Do domestic investors have an edge?

The trading experience of foreign investors in Korea

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Abstract

We exploit a unique dataset to shed new light on the issue of whether domestic investors have an edge over foreign investors in trading domestic stocks by investigating whether foreigners pay more for stocks when they buy and receive less when they sell. Using trade data from Korea from December 1996 to November 1998, we show that the price that foreign investors pay is roughly 0.30 percent higher than the price domestic institutions pay and the price that foreign investors receive is roughly 0.30 percent lower than the price domestic institutions receive for medium and large trades when controlling for firm and stock characteristics as well as contemporaneous market performance; the disadvantage of foreign investors relative to individual investors is much smaller and does not exist for smaller trades. Foreign investors perform more poorly when they trade more intensively, which could be consistent with them being more impatient for larger trades because of liquidity or information reasons. However, there is no evidence that foreign investors have a higher permanent or temporary price impact when they trade intensively.

1. Introduction.

For a long time, the consensus among financial economists as well as among finance academics and practitioners has been that a country's domestic investors have an advantage in trading stocks in their country over foreign investors. A leading explanation for this advantage has been that domestic investors have superior information, but other explanations have been advanced also. For instance, it has been argued that regulators might be more tolerant of domestic investors or even biased against foreign investors. This view that domestic investors have an edge over foreign investors has been used to explain empirical regularities such as the home bias, the volatility of capital flows, and herding among foreign investors. However, recently, a number of papers have provided results that are inconsistent with this view.[1]

In this paper, we use a unique dataset to shed new light on the issue of whether domestic investors have an edge over foreign investors in trading domestic stocks by investigating whether foreigners pay more for stocks when they buy and receive less when they sell. One advantage of such an investigation is that it relies less on models of expected returns than existing papers that examine the performance of foreign investors compared to domestic investors. Using a dataset of all trades on the Korean stock exchange from December 2, 1996 to November 30, 1998, we find evidence that foreign investors are at a disadvantage for medium and large trades but not for small trades. Compared to domestic institutions, foreign investors pay roughly 0.30 percent more when they buy and receive roughly 0.30 percent less when they sell for medium and large trades after controlling for possible determinants of trade prices. This means that on a roundtrip trade foreign investors would face greater transaction costs of the order of 0.60%, which would be substantial for any foreign investor who is not a long-term buy-and-hold investor. For instance, an investor who trades three times in the year would contemplate a drag on his performance of 180 basis points. To put this in perspective, the roundtrip edge we estimate is of the same magnitude as

[1] See, for instance, Grinblatt and Keloharju (2000), Seasholes (2000), and Froot and Ramadorai (2001).

the difference in the monthly estimates of Jensen's alpha between the top decile and the bottom decile of diversified mutual funds in the U.S. of 0.67% from 1963 through 1993 reported by Carhart (1997). In other words, the roundtrip edge could have a substantial impact on the performance of a fund. The extent to which foreign investors trade at worse prices relative to Korean individuals is related to proxies for information asymmetries about firms, namely the book-to-market ratio of the stock and the bid-ask spread of the stock. However, when we compare the prices at which Korean institutions and foreign institutions trade, proxies for information asymmetries are not significant, so that domestic investors do not have a bigger edge over foreign investors for more opaque firms.

All our regressions show that foreigners trade at less advantageous prices when they trade intensely. This could be the case because foreigners are more impatient rather than because they are at a disadvantage. Foreign investors might be more impatient than local investors because of different liquidity concerns or because the private information they have becomes public more quickly. To find out whether foreign investors are more impatient, we investigate stock returns during and following short periods of intense trading by Korean individuals, Korean institutions, and foreign institutions. None of our evidence suggests that foreign investors are more impatient or better informed than domestic investors. The returns associated with periods of intense trading are consistent with Korean individuals being better informed than foreign institutions. There is little difference between the returns associated with intensive trading by Korean institutions and foreign institutions.

As far as we know, this is the first paper that compares in any country the prices domestic and foreign investors pay or receive when they trade. More effort has been expended on understanding whether foreigners earn more or less than domestic investors on their investments in stocks. Studies that evaluate investment performance face the problem that their results are sensitive to how they control for priced risk. In contrast, when comparing prices within a calendar day, control for risk priced in asset pricing models is

not important, so that the conclusions one reaches do not depend on the choice and parameters of asset pricing models.

The controls for risk may partly explain why there is no agreement in the literature on whether foreigners perform better than domestic investors and on whether domestic investors have an information advantage. Hau (2001) investigates trading data for professional investors. In his work, he shows that local investors perform better than other investors. However, his paper is focused on professional investors only and looks at the performance of traders over time rather than whether they buy or sell at advantageous prices. Other papers look at the performance of foreign investors compared to the performance of domestic investors over periods of various lengths. Grinblatt and Keloharju (2000) and Seasholes (2000) argue that as a result of their better access to expertise and talent, foreign institutions should perform better than domestic institutions. Using daily data for the 16 largest Finnish stocks, Grinblatt and Keloharju (2000) find that over a two-year period foreigners and domestic financial corporations buy more stocks that perform well over the next 120 trading days than domestic individual investors, but their sample period is too short for them to conduct a study of holding period returns. Seasholes (2000) finds that foreign investors buy (sell) ahead of good (bad) earnings announcements in Taiwan while domestic investors do the opposite. Froot, O'Connell, and Seasholes (2001) and Froot and Ramadorai (2001) use flow data to show that foreign investors trade ahead of better returns. These papers are consistent with better information and greater sophistication on the part of foreign investors. However, evidence on the performance of foreign investors is mixed. For instance, Shukla and van Inwegen (1995) show that U.K. money managers underperform American money managers when picking U.S. stocks. Kang and Stulz (1997) using annual data for 18 years find no evidence that foreign investors outperform domestic investors in Japan. Coval and Moskowitz (2000), using only U.S. stock returns, provide evidence that investor location matters, in that mutual fund managers are better at picking stocks of firms that are close to where they are than stocks of firms from a more distant location.

Throughout the paper, we compare foreign investors to both domestic institutional investors and domestic individuals. Such a comparison is important for two reasons. First, foreign investors are mostly institutional investors. Consequently, we have to understand whether foreign investors differ from domestic investors as a group because they are foreign or simply because they are institutional investors. Second, in emerging markets, domestic institutional investors are not as important as they are in developed markets and their actions may at times be affected by political considerations. Foreign investors could do well compared to domestic institutions simply because their personnel is more experienced, has access to more proprietary research, and does not have to worry about trading to fulfill political objectives or to help out related companies.

The paper proceeds as follows. In Section 2, we introduce our data. In Section 3, we compare the prices at which various investor classes trade. In Section 4, we compare the price impact and the performance of intensive trading for domestic and foreign investors. We conclude in Section 5.

2. The Korea Stock Exchange and sample construction.

Over our sample period, the Korea Stock Exchange (KSE) holds two trading sessions on each weekday: a morning session and an afternoon session. 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 10 minutes of each day, when orders are collected for the closing batch auction. Trading prices during the rest of the trading hours are determined by continuous (or non-batch) auction. During our sample period, there is a morning session on Saturdays. 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 market orders are allowed as well.

The database we use includes all transactions on the KSE for the period from December 2, 1996 to November 30, 1998, which is compiled by the Institute of Finance and Banking (IFB) at Seoul National

University. 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. Institutions are further classified into various types of institutions, such as securities firms, mutual funds, banks, and insurance companies. Foreign investors in Korea have to register with the Financial Supervisory Service (FSS) and obtain an ID number before they can start trading stocks. Through this ID number, the FSS makes sure 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, 1997, 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, to 50% on December 11, 1997, to 55% on December 30, 1997, and finally to 100% on May 25, 1998. 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.

We have detailed ownership information for 1998. At the end of 1998, foreign investors owned 18% of the capitalization of Korean stocks. Domestic banks owned 7.30% of the Korean stock market, while domestic money managers owned 6.30%. Domestic institutional investors owned a smaller fraction of the Korean stock market than foreign investors. Korean corporations owned 19.80% of the market, while the government and government-owned firms owned 19.70% of the market. Finally, individuals owned 28.90% of the market. Compared to Western countries, few individuals owned stocks directly since only 4.1% of Korean domestics were investors in the market.

Most of the trading in the Korean stock market is done by individual investors. In 1998, 77.43% of the gross value of stock sales was by domestic individual investors. In contrast, 5.9% of the gross value of

stock sales was by foreign investors and 13.71% was by domestic institutional investors. The gross stock sales by the government and by corporations together represented only 2.88% of the gross stock sales. The fact that the trading of the government and of corporations represents such a small fraction of the overall trading explains why we do not focus on it in our study. With this data, domestic investors are more active traders than foreign investors and domestic individuals are more active traders than domestic institutions. This contrasts with the results of Tesar and Werner (1995) for more developed countries, where foreign investors are more active traders than local investors. Foreign investors sell stocks for a gross amount equal to 47% of their end-of-year ownership, while domestic individual investors sell stocks for a gross amount equal to 381% of their end-of-year ownership. Domestic institutions sell stocks for a gross amount of 143% of the value of their end-of-year holdings. Foreign investors are mostly institutions, but it follows that foreign institutions trade much less in Korea than domestic institutions.

Table 1 provides another way to look at the relative importance of individuals, domestic institutions, and foreign investors in the trading of Korean stocks. In this table, we divide up the day in segments. We see that individual investors account for more than half of the value of the stocks traded in each segment in the table. Except for the afternoon opening batch and the closing batch, the value of trades by foreign investors is lower than the value of trades by domestic institutions.

Figure 1 shows the cumulative net flows of various investor groups over our sample period against the backdrop of the ownership limit and the performance of the Korea stock market. Over the sample period, foreign investors never have net negative cumulative flows and neither do individual investors. Both foreign investors and Korean individual investors accumulate holdings of Korean stocks over the sample period by buying from Korean financial institutions that are net sellers over our sample period. This figure puts in perspective the impact of the Asian crisis on holdings of Korean stocks by foreign investors. Though foreign investors sold stocks at the height of the crisis, they did not sell enough to make their ownership of the Korean stock market fall below what it had been at the end of 1996. Since

the Korean stock market experienced dramatic changes during our sample period, we control for market conditions in our regressions.

Over our sample period there are three Korean 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. At most, New York trading affects the results for three stocks.

For the batch auctions, we cannot identify who initiates a trade. In contrast, for the trades that do not take place during the batch auctions, we can use either all trades involving an investor class or only trades initiated by that investor class. We call a trade initiated by an investor class a price-setting trade by that investor class. 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 where the buy (sell) order of the foreign investors came after the sell-side (buy-side) order and hence made the trade possible. We consider split trades originated from one order as one trade irrespective of whether we consider all trades or only price-setting trades.

3. Do foreign investors trade at worse prices?

In this section, we investigate whether the various investor classes trade at different prices. We include in our sample all days where foreign investors traded a stock. This means that we estimate whether foreign investors are at a disadvantage given that they trade. Our approach does not, therefore, address the extent to which foreign investors are at a disadvantage unconditionally. We do not attempt to

estimate what their disadvantage would be on days and for stocks where the disadvantage is large enough to make it uneconomical for foreign investors to trade.

For both domestic and foreign investors, we generally report results for three investor classes: (1) individual investors, (2) securities firms, mutual funds, and pension funds (money managers), and (3) banks, insurance companies, and merchant banks (banks). We do not report results for resident foreign investors because their economic importance is trivial. We also ignore government and corporate holdings.

Define P_i^{dt} as the price of stock *i* on day *d* for trade t and V_i^{dt} as the size of the trade for stock *i* on day *d* for trade *t*. We first compute the volume-weighted average price at which the stock traded using all trades on that day:

$$A_i^d = \frac{\sum_t P_i^{dt} V_i^{dt}}{\sum_t V_i^{dt}}$$

We then compute the volume-weighted average price for all purchases and sales, respective, involving the investor class we are interested in:

$$B_{i,j}^d = \frac{\sum_t P_{i,j}^{dt} V_{i,j}^{dt}}{\sum_t V_{i,j}^{dt}}$$

where the subscript *j* denotes the investor class *j*. We finally compute the price ratio, $B_{i,j}^d / A_i^d$, which is the average price for all purchases (or sales) all trades for a stock on a given day. The price ratio for purchases (sales) would be greater (less) than one if the investor class trades at a disadvantage.

In the remainder of this section, we first provide evidence on the ratios over our sample period for the various investor classes for buy and sell trades. We then investigate the determinants of these ratios across stocks using cross-sectional regressions.

3.1. Trade prices of foreign and domestic investors.

The equally-weighted average of these ratios across days and stocks for each investor class is shown in Panel A of Table 2 for purchases for each investor class. In other words, for foreign money managers, the ratio gives us the equally-weighted average across stocks and days of the volume-weighted average price at which they bought stocks normalized by the volume-weighted average price at which the stocks traded on the days they were bought. Looking at the foreign money managers in Panel A of Table 2, we see that the ratio (multiplied by 100) is 99.988, which is insignificantly different from 100. This means that foreign money managers do not trade at prices significantly different from the average price in a day. However, they trade at significantly higher prices than Korean individuals. The ratio for foreign money managers is higher than the ratio of Korean individual investors by 0.15. This means that foreign money managers buy stocks at a price that is on average 0.15% greater than the average daily price relative to Korean individual investors. The t-statistic for this difference is 10.50.

Differences in the size of trades across groups could explain our results. For instance, it could be that domestic individuals make more small trades and that the prices for these trades are more advantageous. To examine the impact of trade size on our results, we divide trades into small, medium, and large trades. Small trades are trades for less than 5M won, while medium trades are between 5M and 50M won, and large trades are trades for more than 50M.[2] Small trades are overwhelmingly by domestic individuals during our sample period. 53.9% of daily trades are small trades by individuals. Another 29.96% are medium-size trades by individuals. The small and medium trades of foreign investors represent 1.93% and 3.60%, respectively, of daily trades.

We find that for small-size trades, there is no evidence that foreigners are at a disadvantage. They trade at the same prices as individuals and at better prices than domestic institutions. However, foreign money managers trade at worse prices than domestic individuals and domestic institutions for medium

[2] The 5 million won is roughly equivalent to U$4,200 at the exchange rate of 1,200 won per U$. The cutoff in won value rather than in shares is chosen to control for the differences in prices across stocks.

trades and at worse prices than domestic institutions for large trades. Strikingly, domestic institutions pay significantly lower prices for large purchase trades than either domestic individual investors or foreign investors. In particular, domestic money managers pay 0.14% less than foreign money managers.

As shown in Choe, Kho, and Stulz (1999), foreign investors are momentum traders. This creates a concern with our results. Suppose the stock price increases early in the day, leading to purchases by foreign investors later in the day. Since foreign investors buy after the stock's price has increased, they will necessarily appear to be buying at a high price compared to the average price during the day. To make sure that we do not conclude that foreigners buy at a higher price because they are momentum traders, we also compared the price foreigners pay to the end-of-day price. Using closing prices as a benchmark changes none of our conclusions. For instance, for large trades, the average difference in price between domestic money managers and foreign money managers is the same to two decimals.

Let's now turn to Panel B of Table 2, where we investigate the selling trades of investors. The average selling price ratio for foreign money managers is significantly below one, so that they sell at a lower price than the average price during the day. Foreign investors sell at worse prices than domestic individuals and domestic banks, but not than domestic money managers. When we split trades according to their size, we find that again foreign money managers are at a disadvantage for medium and large trades. For small trades, they sell at worse prices than individuals but at higher prices than domestic money managers. For medium and large trades, they sell at lower prices than Korean individuals and money managers. The same results hold when we use closing prices.

A concern with our sample period is that it includes the East Asian crisis. Could it be that our results are due to some of the dramatic days of the crisis in Korea? Or, alternatively, could our results be dampened by the days during the crisis with large absolute returns? We selected seven two-day periods

during the crisis that are associated with major events.[3] We find that foreign investors are at a disadvantage relative to domestic institutions if they buy when a positive event takes place and when they sell when a negative event takes place.

3.2. The determinants of trade prices.

In Table 2, we show that foreign investors trade at less advantageous prices. We now estimate multiple regressions to investigate how the extent to which domestic investors have an edge over foreign investors differs across stocks. In these regressions, we attempt to control for variables that are correlated with differences in trading styles across investors and differences in firm characteristics. The difference in the daily average price ratios is regressed on a constant, dummies for medium and large size trades, dummy for large size trades, and variables that control for information asymmetries, market conditions, past returns, and intra-day momentum. All foreign investors are aggregated in one group. The regressions are also estimated on subsamples where the sample firms are split into three groups according to firm size. We do not report these regressions in a table but discuss them in the text.

Panel A of Table 3 provides descriptive statistics for the explanatory variables. We use trade-size dummies in our regressions to investigate whether trade price differences between domestic and foreign investors depend on the trade size. We then control for stock characteristics, stock returns, and the market return. It is often argued that information asymmetries fall as firms get larger. Further, firms with more

[3] The events we selected are: 1) currency devaluation on 11/17/97 in Korean time (Event days = 11/15/97 and 11/15/97); 2) seek for IMF help on 11/21/97 in Korean time (Event days = 11/20/97 and 11/21/97); 3) resume talks on rescue package on 12/01/97 in New York time (Event days = 12/01/97 and 12/02/97); 4) agreed on terms of the rescue package on 12/04/97 in New York time (Event days = 12/04/97 and 12/05/97); 5) speed up delivery of the rescue loan on 12/15/97 in New York time (Event days = 12/15/97 and 12/16/97); 6) rollover short-term bank debt on 12/30/97 in New York time (Event days = 01/03/98 and 01/05/98); 7) agreed new loans to Korean banks on 01/29/98 in New York time (Event days = 01/30/98 and 01/31/98).

growth opportunities or lower book-to-market ratio may have more information asymmetries because intangible assets are harder to assess. If foreign investors are at a disadvantage when trading stocks where information asymmetries are more important, one would expect the difference between domestic and foreign investor trade prices to fall as the log of the market value of the firm's equity increases (lsize) and fall as the book-to-market ratio increases (btm). If foreign investors, perhaps because of momentum trading, are more impatient in their buying when the return on the market is higher and more impatient in their selling when the return on the market is lower, we should see a negative coefficient on the KOSPI index return (kret) on the same day. If investors are momentum traders, they are more likely to buy if the return of the stock in the recent past (ctc5) is high, if the overnight return (cto) is high, and if the contemporaneous return (otc) is high. Since foreign investors are more likely to be momentum traders than individuals and since the intensity of their momentum trading may differ from the intensity of the momentum trading of domestic institutions, we control for all these returns. Finally, we control for the average bid-ask spread prior to market close over the previous 50 trading days (avgbas), the stock's average volatility over the previous 50 trading days (avgsig), and the average turnover of the stock over the previous 50 trading days (avgturn). Specifically, the variables are constructed as follows:

- Firm characteristics and market return:
  (1) **lsize** = Log market value of equity on the previous day
  (2) **btm** = Book-to-market ratio on the previous day
  (3) **kret** = KOSPI index return for the day (%)
- Momentum-related characteristics:
  (1) **ctc5** = Previous 5-day return (%) (previous 6th day close to previous close)
  (2) **cto** = Overnight return (%) (previous close to opening price)
  (3) **otc** = Day-time return (%) (opening to closing price)
- Trade-related characteristics that proxy for liquidity and execution costs:

(1) **avgbas** = Average of previous 50 daily bid-ask spreads (at least 30 daily observations required), where daily bid-ask spread (%) = (ask-bid)/[(ask+bid)/2] prior to market close

(2) **avgsig** = Average of previous 50 daily volatilities (at least 30 daily observations required), where daily volatility (%) = (high-low)/[(high+low)/2]

(3) **avgturn** = Average of previous 50 daily turnover ratios (at least 30 daily observations required), where daily turnover ratio (%) = total share trading volume for the day / total shares outstanding for the firm

(4) **avgdf** = Buy (or sell) trade value differences between two investor types for a stock-day / total trade value for the stock-day (%)

In panels B and C of Table 3, we provide regression estimates from a pooled regression that uses all observations throughout the sample period. Alternatively, we also estimate the regression cross-sectionally for each day and estimate the *t*-statistics from the time-series of the coefficients. The advantage of this approach is that the *t*-statistics are conservative if the dependent variables observed daily are not independent across stocks, but the disadvantage is that we cannot use the market return as an explanatory variable. None of our conclusions change with these estimates.

Panel B estimates the regressions using the difference in buy price ratios between domestic individuals and foreign investors. Regression (1) uses as explanatory variables the dummies for trade size, the log of firm size, book-to-market, and the return on the Korean stock market. The only significant variable is book-to-market, showing that foreign investors buy at a less disadvantageous price when the firm has a higher book-to-market ratio or less information asymmetry since the book-to-market ratio is often used as a proxy for information asymmetries. Neither firm size nor the return on the Korean stock market are significant. The regression has little explanatory power in terms of the adjusted R-squared.

Regression (2) includes variables that control for returns of the stock and for other stock characteristics. When we use the bid-ask spread as a proxy for information asymmetries and the turnover ratio as a proxy for liquidity, foreign investors do worse trading stocks with greater information asymmetries and less liquidity. We also see that foreigners trade at better prices stocks that have performed well over the last five days and overnight. However, they perform worse for stocks that do well during the trading day. Surprisingly, the price foreigners pay relative to domestic investors increases with firm size when we include the additional explanatory variables. This is surprising since we would expect information asymmetries to be negatively related to size.

Regression (3) of the panel adds the difference in the value of the buy trades of individual investors and foreign investors. The significant positive coefficient for this variable indicates that the more domestic investors buy relative to foreign investors, the more advantageous the prices at which foreign investors trade. A one standard deviation increase in the difference of buy trades (48.44%) leads to an increase in the price domestic individual investors pay relative to foreign investors of roughly 0.15%. In that regression, the book-to-market ratio is no longer significant and size has a negative coefficient. The coefficient on the bid-ask spread is still significant and negative. A one standard deviation increase in the bid-ask spread (0.65%) corresponds to a decrease in the price paid by foreign investors relative to domestic investors of about 0.1%. The impact of a one standard deviation move in the other variables is less than 0.1%.

As shown in Choe, Kho and Stulz (1999) for Korea and Kang and Stulz (1997) for Japan, there is a size bias in holdings of stocks by foreign investors. We therefore look at subsamples based on firm size. Foreign investors are most active in the subsample of large firms and least active in the subsample of small firms. We find that the variables that are consistently significant across size subsamples are the bid-ask spread and the difference in trade value. However, if we estimate regression (1) on firm size groups, the firm-size variable (lsize) has a significant positive coefficient for large firms, indicating that foreign

investors are at less of a disadvantage for the largest firms. Yet, as for the sample as a whole, the coefficient becomes negative when we add the bid-ask spread to the regression.

Panel C has regressions comparing foreign investors to domestic institutions. These results differ somewhat from the results we found for individuals. In all the regressions, the dummies for medium and large trades are now negative and highly significant, so that foreign investors pay more than institutions for such trades taking into account firm characteristics and market returns. The difference in price for medium and large trades between domestic and foreign investors is between 0.3% and 0.4%. Book-to-market is positive and significant across all regressions. However, the bid-ask spread coefficient is positive with a much lower *t*-statistic than in Panel B. The difference in the amount of buying between domestic institutions and foreign investors has a significant positive coefficient which is similar to the one observed in panel B for the difference in the amount of buying between domestic individuals and foreign investors. When we split the sample according to firm size, we find that the disadvantage of foreign investors falls only very slightly for the largest firms. The bid-ask spread has a significant negative coefficient for large firms. The advantage of domestic institutions over foreign investors does not seem to be related to firm characteristics.

We now turn to sales. In contrast to the regressions for purchases, foreign investors are at a disadvantage for medium and large trades relative to domestic individuals when controlling for trade determinants. However, this disadvantage is only of the order of 0.05% to 0.15%. Regression (1) of Panel D shows that foreign investors sell at a lower price than domestic individuals for medium and large trades, for stocks of larger firms, and on days when the market is doing well. In Regression (2), we control for the bid-ask spread and other stock return characteristics. The significant coefficient on firm size disappears when we restrict our sample to large firms. Except for the coefficient for book-to-market, the coefficients from these regressions are mostly of the opposite sign of those of panel B. This is also the case when we split the sample according to firm size.

Panel E reports the regressions comparing the selling prices received by domestic institutions and foreign investors. The coefficients on the trade size dummy variables are positive and highly significant. Controlling for trade price determinants, foreign investors have a disadvantage relative to domestic institutions of the order of 0.30% for medium and large trades, but this disadvantage falls roughly in half for firms in the top size tertile. Book-to-market has a significant negative coefficient, indicating that foreigners are less at a disadvantage in selling stocks with a high book-to-market coefficient, which presumably are stocks of firms where information asymmetries are less important. The bid-ask spread does not seem to matter, but the difference in sell trade values as a significant negative coefficient, so that the disadvantage of foreign investors worsens as they sell more relative to domestic institutions.

4. The price impact of intensive buying and selling by investor classes.

So far, we have evidence that foreigners are more at a disadvantage for larger trades. This is the case because the dummy variables for medium and large trades show an edge for domestic institutions when foreigners buy and for both domestic individuals and institutions when foreigners sell. This is also the case because for all our regressions foreign investors are at more of a disadvantage as they trade more in a day relative to domestic investors. Why do foreign investors pay more and receive less when they trade more? There is at least one explanation that is inconsistent with foreign investors being at a disadvantage: foreign investors could simply be more impatient than domestic investors when they trade intensely. This greater impatience could be due to differences in liquidity concerns or because they have private information that is more short-lived than for domestic investors. To investigate this possible explanation, we examine the intra-day returns during and following periods of intense trading by domestic individual investors, domestic institutions, and foreign institutions. If foreign investors are more impatient, their trades should have more of a temporary impact relative to the trades of domestic investors. If they are better informed, they should have more of a permanent impact.

To construct our sample of intra-day intensive trading, we use stocks for which we have at least 300 days with trading on the day and on the previous day. Further, we eliminate all stocks whose price falls below 1,000 won during the sample period. We end up with a sample of 512 stocks out of a possible 785 stocks. We then divide each week day into 47 five-minute intervals from 9:30 a.m. to 15:00 p.m., treating the time interval of 11:30 a.m. to 13:05 p.m. as a single interval containing the lunch break and similarly for the time interval of 14:50 p.m. to 15:00 p.m., which contains an order collection period for the close. For Saturdays, we have 23 five-minute periods. We look at returns for the 10 five-minute periods preceding the event and the 10 subsequent five-minute periods. We allow the sequence of five-minute periods to cross day boundaries. When they do, we count the overnight return as a five-minute period.

For each of the intervals for each of the 512 stocks over the sample period, we compute price-setting order imbalances by an investor type by subtracting the price-setting sell volume from the price-setting buy volume. We then select 10 intervals with the largest net buy price-setting imbalances and 10 intervals with the largest net sell price-setting imbalances for each stock and each investor type. For each of the selected events, we examine stock returns from the previous tenth (D-10) to the subsequent tenth (D+10) intervals surrounding the event. We report raw stock returns as well as returns adjusted for the sample average for the same day of the week and the same time interval.

We first consider the largest price-setting imbalances by foreign investors in Panel A of Table 4. A period of intensive buying follows a series of positive returns. Net buy imbalances have a strong positive mean-adjusted return of 1.04% during the intense buying interval (D0). Interval (D+1) is still positive, but not significantly so. After that, there is a string of negative returns.

If the period of intensive trading leads to a greater price increase than the price increase in the long-run resulting from the information conveyed by the intensive trading, perhaps because a compensation is required for liquidity providers, one can expect the excess in the price increase to disappear over the next few periods. Consequently, we measure the permanent effect of the intensive trading by the cumulative

abnormal return from the end of the period immediately preceding the intensive trading to 10 periods after the intensive trading period, CAR(0,+10). If stock prices adjust completely to the new information over the 10 periods following the intensive trading period, the cumulative abnormal return from interval +1 to interval +10, CAR(+1,+10), corresponds to the transitory part of the return associated with the intensive trading period, which we call the temporary price effect following Holthausen, Mayers, and Leftwich (1987). Panel A of Table 4 shows that the permanent effect of the intensive buying by foreign investors is 0.897% in contrast to the temporary effect which is a significantly negative -0.144%. This pattern of returns is consistent with foreign investors compensating liquidity providers.

When we turn to intensive selling intervals, we find that intensive selling periods follow positive returns. The cumulative mean-adjusted return from D-10 to D-1 is 0.137%, in contrast to 0.314% for intensive buying intervals. The mean-adjusted return at D0 is –0.730%. The permanent effect is only –0.136% with a *t*-statistic of –2.97. In contrast, the temporary effect is 0.594% with a *t*-statistic of 13.37. The permanent effect of sales is therefore minimal and most of the price declines during the period of intensive selling reverses over the subsequent periods, and thus can be regarded as a compensation for liquidity providers.

We now compare the price impact of intensive trading by foreign investors to the price impact of intensive trading by domestic investors. Panel B of Table 4 shows that purchases by domestic institutions have a higher price impact than purchases by foreign investors. The D0 mean-adjusted return for institutions is 1.220% which is 0.179% more than for foreign investors. The permanent impact is 0.950%, which exceeds the price impact of trades by foreign investors by 0.053%. Looking at sell trades by domestic institutions, we find that institutions sell after positive returns. Their price impact at D0 is higher in absolute value since it is –0.933 compared to –0.730 for foreign investors, but the permanent impact is actually less for domestic institutions since it is –0.085% compared to –0.136% for foreign institutions.

Based on this evidence, one has to conclude that the differences in price impact between domestic and foreign institutional investors are small.

A legitimate question, however, is whether foreign institutions and domestic institutions trade in different amounts when they trade intensely. To address this question, we looked at matched intensive trading periods. For each period of intensive trading by foreign investors, we find a period of intensive trading by domestic institutions that has an order imbalance relative to the day's trading volume within 30% of the order imbalance of foreign investors during their intensive trading period. Though we do not reproduce the results in a table, we find that we cannot reject that the permanent or temporary price impact of intensive trading is the same for domestic and foreign institutions.

Panel C of Table 4 provides evidence for domestic individual investors. Domestic individual investors buy intensively after intervals of negative returns. We see that the immediate price impact of their buy trades is similar to the one of domestic institutions, but the permanent price impact is higher. Domestic individuals sell after intervals of positive returns. The immediate price impact of their sell trades is comparable to the one of domestic institutions, but the permanent price impact is higher also. For individual trades, the permanent price impact for sell trades is –0.456%, while for domestic institutions it is –0.085%. In other words, the permanent price impact of individual investors is consistent with them being better informed than either domestic or foreign institutions. Though not reported, it is striking that the relative size of the price-setting imbalances for our events of domestic institutions and foreign investors are roughly of the same size. For instance, the price-setting buy imbalance of foreign investors at D0 is 20.72% relative to the total trade volume of the day, while the price-setting buy imbalance of domestic institutions is 20.27%. In contrast, the price-setting buy imbalance of individuals is a much smaller 6.28%. In other words, individuals have a large permanent price impact out of trades that are less than a third the size of the trades of domestic or foreign institutions.

A concern with our results is that they could be driven by differences in firm and market condition characteristics. To control for these difference, we regress the permanent price impact of intensive trading on dummies for investor groups and the variables we used in the regressions reported in the previous section. In addition, we also control for whether a price limit is hit during the day because in that case it may take longer for the impact of the trading to work itself out.[4] The coefficient for the constant and investor dummies in Panels A and B of Table 5 show that the permanent price impact is larger for domestic individuals compared to domestic institutions and foreign investors for periods of intensive buying and of intensive selling. The differences in the permanent price impact are significant only for periods of intensive selling after taking into account control variables. Using a F-test, the difference between the coefficients for foreign investors and for domestic institutions is not significant. Consequently, both domestic and foreign institutions have less of a permanent price impact than domestic individuals, but convincingly so only for periods of intensive selling.

We provide the same regressions for the temporary price impact in Panels C and D. Periods of intensive buying by domestic institutions entail a more negative temporary price impact than either periods of intensive buying by domestic individuals or by foreign investors. For periods of intensive selling, both foreign investors and domestic institutions have a more positive temporary price impact than individuals and there is no difference between foreign investors and domestic institutions using an F-test.

These regressions indicate that there is no evidence that foreign investors' periods of intensive trading have a higher permanent price impact during a day. There is therefore no indication that foreign investors are somehow better informed. There is no indication either that they are more impatient than domestic

[4] The price limits have become wider over time: ±8% from 11/25/1996 to 2/28/1998, ±12% for the period from 3/2/1998 to 12/5/98, ±15% for the period from 12/7/1998 to now.

institutions, in that the temporary impact of their periods of intensive trading is never less than the temporary impact of periods of intensive trading of domestic institutions.

5. Conclusion.

In this paper, we examined whether foreign investors pay more than domestic investors when they buy shares and receive less when they sell shares. We find that they do controlling for firm characteristics and market conditions, but more so compared to domestic institutions than to domestic individual investors and only for medium and large trades. The absolute value of the difference between the price for domestic institutions and foreign investors is roughly 0.30% for medium and large trades, but that difference is smaller for large firms. As discussed in the introduction, the roundtrip difference is roughly equivalent to the difference in Jensen's alpha between the top and bottom decile of mutual funds in the U.S. from 1962 through 1993. We examine whether this difference can be traced to greater impatience of foreign investors through an analysis of the price impact of intensive five-minute trading periods. We find that greater impatience cannot account for the disadvantage of foreign investors relative to domestic institutions. The evidence is consistent with institutional investors, whether foreign or local, being more impatient and less well-informed than domestic individuals.

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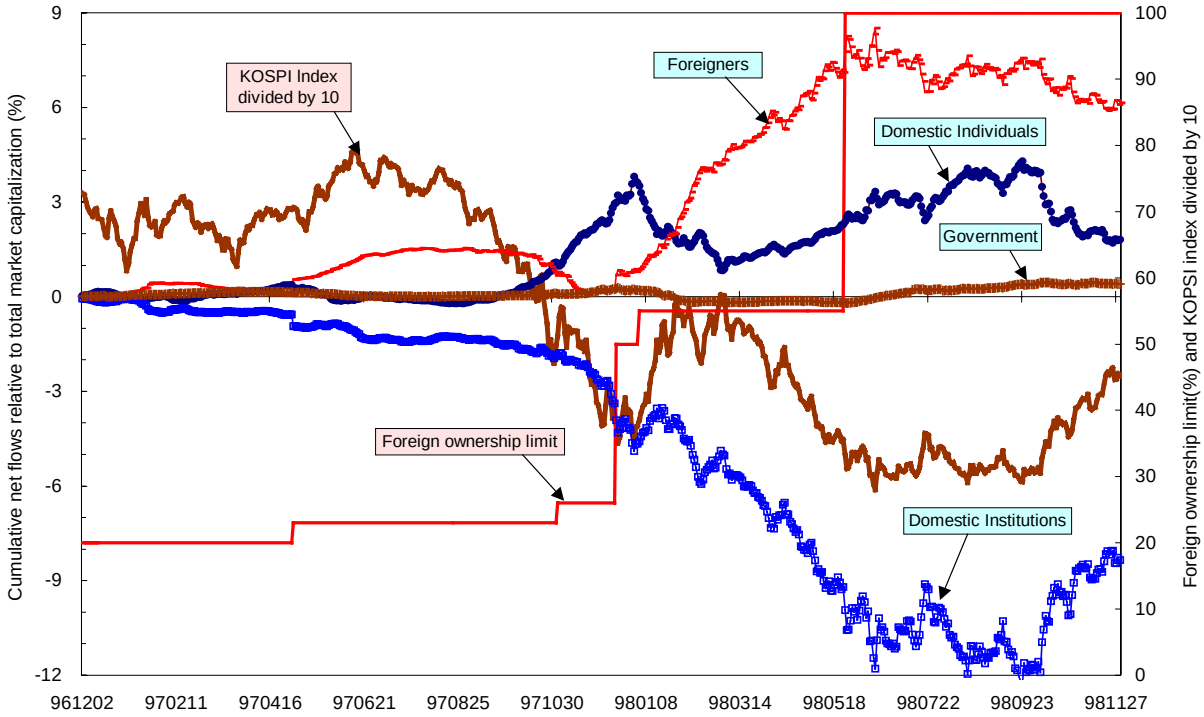

Figure 1. Cumulative net flows relative to total market capitalization for various investor groups (%, left axis), foreign ownership limit (%, right axis), and KOSPI index divided by 10 (right axis).

Table 1. Average proportion (%) of intraday trading volume for each type of investor

This table reports the average proportions (%) of intraday trading volume for each of three classes of investors relative to the total trading volume for the interval and for the day (both in shares and values, respectively). The three classes of investors include (1) Korean individuals (2) Korean money managers (securities, mutual, pension funds) and banks (banks, insurance, merchant banks), and (3) Foreign money managers and banks (including domestic foreigners).

Trading intervals	Relative to the trading volume for the interval						Relative to the trading volume for the day					
	(in values)			(in shares)			(in values)			(in shares)		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Morning opening batch	75.0	12.4	12.7	81.8	8.8	9.4	2.9	0.7	0.7	3.9	0.5	0.5
9:30 – 10:30	71.4	17.0	11.6	76.9	13.7	9.5	18.8	4.5	3.0	20.6	3.6	2.4
10:30 – 11:30	68.8	17.2	14.0	74.3	14.2	11.5	15.8	3.9	3.1	17.0	3.2	2.6
Afternoon opening batch	70.1	12.8	17.1	77.8	9.2	13.0	1.4	0.3	0.4	1.9	0.2	0.3
13:00 – 14:00	65.2	17.9	16.9	71.6	14.6	13.8	10.5	3.0	2.8	11.6	2.4	2.2
14:00 – 14:50	65.6	18.0	16.5	71.5	14.8	13.7	11.6	3.2	3.0	12.4	2.6	2.4
Closing batch	62.2	18.7	19.1	67.8	15.9	16.3	4.4	1.4	1.4	4.5	1.1	1.1
Extended trading hours	60.4	20.5	19.1	65.4	17.3	17.3	0.2	0.4	0.2	0.2	0.2	0.3

Table 2. Average buy (or sell) price ratios for each investor, relative to the average trading price (12/2/96 ~ 11/30/98: 586 days)

The average buy (or sell) price ratio (%) is computed as $(B_{i,j}^d / A_i^d) \times 100$ (%), where $B_{i,j}^d = \Sigma_t P_{i,j}^{dt} V_{i,j}^{dt} \big/ \Sigma_t V_{i,j}^{dt}$ is the volume-weighted average buy (or sell) price for investor type j (j=(1), …, (6)) for stock i on day d, and $A_i^d = \Sigma_t P_i^{dt} V_i^{dt} \big/ \Sigma_t V_i^{dt}$ is the volume-weighted average price for all trades for stock i on day d. In order to control for volume effects, $B_{i,j}^d$ is further disaggregated into three groups based on trade sizes whose cutoff points are 5 million won and 50 million won. Split trades originated from an order are aggregated into a trade. The price ratios are averaged across stocks on a day and then across days. Stocks whose prices have fallen below 1,000 won during the sample period are excluded from the analysis, and the analysis was performed on the stock-days with at least one foreign trade.

Panel A. Average buy price ratios (%)

Buy price ratios	Domestic investors			Non-domestic foreign investors		
	(1) Individual	(2) Money managers	(3) Banks	(4) Individual	(5) Money managers	(6) Banks
All stock-day observations aggregating all trades						
Avg. of daily median trade size (000 won)	17,282	53,219	67,581	19,289	44,043	57,930
Avg. of mean *A* (won)	26,626	28,897	28,681	24,659	30,635	34,857
Avg. of mean Buy *B/A*	99.877	100.009	99.936	99.998	99.988	99.928
(t-stat: $H_0 = 100$)	(-24.70)	(0.83)	(-3.94)	(-0.04)	(-1.14)	(-2.75)
Avg. of median Buy *B/A*	99.995	100.020	99.965	100.025	100.005	99.964
Avg. of std dev of Buy *B/A*	0.704	1.213	1.319	1.482	1.222	1.065
Avg. number of stocks per day	117.1	72.4	30.5	6.7	67.7	9.7
Difference of Buy *B/A* from (1)		-0.139	-0.034	-0.066	-0.150	-0.055
(t-stat: $H_0 = 0$)		(-10.27)	(-1.74)	(-1.58)	(-10.50)	(-1.76)
Difference of Buy *B/A* from (2)			0.055	-0.002	0.024	0.012
(t-stat: $H_0 = 0$)			(2.51)	(-0.04)	(1.53)	(0.33)
Difference of Buy *B/A* from (3)				-0.120	-0.037	-0.019
(t-stat: $H_0 = 0$)				(-1.41)	(-1.39)	(-0.34)
Small trades subsample (≤ 5 million won)						
Avg. of daily median trade size (000 won)	1,830	2,204	2,468	2,399	2,540	2,564
Avg. of mean *A* (won)	26,231	24,761	24,200	18,987	29,877	30,324
Avg. of mean Buy *B/A*	99.758	99.913	99.758	99.791	99.729	99.647
(t-stat: $H_0 = 100$)	(-40.87)	(-3.16)	(-5.24)	(-3.50)	(-17.60)	(-7.97)
Avg. number of stocks per day	116.5	32.9	6.5	3.5	32.1	4.5
Difference of Buy *B/A* from (1)		-0.169	-0.041	0.029	-0.014	0.123
(t-stat: $H_0 = 0$)		(-5.95)	(-0.81)	(0.47)	(-0.79)	(2.60)
Difference of Buy *B/A* from (2)			0.234	0.271	0.130	0.286
(t-stat: $H_0 = 0$)			(2.47)	(2.20)	(3.08)	(3.32)
Medium trades subsample (≤ 50 million won)						
Avg. of daily median trade size (000 won)	10,088	22,434	24,459	16,404	19,041	18,660
Avg. of mean *A* (won)	26,387	28,882	26,850	25,833	31,115	36,939
Avg. of mean Buy *B/A*	99.926	99.898	99.860	100.030	99.944	99.930
(t-stat: $H_0 = 100$)	(-15.17)	(-8.92)	(-6.66)	(0.62)	(-5.53)	(-2.23)
Avg. number of stocks per day	113.5	55.3	21.3	4.7	54.4	7.9
Difference of Buy *B/A* from (1)		0.011	0.076	-0.086	-0.043	-0.042
(t-stat: $H_0 = 0$)		(0.79)	(3.25)	(-1.70)	(-3.14)	(-1.18)
Difference of Buy *B/A* from (2)			0.053	-0.204	-0.045	-0.108
(t-stat: $H_0 = 0$)			(1.82)	(-2.60)	(-2.54)	(-2.17)
Large trades subsample (> 50 million won)						
Avg. of daily median trade size (000 won)	75,491	135,665	149,954	102,705	148,181	191,377
Avg. of mean *A* (won)	28,092	34,301	34,524	34,416	37,378	44,285
Avg. of mean Buy *B/A*	100.116	100.005	100.032	100.081	100.130	100.064
(t-stat: $H_0 = 100$)	(11.25)	(0.43)	(1.63)	(0.78)	(9.44)	(1.20)
Avg. number of stocks per day	48.3	39.4	15.7	1.8	27.5	3.8
Difference of Buy *B/A* from (1)		0.122	0.113	0.133	-0.017	0.018
(t-stat: $H_0 = 0$)		(6.14)	(3.75)	(1.02)	(-0.62)	(0.23)
Difference of Buy *B/A* from (2)			-0.027	-0.156	-0.142	-0.163
(t-stat: $H_0 = 0$)			(-0.92)	(-0.88)	(-5.26)	(-2.18)

Table 2. (Continued)

Panel B. Average sell price ratios (%)

Sell price ratios	Domestic investors			Non-domestic foreign investors		
	(1) Individual	(2) Money managers	(3) Banks	(4) Individual	(5) Money managers	(6) Banks
All stock-day observations aggregating all trades						
Avg. of daily median trade size (000 won)	17,784	41,464	61,215	19,319	39,986	38,284
Avg. of mean *A* (won)	26,947	27,570	27,468	27,709	28,060	29,016
Avg. of mean Sell *B/A*	100.111	99.891	100.044	100.002	99.961	99.968
(t-stat: $H_0 = 100$)	(29.91)	(-10.33)	(2.68)	(0.06)	(-4.06)	(-1.31)
Avg. of median Sell *B/A*	100.011	99.938	100.021	100.012	99.952	99.946
Avg. of std dev of Buy *B/A*	0.578	1.294	1.341	1.478	1.221	0.979
Avg. number of stocks per day	117.5	88.9	34.8	6.0	66.2	8.8
Difference of Sell *B/A* from (1)		0.231	0.080	0.058	0.174	0.143
(t-stat: $H_0 = 0$)		(18.48)	(4.42)	(1.35)	(14.35)	(5.07)
Difference of Sell *B/A* from (2)			-0.138	-0.022	-0.017	-0.051
(t-stat: $H_0 = 0$)			(-6.57)	(-0.39)	(-1.08)	(-1.43)
Difference of Sell *B/A* from (3)				-0.013	0.166	0.106
(t-stat: $H_0 = 0$)				(-0.16)	(6.49)	(1.88)
Small trades subsample (≤ 5 million won)						
Avg. of daily median trade size (000 won)	1,710	1,302	2,453	2,257	2,548	2,530
Avg. of mean *A* (won)	26,729	25,959	23,226	20,522	24,855	25,239
Avg. of mean Sell *B/A*	100.212	99.825	100.235	100.086	100.190	100.145
(t-stat: $H_0 = 100$)	(45.46)	(-9.64)	(5.96)	(1.24)	(12.62)	(3.43)
Avg. number of stocks per day	117.3	64.6	8.7	3.0	30.8	4.1
Difference of Sell *B/A* from (1)		0.377	-0.017	0.088	0.050	0.043
(t-stat: $H_0 = 0$)		(20.64)	(-0.43)	(1.25)	(3.24)	(1.01)
Difference of Sell *B/A* from (2)			-0.394	-0.274	-0.218	-0.155
(t-stat: $H_0 = 0$)			(-6.22)	(-2.27)	(-8.07)	(-2.49)
Medium trades subsample (≤ 50 million won)						
Avg. of daily median trade size (000 won)	9,905	21,380	23,635	16,879	18,816	18,360
Avg. of mean *A* (won)	26,814	28,759	26,057	29,993	28,255	29,425
Avg. of mean Sell *B/A*	100.077	100.023	100.112	100.006	99.974	99.955
(t-stat: $H_0 = 100$)	(18.43)	(1.95)	(5.44)	(0.11)	(-2.60)	(-1.69)
Avg. number of stocks per day	115.1	62.9	25.2	4.1	53.1	7.0
Difference of Sell *B/A* from (1)		0.098	0.002	0.051	0.131	0.184
(t-stat: $H_0 = 0$)		(7.49)	(0.09)	(0.99)	(10.83)	(5.47)
Difference of Sell *B/A* from (2)			-0.129	0.023	0.083	0.055
(t-stat: $H_0 = 0$)			(-4.58)	(0.33)	(4.56)	(1.27)
Large trades subsample (> 50 million won)						
Avg. of daily median trade size (000 won)	80,765	139,382	139,992	116,320	133,123	154,066
Avg. of mean *A* (won)	30,365	33,609	32,285	36,055	33,507	35,142
Avg. of mean Sell *B/A*	99.964	99.872	99.969	100.046	99.784	99.874
(t-stat: $H_0 = 100$)	(-3.60)	(-11.09)	(-1.59)	(0.39)	(-14.40)	(-2.56)
Avg. number of stocks per day	47.4	42.7	18.1	1.8	25.8	3.1
Difference of Sell *B/A* from (1)		0.142	0.032	-0.093	0.244	0.143
(t-stat: $H_0 = 0$)		(7.18)	(1.13)	(-0.60)	(9.22)	(2.46)
Difference of Sell *B/A* from (2)			-0.071	-0.032	0.131	0.023
(t-stat: $H_0 = 0$)			(-2.45)	(-0.24)	(5.17)	(0.36)

Table 3. Pooled regressions of the differences in trade price ratios between foreigners and domestic investors

The dependent variable is avgbb, the differences in buy (sell) price ratios (%) between two types of investors per stock-day, e.g., domestic individual's B/A(%) – foreigner's B/A(%). Buy (sell) price ratio is computed as $\left(B_{i,j}^{d} \Big/ A_{i}^{d}\right)\times 100$, where $B_{i,j}^{d}$ is the volume-weighted average buy (sell) price for investor type *j* for stock *i* on day *d*, and A_{i}^{d} is the volume-weighted average price for all trades for stock *i* on day *d*. Explanatory variables include the trade-size dummies (TrdSize2 and TrdSize3) and those variables explained below: lsize = log market value of equity on the previous day; btm = book-to-market ratio on the previous day; kret = market returns for the day; avgbas = average of previous 50 daily bid-ask spreads (at least 30 daily observations required), where daily bid-ask spread (%) = (ask-bid)/[(ask+bid)/2] observed prior to market close; avgsig = average of previous 50 daily volatilities (at least 30 daily observations required), where daily volatility (%) = (high-low)/[(high+low)/2]; avgturn = average of previous 50 daily turnover ratios (at least 30 daily observations required), where daily turnover ratio (%) = total share trading volume for the day / total shares outstanding for the firm; avgdf = trade value differences between two investor types / total trade value for stock-day(%); ctc5 = previous 5-day return (%) (previous 6th-day close to the last close); cto = overnight return (%) (previous close to opening price); otc = day-time return (%) (open-to-close). T-statistics in parentheses are based on White's (1980) heteroskedasticity-consistent standard errors.

Panel A. Summary statistics for the variables used in the regressions

Variable	avgbb	lsize	btm	kret	avgbas	avgsig	avgturn	avgdf	ctc5	cto	otc
Regressions for the Buy price ratio differences: Domestic individual – Foreigners (Nobs = 61,738)											
Mean	-0.035	12.426	0.428	0.030	1.004	5.097	0.661	31.552	1.070	0.110	0.592
Median	0.000	12.401	0.283	-0.018	0.852	5.013	0.453	39.826	0.000	0.000	0.000
Minimum	-19.392	7.990	0.009	-8.442	0.181	0.415	0.005	-99.881	-91.582	-12.000	-19.725
Maximum	15.444	16.117	4.482	8.504	7.950	11.311	10.735	99.987	75.758	12.000	27.200
Std Dev	1.662	1.264	0.449	2.488	0.647	1.372	0.665	48.444	10.290	2.778	3.891
Regressions for the Buy price ratio differences: Domestic institutions – Foreigners (Nobs = 36,615)											
Mean	0.011	12.736	0.393	0.121	0.899	4.993	0.637	-1.598	1.777	0.147	0.678
Median	0.000	12.662	0.273	0.079	0.775	4.922	0.460	0.582	0.756	0.000	0.197
Minimum	-15.674	8.728	0.009	-8.096	0.181	0.685	0.014	-99.845	-90.918	-12.000	-19.725
Maximum	16.400	16.117	4.162	8.504	7.510	9.945	10.470	98.892	75.758	12.000	27.200
Std Dev	1.843	1.168	0.386	2.481	0.550	1.295	0.587	32.124	10.009	2.637	3.826
Regressions for the Sell price ratio differences: Domestic individual – Foreigners (Nobs = 61,876)											
Mean	0.142	12.371	0.437	-0.090	0.998	4.972	0.635	35.193	-0.173	-0.052	0.022
Median	0.055	12.329	0.301	-0.095	0.856	4.878	0.427	42.286	-0.781	0.000	0.000
Minimum	-16.675	7.990	0.011	-8.096	0.181	0.543	0.005	-99.387	-91.316	-12.000	-21.160
Maximum	17.428	16.117	4.383	8.504	7.950	11.117	10.252	99.981	75.839	12.000	22.590
Std Dev	1.614	1.278	0.438	2.486	0.628	1.330	0.647	44.035	10.350	2.770	3.945
Regressions for the Sell price ratio differences: Domestic institutions – Foreigners (Nobs = 43,039)											
Mean	0.028	12.683	0.437	-0.057	0.900	4.954	0.606	-0.228	0.149	0.072	0.020
Median	0.000	12.635	0.305	-0.059	0.780	4.886	0.427	1.419	-0.606	0.000	0.000
Minimum	-16.141	8.059	0.009	-8.096	0.181	0.543	0.005	-99.226	-91.316	-12.000	-21.160
Maximum	21.905	16.117	4.383	8.504	7.380	10.864	9.984	99.204	75.839	12.000	22.590
Std Dev	1.882	1.215	0.427	2.541	0.552	1.308	0.575	31.358	10.554	2.734	3.929

Table 3. (Continued)

Panel B. Differences in Buy price ratios: Domestic Individuals minus Foreigners (%) (Nobs = 61,738)

Reg. No.	Intercept	TrdSize2	TrdSize3	lsize	btm	kret	avgbas	avgsig	avgturn	avgdf	ctc5	cto	otc	Adj. Rsq.
(1)	-0.0517	-0.0110	0.0187	-0.0017	0.0956	0.0001								0.0006
	(-0.74)	(-0.73)	(0.88)	(-0.31)	(6.32)	(0.05)								
(2)	0.9291	-0.0290	-0.0397	-0.0605	0.0330	0.0081	-0.2252	0.0002	0.0367		0.0076	0.0277	-0.0266	0.0190
	(8.97)	(-1.95)	(-1.87)	(-8.45)	(1.96)	(2.49)	(-16.45)	(0.02)	(2.74)		(11.69)	(9.96)	(-12.96)	
(3)	0.5624	-0.0416	-0.0540	-0.0347	-0.0165	0.0015	-0.1583	-0.0133	0.0041	0.0031	0.0079	0.0288	-0.0215	0.0249
	(5.36)	(-2.80)	(-2.55)	(-4.79)	(-0.97)	(0.45)	(-11.26)	(-2.21)	(0.30)	(19.49)	(12.12)	(10.40)	(-10.43)	

Panel C. Differences in Buy price ratios: Domestic Institutions minus Foreigners (%) (Nobs = 36,615)

Reg. No.	Intercept	TrdSize2	TrdSize3	lsize	btm	kret	avgbas	avgsig	avgturn	avgdf	ctc5	cto	otc	Adj. Rsq.
(1)	0.2562	-0.3261	-0.3966	-0.0032	0.1820	-0.0171								0.0092
	(2.35)	(-13.13)	(-13.78)	(-0.39)	(7.16)	(-4.43)								
(2)	0.0065	-0.3296	-0.3945	0.0104	0.2017	0.0065	0.0670	0.0036	0.0110		0.0013	-0.0241	-0.0248	0.0113
	(0.04)	(-13.27)	(-13.65)	(0.91)	(7.04)	(1.37)	(2.72)	(0.40)	(0.49)		(1.35)	(-5.69)	(-8.15)	
(3)	-0.1300	-0.3362	-0.3958	0.0204	0.1985	0.0040	0.0774	0.0057	0.0070	0.0023	0.0012	-0.0216	-0.0234	0.0128
	(-0.78)	(-13.53)	(-13.70)	(1.78)	(6.93)	(0.84)	(3.14)	(0.63)	(0.31)	(7.52)	(1.23)	(-5.09)	(-7.70)	

Panel D. Differences in Sell price ratios: Domestic Individuals minus Foreigners (%) (Nobs = 61,876)

Reg. No.	Intercept	TrdSize2	TrdSize3	lsize	btm	kret	avgbas	avgsig	avgturn	avgdf	ctc5	cto	otc	Adj. Rsq.
(1)	-0.3501	0.0465	0.1495	0.0355	0.0180	0.0138								0.0023
	(-5.28)	(3.20)	(7.17)	(6.80)	(1.20)	(5.28)								
(2)	-1.1543	0.0438	0.1430	0.0762	0.0430	-0.0158	0.1768	0.0319	-0.0707		0.0008	0.0286	0.0300	0.0118
	(-11.35)	(3.02)	(6.78)	(10.80)	(2.57)	(-4.96)	(12.56)	(5.36)	(-5.21)		(1.30)	(10.66)	(15.18)	
(3)	-0.8690	0.0463	0.1345	0.0569	0.0588	-0.0200	0.1235	0.0475	-0.0383	-0.0028	0.0027	0.0337	0.0365	0.0160
	(-8.44)	(3.20)	(6.39)	(7.96)	(3.51)	(-6.27)	(8.56)	(7.91)	(-2.80)	(-16.24)	(4.23)	(12.51)	(18.12)	

Panel E. Differences in Sell price ratios: Domestic Institutions minus Foreigners (%) (Nobs = 43,039)

Reg. No.	Intercept	TrdSize2	TrdSize3	lsize	btm	kret	avgbas	avgsig	avgturn	avgdf	ctc5	cto	otc	Adj. Rsq.
(1)	-0.4071	0.2764	0.3001	0.0203	-0.0580	-0.0340								0.0072
	(-4.12)	(12.94)	(11.45)	(2.68)	(-2.68)	(-9.53)								
(2)	-0.4991	0.2881	0.3199	0.0228	-0.0665	-0.0142	0.0205	0.0066	0.0071		-0.0009	-0.0085	-0.0257	0.0091
	(-3.23)	(13.45)	(12.10)	(2.15)	(-2.70)	(-3.22)	(0.87)	(0.77)	(0.33)		(-1.06)	(-2.24)	(-9.21)	
(3)	-0.5155	0.3003	0.3259	0.0231	-0.0703	-0.0166	0.0234	0.0063	0.0164	-0.0024	-0.0002	-0.0050	-0.0229	0.0106
	(-3.34)	(14.00)	(12.33)	(2.17)	(-2.86)	(-3.76)	(0.99)	(0.73)	(0.76)	(-8.21)	(-0.27)	(-1.30)	(-8.13)	

Table 4. Intraday returns and volatility (%) around 5-minute intervals of large price-setting order imbalances

The price-setting order-imbalance (price-setting buy minus price-setting sell in shares) attributable to each type of investor (foreigners, domestic institutions, individuals) is calculated for each eligible stock listed at the KSE from Dec. 2, 1996 to Nov. 30, 1998, and then is normalized by the total share volume for the stock on the day. The samples in Panels A, B, and C comprise ten intervals with the largest normalized price-setting net buy and sell order-imbalances selected for each stock, excluding those with less than 1,000 shares. The Mean-adj ret for each day is the mean of the interval return for the stock exceeding the mean observed on the same day of the week and the same time interval over the sample period. The |Mean-adj ret| is a measure of volatility computed as the mean of absolute values of the mean-adjusted returns. The CAR(–10, –1), CAR(0,+1), CAR(0, +10), and CAR(+1,+10) are the cumulative returns from days –10 to –1, from 0 to +1 (total effect of an event), from 0 to +10 (permanent effect), and from +1 to +10 (temporary effect), respectively, and the *t*-statistics are reported in parentheses.

Panel A. Foreigners' normalized price-setting order-imbalance events

Event Interval	Net Buy (N=4,110)							Net Sell (N=4,158)						
	Raw ret		Mean-adj ret		Cumulative mean-adj ret.		|Mean-adj ret|	Raw ret		Mean-adj ret		Cumulative mean-adj ret.		|Mean-adj ret|
D–10	-0.021	(-1.37)	-0.019	(-1.28)	-0.019	(-1.28)	0.424	-0.013	(-0.85)	-0.012	(-0.80)	-0.012	(-0.80)	0.441
D–9	0.026	(1.69)	0.026	(1.72)	0.007	(0.32)	0.430	-0.004	(-0.22)	-0.002	(-0.12)	-0.015	(-0.67)	0.448
D–8	0.000	(0.02)	-0.001	(-0.06)	0.006	(0.23)	0.432	-0.027	(-1.70)	-0.025	(-1.60)	-0.040	(-1.53)	0.457
D–7	0.036	(2.37)	0.038	(2.48)	0.043	(1.57)	0.422	0.011	(0.67)	0.011	(0.65)	-0.029	(-1.00)	0.467
D–6	0.031	(1.94)	0.033	(2.07)	0.076	(2.53)	0.443	0.020	(1.23)	0.019	(1.18)	-0.009	(-0.30)	0.454
D–5	0.032	(1.96)	0.031	(1.88)	0.107	(3.21)	0.461	0.025	(1.51)	0.028	(1.70)	0.019	(0.53)	0.464
D–4	0.006	(0.35)	0.006	(0.40)	0.114	(3.25)	0.445	0.061	(3.29)	0.058	(3.16)	0.077	(2.02)	0.502
D–3	0.037	(2.23)	0.038	(2.28)	0.151	(4.08)	0.482	0.041	(2.33)	0.040	(2.26)	0.117	(2.89)	0.482
D–2	0.043	(2.20)	0.045	(2.29)	0.196	(4.97)	0.547	0.002	(0.12)	0.004	(0.23)	0.121	(2.87)	0.522
D–1	0.115	(5.70)	0.118	(5.96)	0.314	(7.42)	0.587	0.014	(0.68)	0.016	(0.81)	0.137	(3.00)	0.583
D 0	1.053	(30.20)	1.041	(30.25)	1.356	(26.75)	1.378	-0.738	(-23.85)	-0.730	(-23.78)	-0.592	(-11.23)	1.182
D+1	0.012	(0.61)	0.013	(0.66)	1.368	(27.22)	0.570	0.270	(11.53)	0.265	(11.47)	-0.327	(-6.21)	0.636
D+2	-0.017	(-0.86)	-0.013	(-0.67)	1.355	(26.48)	0.580	0.124	(6.16)	0.124	(6.23)	-0.203	(-3.84)	0.572
D+3	-0.058	(-3.30)	-0.061	(-3.47)	1.294	(24.99)	0.524	0.069	(3.86)	0.066	(3.68)	-0.137	(-2.57)	0.533
D+4	-0.005	(-0.26)	-0.010	(-0.57)	1.284	(24.25)	0.523	0.052	(3.04)	0.049	(2.89)	-0.089	(-1.63)	0.498
D+5	-0.021	(-1.19)	-0.023	(-1.29)	1.261	(23.44)	0.510	0.007	(0.38)	0.002	(0.13)	-0.086	(-1.55)	0.511
D+6	-0.011	(-0.60)	-0.014	(-0.79)	1.247	(22.86)	0.493	0.033	(1.88)	0.030	(1.74)	-0.056	(-0.99)	0.493
D+7	-0.018	(-1.23)	-0.019	(-1.29)	1.228	(22.32)	0.453	0.013	(0.77)	0.012	(0.67)	-0.044	(-0.77)	0.484
D+8	-0.008	(-0.55)	-0.008	(-0.51)	1.220	(22.03)	0.451	0.003	(0.18)	-0.002	(-0.16)	-0.047	(-0.80)	0.440
D+9	-0.010	(-0.58)	-0.012	(-0.70)	1.209	(21.47)	0.450	0.034	(2.20)	0.033	(2.14)	-0.014	(-0.23)	0.457
D+10	0.005	(0.36)	0.003	(0.19)	1.212	(21.06)	0.442	0.016	(0.99)	0.016	(1.00)	0.002	(0.03)	0.449
CAR(–10, –1)	0.305	(7.13)	0.314	(7.42)				0.132	(2.85)	0.137	(3.00)			
CAR(0,+1)	1.065	(30.45)	1.054	(30.60)				-0.468	(-14.70)	-0.464	(-14.73)			
CAR(0,+10)	0.922	(20.30)	0.897	(19.93)				-0.118	(-2.56)	-0.136	(-2.97)			
CAR(+1,+10)	-0.131	(-2.96)	-0.144	(-3.26)				0.620	(13.79)	0.594	(13.37)			

Table 4. (Continued)

Panel B. Domestic institutions' normalized price-setting order-imbalance events

Event Interval	Net Buy (N=4,925)							Net Sell (N=4,967)						
	Raw ret		Mean-adj ret		Cumulative mean-adj ret.		|Mean-adj ret|	Raw ret		Mean-adj ret		Cumulative mean-adj ret.		|Mean-adj ret|
D–10	-0.024	(-1.76)	-0.024	(-1.80)	-0.024	(-1.80)	0.384	0.019	(1.26)	0.018	(1.20)	0.018	(1.20)	0.406
D–9	-0.029	(-2.03)	-0.027	(-1.88)	-0.051	(-2.76)	0.404	0.022	(1.31)	0.024	(1.47)	0.042	(1.92)	0.446
D–8	-0.016	(-1.11)	-0.017	(-1.19)	-0.068	(-3.08)	0.416	0.033	(2.16)	0.035	(2.29)	0.077	(3.07)	0.428
D–7	-0.012	(-0.85)	-0.010	(-0.74)	-0.078	(-3.14)	0.394	0.051	(3.13)	0.050	(3.10)	0.127	(4.37)	0.442
D–6	-0.024	(-1.74)	-0.021	(-1.49)	-0.099	(-3.67)	0.396	0.010	(0.64)	0.014	(0.90)	0.141	(4.46)	0.442
D–5	-0.019	(-1.29)	-0.021	(-1.43)	-0.119	(-4.06)	0.415	0.046	(2.75)	0.045	(2.69)	0.186	(5.37)	0.456
D–4	-0.002	(-0.12)	0.001	(0.09)	-0.118	(-3.77)	0.409	0.061	(3.77)	0.061	(3.82)	0.247	(6.69)	0.456
D–3	0.046	(2.96)	0.044	(2.83)	-0.074	(-2.24)	0.446	0.061	(3.60)	0.061	(3.62)	0.308	(7.96)	0.460
D–2	0.030	(1.77)	0.028	(1.71)	-0.046	(-1.28)	0.489	0.088	(4.79)	0.085	(4.63)	0.392	(9.48)	0.499
D–1	0.078	(4.02)	0.079	(4.09)	0.033	(0.85)	0.591	0.019	(0.94)	0.022	(1.13)	0.415	(9.28)	0.546
D 0	1.237	(34.05)	1.220	(33.93)	1.253	(25.56)	1.686	-0.942	(-25.81)	-0.933	(-25.80)	-0.518	(-9.55)	1.484
D+1	0.125	(5.44)	0.121	(5.29)	1.374	(28.13)	0.693	0.306	(12.05)	0.298	(11.88)	-0.220	(-4.05)	0.728
D+2	-0.056	(-2.52)	-0.052	(-2.38)	1.322	(26.76)	0.682	0.186	(8.64)	0.186	(8.67)	-0.034	(-0.63)	0.608
D+3	-0.047	(-2.41)	-0.056	(-2.93)	1.266	(25.16)	0.582	0.119	(6.75)	0.117	(6.66)	0.083	(1.52)	0.523
D+4	-0.048	(-2.42)	-0.058	(-2.97)	1.208	(23.37)	0.558	0.078	(4.42)	0.075	(4.25)	0.158	(2.84)	0.506
D+5	-0.067	(-3.61)	-0.071	(-3.86)	1.137	(21.66)	0.525	0.067	(3.93)	0.059	(3.46)	0.216	(3.88)	0.459
D+6	-0.023	(-1.26)	-0.024	(-1.35)	1.113	(20.80)	0.489	0.025	(1.65)	0.023	(1.52)	0.240	(4.26)	0.446
D+7	-0.053	(-3.19)	-0.057	(-3.45)	1.056	(19.58)	0.466	0.051	(3.17)	0.046	(2.91)	0.286	(5.00)	0.453
D+8	-0.046	(-2.83)	-0.048	(-2.98)	1.008	(18.52)	0.452	0.044	(2.73)	0.039	(2.45)	0.325	(5.63)	0.446
D+9	0.007	(0.44)	0.004	(0.24)	1.012	(18.53)	0.445	0.004	(0.28)	0.001	(0.06)	0.326	(5.61)	0.438
D+10	-0.026	(-1.71)	-0.028	(-1.86)	0.983	(17.81)	0.430	0.008	(0.51)	0.004	(0.24)	0.330	(5.59)	0.458
CAR(–10, –1)	0.028	(0.72)	0.033	(0.85)				0.409	(9.09)	0.415	(9.28)			
CAR(0,+1)	1.362	(36.49)	1.341	(36.28)				-0.637	(-17.34)	-0.634	(-17.47)			
CAR(0,+10)	1.004	(21.40)	0.950	(20.49)				-0.053	(-1.19)	-0.085	(-1.93)			
CAR(+1,+10)	-0.233	(-5.04)	-0.270	(-5.90)				0.889	(19.67)	0.848	(18.93)			

Table 4. (Continued)

Panel C. Domestic individuals' normalized price-setting order-imbalance events

Event Interval	Net Buy (N=5,046)							Net Sell (N=5,040)						
	Raw ret		Mean-adj ret		Cumulative mean-adj ret.		|Mean-adj ret|	Raw ret		Mean-adj ret		Cumulative mean-adj ret.		|Mean-adj ret|
D–10	-0.053	(-3.23)	-0.052	(-3.16)	-0.052	(-3.16)	0.406	0.009	(0.61)	0.011	(0.80)	0.011	(0.80)	0.369
D–9	-0.032	(-1.87)	-0.030	(-1.79)	-0.082	(-3.60)	0.394	0.013	(0.87)	0.017	(1.12)	0.028	(1.40)	0.382
D–8	-0.029	(-1.69)	-0.030	(-1.75)	-0.112	(-4.13)	0.417	0.012	(0.87)	0.017	(1.23)	0.045	(1.92)	0.366
D–7	-0.044	(-2.89)	-0.044	(-2.91)	-0.156	(-5.21)	0.367	0.021	(1.40)	0.023	(1.53)	0.068	(2.50)	0.388
D–6	-0.067	(-4.06)	-0.066	(-4.02)	-0.222	(-6.76)	0.402	0.010	(0.70)	0.013	(0.90)	0.081	(2.75)	0.384
D–5	-0.045	(-2.63)	-0.045	(-2.65)	-0.267	(-7.43)	0.402	0.032	(2.07)	0.035	(2.29)	0.116	(3.59)	0.380
D–4	-0.024	(-1.29)	-0.025	(-1.37)	-0.293	(-7.46)	0.439	0.019	(1.14)	0.019	(1.16)	0.135	(3.84)	0.398
D–3	-0.018	(-0.97)	-0.019	(-1.01)	-0.311	(-7.48)	0.445	0.045	(2.72)	0.048	(2.92)	0.183	(4.82)	0.417
D–2	-0.027	(-1.29)	-0.030	(-1.41)	-0.341	(-7.53)	0.530	0.038	(2.07)	0.037	(2.03)	0.220	(5.28)	0.465
D–1	-0.009	(-0.34)	-0.012	(-0.50)	-0.353	(-6.94)	0.674	0.027	(1.11)	0.025	(1.06)	0.245	(5.22)	0.625
D 0	1.233	(28.64)	1.212	(28.38)	0.859	(13.30)	1.804	-0.950	(-25.67)	-0.945	(-25.85)	-0.700	(-12.06)	1.527
D+1	0.244	(8.10)	0.236	(7.91)	1.095	(16.98)	0.862	0.201	(8.75)	0.196	(8.59)	-0.504	(-8.68)	0.624
D+2	-0.106	(-4.03)	-0.106	(-4.06)	0.989	(14.92)	0.741	0.127	(5.89)	0.127	(5.95)	-0.376	(-6.44)	0.568
D+3	-0.081	(-3.29)	-0.090	(-3.69)	0.899	(13.44)	0.658	0.055	(2.74)	0.046	(2.36)	-0.330	(-5.53)	0.513
D+4	-0.044	(-1.96)	-0.052	(-2.34)	0.847	(12.55)	0.589	0.047	(2.60)	0.038	(2.08)	-0.292	(-4.87)	0.474
D+5	-0.037	(-1.75)	-0.042	(-2.02)	0.805	(11.74)	0.551	0.051	(2.62)	0.042	(2.17)	-0.251	(-4.15)	0.484
D+6	-0.026	(-1.27)	-0.031	(-1.57)	0.773	(11.12)	0.524	-0.027	(-1.62)	-0.029	(-1.69)	-0.279	(-4.57)	0.447
D+7	-0.029	(-1.41)	-0.035	(-1.73)	0.739	(10.52)	0.528	0.001	(0.05)	-0.003	(-0.18)	-0.282	(-4.55)	0.427
D+8	0.006	(0.28)	0.003	(0.13)	0.741	(10.45)	0.540	0.062	(3.70)	0.057	(3.44)	-0.225	(-3.60)	0.412
D+9	0.033	(1.55)	0.029	(1.41)	0.771	(10.69)	0.523	0.019	(1.08)	0.017	(0.99)	-0.208	(-3.32)	0.410
D+10	0.031	(1.67)	0.026	(1.40)	0.797	(10.91)	0.477	0.002	(0.11)	-0.003	(-0.18)	-0.211	(-3.33)	0.376
CAR(–10, –1)	-0.347	(-6.77)	-0.353	(-6.94)				0.226	(4.76)	0.245	(5.22)			
CAR(0,+1)	1.477	(32.79)	1.448	(32.41)				-0.749	(-19.65)	-0.749	(-19.93)			
CAR(0,+10)	1.225	(20.99)	1.150	(19.86)				-0.414	(-8.73)	-0.456	(-9.76)			
CAR(+1,+10)	-0.008	(-0.15)	-0.062	(-1.18)				0.536	(12.65)	0.488	(11.59)			

Table 5. Regression estimates for the permanent impact, CAR(0, 10), and temporary impact, CAR(1,10), of large order-imbalances

The permanent impacts measured by CAR(0,10) and the temporary impacts measured by CAR(1,10) around 5-minute intervals of large price-setting order imbalances reported in Table 4 are regressed on the investor group dummies (domestic institutions and foreigners) and stock characteristic variables, including the log market value of equity on the previous day (lsize), book-to-market ratio on the previous day (btm), KOSPI index return for the day (kret), price-limit hit dummies for the day (pup and pdn), previous 5-day return (ctc5), overnight return (cto), average bid-ask spread prior to market close over the previous 50 days (avgbas), average high-low volatility over the previous 50 trading days (avgsig), the average turnover ratio over the previous 50 trading days (avgturn), and the order imbalances divided by the shares outstanding (Order imbal./Shares os).

$$CAR(0,10)_{it} \text{ or } CAR(1,10)_{it} = a_0 + a_1\delta_{it}^{inst} + a_2\delta_{it}^{for} + \sum_{j=1}^{11} c_j X_{j,it} + \varepsilon_{it}$$

Panel A. Permanent impact of large net-buy order-imbalances

Reg. No.	a_0	a_1	a_2	lsize	btm	kret	pup	pdn	ctc5	cto	avgbas	avgsig	avgturn	Order imbal./ Share os	adjrsq	Nobs
(1)	3.428	-0.068	-0.120	-0.213	-0.031	0.221									0.0310	12,667
	(11.76)	(-0.96)	(-1.62)	(-8.49)	(-0.49)	(18.02)										
(2)	3.068	-0.120	-0.153	-0.192	-0.112	0.079	2.733	-3.210	-0.014	-0.174					0.1178	12,667
	(10.88)	(-1.74)	(-2.12)	(-7.95)	(-1.85)	(6.00)	(23.58)	(-26.38)	(-4.88)	(-18.44)						
(3)	0.901	-0.210	-0.179											0.599	0.0110	12,667
	(17.23)	(-2.99)	(-2.44)											(11.54)		
(4)	1.329	-0.097	-0.066	-0.098	-0.201	0.079	2.602	-3.180	-0.016	-0.162	0.168	0.080	-0.083	0.447	0.1265	12,667
	(3.00)	(-1.40)	(-0.90)	(-3.09)	(-2.93)	(6.01)	(22.39)	(-26.12)	(-5.55)	(-17.06)	(4.17)	(3.09)	(-1.72)	(8.99)		
F-test: $a_2 = a_1$		0.21														
(P-val)		(0.648)														

Panel B. Permanent impact of large net-sell order-imbalances

Reg. No.	a_0	a_1	a_2	lsize	btm	kret	pup	pdn	ctc5	cto	avgbas	avgsig	avgturn	Order imbal./ Share os	adjrsq	Nobs
(1)	-0.679	0.249	0.185	0.043	-0.268	0.228									0.0396	12,654
	(-2.60)	(3.89)	(2.78)	(1.92)	(-5.23)	(20.78)										
(2)	-0.930	0.194	0.203	0.055	-0.285	0.118	2.222	-2.386	0.007	-0.103					0.0944	12,654
	(-3.65)	(3.12)	(3.15)	(2.52)	(-5.69)	(9.79)	(22.38)	(-17.97)	(2.45)	(-11.79)						
(3)	-0.604	0.394	0.401											0.480	0.0110	12,654
	(-13.03)	(6.14)	(6.07)											(9.60)		
(4)	-0.909	0.167	0.235	0.064	-0.188	0.120	2.163	-2.381	0.004	-0.104	0.107	-0.080	0.023	0.350	0.0990	12,654
	(-2.23)	(2.68)	(3.62)	(2.18)	(-3.24)	(9.94)	(21.46)	(-17.93)	(1.38)	(-11.89)	(2.84)	(-3.38)	(0.51)	(7.01)		
F-test: $a_2 = a_1$		1.11														
(P-val)		(0.292)														

Table 5. (Continued)

Panel C. Temporary impact of large net-buy order-imbalances

Reg. No.	a_0	a_1	a_2	lsize	btm	kret	pup	pdn	ctc5	cto	avgbas	avgsig	avgturn	Order imbal./ Share os	adjrsq	Nobs
(1)	-0.034	-0.154	-0.030	0.004	-0.285	0.194									0.0227	12,667
	(-0.12)	(-2.27)	(-0.43)	(0.15)	(-4.69)	(16.41)										
(2)	-0.437	-0.117	0.012	0.025	-0.356	0.103	2.108	-1.581	-0.018	-0.089					0.0617	12,667
	(-1.57)	(-1.72)	(0.16)	(1.04)	(-5.94)	(7.88)	(18.44)	(-13.16)	(-6.22)	(-9.55)						
(3)	-0.287	-0.149	0.052											0.431	0.0060	12,667
	(-5.71)	(-2.22)	(0.73)											(8.66)		
(4)	0.089	-0.187	0.010	0.017	-0.135	0.102	2.110	-1.535	-0.018	-0.093	0.048	-0.149	0.132	0.349	0.0676	12,667
	(0.20)	(-2.73)	(0.14)	(0.54)	(-1.98)	(7.84)	(18.37)	(-12.76)	(-6.07)	(-9.86)	(1.21)	(-5.82)	(2.78)	(7.09)		
F-test: $a_2 = a_1$		8.45														
(P-val)		(0.004)														

Panel D. Temporary impact of large net-sell order-imbalances

Reg. No.	a_0	a_1	a_2	lsize	btm	kret	pup	pdn	ctc5	cto	avgbas	avgsig	avgturn	Order imbal./ Share os	adjrsq	Nobs
(1)	2.701	0.338	0.137	-0.197	-0.025	0.158									0.0259	12,654
	(10.69)	(5.43)	(2.13)	(-9.04)	(-0.50)	(14.84)										
(2)	2.579	0.316	0.157	-0.188	-0.058	0.112	1.007	-1.892	-0.008	-0.122					0.0540	12,654
	(10.28)	(5.14)	(2.47)	(-8.76)	(-1.18)	(9.46)	(10.31)	(-14.49)	(-3.01)	(-14.19)						
(3)	0.381	0.326	0.142											0.399	0.0078	12,654
	(8.52)	(5.28)	(2.22)											(8.29)		
(4)	1.030	0.318	0.232	-0.102	-0.159	0.110	0.846	-1.959	-0.012	-0.119	0.189	0.063	-0.093	0.386	0.0635	12,654
	(2.58)	(5.19)	(3.65)	(-3.56)	(-2.80)	(9.31)	(8.55)	(-15.03)	(-4.39)	(-13.86)	(5.11)	(2.74)	(-2.13)	(7.89)		
F-test: $a_2 = a_1$		1.84														
(P-val)		(0.175)														