aggregated across all stocks in month t. Then, $H(i,j,t)$ is defined as the herding index for investors in group i, on stock j, in month t:

$$H(i,j,t) = \left| \frac{B(i,j,t)}{B(i,j,t)+S(i,j,t)} - p(i,t) \right| - E\left| \frac{B(i,j,t)}{B(i,j,t)+S(i,j,t)} - p(i,t) \right| \quad (4)$$

$$p(i,t) = \frac{\sum_{j=1}^{N} B(i,j,t)}{\sum_{j=1}^{N} B(i,j,t) + \sum_{j=1}^{N} S(i,j,t)} - \quad (5)$$

$$H(i,t) = \frac{1}{N} \sum_{j=1}^{N} H(i,j,t) \quad (6)$$

$$H(i) = \frac{1}{NT} \sum_{t=1}^{T} \sum_{j=1}^{N} H(i,j,t) \quad (7)$$

$H(i,t)$ is the herding index for group i in month t, averaged across all stocks. $H(i)$ is the herding index for group i, averaged across all months in the sample. In the definition of $H(i,j,t)$, is subtracted to make sure that the resulting index is insensitive to general market conditions (i.e. a bull or bear market). By taking absolute values, the first term in Eq. (4) captures how much of the investment is polarized in the direction of either buying or selling. The second term in Eq. (4), also called the adjustment factor, is subtracted to correct for the mean value of the first term under the assumption of no herding.[7] The second term can be computed under the assumption that follows a binomial distribution. Note that for large N and T, and follow normal distributions by the central limit theorem.

To avoid any possible bias in computing the herding indices, we exclude certain investors and observations (stock–month) from our sample. Like the sample we have constructed to examine positive feedback trading, we exclude here: (i) investors that are registered after December 31, 1996, (ii) investors who buy stocks for direct investment purpose, (iii) stock–months for which the foreign ownership limit is reached, and (iv) stock–months for which the stocks are not owned by foreign investors in the previous month. The last exclusion is motivated by the short-selling constraint. When short selling is not allowed, any trade on that stock would have to first show up as a buy, thus biasing the herding index upward (Wylie, 1997). Finally, if a stock in a given month is traded by only one foreign investor in that group, that observation is dropped.

The basic results are presented in Table 5. For each investor group i and each sub-period, we report the corresponding herding statistics, $H(i)$, with standard errors in the parentheses below. Then we perform a sequence of difference-in-mean tests between individual and institutional investors (reported in rows 3, 6, and 9), and between non-resident and resident investors of any given group (reported in column 3).

A number of patterns stand out. First, except for the Korean subsidiaries/

[7] Also, the adjustment factor, the second term in Eq. (4), is a decreasing function of the number of traders active, $[B(i,t) + S(i,t)]$.

Table 5
Herding[a]

		(1) Resident	(2) Non-Resident	*(3) =(2)−(1)*
Tranquil period	(1) Individual	7.102***	13.241***	*6.139**
		(2.136)	(2.571)	*(3.343)*
		[81]	[58]	
	(2) Institution	0.971	5.781***	*4.810****
		(1.520)	(0.455)	*(1.587)*
		[103]	[1,195]	
	(3)=(2)−(1)	*−6.132***	*−7.460****	
		(2.622)	*(2.611)*	
Pre-crisis period	(4) Individual	8.301**	11.860***	*3.559*
		(3.338)	(3.071)	*(4.535)*
		[41]	[43]	
	(5) Institution	−2.345	4.690***	*7.035****
		(1.548)	(0.487)	*(1.622)*
		[163]	[1,140]	
	(6)=(5)−(4)	*−10.646****	*−7.169***	
		(3.679)	*(3.109)*	
In-crisis period	(7) Individual	4.848**	8.422***	*3.574*
		(2.093)	(2.160)	*(3.007)*
		[57]	[92]	
	(8) Institution	1.602	2.553***	*0.952*
		(1.487)	(0.401)	*(1.540)*
		[139]	[1,523]	
	(9)=(8)−(7)	*−3.246*	*−5.869****	
		(2.568)	*(2.197)*	

[a] Notes:

$$H(j,t) = \left| \frac{B(j,t)}{B(j,t)+S(j,t)} - p(t) \right| - E\left| \frac{B(j,t)}{B(j,t)+S(j,t)} - p(t) \right|$$

$$p(t) \equiv \frac{\sum_{j=1}^{J} B(j,t)}{\sum_{j=1}^{J} B(j,t) + \sum_{j=1}^{J} S(j,t)}$$

where $B(j,t)$ is number of buyers on stock j at month t; $S(j,t)$ is number of sellers on stock j at month t; and $J$is the total number of stocks listed in the exchange. Each cell reports herding measure in percentage terms.

branches of foreign institutions, all other three categories of foreign investors have engaged in statistically significant herding. This is true in each of three sub-periods.

Second, based on the point estimates, foreign investors outside Korea (the non-resident individuals or institutions) always herd more than their counterpart

inside Korea in each of the three sub-periods. The values of the herding statistic for the non-resident foreign investors are often twice as high as resident foreign investors. In half of the cases, the differences are statistically significant.

Third, individual investors always herd more than institutions. The herding measure for the individuals is generally twice as big as or more than that for institutional investors. In five out of the six cases, the difference is statistically significant.

These patterns are consistent with the theory that herding is induced by informational asymmetry. At the same time, the contrast between institutional investors (who are subject to regular relative performance evaluations) and individuals (who are not) suggests that the incentive to herd driven by the relative performance review considerations is probably not the dominant feature of the data.

Herding indices essentially measure the degree of correlation in trading behaviors among investors in a given group. As such, they do not by themselves distinguish between two possibilities: that investors intentionally mimic each other's trading, versus that investors respond to common information about the fundamentals.

To distinguish between the two is difficult. We can provide some suggestive evidence here by examining ex post profitability of the herding behavior in our sample. If the high values of herding statistics in our sample simply reflect the fact that the investors are responding to common information and that this information is return-relevant, then, we would expect that those stocks that the investors herd to buy should yield positive abnormal returns (relative to those stocks they do not herd as much), and those stocks that they herd to sell should yield negative abnormal returns.

Our strategy is to examine the following. For each investor group and each time period, we link the ex post return on a particular stock j, adjusted for its risk level, with a measure of the degree of herding on that stock. We adjust for risk on both sides of the regressions. On the left-hand-side, we construct an ex post profitability measure of trading in stock j from $t-1$ to t and hold it for n months, relative to the profitability that would have been attained if the previous month's position were to continue:

$$\text{Performance}(j,t,n) = \frac{1}{K}\sum_{k}\left[\frac{Q(k,j,t) - Q(k,j,t-1)}{Q^{*}(k,j,t)}\right] R(j,t+n) \tag{8}$$

As before, $Q(k,j,t)$ is investor k's position in stock j at time t, $Q^{*}(k,j,t)$ is the average of $Q(k,j,t)$ and $Q(k,j,t-1)$, and $R(j,t+n)$ is the return on stock j if held from month t to month $t+n$.

On the right-hand-side of the regressions, we include time and industry dummies to control for market-wide and industry-wide risk factors. In addition, we create a 'buying-herding' dummy to indicate when the herding is on the buying side:

$$D(j,t) = 1 \text{ if } B(j,t)/[B(j,t) + S(j,t)] > p(t) \quad (9)$$

As for the herding statistics, $B(j,t)$ and $S(j,t)$ are the numbers of buyers and sellers of stock j at time t, respectively; and $p(t)$ is the average tendency to buy at time t across all stocks for that investor group. We can use $[1 - D(j,t)]$ to denote 'selling-herding.' We run the following type of regressions:

$$\text{Performance}(j,t,n) = \text{constant, time dummies, industry dummies,} + \beta_1 D(j,t)\, H(j,t) + \beta_2 [1 - D(j,t)]\, H(j,t) + e(j,t) \quad (10)$$

If stocks that investors herd to buy or herd to sell generate abnormal returns ex post, we would expect $\beta_1 > 0$ and $\beta_2 < 0$. We perform such a regression for every investor group (e.g. non-resident institutions) in every sub-period (e.g. tranquil period) for both 1- and 3-month horizons. The results for the 1-month horizon are reported in the top panel of Table 6. Among the 24 coefficients reported, ten of them are statistically significant. However, of these ten, three have the correct sign, and seven have the wrong sign. In other words, herding is more often on the wrong side than not. In the remaining 14 cases, (risk-adjusted) returns from herding is essentially not different from randomly picking stocks to buy or sell. To summarize the results differently, there is no single group of investors that has profited consistently from herding in all three sub-periods, nor is there a sub-period in which all groups of investors have profited from herding. Hence, overall, at the 1-month horizon, herding does not appear to generate systematic ex post profits for the foreign investors.

The lower panel of Table 6 computes risk-adjusted returns if the investors were to hold their stocks for 3 months. We have also computed ex post profitability in US dollar terms (i.e. the exchange rate movement is incorporated into the profitability calculations. However, this table is not reported in order to save space). In both cases, the qualitative features are very similar to the top panel of Table 6. Thus, we conclude that whatever motivates the herding behavior in our sample, it does not appear to generate systematic ex post abnormal returns.

5. Concluding remarks

In this paper, we provide an account of foreign investors' trading behavior in the Korea Stock Exchange (KSE) during the period December 1996–June 1998. The unique data set in the paper details every foreign investor's monthly stock positions.

An important finding of the paper is that heterogeneity among foreign investors matters. Lumping them together would give misleading pictures. For example, the Korean branches/subsidies of foreign institutions or foreign individual investors

Table 6
Ex post profitability of herding[a]

		Residents			Non-Residents		
		Herd-buy β_1	Herd-sell β_2	R^2	Herd-buy β_1	Herd-sell β_2	R^2
One-month investment horizon							
Tranquil period	Individuals	0.066	0.060	*0.63*	0.029	0.020	*0.50*
		(0.217)	(0.034)	*[67]*	(0.066)	(0.044)	*[50]*
	Institutions	0.321*	0.083*	*0.43*	0.023*	0.004	*0.09*
		(0.191)	(0.043)	*[93]*	(0.013)	(0.006)	*[1,152]*
Pre-crisis period	Individuals	−0.918	0.014	*0.61*	−0.518**	0.105	*0.48*
		(0.916)	(0.107)	*[33]*	(0.221)	(0.083)	*[34]*
	Institutions	−0.030	0.108*	*0.46*	−0.129***	0.040***	*0.19*
		(0.034)	(0.058)	*[156]*	(0.017)	(0.012)	*[1,109]*
In-crisis period	Individuals	−0.154	−0.374*	*0.67*	−0.442**	0.070	*0.88*
		(0.879)	(0.202)	*[46]*	(0.209)	(0.073)	*[83]*
	Institutions	0.156	−0.031	*0.55*	−0.167***	0.033	*0.08*
		(0.731)	(0.366)	*[132]*	(0.064)	(0.045)	*[1,489]*
Three-months investment horizon							
Tranquil period	Individuals	0.243	0.138	*0.52*	−0.044	0.091	*0.63*
		(0.520)	(0.0820	*[66]*	(0.119)	(0.079)	*[50]*
	Institutions	0.758	0.452***	*0.29*	0.039*	0.007	*0.10*
		(0.752)	(0.167)	*[93]*	(0.021)	(0.011)	*[1,152]*
Pre-crisis period	Individuals	−0.876	0.149	*0.53*	−0.730*	0.241*	*0.67*
		(1.515)	(0.178)	*[33]*	(0.357)	(0.134)	*[34]*
	Institutions	−0.404***	0.503***	*0.51*	−0.344***	0.147**	*0.21*
		(0.102)	(0.172)	*[156]*	(0.045)	(0.030)	*[1,109]*
In-crisis period	Individuals	−0.386	−0.011	*0.51*	−0.629	0.257	*0.52*
		(0.431)	(0.099)	*[46]*	(0.494)	(0.172)	*[83]*
	Institutions	−0.319	−0.092	*0.53*	−0.193***	0.090*	*0.08*
		(0.855)	(0.428)	*[132]*	(0.075)	(0.052)	*[1,489]*

[a] Notes: (1) $PN(j,t,n) = \alpha + \alpha_{ind} + \alpha_t + \beta_1 D(j,t)\, H(j,t) + \beta_2 [1 - D(j,t)]\, H(j,t) + \epsilon_{jt}$, where $PN(j,t,n)$ is computed by taking an average of $PN(k,j,t)$ over investor k; α a constant; α_{ind} an industry dummy; α_t a year–month dummy; $H(j,t)$ a herding measure of stock j at month t; and $n = 1$ and 3. (2) $D(j,t) = 1$ if $B(j,t)/[B(j,t) + S(j,t)] > P(t)$ and 0 if otherwise. (3) Standard errors are in the parentheses and numbers of observations are in the brackets. ***, **, and * denote significance levels at 1, 5, and 10% levels, respectively.

living in Korea are less likely to engage in positive feedback trading and less likely to engage in herding than their non-resident counterparts.

We note that foreign investors in our sample were a small part of the overall Korean market (their positions were about 15% of the market capitalization). In part because of their size, their trading is unlikely to have had a big impact on the prices (Choe et al., 1999). However, as more and more emerging markets are

made more open to international investors, their impact could increase. Even in Korea, additional openness of the capital account and the equity market has taken place since the end of our sample. The trading pattern by the foreign investors as revealed in this paper, if confirmed by future studies from other emerging markets, could potentially translate into more market instability in the developing countries.

If one is to consider controls on foreign capital inflows, one area that has not received much attention is policies that may encourage foreign investors to acquire more information about the emerging market (e.g., by setting up a subsidiary or a branch in the country). This paper suggests that it may be worth exploring.

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