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Do foreign investors destabilize stock markets? The Korean experience in 1997[☆]

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Abstract

This paper examines the impact of foreign investors on stock returns in Korea from November 30, 1996 to the end of 1997 using order and trade data. We find strong evidence of positive feedback trading and herding by foreign investors before the period of Korea's economic crisis. During the crisis period, herding falls, and positive feedback trading by foreign investors mostly disappears. We find no evidence that trades by foreign investors had a destabilizing effect on Korea's stock market over our sample period. In particular, the market adjusted quickly and efficiently to large sales by foreign investors, and these sales were not followed by negative abnormal returns. © 1999 Elsevier Science S.A. All rights reserved.

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1. Introduction

In the second half of 1997, it became extremely common for political leaders as well as journalists to argue that foreign investors exert a destabilizing influence on emerging market economies. Foreign investors were often blamed for the dramatic difficulties of the East Asian countries and for the collapse of their currencies and stock markets. For instance, Stiglitz (1998) calls for greater regulation of capital flows, arguing that ‘...developing countries are more vulnerable to vacillations in international flows than ever before’. Academics have pointed out that foreign investors could have a destabilizing effect for a variety of reasons. Dornbusch and Park (1995) argue that foreign investors pursue strategies that make stock prices overreact to changes in fundamentals and more recently Radelet and Sachs (1998) attribute the East Asian economic crisis to financial panic. If foreign investors can indeed destabilize economies, the benefits from opening markets to investors from all countries are substantially weakened and perhaps reversed. It is therefore crucially important to understand whether this is the case.

This paper examines the impact of foreign investors on stock returns in Korea over the period from November 30, 1996, to the end of 1997.¹ In 1996, Korea was bigger than Mexico but smaller than Canada in terms of GDP and of stock market capitalization. Our sample period includes Korea’s dramatic economic crisis during the last few months of 1997. A good measure of the intensity of this crisis is that a dollar invested in Korea’s stock market index on October 1, 1997 would have been worth 35 cents on the last day of trading of 1997. Information for each trade on the Korea Stock Exchange allows us to classify buying and selling investors into three categories: Korean individual investors, Korean institutional investors, and foreign investors.

These data enable us to investigate the pattern and impact of net purchases by institutions, individuals, and foreign investors during the trading day as well as across days. Since the data include the time that an order arrives at the market, we can identify all trades that are initiated by foreign investors. We can therefore investigate stock returns around the time of trades initiated by foreign investors. Furthermore, a number of studies, e.g., Bohn and Tesar (1996) and Clark and Berko (1996), show a positive contemporaneous relation between equity flows and stock returns using monthly data.² Such a relation could hold if foreign

¹ Cross-border equity flows are dwarfed by other cross-border capital flows [see Stulz (1999) for some data] but no other flows are documented at the trade level, so we could not conduct our study on non-equity transactions by foreign investors.

² Stulz (1999) provides a review of the earlier studies that use monthly data. Bailey et al. (1998) investigate the Tequila effect focusing on order-imbalances on the NYSE without being able to distinguish trades by foreign and domestic investors. They find no significant evidence of such an effect for foreign stocks traded on the NYSE.

investors buy following positive returns and sell following negative returns, if foreign investors have a permanent impact on stock prices, and/or if the foreign investors are good market timers and invest before prices increase.³ With our data, we can differentiate between these possible views of the relation between equity flows and stock prices.

It is often argued that the trades of foreign investors are highly correlated, so that they buy and sell as a herd. For instance, Krugman (1997) describes money managers as ‘an extremely dangerous flock of financial sheep’. This herding could make trades by foreign investors destabilizing because foreign investors end up trading as a group, thereby creating disarray and possibly panic in the markets that they exit and overheating in the markets that they enter. To investigate herding, we use the measures developed in Lakonishok et al. (1992) and Wermers (1999) and find them to be significantly positive. These herding measures are large for stocks of all sizes compared to the herding measures for institutional investors in the U.S. During the Korean crisis period, the herding measures appear to decrease when we look either at all foreign investors or only U.S. investors. The fact that these measures do not decrease for the larger stocks in our sample suggests that one possible reason for the decrease in herding is that lower liquidity during the crisis may have limited the trading of foreign investors.

Dornbusch and Park (1995) and others contend that the trades of foreign investors are affected by past returns, so that they buy when prices have increased and sell when they have fallen. Such a practice is called positive feedback trading, and it would lead to the herding we document. Theoretical models have shown that investors who buy as prices increase and sell as prices decrease can exert a destabilizing influence on the stock market. DeLong et al. (1990) offer an analysis of these potential destabilizing effects of positive feedback trading. We investigate the period before the Korean crisis separately from the period during the crisis. Before the crisis, we find clear evidence of positive feedback trading: foreign investors buy (sell) more Korean stocks on days following an increase (decrease) in the market as a whole and they buy (sell) Korean shares that outperformed (underperformed) the market over the previous day. This evidence is consistent with the evidence of Froot et al. (1998). They investigate the relation between equity flows and stock index returns with trades of the institutions using State Street Bank & Trust as their repository, and they conclude that past returns explain 60–85% of the quarterly covariance between stock index returns and equity flows. When we turn to the crisis period,

³ Nofsinger and Sias (1999) make a similar point concerning the assessment of herding by domestic institutional investors using low-frequency (monthly or yearly) data. They note that herding measured this way is consistent with positive feedback trading at high frequency as well as with domestic institutional investors having a permanent impact on prices.

the evidence of positive feedback trading becomes much weaker. In particular, the sign of the previous day's market return has no information for the trades of foreign investors on the next day. We also find that the sign of the previous day's stock return is not helpful in predicting the trades of foreign investors in that stock the next day.

In theoretical models, concerns that positive feedback trading and herding have a destabilizing impact on prices arise because positive feedback traders can push prices away from fundamentals when they form a herd. The argument is that traders can make money by buying following price increases regardless of whether the price increases are rational or not because positive feedback traders will push prices higher. Investors trading on fundamentals might make money in the long run by selling short when prices are too high. Unfortunately for these investors, positive feedback trading can keep prices increasing long enough to force them to liquidate their positions before they start making profits. The argument that positive feedback trading and herding are destabilizing therefore implies that prices exhibit momentum. In other words, if positive feedback traders are selling, prices keep falling. For at least two reasons, however, positive feedback trading and herding are not necessarily destabilizing. First, investors trading on fundamentals may be sufficiently powerful in the markets to prevent prices from moving away from fundamental values. Second, positive feedback traders may be trading in response to information about fundamentals, so that their trading does not drive prices away from fundamentals. Empirical research is therefore required to settle the issue of whether positive feedback trading and herding are destabilizing.

To examine whether the trading practices of foreign investors are destabilizing, we conduct two distinct event studies. In the first study, we measure abnormal returns for the 11 five-minute intervals centered on intervals with large foreign trades for the stocks in our sample. In the second study, we use days instead of five-minute intervals. The hypothesis that foreign trades are destabilizing can be rejected if additional price movements in the same direction as the price impact of the trades do not follow large foreign trades. In other words, if further price drops do not follow a large foreign sale, we conclude that net selling by foreign investors is not destabilizing. Presumably, one might be able to construct scenarios in which rational pricing implies momentum. From the perspective of this study, however, the absence of momentum following large trades by foreign investors means that we can reject the hypothesis that these trades are destabilizing.

Considering first the analysis using intraday data, we find that large buy trades initiated by foreign investors are associated with a stock price increase for the five minutes during which the large buy trade takes place and during the next five minutes. Thereafter, there are no positive significant returns. Large sell trades initiated by foreign investors are associated with a stock price decline that is partially reversed over the next 25 minutes of trading. The last three months of

1997 do not seem to differ from the rest of the sample with respect to the intraday returns surrounding large purchases or sales initiated by foreign investors.⁴ None of this evidence suggests that sales by foreign investors have a destabilizing impact.

When we look at daily returns, we focus on all trades by foreign investors rather than only the trades they initiate. We find that the significantly positive returns on days with large net foreign buying of a stock are followed by reversals prior to the last three months of 1997, but not during the Korean crisis period. Rather surprisingly, days with large net foreign selling of a stock have a positive market-adjusted return before the crisis period. Such a result is consistent with trades by Korean individuals having a much stronger impact on returns than trades by foreign investors. Days with large net selling by foreign investors are days with large net buying by Korean individuals. Based on our evidence, the impact of domestic buying on stock returns dominates the impact of foreign selling. During the last three months of 1997, days with large foreign net selling do not have significant market-adjusted returns; even raw returns on these days are not significantly negative. There is therefore no convincing evidence that foreign investors play a destabilizing role.

An interesting feature of the Korean stock market is the existence of daily price limits on individual stocks. The daily return of individual stocks cannot exceed 8% in absolute value during our sample period. Price limits make it more likely that we will find effects consistent with a destabilizing influence of foreign investors because, on average, a stock that has fallen 8% in one day is likely to have a negative return the next day. Hence, whenever foreign investors trade on days when the limit is hit, one would expect a negative return the next day rather than a reversal. As discussed later, our conclusions are not affected by the existence of price limits.

The paper proceeds as follows. In Section 2, we introduce our data and present information on foreign holdings of stocks. In Section 3, we test for herding. In Section 4, we investigate whether foreign investors engage in positive feedback trading and how their trading compares to domestic trading. In Section 5, we look at the intraday and daily returns associated with large foreign trades. We conclude in Section 6.

2. The Korea Stock Exchange and sample construction

The Korea Stock Exchange (KSE) holds two trading sessions on each weekday: a morning session and an afternoon session. The morning session operates

⁴ Interestingly, the price impact around large foreign trades is not very different from the evidence for block trades in the U.S. For example, Holthausen et al. (1990) find that most of the effect of a large block trade on the NYSE is permanent and takes place with the trade itself.

from 9:30 through 11:30, and the afternoon session starts at 13:00 and closes at 15:00. Batch auctions are used three times a day to determine the opening prices of each session and the daily closing prices. There are no trades during the last ten minutes of each day, when orders are collected for the closing batch auction at 15:00. Trading prices during the rest of the trading hours are determined by continuous (or non-batch) auction. On Saturdays, there is only a morning session and the closing price is determined by the batch auction. The KSE does not have designated market makers. Buyers and sellers meet via the Automated Trading System (ATS). Before November 25, 1996, only limit orders were allowed, but since then markets orders have been allowed as well.

The database used is the intersection of two databases with raw data provided by the KSE and compiled by the Institute of Finance and Banking (IFB) at Seoul National University. The first database includes all transactions on the KSE for the period from 1993 to 1997. This database has each order time-stamped as of the time that it arrives at the exchange and as of the time that the order is executed. The data provide information on the country of residence of investors as well as on whether they are individuals or institutions. The second database has daily foreign ownership data from November 30, 1996, through the end of 1997 for all stocks listed on the KSE. Foreign investors in Korea must register with the Securities Supervisory Board (SSB) and obtain an ID number before they can start trading stocks. The SSB uses this ID number to ensure that the foreign ownership limit for each company and each foreign investor is not exceeded by informing the KSE whether a foreign order satisfies the company and investor limits. The ownership limit for each individual foreign investor was 5% of a firm's shares until May 2, 1997, when it increased to 6%. It then increased to 7% on November 3, and to 50% on December 11, 1997. In addition, foreign investors as a group could not own more than 20% of a firm's shares. This aggregate ownership limit on foreign investors increased to 23% on May 2, 1997, to 26% on November 3, 1997, and finally to 50% on December 11, 1997. Foreign investors are not allowed to sell shares short. There is no record of daily foreign ownership available prior to November 30, 1996. Since we need both databases for our study, we are therefore constrained to use the sample period of the daily foreign ownership database. One limitation of the foreign ownership database is that it is possible that trades we identify as foreign trades are actually trades by Korean investors who set up a foreign nominee company to trade on the KSE.

Over our sample period there are three Korean American Depository Receipts (ADRs) trading on the NYSE in addition to the Korea Fund. At the end of 1996, the shares corresponding to the ADRs represent a small fraction of the outstanding shares of the firms that have issued ADRs (2.3% for Kepco, 5.2% for Posco, and 1.8% for SK Telecom). Our data exclude New York trading. If Korean residents trade in New York, we have no way of knowing it. This may not be important, however, because all ADRs are treated as shares

held by foreign investors that count towards the foreign ownership limit. In addition, New York trading does not appear to be important. NYSE ADR daily trading represents less than 20% of the daily trading volume in Korea of the company's stock for the whole sample period and less than 10% during the crisis.

We conduct our analysis on two types of trades. First, we use all trades, regardless of who initiates the trade. Since we are concerned about the impact of trades by foreign investors on prices, we would like to identify those trades that are most likely to affect prices. Thus, we consider what we call price-setting trades. For NYSE data, it is common to identify the initiating party of a trade using a tick test such as the one proposed by Lee and Ready (1991). There is no need for a tick test with our data because we know which party initiates the trade. A buy-side (sell-side) price-setting trade for foreign investors is a trade in which the foreign investors' buy (sell) order comes after the sell-side (buy-side) order and hence makes the trade possible. For price-setting trades, we can therefore only consider trades that take place during the non-batch auction period. We consider split trades originated from one order as one trade irrespective of whether we consider all trades or only price-setting trades.

The sample of stocks we use throughout the paper contains 414 of the 762 stocks listed on the KSE at the end of November 1996 and is constructed as follows. We start from the common stocks whose foreign investment ceiling was 20% at the end of November 1996. Government-operated firms and firms with direct foreign investment had a different ceiling and were excluded. A large number of stocks have infrequent trading by foreign investors. We therefore require stocks to have more than 20 days of foreign price-setting trades from December 2, 1996 to October 31, 1997. We also exclude 48 stocks that were at the foreign ownership limit on December 2, 1996. Since foreign investors cannot buy shares of these stocks on the exchange, we cannot use them for tests that require foreign investors to be able to both buy and sell shares. These 48 stocks are interesting because they are larger firms. The capitalization of the stocks at the limit on December 2, 1996, is on average 521 billion Won and in total 21% of the market's capitalization, in contrast to the capitalization of the stocks in our sample which is on average 159 billion Won and in total 55% of the market's capitalization. Since the ownership limits are higher during the crisis period and are no longer binding, we discuss results of an analysis of the impact of trades by foreign investors on the 48 stocks during the crisis.

Our dataset misses two types of transactions by foreign investors. First, foreign investors could buy Korean shares from other foreign investors on the over-the-counter market by offering a premium. Such trades enabled investors indexing to a Korean benchmark to do so when stocks in the benchmark were at the foreign ownership limit. There would seem to be no reason for foreign investors to use the over-the-counter market for stocks where foreign ownership is below the aggregate foreign investment ceiling. Consequently,

over-the-counter trades should not be relevant for our sample. Second, foreign investors could enter into over-the-counter derivatives transactions functionally equivalent to trades in Korean shares, such as equity swaps on the KOSPI index. Such transactions are not included in our dataset. Discussions with practitioners suggest that such swap transactions occurred during the crisis period between equity portfolio managers and hedge funds.

Table 1 provides information on foreign ownership by size deciles at the end of November 1996 as well as information on foreign volume and foreign price-setting volume for the period from December 2, 1996 to December 27, 1997. As documented by Kang and Stulz (1997) for Japan, foreign ownership is strongly positively related to size. For the smallest decile of Korean stocks, median foreign ownership is 2.09%. It increases to 13.48% for the largest decile. The average foreign ownership is 3.16% for the smallest decile and 11.89% for the largest decile. Overall, average foreign ownership is 6.47% and median foreign ownership is 4.52%. Although we do not reproduce these results in a table, we find that the median market model beta of the stocks held by foreign investors is 1.05 and the mean beta (against the KOSPI index) is 1.01. There is therefore no evidence that foreign investors choose stocks that have different systematic risk than the typical stock. Table 1 shows that foreign investors are not trading disproportionately relative to their ownership, and the volume of their price-setting trades is not disproportionate either. These results contrast with the results of Tesar and Werner (1995) who find that the turnover rates of foreign investors in Canada, the U.K., and the U.S. are higher than the turnover rates of domestic investors in these markets.

It is useful to compare foreign ownership in our sample to foreign ownership in the market as a whole. The average foreign ownership across the sample stocks is higher at the beginning of our sample period (6.47%) than in the market as a whole (5.69%). In contrast, value-weighted foreign ownership, defined as the value of shares held by foreign investors divided by the market capitalization, is higher in the market as a whole (12.00%) than in our sample (9.38%). The difference between the equal-weighted and value-weighted measures arises because foreign investors hold more stocks in large companies and the foreign ownership limit is more likely to be binding for large capitalization stocks than for other stocks.

Fig. 1 shows the time-series of the KOSPI index, the Won/USD exchange rate, and various measures of foreign ownership. In our sample, foreign investors hold 4.62% of a firm's shares on average at the end of the sample period as compared to 6.47% at the beginning of the sample period. The same pattern, though less pronounced, holds for the market as a whole, where average foreign ownership falls from 5.69% to 5.04%. Using a value-weighted measure of foreign ownership, however, there is no drop in ownership for the market as a whole. For the market as a whole, foreign investors own 12.00% of the market capitalization at the start of our sample period and 14.73% at the end. In

Table 1
 Foreign ownership, percentage of daily trade volume and price-setting trade volume for three types of investors at the KSE from Dec. 2, 1996 to Dec. 27, 1997.

The sample consists of 414 common stocks selected from all 762 common stocks listed on the KSE on Nov. 30, 1996. The sample stocks are those that do not hit the foreign investment ceiling of 20% as of Nov. 30, 1996. Stocks with ceilings other than 20% are excluded (e.g., those with foreign direct investment shares or government-operated firms). The sample stocks also have more than 20 days of foreign price-setting trades from Dec. 2, 1996 to Oct. 31, 1997. The table shows averages of the foreign ownership across the 414 stocks by size decile as of Nov. 30, 1996. Also presented are the average percentages of daily trade volume and price-setting trade volume attributed to institutions, individuals, and foreigners from Dec. 2, 1996 to Dec. 27, 1997. A price-setting buy (sell) trade is defined as a trade where the buy-side (sell-side) order is received at the exchange later than the sell-side (buy-side) order.

Firm size Decile	Foreign ownership (%)			Percentage of daily trade volume (%)						Percentage of daily price-setting volume (%)					
	# of stocks	Mean	Median	Stock-days	Institution	Individual	Foreigner	Stock-days	Institution	Individual	Foreigner	Stock-days	Institution	Individual	Foreigner
1 (Smallest)	41	3.16	2.09	12,681	6.41	91.43	1.33	11,403	6.22	92.04	1.10	12,350	8.01	89.04	2.03
2	41	4.31	2.77	12,622	8.73	87.92	2.19	12,350	8.01	89.04	2.03	12,210	9.38	87.43	2.53
3	42	5.94	3.95	12,788	9.99	86.38	2.75	12,234	10.61	86.13	2.35	12,450	11.70	84.13	3.12
4	41	5.37	3.74	12,704	11.27	85.33	2.46	12,463	12.61	82.87	3.54	12,764	12.87	82.09	3.80
5	42	4.95	3.50	12,960	12.21	83.39	3.26	12,050	17.15	76.67	5.01	12,847	17.79	73.91	7.22
6	41	5.13	3.49	12,711	13.08	82.26	3.49	12,711	13.08	82.26	3.49	12,711	13.08	82.26	3.49
7	42	6.08	4.11	12,990	13.49	81.28	3.80	12,753	18.60	67.31	12.86	12,711	18.61	67.87	12.44
8	41	8.22	6.23	12,744	17.10	76.74	4.83	12,807	17.64	73.62	7.34	12,847	17.79	73.91	7.22
9	42	9.64	8.85	13,087	17.64	73.62	7.34	12,753	18.60	67.31	12.86	12,711	18.61	67.87	12.44
10 (Largest)	41	11.89	13.48	12,753	18.60	67.31	12.86	12,753	18.60	67.31	12.86	12,711	18.61	67.87	12.44
All (414 stocks)	414	6.47	4.52	128,040	12.87	81.54	4.44	123,482	12.58	82.07	4.37	123,482	12.58	82.07	4.37

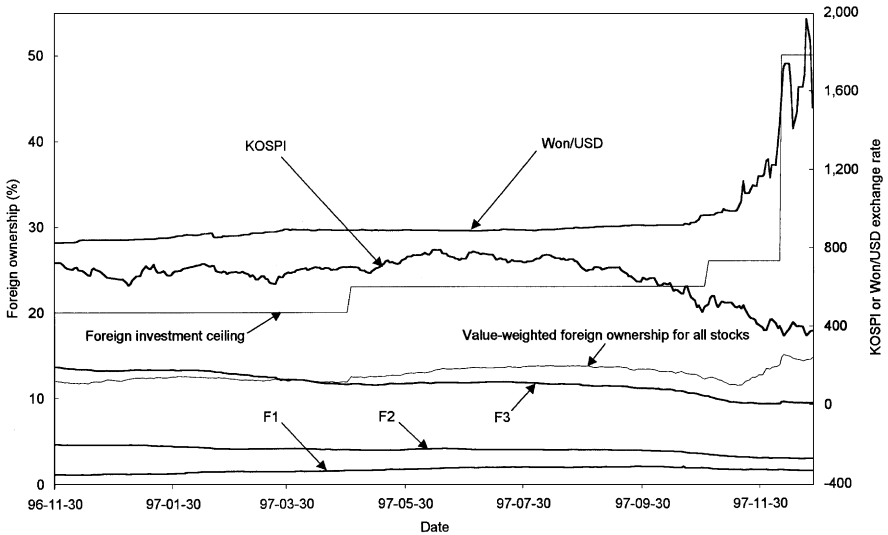


Fig. 1. Time-series plots of the daily foreign ownership for 414 stocks by three groups (F1–F3) based on their foreign ownership rankings as of Nov. 30, 1996, the daily value-weighted foreign ownership computed as total value of foreign holdings to total market value (for 762 common stocks), the KOSPI daily index, and the Won/USD daily exchange rates for the period from Nov. 30, 1996 to Dec. 27, 1997.

contrast, in our sample, foreign investors own 9.38% at the start of our sample period and 9.04% at the end. It is important to note, however, that while the share of the market capitalization held by foreign investors increased for the market as a whole, the dollar value of the Korean shares held by foreign investors fell dramatically because of the fall both in equity values and in the dollar price of the Won, which is documented in Fig. 1.

3. Do foreign investors herd?

In this section, we evaluate the extent to which foreign investors herd both before and during the crisis period. There is a growing theoretical and empirical literature on herding. Recent papers by Nofsinger and Sias (1999) and Wermers (1999) contain overviews of the theoretical and empirical literatures on herding. In this literature, herding can be the outcome of investors using the same information to trade or the product of irrational psychological factors. Our tests of herding take the narrow and simple view of herding that is prevalent in the empirical literature. We consider that foreign investors herd if they trade similarly over a short interval of time, namely a day. We therefore do not test

alternate models in which herding takes place over longer periods of time in this paper. Such tests would be useful, but the crisis period is too short to make it possible to implement such tests. Investigating herding would not be very interesting if there were few foreign investors. This is not the case. At the end of 1996, there were 5,294 registered foreign investors. Interestingly, this number increased sharply over the last two years. In June 1998, there were 7,998 registered foreign investors. At that time, U.S. investors represented 37.7% of the total number of foreign investors.

As a starting point for our investigation, Table 2 provides statistics for trading by foreign investors during our whole sample period for the 414 stocks in our sample. For the 16 countries with trading reported separately, we find that 14 countries are net sellers of shares. More importantly, when we compute the dollar value of shares sold and the dollar value of shares bought for each of the 16 countries using Won transaction prices and daily exchange rates, we find that the dollar value of the purchases exceeds the dollar value of the sales for only four countries. The preponderance of net selling cannot be explained by chance at reasonable significance levels if the sign of the net trading is random across investors. This result is, however, consistent with herding. Most of the trading is done by investors from the U.K., U.S., and Malaysia.⁵ The U.S. investors buy and sell the most shares. U.S. investors sell more shares than they buy, but the value of their purchases exceeds the value of their sales because they buy higher priced shares than they sell. The U.K. investors trade less but their net selling of shares is dramatic compared to the net selling of shares of U.S. investors. The U.K. investors bought 64 million shares, but sold 123 million shares. Finally, the Malaysian investors are the second most active group of investors. Investors from Germany and Taiwan actually bought more shares than they sold. We also constructed but do not report a table like Table 2 for the 762 stocks traded on the Korea Stock Exchange. The results for that table are similar to those shown here, except that the dollar amount of net selling is smaller. The reason for that is that foreign investors bought more shares of the stocks at the foreign ownership limit as that limit was relaxed.

To investigate whether foreign investors herd, we follow the approach of Lakonishok et al. (1992) and Wermers (1999) to estimate the importance of herding. We compute their herding measure using a daily horizon and treat each trade on a day as made by a different foreign investor since we do not have identifications for individual foreign investors. Specifically, the herding measure

⁵ Trading from Malaysia is unlikely to be trading by Malaysian investors. The government of Malaysia established in 1990 an international offshore financial center in the federal territory of Labuan, which a lawyer described to us as the equivalent of the Cayman Islands in the Asia-Pacific region. Although we cannot identify Korean investors using the Labuan financial center to trade in Korea under nominee names, our results do not change even after excluding Malaysian investors as a whole.

Table 2

Trading activity of foreign investors by country at the KSE from Dec. 2, 1996 to Dec. 27, 1997.

For each of the foreign buy and sell trades at the KSE from Dec. 2, 1996 to Dec. 27, 1997, the foreign investor's country is identified using the corresponding codes in the IFB/KSE database. The sample stocks include 414 stocks selected from all 762 common stocks listed on the KSE on Nov. 30, 1996. The table shows the trading volume by foreign investors aggregated across their countries and expressed both in terms of thousands of shares and dollars. The dollar volume is valued at each transaction price in Korean Won and then converted into dollars using the daily exchange rate.

Foreign investors' country	Shares bought		Shares sold		Net bought ('000 shrs)		Amount bought ('000 US)		Amount sold ('000 US)		Net bought ('000 US)	
	('000 shrs)	(%)	('000 shrs)	(%)	('000 shrs)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
US	132,019	(31.1)	148,031	(25.1)	- 16,012	(25.1)	1934,366	(28.6)	1593,486	(21.2)	340,880	
UK	64,434	(15.2)	123,394	(20.9)	- 58,960	(20.9)	1036,613	(15.3)	1400,242	(18.6)	- 363,629	
Ireland	45,286	(10.7)	72,674	(12.3)	- 27,388	(12.3)	893,825	(13.2)	1144,744	(15.2)	- 250,919	
Germany	1,048	(0.2)	856	(0.1)	192	(0.1)	12,841	(0.2)	10,848	(0.1)	1,993	
France	4,953	(1.2)	6,949	(1.2)	- 1,996	(1.2)	76,796	(1.1)	83,951	(1.1)	- 7,155	
Canada	14,254	(3.4)	16,916	(2.9)	- 2,662	(2.9)	165,873	(2.4)	168,019	(2.2)	- 2,146	
Swiss	7,458	(1.8)	17,424	(3.0)	- 9,966	(3.0)	124,681	(1.8)	221,780	(2.9)	- 97,099	
Netherlands	3,201	(0.8)	8,758	(1.5)	- 5,557	(1.5)	61,074	(0.9)	92,028	(1.2)	- 30,954	
Luxembourg	12,574	(3.0)	14,659	(2.5)	- 2,085	(2.5)	206,820	(3.1)	183,421	(2.4)	23,399	
Australia	6,741	(1.6)	10,057	(1.7)	- 3,316	(1.7)	95,819	(1.4)	124,544	(1.7)	- 28,725	
New Zealand	5,380	(1.3)	7,998	(1.4)	- 2,618	(1.4)	122,664	(1.8)	125,556	(1.7)	- 2,892	
Japan	1,758	(0.4)	3,482	(0.6)	- 1,724	(0.6)	28,460	(0.4)	32,726	(0.4)	- 4,266	
Malaysia	105,666	(24.9)	133,536	(22.6)	- 27,870	(22.6)	1674,544	(24.7)	1982,099	(26.3)	- 307,555	
Taiwan	1,278	(0.3)	595	(0.1)	683	(0.1)	14,418	(0.2)	7,793	(0.1)	6,625	
Singapore	2,685	(0.6)	3,884	(0.7)	- 1,199	(0.7)	52,409	(0.8)	70,046	(0.9)	- 17,637	
Hong Kong	1,049	(0.2)	2,535	(0.4)	- 1,486	(0.4)	17,607	(0.3)	26,874	(0.4)	- 9,267	
Others (31 countries)	14,659	(3.5)	17,999	(3.1)	- 3,340	(3.1)	252,122	(3.7)	257,636	(3.4)	- 5,514	
Total	424,443	(100.0)	589,747	(100.0)	- 165,304	(100.0)	6770,932	(100.0)	7525,793	(100.0)	- 754,861	

is computed as $|p_{it} - E(p_{it})| - E|p_{it} - E(p_{it})|$, where p_{it} is the proportion of foreign investors buying stock i on day t among all foreign investors trading that stock on that day, $E(p_{it})$ is the expected proportion of foreign investors buying on day t relative to all foreign investors. $E|p_{it} - E(p_{it})|$ is an adjustment factor computed assuming that in the absence of herding the number of foreign investors with net purchases follows a binomial distribution that we compute as in Wermers (1999). We compute this herding measure for each stock each day using all 414 stocks. We then create portfolios based on size and past-week returns and take an average across stocks for each portfolio. The portfolios are equally weighted and rebalanced every week.

Table 3 shows estimates of the herding measure using all foreign investors. It is immediately apparent that the herding measures were uniformly positive before the Korean crisis. Wermers (1999) provides herding measures for U.S. mutual funds from 1975 to 1994. He splits his sample across size quintiles and past-return quintiles. Looking at his data across all funds, the highest herding measure he finds is 8.39%, except for the smallest stocks. In contrast, before the crisis, no herding measure we report is below 20%. Wermers (1999) looks at herding over a quarter. In contrast, we measure herding on a daily basis. When measured over longer time intervals, herding could increase if not all institutions that move in the same direction do so on the same day or it could decrease if similar trades by institutions lead some institutions to trade in the opposite direction. The first possibility would seem to be more important than the second one, so that we may understate herding. In contrast to Wermers (1999), it does not seem that herding is systematically related to prior return or size. While there is strong evidence of herding prior to the Korean crisis, there is no evidence that herding is more important during the crisis period. Twenty-four of 25 measures are lower during the crisis period than before and 18 are significantly lower at the 10% level using t-tests for mean differences. As explained earlier, though, herding does not have to be destabilizing.

In Table 3, we treat each purchase as a purchase by a distinct foreign investor, which may overstate the degree of herding, since the same foreign investor may buy or sell the same stock several times during the same day. One way we avoid this problem is to investigate herding across classes of foreign investors rather than across all foreign investors. Using the identification codes in our data for the country of residence as well as the investor type, we attribute each trade by foreign investors to one of 658 classes based on both 47 countries and 14 investor types. Foreign investors are divided into resident and non-resident. The classes of non-resident foreign investors are individuals, banks, insurance companies, securities firms, mutual funds divided into two types (corporate types, which issue stocks, and contract types, which issue beneficiary certificates with generally a stated maturity), other corporations, non-resident Korean investors, and pension funds. (Non-resident Korean investors account for less than 1/100 of 1% of the shares sold by foreign investors.) There are also five classes of

Table 3
Lakonishok et al. (1992) herding measures (in percentages) for foreign investors by size and past-week return portfolios on the KSE stocks

To compute herding measures for foreign investors, each of the foreign buy and sell trades on a sample of the 414 stocks at the KSE from Dec. 2, 1996 to Dec. 27, 1997 is assumed to originate from a separate foreign investor, using the identification codes in the IFB/KSE database. The herding measure for a given stock-day is then computed as $|p_t - E(p_t)| - E|p_t - E(p_t)|$, where p_t is the proportion of foreign investors buying stock i on day t among all foreign investors trading that stock on that day, $E(p_t)$ is the expected proportion of foreign investors buying on that day relative to all foreign investors active on that day, and $E|p_t - E(p_t)|$ is the adjustment factor computed under the hypothesis that in the absence of herding the number of purchases is binomially distributed. The stock is excluded if it is traded by less than two foreign investors on day t . The herding measure computed above for each stock-day is then averaged within size and past-week return portfolios (both in terms of the U.S. dollar), which are rebalanced every week. The t -statistics for the means are presented in parentheses, and the number of stock-days are presented below the t -statistics. Test statistics for difference in means (assuming unequal variances) and medians (using the Wilcoxon rank-sum test) across two subperiods are presented in braces and brackets, respectively.

Past-week return portfolio	Before Korean Crisis (Dec. 2, 1996–Sept. 30, 1997)					During Korean Crisis (Oct. 1, 1997–Dec. 27, 1997)					Difference in means and medians (before-after)				
	S1 (Smallest Cap)	S2	S3	S4	S5 (Largest Cap)	S1 (Smallest Cap)	S2	S3	S4	S5 (Largest Cap)	S1 (Smallest Cap)	S2	S3	S4	S5 (Largest Cap)
P1 (Lowest)	22.857 (28.59) 413	23.36 (33.30) 550	22.847 (35.69) 616	23.234 (41.22) 885	21.806 (50.59) 1489	19.495 (10.60) 114	18.884 (10.94) 116	17.684 (11.64) 149	16.878 (17.32) 281	18.483 (23.08) 418	{1.68} [2.91]	{2.40} [3.85]	{3.13} [4.38]	{5.65} [7.25]	{3.65} [4.99]
P2	22.743 (29.77) 458	24.899 (39.33) 545	23.831 (37.73) 573	21.475 (40.57) 971	22.381 (49.75) 1455	19.861 (10.88) 114	26.282 (14.51) 94	18.978 (13.61) 139	19.049 (16.29) 193	18.693 (20.97) 264	{1.46} [2.32]	{-0.72} [-0.07]	{3.17} [4.80]	{1.89} [3.73]	{3.69} [5.59]
P3	23.111 (28.20) 365	24.958 (37.93) 518	24.389 (39.43) 646	23.222 (41.12) 875	21.845 (47.45) 1443	16.161 (7.66) 96	22.016 (11.08) 110	19.481 (13.37) 164	21.178 (17.26) 288	18.795 (22.12) 395	{3.07} [4.05]	{1.41} [2.01]	{3.10} [4.72]	{1.51} [4.03]	{3.16} [4.96]
P4	24.814 (36.50) 462	22.355 (32.16) 546	24.485 (41.65) 643	23.174 (40.32) 845	23.241 (53.94) 1462	16.058 (8.70) 117	16.469 (10.07) 87	16.729 (12.45) 117	16.972 (17.00) 174	19.484 (20.80) 287	{4.45} [5.48]	{3.31} [4.46]	{5.29} [7.67]	{5.38} [7.18]	{3.64} [5.61]
P5 (Highest)	23.616 (31.85) 390	23.391 (29.28) 461	23.313 (36.58) 654	23.113 (41.95) 883	22.874 (53.10) 1461	23.193 (9.41) 94	19.175 (10.47) 126	17.593 (10.83) 145	21.791 (17.22) 272	21.27 (21.36) 397	{0.16} [1.02]	{2.11} [3.72]	{3.28} [5.09]	{0.96} [1.79]	{1.48} [3.24]

resident foreign investors: individual, bank, insurance, securities firms, and other corporations. If the net purchase on a stock by one of the classes during a day is positive (negative), we count it as a buy (sell) for the stock on that day by the class of foreign investors, and then compute the herding measure as described earlier. This approach aggregates all trades on a stock during a day by a class of foreign investors, e.g., U.S. mutual funds, in either one buy or one sell. Since we aggregate many buys and sells into one trade with this measure, it could understate herding substantially by ignoring herding within classes. It is therefore not surprising that Table 4 reports lower herding measures than Table 3. The average of the herding measures over all stock-days falls from 22.2% in Table 3 to 3.5% in Table 4. The magnitude of this average is more similar to that of Wermers (1999), but remember that the herding measures of Table 4 represent a lower bound for herding among foreign investors and that they are computed for a day. Twenty-two out of 25 measures are significantly positive at the 10% level before the crisis. Herding drops off during the crisis, but not for the largest stocks. This is consistent with lower liquidity reducing the ability of foreign investors to trade in the smaller stocks.

4. Are foreign investors positive feedback traders?

Investors can be positive feedback traders for rational reasons or because of behavioral biases. Investors who pursue portfolio insurance strategies as well as investors with extrapolative expectations are positive feedback traders. Investors with such strategies are often viewed as destabilizing because their sales lead the market to fall further and their purchases increase prices further. Positive feedback traders are often blamed for the stock market crash of 1987. In some models, positive feedback trading leads to bubbles, where prices depart from fundamentals, and to crashes when bubbles burst. Besides contributing to the volatility of stock returns, it is argued that such trading leads to destabilizing capital flows because equity investors rush into countries whose stock markets are booming and flee from countries whose stock markets are falling.

Foreign investors may act like positive feedback traders without destabilizing equity markets. One reason is that greater foreign ownership can lead to a lower risk premium for stocks in a country since the risks of these stocks can be better shared internationally. Stulz (1998) provides an analysis of the relation between foreign ownership and the risk premium and a review of the evidence. As a result, a period when foreign investors enter a market can also be a period when the market is doing well because of these investors. Equity markets also become more receptive to foreign investors as economies liberalize. Liberalization itself leads to stock market appreciation and in this scenario this appreciation is followed by inflows of foreign equity investments. Bekaert and Harvey (1998, 2000) and Henry (2000) give evidence on the relation between liberalization

Table 4
Lakonishok et al. (1992) herding measures (in percentages) for foreign investor classes by size and past-week return portfolios on the KSE stocks.

To compute herding measures for foreign investor classes, each of foreign buy and sell trades on a sample of the 414 stocks at the KSE from Dec. 2, 1996 to Dec. 27, 1997 is attributed to one of the foreign investor classes (658 classes across 47 countries and 14 investor types), using the identification codes in the IFB/KSE database. The herding measure for a given stock-day is then computed as $|p_{it} - E(p_{it})| - E(|p_{it} - E(p_{it})|) - E(p_{it})$, where p_{it} is the proportion of foreign investor classes net buying stock i on day t among all foreign investor classes trading that stock on that day, $E(p_{it})$ is the expected proportion of foreign investor classes net buying on that day relative to all foreign investor classes active, and $E(|p_{it} - E(p_{it})|)$ is the adjustment factor computed under the null of no herding that the number of net buying classes is binomially distributed. The stock is excluded if it traded by less than two foreign investor classes on day t . The herding measure computed above for each stock-day is then averaged within size and past-week return portfolios (both in terms of the U.S. dollar), which are rebalanced equally every week. The t -statistics for the means are presented in parentheses, and the number of stock-days are presented below the t -statistics. Test statistics for difference in means (assuming unequal variances) and medians (using the Wilcoxon rank-sum test) across two subperiods are presented in braces and brackets, respectively.

portfolio	Past-week return					During Korean Crisis (Oct. 1, 1997–Dec. 27, 1997)					Difference in means and medians (before-during)				
	S1 (Smallest Cap.)	S2	S3	S4	S5 (Largest Cap.)	S1 (Smallest Cap.)	S2	S3	S4	S5 (Largest Cap.)	S1 (Smallest Cap.)	S2	S3	S4	S5 (Largest Cap.)
P1 (Lowest)	6.942 (4.04) 12.6	9.351 (5.61) 144	3.870 (3.09) 247	2.482 (2.53) 386	2.574 (4.18) 725	0.869 (0.30) 29	4.734 (1.85) 54	-0.521 (-0.40) 96	5.472 (3.22) 119	2.448 (2.43) 213	{1.79} [1.68]	{1.51} [1.44]	{2.44} [1.83]	{-1.52} [-1.54]	{0.11} [0.03]
P2	4.129 (2.62) 155	6.352 (4.68) 225	2.416 (1.96) 261	0.224 (0.28) 514	3.886 (6.39) 787	4.626 (1.92) 40	5.249 (2.58) 78	1.433 (0.85) 89	3.596 (2.35) 135	3.909 (4.13) 264	{-0.17} [0.04]	{0.45} [0.50]	{0.47} [0.18]	{-1.95} [-2.05]	{-0.02} [-0.01]
P3	4.344 (2.17) 112	6.427 (4.39) 201	2.341 (1.98) 254	2.491 (2.48) 363	3.165 (4.50) 639	2.854 (0.83) 30	8.261 (3.38) 44	0.524 (0.34) 98	0.694 (0.48) 107	3.901 (3.77) 203	{0.38} [0.29]	{-0.64} [-0.30]	{0.94} [0.63]	{1.03} [0.63]	{-0.59} [-0.48]
P4	8.236 (4.46) 12.6	5.855 (3.99) 202	3.353 (2.65) 237	3.907 (4.10) 399	3.654 (5.64) 729	1.236 (0.55) 37	1.228 (0.55) 55	0.941 (0.59) 93	1.035 (0.76) 151	6.488 (5.45) 242	{2.40} [2.12]	{1.74} [1.36]	{1.19} [1.02]	{1.73} [1.37]	{-2.09} [-1.64]
P5 (Highest)	2.592 (1.33) 10.5	0.522 (0.32) 154	4.541 (3.92) 264	4.294 (4.32) 383	3.501 (5.56) 733	6.098 (1.28) 22	3.785 (1.55) 56	5.389 (2.63) 97	2.307 (1.59) 118	4.235 (3.41) 193	{-0.68} [-0.33]	{-1.11} [-1.29]	{-0.36} [-0.23]	{1.13} [0.76]	{-0.53} [-0.28]

and stock market appreciation. Finally, in models that emphasize information asymmetries between domestic and foreign investors, as in Brennan and Cao (1997), foreign investors learn more from stock returns than domestic investors do because stock prices impound the information that domestic investors have, so price increases reveal the domestic investors' favorable information to foreign investors. Since this information leads investors to have more favorable expectations for stock returns, it leads them to invest more without acting irrationally.

Fig. 1 suggests that, if positive feedback trading by foreign investors had a significant impact on stock price behavior in Korea, it must have been subtler than implied by the most aggressive critiques of the influence of foreign investors. Fig. 2 shows the net buying of foreign investors on a daily basis. It is clear that, starting with the end of September 1997, foreign investors are net sellers every day for the stocks in our sample. This is consistent with a withdrawal of foreign equity investors. It has to be kept in mind, however, that when we look at levels of foreign ownership there is simply no collapse so that foreign investors must have bought stocks that were at the foreign ownership limit at the end of 1996 and sold stocks in our sample. At the same time, the behavior of the foreign investors in Fig. 2 is largely consistent with the view that these investors sell in falling markets and buy in rising markets. The periods of mostly foreign net buying occur when stock prices are increasing, and the periods of persistent net selling by foreign investors are periods of falling stock prices.

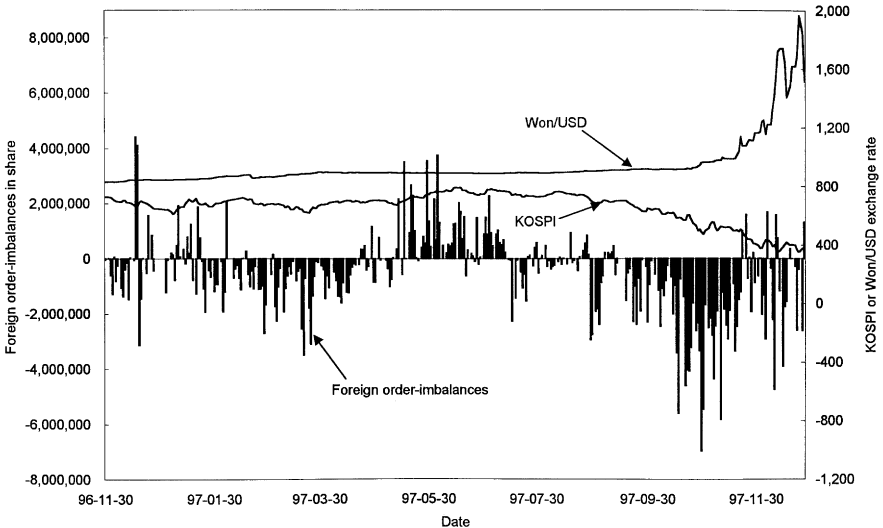


Fig. 2. Time-series plots of the daily foreign net buy-sell volume in shares (order imbalances) for the 414 sample stocks, the KOSPI daily index, and the Won/USD daily exchange rates for the period of Nov. 30, 1996 to Dec. 27, 1997.

To investigate whether the impression of positive feedback trading given by Fig. 2 is statistically significant, we consider the price-setting order imbalance of investors, conditioning on the sign of the market return of the prior day, of the same day, and of the next day. A stock's price-setting order imbalance is computed as the price-setting buy volume minus the price-setting sell volume by a class of investors for a day normalized by the stock's average daily price-setting volume over the sample period. In Table 5, we show equally-weighted averages of the normalized price-setting order imbalances across stocks.⁶ There is evidence that foreign investors buy following a positive market return and sell following a negative market return before the Korean crisis. The same is true, however, for Korean individual investors. The contemporaneous relation between order imbalance and the sign of the market return is dramatic for Korean individual investors. The order imbalances are much smaller in absolute value for foreign investors and institutional investors. Finally, there are no significant differences between order imbalances for positive or negative lead market returns for either domestic investors or foreign investors.

The results for the Korean crisis period are quite different for foreign investors. Irrespective of the market return, foreign investors are net sellers of shares following days with positive market returns. This is not surprising in light of Fig. 2. What is surprising, though, is that foreign investors sell more when the market is doing well than when it is doing poorly. Foreign investors have a significantly higher sell-order price-setting imbalance if the market was up the previous day than if it was down and they have a significantly higher sell-order imbalance if the market is up the same day than if it is down. Table 5 provides evidence that during the crisis Korean individual investors acted like positive feedback traders while foreign investors did not. Since domestic individual investors have large price-setting net buy order imbalances when the market was up the previous day or is up the same day, foreign investors are selling the most when domestic demand is the highest. This cannot be viewed as destabilizing behavior.

We also investigate the relation between the sign of the market return and total order imbalances but do not report the results. The results for foreign investors similarly support the positive feedback trading hypothesis. The key difference in the results has to do with Korean individual investors. The total order imbalances of Korean individual investors are systematically positive both before and during the crisis, thus absorbing the negative order imbalances of Korean institutions and foreign investors.

Western business hours are over when the Korean stock market is open. This raises the question of whether returns on Korean shares observed in New York affect the trading of foreign investors in Korea. We find that an equally weighted

⁶ Note that there is no reason for the averages to sum to zero across trader types.

Table 5
Price-setting order imbalances ($\times 100$) and market returns at the KSE from Dec. 2, 1996 to Dec. 27, 1997.

The price-setting order imbalance for each of the 414 stocks on day t is computed as daily price-setting buy volume less price-setting sell volume attributed to each type of investor (institutions, individuals, and foreigners), and then normalized by the stock's average daily price-setting volume over the period from Dec. 2, 1996 to Dec. 27, 1997. The table shows means of the daily normalized order imbalance ($\times 100$) on days of (lagged, current, and lead) market increases and decreases, separately, with the KOSPI index as the market. A t -test for the mean difference is reported in parentheses.

Market returns	(1) Institutions order imbalance	(2) Individuals order imbalance	(3) Foreigners order imbalance	Test of (3) – (1)	Test of (3) – (2)
<i>Before the Korean Crisis (Dec. 2, 1996–Sept. 30, 1997)</i>					
$R_{nr-1} > 0$ (108 days; 43,278 stock-days)	-0.559	0.471	0.190	(3.60)	(-1.25)
< 0 (134 days; 52,970 stock-days)	-0.841	-0.359	-0.143	(3.40)	(1.08)
t -statistics for mean difference	(1.12)	(3.18)	(2.23)		
$R_{nr} > 0$ (109 days; 43,652 stock-days)	-0.162	5.004	0.221	(1.51)	(-20.05)
< 0 (133 days; 52,596 stock-days)	-1.173	-4.127	-0.171	(5.96)	(21.19)
t -statistics for mean difference	(3.84)	(34.74)	(2.60)		
$R_{nr+1} > 0$ (109 days; 43,040 stock-days)	-0.580	-0.181	0.064	(2.56)	(1.10)
< 0 (133 days; 53,208 stock-days)	-0.823	0.172	-0.039	(4.59)	(-1.05)
t -statistics for mean difference	(0.91)	(-1.35)	(0.69)		
<i>During the Korean Crisis (Oct. 1, 1997–Dec. 27, 1997)</i>					
$R_{nr-1} > 0$ (29 days; 11,022 stock-days)	-7.810	5.561	-2.955	(7.96)	(-8.92)
< 0 (43 days; 15,846 stock-days)	-2.188	-0.381	-1.606	(1.69)	(-2.30)
t -statistics for mean difference	(-10.57)	(5.98)	(-2.96)		
$R_{nr} > 0$ (29 days; 10,923 stock-days)	-8.005	13.550	-3.130	(8.62)	(-19.07)
< 0 (43 days; 15,945 stock-days)	-2.089	-5.817	-1.494	(1.57)	(7.32)
t -statistics for mean difference	(-10.80)	(19.87)	(-4.05)		
$R_{nr+1} > 0$ (30 days; 11,133 stock-days)	-6.514	5.651	-2.104	(7.20)	(-8.81)
< 0 (42 days; 15,735 stock-days)	-3.065	-0.487	-2.199	(2.55)	(-2.90)
t -statistics for mean difference	(-6.33)	(6.37)	(0.22)		

portfolio of the returns of Korean ADRs for the NYSE trading day has no information for trading by foreign investors in Korea. In contrast, however, the return on the Korea Fund seems to affect trading by foreign investors in Korea. A positive (negative) open-to-close return on the Korea Fund is associated with a positive (negative) foreign order imbalance in Korea the next day. The difference in foreign order imbalances following a positive or negative open-to-close return on the Korea Fund is significant at the 10% level.

The fact that Western business hours are over when the Korean stock market opens creates the concern that the opening batch auction may be important for foreign investors. Results that use price-setting trades do not include that auction. In our sample of all trades by foreign investors, less than 5% of the trades by these investors take place during that auction. We nevertheless investigate the trades during the opening batch auction. Though we do not report these results, they are consistent with the results we have discussed. The mean order imbalance of foreign investors across stocks is positively related to the previous trading day market return, but not during the crisis period. Interestingly, this mean order imbalance is not related to the overnight market return. In contrast, the overnight market return has a positive effect on the opening trades of Korean individuals and a negative effect on the opening trades of Korean institutions.

Table 5 provides evidence on positive feedback strategies that are conditioned on the sign of the market return. The rationale for this dichotomous approach is that it is unlikely that foreigners are going to sell twice as much if the market falls by 6% instead of 3%. With this approach, we do not have to take a position on the precise relation between trades and the size of the market return. We also investigate a model in which trading depends linearly on the level of the market return. In results not reported, we estimate a pooled regression of daily price-setting order imbalances of individual stocks (normalized by daily average price-setting volume of the stock over our sample period) of the three groups of traders on the market return of the previous day and the current day. We use interactive dummy variables to evaluate differences in the impact of market returns on the trading of the three groups of investors. There is clear evidence of positive feedback trading by foreign investors in these regressions for the pre-crisis period, but it disappears for the crisis period. If we use the pooled regressions to estimate the impact of the daytime returns of the Korea Fund on the NYSE on trading by foreign investors in Korea, there is a positive insignificant effect both before and during the crisis. This suggests that the previous trading-day return on the Korean stock market has more influence on trading by foreign investors than the previous trading-day return of the Korea Fund on the NYSE for the period before the crisis.

In Table 6, we investigate the extent of positive feedback trading using individual stock returns rather than market returns. In Tables 6 and 7, we use the total order imbalances to include the opening and closing sessions. The

Table 6
 Order imbalances ($\times 100$) and individual stocks' lagged excess returns over market returns at the KSE from Dec. 2, 1996 to Dec. 27, 1997.
 The order imbalance for each of the 414 stocks on day t is computed as daily buy volume less sell volume attributed to each type of investor (institutions, individuals, and foreigners), and then normalized by the stock's average daily volume over the period from Dec. 2, 1996 to Dec. 27, 1997. The table shows means of the daily normalized order imbalances ($\times 100$) for quintile portfolios of stocks, P1(lowest) through P5(highest), formed based on lagged excess returns over market returns (KOSPI index), which are rebalanced daily. The t -statistics of the means are presented in parentheses, and t -tests for the mean difference across different investor types are also reported in parentheses.

Prior-day return portfolios	Number of days	(1) Institutions order imbalance	(2) Individuals order imbalance	(3) Foreigners order imbalance	Test of (3) – (1)	Test of (3) – (2)
<i>Before the Korean crisis (Dec. 2, 1996–Sept. 30, 1997)</i>						
$R_{it-1} - R_{m,t-1}$	241	-1.230 (-7.08)	2.167 (10.97)	-1.006 (-8.42)	(1.06)	(-13.75)
P1 (Lowest)	241	-0.469 (-3.25)	0.628 (3.72)	-0.258 (-2.49)	(1.19)	(-4.47)
P2	241	-0.036 (-0.22)	0.009 (0.05)	-0.075 (-0.58)	(-0.18)	(-0.39)
P3	241	0.050 (0.29)	-0.464 (-2.83)	0.421 (3.12)	(1.70)	(4.16)
P4	241	-0.412 (-1.88)	-0.181 (-0.71)	0.394 (2.31)	(2.91)	(1.88)
P5 (Highest)	241	0.818 (2.93)	-2.348 (-7.29)	1.400 (6.72)		
P5 – P1						
<i>During the Korean crisis (Oct. 1, 1997–Dec. 27, 1997)</i>						
$R_{it-1} - R_{m,t-1}$	72	-3.796 (-4.06)	5.982 (5.44)	-2.587 (-6.25)	(1.18)	(-7.29)
P1 (Lowest)	72	-2.388 (-2.48)	4.650 (4.19)	-2.644 (-6.49)	(-0.24)	(-6.17)
P2	72	-2.759 (-2.86)	4.570 (4.56)	-2.088 (-5.92)	(0.65)	(-6.27)
P3	72	-1.135 (-0.84)	2.858 (2.08)	-1.973 (-6.93)	(-0.61)	(-3.44)
P4	72	-2.709 (-3.66)	3.402 (3.83)	-1.191 (-2.63)	(1.75)	(-4.61)
P5 (Highest)	72	1.087 (0.91)	-2.580 (-1.82)	1.396 (2.28)		
P5-P1						

Table 7
 Cross-sectional averages of regressions of order imbalances ($\times 100$) on individual stock returns, market returns, and FX returns at the KSE from Dec. 2, 1996 to Dec. 27, 1997.

The order imbalance for each of the 414 stocks on day t is computed as daily buy volume less sell volume attributed to each type of investor (institutions, individuals, and foreigners), and then normalized by the stock's average daily volume over the period from Dec. 2, 1996 to Dec. 27, 1997. The table shows the cross-sectional averages of regressions of the normalized order imbalances ($\times 100$) of each investor type for each stock on the stock's returns, market returns (KOSPI index), and Won/USD FX returns. Each stock return is calculated as $R_{it} = \ln(P_{it}/P_{it-1}) \times 100$, and the FX returns is $S_t = \ln(S_t/S_{t-1}) \times 100$ where $S_t = (\text{Won}/\text{USD})_t$. The table presents cross-sectional means of the estimated parameters across sample stocks. The t -statistics of the cross-sectional means are presented in parentheses, and t -tests for the mean difference in the estimated parameters across different investor types are also reported in parentheses.

Dependent variable: Normalized order imbalance	Cross-sectional means of slope coefficients (t -statistics) for										Average Adj. R^2	Number of stocks
	Constant	R_{it-1}	R_{it}	R_{it+1}	R_{mt-1}	R_{mt}	R_{mt+1}	S_{t-1}	S_t	S_{t+1}		
<i>Before the Korean crisis (Dec. 2, 1996–Sept. 30, 1997)</i>												
(1) Institution's order imbalance	-0.383 (-3.26)	0.070 (1.93)	-0.324 (-7.09)	-0.152 (-4.38)	-0.155 (-2.53)	-0.043 (-0.71)	0.328 (5.58)	0.424 (1.38)	0.294 (1.15)	-0.743 (-2.26)	0.020	414
(2) Individual's order imbalance	0.394 (2.66)	-0.263 (-6.04)	0.055 (0.93)	0.264 (7.46)	0.172 (2.46)	0.486 (6.15)	-0.501 (-7.98)	-0.446 (-1.22)	-0.440 (-1.59)	0.412 (1.15)	0.040	414
(3) Foreigner's order imbalance	-0.083 (-0.72)	0.199 (6.70)	0.337 (7.87)	-0.109 (-4.25)	-0.026 (-0.44)	-0.472 (-7.14)	0.196 (3.78)	0.136 (0.45)	-0.084 (-0.39)	0.122 (0.55)	0.025	414
t -statistics for mean difference: (3)–(1)	(1.83)	(2.77)	(10.55)	(0.99)	(1.51)	(-4.77)	(-1.69)	(-0.67)	(-1.13)	(2.18)		
t -statistics for mean difference: (3)–(2)	(-2.54)	(8.76)	(3.84)	(-8.53)	(-2.16)	(-9.30)	(8.56)	(1.23)	(1.02)	(-0.69)		
t -statistics for mean difference: (2)–(1)	(4.11)	(-5.89)	(5.06)	(8.39)	(3.52)	(5.30)	(-9.64)	(-1.83)	(-1.95)	(2.38)		

During the Korean crisis (Oct. 1, 1997–Dec. 27, 1997)

(1) Institution's order imbalance	-2.747 (-6.52)	0.287 (3.17)	-0.100 (-0.72)	-0.142 (-1.54)	-0.927 (-7.78)	-0.544 (-3.62)	0.035 (0.36)	-0.196 (-2.38)	-0.167 (-1.64)	-0.044 (-0.77)	0.109	413
(2) Individual's order imbalance	4.808 (9.53)	-0.429 (-4.80)	-0.121 (-0.89)	0.215 (2.28)	1.010 (8.49)	1.090 (7.01)	-0.108 (-1.04)	0.227 (1.96)	-0.003 (-0.03)	0.018 (0.30)	0.116	413
(3) Foreigner's order imbalance	-2.262 (-8.57)	0.159 (2.67)	0.235 (4.05)	-0.077 (-1.98)	-0.116 (-2.11)	-0.511 (-7.27)	0.101 (1.79)	-0.060 (-0.79)	0.066 (1.70)	0.026 (0.56)	0.045	413
t-statistics for mean difference: (3)–(1)	(0.97)	(-1.18)	(2.22)	(0.64)	(6.17)	(0.19)	(0.58)	(1.22)	(2.14)	(0.95)		
t-statistics for mean difference: (3)–(2)	(-12.42)	(5.47)	(2.40)	(-2.87)	(-8.59)	(-9.38)	(1.77)	(-2.08)	(0.63)	(0.11)		
t-statistics for mean difference: (2)–(1)	(11.50)	(-5.63)	(-0.11)	(2.71)	(11.50)	(7.56)	(-1.00)	(2.98)	(1.13)	(0.75)		

results are similar if we use only price-setting imbalances. We proceed as follows. On a given day, we compute each stock's return in excess of the market. We rank these excess returns and form five portfolios each day. For each portfolio, we then compute the average of the normalized order imbalance of the stocks in the portfolio for the following day. The table shows that for foreign investors before the crisis the order imbalance increased monotonically with the stock returns on the previous day. The difference in order imbalance between the two extreme portfolios is highly significant. This evidence strongly supports the positive feedback trading hypothesis. In general, the order imbalances fall for individuals and increase for institutions as one moves towards the portfolio with the highest return. This is consistent with individuals being contrarians and institutions being positive feedback traders. However, institutions have sell-order imbalances for all portfolios except the fourth portfolio. When we turn to the results for the crisis period, the order imbalances generally increase for foreign investors as one moves from portfolio 1 to portfolio 5, but foreign investors are net sellers for all portfolios. Institutions are also net sellers, but the absolute value of their order imbalances first falls and then increases. Domestic individuals are net buyers, but they buy more of the stocks that have performed poorly. Except for the best-performing portfolio, the order imbalances of foreign investors and institutional investors are not statistically different both before and during the crisis. In contrast, the order imbalances of foreign investors are significantly different from the order imbalances of Korean individual investors for all portfolios but the middle one before the crisis and for all portfolios during the crisis.

We have now seen results relating order imbalances to the performance of the market and to the performance of individual stocks. We try to assess the relative importance of the market return and individual stock returns by estimating regressions of individual common stock order imbalances on measures of the market return, the stock return, and the foreign exchange return. In all our regressions, we include lagged, contemporaneous, and leading values of our independent variables. The average regression coefficients are reported in Table 7. Before the crisis, the average coefficient of the lagged individual stock return for foreign order imbalances is positive and significant, as one would expect if foreign investors are positive feedback traders. The coefficient of the lagged market return is negative and insignificant. This suggests that positive feedback trading is driven by individual stock returns rather than the market return. The foreign exchange returns do not seem to affect trading by foreign investors. Korean individual investors are again contrarian with respect to individual stock returns, but seem to be positive feedback traders with respect to the market return. Korean institutions are positive feedback traders for individual stocks and contrarian with respect to the market. During the crisis, foreign investors are still positive feedback traders at the individual stock level, but now they are significantly contrarian at the market level. As a result,

a stock's negative return has no impact on a stock's order imbalance if the market has a similar negative return. The lagged foreign exchange return does not matter, but there is weak evidence that the contemporaneous foreign exchange return has a positive effect, so that a depreciation is correlated with selling by foreign investors.⁷ For the crisis period, Korean individual investors are also contrarians with respect to individual stock returns, but positive feedback traders with respect to the market return. Again, Korean institutions behave in the opposite way and more like foreign investors. We also estimate the regressions of Table 7 with dummy variables for stocks affected by price limits at the end of the previous trading day, but our inferences do not change.

One concern with our tests of positive feedback trading is that we focus on normalized trades. The normalization by average price-setting volume that we use is helpful in understanding the importance of positive feedback trading relative to trading volume. We investigated whether the results that we report hold if we use dependent variables that are not normalized. In particular, we repeated all our tests using the fraction of the sum of the purchases and sales attributed to each type of investor (institutions, individuals, and foreigners) as the dependent variable. All our results hold up using this approach. They also hold if we use the price-setting purchases and sales. One might also be concerned that we condition on Won returns in our tests. Table 7 suggests that exchange rate returns are unlikely to affect our results. To make sure, we have also checked the results of Table 5 conditioning on dollar market returns, and we reach the same conclusions. Finally, all our tests use daily data. Tests that examine the existence of positive feedback trading over longer intervals would be useful, but we leave those for further research. Such tests would not enable us to study the crisis period separately as we did with daily data because there would be too few observations.

5. Do foreign investors have a destabilizing influence?

We have now seen that there is strong evidence of positive feedback trading and herding on the part of foreign investors, especially before the Korean crisis. The last question we want to address is whether these investors have a destabilizing influence. With the data available, we can address this issue by looking at whether large trading imbalances by foreign investors are followed by price continuations and by an increase in volatility. For that purpose, we

⁷ Bailey et al. (1998) find stronger evidence of a positive relation between currency depreciation and sales of equities using high-frequency data for Mexican ADRs and closed-end funds trading on the NYSE. They find that Peso depreciation is accompanied by an increase in transactions at the bid relative to transactions at the ask for these securities over half-hour intervals from December 21, 1994 to April 30, 1995.

conduct two event studies. The first study uses intraday returns, and the second uses daily returns. Our approach complements the studies that focus on the impact of capital market liberalization on stock market volatility. These studies generally find that opening a stock market to foreign investors does not increase its volatility [see Stulz (1999) for a review and Bekaert and Harvey (2000) for more recent evidence], but they do not directly consider whether trades by foreign investors can have a destabilizing impact. As discussed earlier, there are tax advantages for Korean investors trading out of Malaysia and Ireland. In results not reported here, we perform all the tests of this section excluding trades from Malaysia and Ireland. Our results are unchanged. We also perform the event studies during the crisis period for the 48 stocks that are at the ownership limit at the start of our sample period and find that trades by foreign investors have less impact on these stocks than on our sample stocks.

5.1. Intraday event study

We divide each day into 46 five-minute intervals from 9:30 to 15:00, treating the time interval of 11:30–13:05 as a single interval containing the lunch break and similarly the time interval of 14:45–15:00, which contains an order collection period for the close. We exclude Saturdays since we have much less freedom in choosing an event that has a sufficient number of intraday intervals prior to and after an event. For each of the intervals for each of the 414 stocks over the sample period, we compute foreign order imbalances by subtracting foreign sell volume from foreign buy volume during the interval. We then select the five intervals for net buy (positive) imbalances and net sell (negative) imbalances with the largest foreign order imbalances in absolute value for each of the 414 stocks. For each of the selected events, we examine stock returns from the previous fifth (-5) to the subsequent fifth ($+5$) interval surrounding the event. To avoid crossing day boundaries when we examine -5 to $+5$ intervals, the events are selected from the seventh interval (10:00–10:05) through the 41st interval (14:20–14:25), excluding the 25th interval (11:30–13:05), which contains a batch auction period. Among the events selected above, we exclude those with foreign order imbalances less than 1,000 shares in absolute value. The above sampling procedure is also applied to the case of the foreign price-setting volume.

Table 8 describes the samples constructed with our procedure. We report the results for the whole sample, the subperiod before the crisis, and the crisis period. Though we study the returns around the events using all the largest imbalances as well as the largest price-setting imbalances, we report only the results for the largest price-setting imbalances. These are trades initiated by foreign investors, so we expect the impact of their imbalances to be the largest. For each class of events, we report raw returns, mean-adjusted returns, and the absolute value of the mean-adjusted returns as a measure of volatility. We

Table 8

Descriptive statistics of large foreign order imbalances (in shares) in five-minute intervals.

For each of the 414 stocks at the KSE from Dec. 2, 1996 to Dec. 27, 1997, the foreign order imbalance (buy volume less sell volume) within a five-minute trading interval during continuous auction sessions (excluding Saturdays) is computed in two ways: one is based on all foreign trades and the other based on foreign price-setting trades. Among these, five intervals with the largest order imbalances in terms of net buy, net sell, price-setting net buy, and price-setting net sell are selected for each stock, but excluding those with less than 1,000 shares. The results are presented below for the full sample period and two subperiods before and during the Korean crisis.

Descriptive statistics	Net buy order imbalances			Net sell order imbalances		
	Full sample	Before crisis	During crisis	Full sample	Before crisis	During crisis
Nobs	1,970	1,685	285	2,009	1,444	565
Mean	19,860	20,132	18,255	20,964	16,255	33,000
Maximum	2,000,000	2,000,000	292,760	1,387,500	315,840	1,387,500
Q3	15,100	15,000	17,020	19,790	15,000	30,000
Median	6,180	6,140	6,810	8,160	6,990	12,000
Q1	3,000	3,000	3,890	4,000	3,685	5,000
Minimum	1,000	1,000	1,000	1,000	1,000	1,000

Descriptive statistics	Price-setting net buy order imbalances			Price-setting net sell order imbalances		
	Full sample	Before crisis	During crisis	Full sample	Before crisis	During crisis
Nobs	1,826	1,595	231	1,915	1,386	529
Mean	17,849	17,103	22,998	16,602	14,070	23,235
Maximum	2,000,000	2,000,000	463,000	1,387,500	316,400	1,387,500
Q3	13,070	12,250	16,970	14,230	11,140	20,000
Median	5,490	5,330	6,140	5,590	5,000	9,000
Q1	2,700	2,610	3,000	3,000	2,900	3,820
Minimum	1,000	1,000	1,000	1,000	1,000	1,000

obtain mean-adjusted returns by subtracting the sample mean return for the stock on the same day of the week and same time of day over the whole sample period as the event return to control for the well-known day-of-the-week effect as well as the time-of-the-day effect.

Panel A of Table 9 presents the returns for the five-minute intervals for the five intervals preceding the event and the five intervals after it. It is immediately apparent that the largest price-setting net buy order imbalances occur following positive returns for the stock, so that foreigners buy following price increases. The price increase continues for one period after the purchase by foreign investors, but then the returns are insignificantly different

Table 9

Intraday returns and volatility (%) around five-minute intervals of large foreign price-setting order imbalances.

The foreign price-setting order imbalance within a five-minute trading interval during continuous auction sessions for each of the 414 stocks at the KSE from Dec. 2, 1996 to Dec. 27, 1997, excluding Saturdays, is computed as foreign price-setting buy volume less price-setting sell volume. The samples in Panels A and B comprise the five intervals with the largest price-setting net buy and net sell order imbalances, respectively, for each stock, but excluding those of less than 1,000 shares. The Mean-adj ret for each interval is the mean of the interval return for the stock exceeding the mean observed on the same day of the week and same time of day over the sample period, and the |Mean-adj ret| is a measure of volatility computed as the mean of absolute values of the mean-adjusted returns. The CAR(0.5) is the cumulative returns from intervals 0 through 5, and the *t*-statistics are reported in parentheses.

Mean statistics	5-minute intervals relative to the foreign net buy order imbalance (interval 0)										CAR(0.5)	
	-5	-4	-3	-2	-1	0	1	2	3	4		5
<i>Panel A. Five-minute returns and volatility (%) around large foreign price-setting net buy order imbalances</i>												
<i>Full period (Dec. 2, 1996 to Dec. 27, 1997; N = 1,826)</i>												
Raw ret	0.059 (3.19)	0.065 (3.42)	0.021 (1.01)	0.072 (3.13)	0.155 (6.22)	0.649 (17.60)	0.109 (5.23)	0.004 (0.15)	-0.005 (-0.21)	-0.015 (-0.62)	-0.015 (-0.66)	0.728 (14.91)
Mean-adj ret	0.057 (3.14)	0.066 (3.51)	0.024 (1.15)	0.075 (3.31)	0.157 (6.39)	0.648 (17.75)	0.107 (5.20)	0.007 (0.31)	-0.003 (-0.12)	-0.014 (-0.59)	-0.012 (-0.57)	0.733 (15.18)
Mean-adj ret	0.401	0.396	0.427	0.464	0.516	0.959	0.483	0.505	0.449	0.481	0.429	
<i>Before the Korean crisis (Dec. 2, 1996 to Sept. 30, 1997; N = 1,595)</i>												
Raw ret	0.063 (3.46)	0.058 (3.34)	0.048 (2.61)	0.085 (4.34)	0.174 (8.05)	0.574 (17.54)	0.123 (5.79)	0.025 (1.09)	0.005 (0.24)	-0.014 (-0.64)	-0.035 (-1.88)	0.679 (14.80)
Mean-adj ret	0.062 (3.39)	0.059 (3.41)	0.052 (2.80)	0.088 (4.52)	0.176 (8.26)	0.575 (17.74)	0.122 (5.79)	0.029 (1.24)	0.007 (0.33)	-0.012 (-0.58)	-0.033 (-1.79)	0.687 (15.14)
Mean-adj ret	0.391	0.368	0.390	0.429	0.476	0.876	0.474	0.478	0.434	0.449	0.389	

During the Korean crisis (Oct. 1, 1997 to Dec. 27, 1997; N = 231)

Raw ret	0.026 (0.36)	0.114 (1.26)	-0.167 (-1.60)	-0.021 (-0.17)	0.025 (0.20)	1.166 (6.46)	0.012 (0.16)	-0.147 (-1.55)	-0.070 (-0.87)	-0.022 (-0.18)	0.125 (1.07)	1.064 (4.86)
Mean-adj ret	0.026 (0.37)	0.118 (1.32)	-0.167 (-1.61)	-0.012 (-0.10)	0.027 (0.21)	1.153 (6.46)	0.004 (0.05)	-0.141 (-1.49)	-0.067 (-0.85)	-0.025 (-0.21)	0.129 (1.11)	1.052 (4.85)
Mean-adj ret	0.470	0.589	0.680	0.700	0.795	1.533	0.545	0.692	0.552	0.704	0.705	

Panel B. Five-minute returns and volatility (%) around large foreign price-setting net sell order imbalances

Full period (Dec. 2, 1996 to Dec. 27, 1997; N = 1,915)

Raw ret	0.043 (1.79)	-0.008 (-0.31)	0.005 (0.25)	-0.021 (-0.91)	0.061 (2.61)	-0.639 (-17.43)	0.203 (6.94)	0.103 (4.47)	0.053 (2.51)	0.049 (2.37)	0.013 (0.58)	-0.218 (-4.86)
Mean-adj ret	0.042 (1.76)	-0.003 (-0.14)	0.010 (0.48)	-0.015 (-0.64)	0.065 (2.80)	-0.630 (-17.36)	0.203 (7.02)	0.103 (4.51)	0.053 (2.53)	0.051 (2.47)	0.016 (0.69)	-0.204 (-4.61)
Mean-adj ret	0.452	0.474	0.444	0.477	0.535	0.959	0.581	0.483	0.460	0.450	0.463	

Before the Korean crisis (Dec. 2, 1996 to Sept. 30, 1997; N = 1,386)

Raw ret	0.053 (2.72)	0.020 (0.92)	0.025 (1.15)	0.015 (0.70)	0.078 (3.19)	-0.487 (-14.23)	0.200 (7.52)	0.083 (3.59)	0.044 (2.04)	0.046 (2.13)	0.023 (1.02)	-0.091 (-1.98)
Mean-adj ret	0.051 (2.65)	0.023 (1.07)	0.028 (1.30)	0.022 (1.02)	0.083 (3.40)	-0.478 (-14.14)	0.202 (7.63)	0.085 (3.67)	0.044 (2.05)	0.048 (2.23)	0.025 (1.15)	-0.075 (-1.64)
Mean-adj ret	0.374	0.416	0.407	0.428	0.503	0.826	0.512	0.458	0.429	0.420	0.407	

During the Korean crisis (Oct. 1, 1997 to Dec. 27, 1997; N = 529)

Raw ret	0.018 (0.26)	-0.080 (-1.22)	-0.047 (-1.00)	-0.115 (-1.94)	0.018 (0.31)	-1.037 (-10.84)	0.209 (2.63)	0.154 (2.71)	0.078 (1.50)	0.057 (1.17)	-0.011 (-0.18)	-0.551 (-5.12)
Mean-adj ret	0.020 (0.28)	-0.073 (-1.12)	-0.038 (-0.82)	-0.110 (-1.90)	0.020 (0.36)	-1.027 (-10.84)	0.207 (2.63)	0.151 (2.68)	0.077 (1.50)	0.057 (1.19)	-0.009 (-0.15)	-0.544 (-5.13)
Mean-adj ret	0.658	0.624	0.538	0.604	0.618	1.307	0.761	0.549	0.541	0.530	0.610	

from zero. There is a large contemporaneous positive return with the event, so the large foreign net buy imbalance is associated with a large stock return. If there is positive information in the foreign net buy imbalance, it gets impounded in prices immediately, since five minutes later prices seem to have adjusted. The absolute five-minute return is obviously large for the event period, but there is little evidence of a persistent sharp increase in volatility following the event.

The patterns for events before the Korean crisis are quite similar to those we have just discussed for the whole sample period. The volatility five periods after the event is back to where it was five periods before the event. The patterns during the crisis are different, however. First, there is no longer any evidence that foreign net buy imbalances follow positive returns. Second, the impact of the event is larger. Third, the event seems to have no positive effect on subsequent returns. In particular, the return for the first period following the event is not significantly positive.

Although we do not report these results in a table, we perform several additional investigations to check the robustness of our conclusions. First, we compute returns around the largest net buy imbalances instead of the largest price-setting net buy imbalances. The only noticeable difference is that the event returns are substantially smaller. For the whole sample period, the average mean-adjusted return is 0.347%, in contrast to 0.648% in Table 9. This is not surprising, since the sample in Table 9 uses only trades initiated by foreign investors. Either way, it is clear that there is a significant positive return associated with the event. There is no evidence that large trades by foreign investors are associated with positive significant mean-adjusted returns beyond the next five minutes, so the market adjusts quickly and efficiently to the trades by these investors. Second, we estimate returns splitting the sample between stocks that hit the price limit during or at the end of the trading day and those that do not. Price limits do not appear to affect our results.

Panel B of Table 9 shows the analysis for the largest price-setting net sell events. One would expect this panel to have results that are symmetric to those in Panel A. Surprisingly, this is not the case. Looking at the subperiod before the crisis, the returns are not negative before the event. In fact, the returns in the period immediately before the event are significantly positive. There is a large negative return associated with the event. In absolute value, it is slightly less than the return for the event in Panel A. We observe significant positive returns for four periods after the event. As a result, the cumulative return associated with the event is small in absolute value and insignificant for mean-adjusted returns. Although there is at best a small permanent effect of sales by foreign investors, there is a temporary effect that is consistent with a reward for those who provide the liquidity to the market. It seems, therefore, that selling by foreign investors is followed by a reversal that is quite substantial in relation to

the event return. The evidence is similar on days that end with the price limit being binding. On these days, the positive returns following the event are not significant, but the price impact of foreign sales is completely reversed 25 minutes after the sale.

The patterns during the crisis are similar to those before the crisis, except that the event return is larger in absolute value. As a result, the reversals end up offsetting about half the price impact of the sale. Neither before nor during the crisis is there evidence that large foreign sales lead to a period of significant negative mean-adjusted returns. During the crisis, the largest net sell imbalances have an average mean-adjusted return of -1.027% , while the largest net buy imbalances have an average mean-adjusted return of 1.153% . There is therefore no evidence that sales by foreign investors lead to disproportionate event returns compared to purchases by foreign investors. Results are similar on days with binding price limits.

The evidence on the largest net sales by foreigners is comparable to the evidence for block sales in the U.S. Holthausen et al. (1990) investigate the adjustment of prices to block sales since block sales are initiated by the seller. They consider the 50 largest downtick transactions for 109 firms selected randomly from December 1, 1982 to January 31, 1984. They find that the trade impact of the block trade is a mean-adjusted return of -1.23% and that it is followed by a significant mean-adjusted return of 0.28% . Strikingly, we find similar stock price impacts for large sales by foreign investors in Korea, since we observe a mean-adjusted return of -1.027% for the five minutes when large sales take place followed by a mean-adjusted return of 0.207% over the next five minutes.

5.2. *Interday event study*

The sampling procedure for daily events is similar to the one described earlier. That is, we compute daily foreign order imbalances by subtracting foreign sell volume from foreign buy volume for the day for each of the 414 stocks (excluding Saturdays). We then select the five trading days with the largest absolute-value order imbalance for each of the 414 stocks. For each of the selected events, we examine stock returns from the previous fifth (-5) to the subsequent fifth ($+5$) trading day surrounding the event day. Among the selected events, we exclude those with daily foreign order imbalances less than 10,000 shares in absolute value. The above sampling procedure is also applied to the daily foreign price-setting volume. We ignore batch auction trades for the case of the price-setting volume, since it is impossible to define price-setting volume during batch auctions.

In the daily event study, we present the results using the five largest imbalances rather than the five largest price-setting imbalances for two reasons. First, as discussed above, for the price-setting imbalances we cannot capture all the

Table 11

Daily returns and volatility (%) around days of large foreign order imbalances.

The daily foreign order imbalance for each of the 414 stocks at the KSE from Dec. 2, 1996 to Dec. 27, 1997, excluding Saturdays, is computed as daily foreign buy volume less sell volume. The samples in Panels A and B comprise the five days with the largest net buy and net sell order imbalances, respectively, selected for each stock, excluding those with less than 10,000 shares. The Mean-adj ret for each day is the mean of the daily return for the stock exceeding the mean observed on the same day of the week over the sample period, and the Market-adj ret is the mean of the daily return exceeding the KOSPI index return. The |Mean-adj ret| is a measure of volatility computed as the mean of absolute values of the mean-adjusted returns. The CAR(0,1) is the cumulative returns from days 0 to 1, and the t -statistics are reported in parentheses.

Mean statistics	Days relative to the foreign net buy order imbalance (day 0)										CAR(0,1)	
	-5	-4	-3	-2	-1	0	1	2	3	4		5
<i>Panel A. Daily returns and volatility (%) around large foreign net buy order imbalances</i>												
<i>Full period (Dec. 2, 1996 to Dec. 27, 1997; N = 1,397)</i>												
Raw ret	0.227 (2.13)	0.297 (2.76)	0.227 (2.17)	0.640 (5.85)	1.016 (8.76)	1.340 (12.11)	-0.344 (-3.30)	-0.306 (-2.91)	-0.369 (-3.46)	-0.252 (-2.37)	-0.353 (-3.29)	0.996 (6.09)
Mean-adj ret	0.561 (5.18)	0.615 (5.66)	0.608 (5.71)	1.010 (9.14)	1.363 (11.56)	1.659 (14.84)	-0.026 (-0.24)	0.017 (0.16)	0.004 (0.03)	0.098 (0.90)	-0.028 (-0.26)	1.633 (9.88)
Market-adj ret	0.302 (3.29)	0.377 (4.04)	0.238 (2.60)	0.569 (6.02)	0.924 (9.17)	1.512 (15.16)	-0.244 (-2.70)	-0.300 (-3.29)	-0.215 (-2.39)	-0.003 (-0.03)	-0.170 (-1.85)	1.267 (8.77)
Mean-adj ret	3.062	3.106	3.037	3.204	3.535	3.510	3.001	2.971	3.016	3.061	3.061	3.061
<i>Before the Korean crisis (Dec. 2, 1996 to Sept. 30, 1997; N = 1,201)</i>												
Raw ret	0.582 (5.93)	0.613 (6.14)	0.454 (4.60)	0.740 (7.23)	1.312 (12.00)	1.718 (16.67)	-0.217 (-2.21)	-0.382 (-3.90)	-0.348 (-3.49)	-0.123 (-1.22)	-0.271 (-2.73)	1.502 (10.07)
Mean-adj ret	0.925 (9.26)	0.942 (9.32)	0.851 (8.51)	1.121 (10.86)	1.661 (14.91)	2.046 (19.62)	0.107 (1.08)	-0.056 (-0.56)	0.036 (0.35)	0.237 (2.31)	0.057 (0.57)	2.154 (14.29)
Market-adj ret	0.486 (5.27)	0.498 (5.33)	0.388 (4.34)	0.626 (6.68)	1.108 (11.19)	1.696 (17.73)	-0.219 (-2.38)	-0.349 (-3.86)	-0.245 (-2.73)	-0.056 (-0.62)	-0.215 (-2.35)	1.477 (10.74)
Mean-adj ret	2.690	2.715	2.676	2.809	3.196	3.234	2.599	2.536	2.606	2.679	2.609	2.609

During the Korean crisis (Oct. 1, 1997 to Dec. 27, 1997; N = 196)

Raw ret	-1.951 (-4.51)	-1.639 (-3.77)	-1.163 (-2.73)	0.029 (0.06)	-0.792 (-1.71)	-0.978 (-2.23)	-1.124 (-2.60)	0.157 (0.35)	-0.493 (-1.10)	-1.042 (-2.41)	-0.854 (-1.84)	-2.102 (-3.08)
Mean-adj ret	-1.670 (-3.82)	-1.388 (-3.17)	-0.881 (-2.04)	0.325 (0.70)	-0.460 (-0.98)	-0.716 (-1.63)	-0.842 (-1.92)	0.460 (1.01)	-0.194 (-0.43)	-0.759 (-1.74)	-0.552 (-1.19)	-1.558 (-2.26)
Market-adj ret	-0.829 (-2.63)	-0.363 (-1.08)	-0.683 (-1.98)	0.218 (0.62)	-0.205 (-0.55)	0.383 (0.98)	-0.397 (-1.27)	0.001 (0.00)	-0.028 (-0.09)	0.324 (0.89)	0.108 (0.32)	-0.014 (-0.02)
Mean-adj ret	5.342	5.502	5.249	5.627	5.617	5.205	5.460	5.638	5.529	5.402	5.827	

Panel B. Daily returns and volatility (%) around large foreign net sell order imbalances

Full period (Dec. 2, 1996 to Dec. 27, 1997; N = 1,588)

Raw ret	-0.334 (-3.15)	-0.325 (-3.02)	-0.638 (-5.69)	-0.639 (-5.51)	-0.151 (-1.24)	0.497 (4.12)	0.152 (1.33)	-0.390 (-3.52)	-0.452 (-4.17)	-0.454 (-4.14)	-0.464 (-4.26)	0.648 (3.66)
Mean-adj ret	-0.038 (-0.36)	0.009 (0.08)	-0.242 (-2.13)	-0.290 (-2.47)	0.161 (1.31)	0.824 (6.75)	0.467 (4.03)	-0.047 (-0.42)	-0.057 (-0.53)	-0.091 (-0.82)	-0.157 (-1.42)	1.291 (7.15)
Market-adj ret	-0.090 (-1.02)	-0.093 (-1.03)	-0.285 (-3.08)	-0.323 (-3.47)	-0.094 (-0.87)	0.266 (2.39)	0.373 (3.86)	0.037 (0.40)	-0.064 (-0.73)	-0.230 (-2.48)	-0.221 (-2.45)	0.639 (4.07)
Mean-adj ret	3.304	3.310	3.471	3.652	3.927	4.064	3.665	3.474	3.384	3.377	3.571	

Table 11 (continued)

Mean statistics	Days relative to the foreign net buy order imbalance (day 0)											CAR(0,1)
	-5	-4	-3	-2	-1	0	1	2	3	4	5	
<i>Before the Korean crisis (Dec. 2, 1996 to Sept. 30, 1997; N = 1,079)</i>												
Raw ret	0.389 (3.71)	0.361 (3.42)	-0.024 (-0.22)	-0.104 (-0.94)	0.424 (3.45)	0.744 (5.79)	0.318 (2.73)	-0.305 (-2.76)	-0.239 (-2.38)	-0.282 (-2.80)	-0.212 (-2.01)	1.062 (5.88)
Mean-adj ret	0.703 (6.60)	0.712 (6.64)	0.403 (3.62)	0.265 (2.37)	0.752 (6.08)	1.086 (8.37)	0.648 (5.46)	0.042 (0.38)	0.175 (1.73)	0.099 (0.97)	0.110 (1.03)	1.733 (9.43)
Market-adj ret	0.293 (3.05)	0.261 (2.67)	0.008 (0.08)	-0.054 (-0.53)	0.395 (3.36)	0.657 (5.46)	0.446 (4.13)	-0.121 (-1.17)	-0.137 (-1.50)	-0.248 (-2.64)	-0.191 (-1.97)	1.104 (6.61)
Mean-adj ret	2.668	2.687	2.751	2.769	3.180	3.537	3.025	2.808	2.540	2.505	2.623	
<i>During the Korean crisis (Oct. 1, 1997 to Dec. 27, 1997; N = 509)</i>												
Raw ret	-1.865 (-8.10)	-1.778 (-7.49)	-1.940 (-7.70)	-1.773 (-6.59)	-1.368 (-5.09)	-0.028 (-0.11)	-0.201 (-0.79)	-0.572 (-2.25)	-0.903 (-3.45)	-0.817 (-3.08)	-0.999 (-3.93)	-0.229 (-0.58)
Mean-adj ret	-1.609 (-6.89)	-1.482 (-6.18)	-1.611 (-6.31)	-1.466 (-5.39)	-1.092 (-4.03)	0.269 (1.03)	0.083 (0.32)	-0.235 (-0.92)	-0.549 (-2.08)	-0.493 (-1.85)	-0.722 (-2.81)	0.352 (0.87)
Market-adj ret	-0.902 (-5.07)	0.843 (-4.55)	-0.906 (-4.93)	-0.896 (-4.64)	-1.131 (-5.00)	-0.562 (-2.43)	0.218 (1.11)	0.374 (1.91)	0.090 (0.47)	-0.192 (-0.92)	-0.283 (-1.47)	-0.345 (-1.03)
Mean-adj ret	4.651	4.630	4.995	5.522	5.511	5.181	5.023	4.885	5.175	5.225	4.956	

market-adjusted returns are significantly positive every day before the event. On the day of the event, there is a large positive significant abnormal return. In contrast to the intraday results, however, there are reversals over the next five days when we use raw or market-adjusted returns. During the crisis, foreigners no longer appear to buy following positive significant abnormal returns. Furthermore, there is no significant impact on the day of the event. Using market-adjusted returns, there is no reversal following the event. The same results apply to days when the price limit is in force at the end of the day.

As with the intraday results, there is a noticeable lack of symmetry between net buy and net sell events. For net sell events, we have the surprising result before the crisis that on net sell days market-adjusted returns are positive. This again suggests that what matters when foreigners sell is that domestic investors buy. The positive market-adjusted return is surrounded by days with positive market-adjusted returns. There are, however, significant negative market-adjusted returns on days +4 and +5. When we look at days when the price limit is hit, the results are similar. When we look at the crisis period, we find that foreign investors sell following significant negative market-adjusted returns. There is a negative market-adjusted return on the event day, and it is followed by five days without a significant negative market-adjusted return. The market-adjusted return on the day that foreign investors sell and on each of the next five days is smaller in absolute value than the market-adjusted return of any of the five days that precede the event day. There is no permanent significant negative effect following large sales by foreign investors. For the sample of events in which the price limit is hit on the event day, the pattern is similar, but the market-adjusted returns are insignificant except for a positive significant market-adjusted return on day +2. Overall, there is no evidence that large foreign sales directly cause falling stock prices.

6. Conclusion

In this paper, we use a large sample of Korean stocks to explore how foreign investors trade and how they impact stock prices. We find evidence that, before the Korean crisis over the last months of 1997, foreign investors engage in positive feedback trading and herd. During the crisis, the evidence of positive feedback trading is much weaker. There is no evidence that herding is more important during the crisis period, and some evidence that it is less important. Neither positive feedback trading nor herding, however, are necessarily destabilizing. When we investigate the impact of episodes of heavy foreign trading on stock prices during the day, or across days, no convincing case can be made that foreign equity investors play a destabilizing role in the equity markets. Although policymakers are often concerned about foreign equity investors because they can withdraw their capital from a country rapidly, it is important

to remember that equity markets have built-in mechanisms that can make foreign equity investors stay when creditors do not. In efficient markets, asset prices fall to reflect new adverse public information even in the absence of trades. After the new information is incorporated into prices, the incentive to sell is no longer as powerful, since one sells at a fair price. With bank loans, however, this mechanism does not work. Loans still have to be paid in full even after adverse information becomes known, so that a creditor wants to take his money out while he can, before the loan has to be renegotiated or the firm goes bankrupt.

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