Short-Term Trading Skills of Individuals, Institutions, and Foreigners: A New Approach Based on Relative Performance

by

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Abstract

This paper evaluates the short-term trading skills of three types of investors: individuals, institutions, and foreigners. Based on a dataset that identifies the types of sellers and buyers for all trades, we examine (1) how stock prices move contemporaneously with the trading activities between types of investors, and (2) given such price movements, whether one type of investor has superior skills in timing purchases (sales) of stocks. Using tests based on daily and weekly horizons, we find evidence that individuals have poor trading skills and provide liquidity to both institutions and foreigners. When domestic institutions trade with foreigners, we find that foreigners generally show superior trading skills.

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Recent decades have witnessed phenomenal growth in foreign investors' participation in emerging economies' stock markets as these markets begin to open their doors to foreigners. Considering foreign institutions' investment expertise and research support, many studies classify foreign investors as a separate type of investor and investigate their performance relative to that of domestic investors. It should be noted, however, that foreign investors are not always at an advantage because they face barriers that are due to geographic locations and linguistic and cultural differences. Empirical findings from prior studies are mixed, and they vary across types of sample data and empirical methods. For example, while Grinblatt and Keloharju (2000), Seasholes (2000), and Froot and Ramadorai (2001) document that foreign investors perform better than domestic investors, Brennan and Cao (1997), Hau (2001), Choe, Kho, and Stulz (2005), Dvořák (2005), and Agarwal, Faircloth, Liu, and Rhee (2009) find the opposite, and Kang and Stulz (1997) report no significant difference between the two investor types in Japan.

There is also a growing literature that compares investment performance between domestic individuals and domestic institutions. Empirical findings generally indicate that individual investors are less informed than institutions are and that individuals provide institutions with liquidity.[3] However, some studies report contradicting results.[4]

The prior research on investors' short-term trading performance generally classifies investors into three types or groups: domestic individuals (i.e., households), domestic institutions, and foreign institutions.[5] What is troublesome is that the existing evidence is mixed regarding which type of investor performs better than other types. In an attempt to disentangle the wide disagreements in empirical results, we propose a *relative performance* evaluation approach using transaction tick data

[3] See, for example, Odean (1999), Barber and Odean (2000, 2001, and 2002), Dorn, Huberman, and Senmueller (2008), Hvidkjær (2008), Kaniel, Saar, and Titman (2008), Barber, Odean, and Zhu (2009), Campbell, Ramadorai, and Schwartz (2009), Linnainmaa (2010), Kelley and Tetlock (2013), and Stoffman (2014).

[4] Several studies suggest that some individual investors perform systematically better than others. See, for example, Sias and Starks (1997), Ivkovic, Sialm, and Weisbenner (2008), and Coval, Hirshleifer, and Shumway (2005).

[5] We use "investor type" and "investor group" interchangeably. We also use "individuals" interchangeably with "households." We use "foreigners" to refer to foreign institutions and use the two expressions interchangeably.

to compare the performance of pairs of investor groups in a controlled setting on an equal footing. Most studies in this line of research have estimated each group's performance separately by aggregating all trades investors in each group made but without considering the type of investor in the counterparty. Such an approach is likely to be inaccurate in estimating short-term trading skills because it does not allow researchers to compare performance between two different types of investors by holding the stocks being traded and the timing of the trades equal. One way to address this concern is to compare trading skills between two investor groups by requiring the stocks being traded and the timing of trades to be the same. An ideal sample, then, is data for the transactions between two groups trading as counterparties. This paper employs such an ideal sample to estimate relative performance more accurately in a controlled setting by using a more refined methodology than that of extant studies. Essentially, we investigate which type of investor performs better when two types of investors trade with each other as counterparties. Our results will shed light on why we have mixed evidence on the performance of foreign investors relative to domestic individual or institutional investors.

In evaluating the trading skills of these three types of investors, our approach has a major advantage over the typical approach of previous research, which measures each investor type's performance independent of other types: By controlling for the effects on its investment performance of various characteristics (e.g., size, liquidity, beta, book-to-market ratio) of the stocks each investor type favors, we can provide a fair evaluation of each investor type's trading skills. Previous studies find that different types of investors favor different kinds of stocks for holding and trading. For instance, institutional investors, whose trades are large, tend to invest in large-cap stocks to avoid high liquidity risks (Lakonishok, Shleifer, and Vishny 1992; Stoffman 2014). Kang and Stulz (1997) also report that foreign investors mitigate the effect of the information asymmetry that is due to language and cultural barriers and physical distance by focusing heavily on large firms and export-oriented firms. Therefore, unless differences in the characteristics of stocks chosen by the three investor groups are properly controlled for, comparing performance across investor groups based on performance

metrics estimated independently for each group is likely to be biased and result in misleading conclusions about each group's trading skills. One way to avoid this bias is to compare the performance of a pair of investor groups by requiring the stocks being traded and the timing of the trades to be the same. Our approach serves these two requirements. Since our analysis identifies the type of investor on both sides for each transaction and compares their performance in each trade exactly at the same time, we are free from biases in measured performance that are due to differences in the stocks favored by different investor groups. Focusing on the counterparties of each trade, our sample automatically includes only the stocks in which both types of traders are interested at the same time. By directly comparing the relative performance of the two counterparties without differences in sample stocks and the timing of trades, we can examine each type of investor's trading skills more fairly—comparing *apples* with *apples*. In short, we compare three investor types' trading skills on a level playing field by determining which group performs better when two different groups trade with each other as counterparties.

In performing our empirical tests, we use the most recent transaction data from the Korean stock market, where both foreigners and domestic institutions play a significant role in trading stocks. Using Korean stocks as a sample is suitable for our purposes because foreigners make up a significant share of the investors who perform trading activities. During our sample period, Korean stocks were fully open to foreigners for direct trading and ownership. Foreigners' average daily monetary value traded was about 20 percent of the total monetary value traded over our sample period, from June 2013 to May 2016. Based on the total market cap, Korean stock markets (the main board and KOSDAQ combined), amounting to US$1,230 billion, ranked eleventh in the world as of the end of our sample period (May 2016). The total ownership by foreigners as of the end of our sample period was about 29 percent of the total market cap of the main board and the KOSDAQ combined. While similar papers study emerging markets like Finland, Taiwan, and Indonesia, the choice of Korean markets for our sample has merit because of the significant presence of foreign investors in the Korean markets.

Our approach compares the relative trading skills of each type of investor by applying Stoffman's (2014) regression model framework to our transaction data. Previous studies do not compare investment performance between two types of investors by considering the trades in which the both types are counterparties. Instead, they typically measure the performance of each investor type independent of other types and compare the measured performance across investor types. In this paper, we first classify investors into three major types based on differences in the quality of information possessed and trading skills: individuals (i.e., households), domestic institutions, and foreigners.[6] We then seek to determine (1) how stock prices move contemporaneously with the trading activity between the two types of investors who are counterparties, and (2) whether, given such price movements, a certain investor type displays superior skills in timing their stock purchases (sales), compared to its counterparty group. Through these two rounds of tests, we determine the *relative* trading skills of each investor type by examining which one is more skillful than its counterparty type in trading stocks over daily and weekly horizons.

Our empirical analyses consist of two sets of tests. First set of tests follows Stoffman's (2014) regression model by using stock returns as the dependent variable to investigate how stock price movements relate to interactions between a particular pair of types of investors. Then, for our second set of tests, we define short-term performance measures reflecting actual transaction prices paid for or received by each investor type and use them as our new dependent variables in the same regression model we used in our first set of tests.

The motivation for our second set of tests is concern about the possibility that a certain investor group can make little profit even if the stock prices move in the direction of their trades. An example of such a case is large purchase (sale) orders initiated by large investors who face market impact costs that are due to the sheer size of their purchases (sale). In such a case, the stock price is likely to

[6] We exclude foreign individuals from our sample, so our definition of "foreigners" refers only to "foreign institutional investors," and we use "foreigners" and "foreign institutions" interchangeably. The portion of trades executed by foreign individuals is trivial in Korean stock markets, so including foreign individuals would not change our main results.

increase (decrease), moving in the direction that favors the investor. However, a daily return based on such a scenario may not benefit the large investor at all if the actual transaction price turns out to be close to that day's closing price, as the positive return on the stock simply reflects the market impact of the investor's large trade.[7]

Another example is trades by investors who pursue a momentum trading strategy (Stoffman 2014). In this case, investors can place a buy (sell) order only after observing a sizable increase (decrease) in price during a particular day. Again, a positive daily return in this case does not easily translate into profits for these investors if their actual purchase (sale) prices are too high (low) and close to the closing price. Therefore, simply using a stock's price change during a whole day to measure the relative performance of the types of investors participating in trading the stock may still confound our inferences.

To get around these concerns, we construct a new set of performance measures reflecting actual purchase (sale) prices paid (received) by each type of investors based on the concept of volume-weighted average price (VWAP). We set the purchase (sale) VWAP of a type of investor as the base price and calculate the returns to that investor from the purchase (sale) VWAP to the stock's closing price on a particular day. The calculated returns are used as our measure of trading performance for the type of investor on that day. By using these measures as the dependent variables in our regression models, we can infer the relative advantage (or disadvantage) of an investor type over its counterparty.

We present two main results from using the complete transaction data that contain information on whether the buyer (seller) is an individual or domestic institution or a foreign investor in Korea over the three-year sample period from June 2013 to May 2016. First, we show that, at a daily horizon, domestic institutions have an edge over individuals in trades, and foreign investors have an edge over both individual and institutional investors as counterparties. Whereas prices consistently move in the direction of institutional trading in trades between individuals and institutions, prices consistently

[7] Institutions are usually put in similar circumstances because of the large size of their trading volume. For discussions on the market impact cost (liquidity cost) of large trading, see, for example, Chan and Lakonishok (1993) and Hendershott and Menkvel (2014).

move in the direction of foreign investors at a daily horizon, no matter who is on the opposite side of their trades. In addition, we find that, through such price movements in favor of institution or foreigners, both of these types of investors can gain trading profits. Therefore, at least over daily horizons, the ability of institutions to predict stock price movements appear to be superior to that of individuals, and foreign investors seem to enjoy their superior timing advantages over both individuals and domestic institutions.

Second, we repeat the same type of analyses over a weekly horizon and find that weekly prices move in the direction of institutions' and foreigners' benefit when these two groups trade with individuals. As in the case of a daily horizon, we find consistent evidence that individuals lose whether they trade with institutions or foreigners. When domestic institutions trade with foreigners, we find no significant relation between weekly stock price movements and the trading between these two institutional groups. However, we obtain significant evidence that, despite the absence of favorable price movements, foreigners can secure positive weekly returns when they trade with domestic institutions.

The main contributions of our study are that, using our proprietary dataset and a new approach based on Stoffman (2014), (1) we find stock prices increase (decrease) whenever domestic or foreign institutions purchase (sell) stocks from individuals at both daily and weekly horizons, and (2) we document the relative advantages foreigners have in their trading with individuals and domestic institutions. We emphasize that our approach of estimating relative performance across different types of investors provides a clear way to detect short-term trading skills of each investor type. Based on our approach, we conclude that in Korean stock market, foreign investors exhibit better trading skills than domestic individual or institutional investors.

The remainder of the paper is organized as follows. Section 1 reviews related literature, Section 2 presents our data, Section 3 reports empirical results pertaining to a daily horizon, Section 4 presents results at a weekly horizon, and Section 5 concludes.

1. Prior Evidence on Short-term Trading Performance by Investor Type

Many studies empirically investigate the investment performance of individuals and institutional investors in a single country, finding compelling evidence that individual investors perform worse than institutional investors do. For example, Barber and Odean (2000) show that households earn poor *net* returns compared to a value-weighted market index after adjusting for trading costs. Barber, Lee, Liu, and Odean (2009) report that individual investors in Taiwan incur substantial losses from trades while institutions enjoy considerable gains. Stoffman (2014) uses transaction data in Finland to show that prices consistently move in the direction of institutional trading when institutions and individuals trade with each other, suggesting that individual investors provide liquidity to institutions.

Other studies classify foreign investors as an investor group that is distinct from individuals and institutional investors. Foreign investors can be expected to be superior performers because of their expertise that stems from sophisticated trading skills, extensive global information networks, and research capabilities. On the other hand, foreigners can be disadvantaged compared to domestic investors because of foreigners' linguistic- and culture-related handicaps in acquiring and processing local information.

Empirical evidence on the performance of foreign investors is mixed. Grinblatt and Keloharju (2000) find that foreign investors in Finland attain superior performance by pursuing momentum strategies. They even show that the momentum-adjusted performance of foreigners is still highly significant. Employing daily trading data from the Taiwan Stock Exchange, Seasholes (2000) finds that foreigners earn abnormal profits by predicting future price movements precisely. Froot and Ramadorai (2001) exploit data on cross-border portfolio flows from the US to twenty-five countries to reveal that foreign purchases forecast equity prices, even after controlling for the price impact caused by their purchasing activities. In addition, according to Barber, Lee, Liu, and Odean (2009), about a half of institutional profits (both foreign and domestic) accrues to foreign institutions, although

foreign institutions' trading volume accounts for only about 20 percent of the total institutional trading in Taiwan.

In contrast, several papers present evidence of foreign investors' poor performance compared to that of domestic investors. In an early study, Brennan and Cao (1997) use data on portfolio flows between the US and Canada, Germany, Japan, and the United Kingdom to investigate the correlation between equity flows and returns and conclude that domestic investors have information advantages over foreign investors in their domestic markets. They show that investors are likely to buy foreign assets when returns on foreign assets are high and to sell when the returns are low. Choe et al. (2005) also argue that domestic investors in Korea have an edge over foreign investors, presenting evidence that foreign investors trade at worse prices than domestic investors do and that prices are likely to move against foreign investors immediately before they trade intensively. Using transaction data in Indonesia, Dvořák (2005) finds that domestic investors enjoy higher profits than foreign investors do and that global brokerages' domestic clients earn higher profits than either local or Asian brokerages do. Agarwal et al. (2009) exploit the complete order and transaction data in Indonesia to classify executed orders into initiated and non-initiated orders and, using methods Choe et al. (2005) use, find that foreign investors trade at worse prices only when they initiate orders. The authors infer that foreigners' poor performance is due to their aggressiveness, such as their tendency to summit orders to initiate trades.

The consensus of extant empirical studies is that individuals perform worse than domestic institutions do, but there is mixed evidence regarding the performance of foreign investors compared to that of domestic investors.

2. Data

2.1. Institutional features of Korean stock markets

The Korea Exchange provides two major trading boards to investors: the main board and the KOSDAQ. Stocks listed on the main board tend to be larger in market cap and total assets, while smaller stocks are usually listed on the KOSDAQ. There are no designated market makers in these markets. All trades are executed on the fully computerized trading platform, and both market orders and limit orders can be submitted throughout the day. Trades are executed based on continuous auction during the trading hours between 9:00 a.m. and 2:50 p.m. Opening prices are determined based on a batch auction of the orders for each stock accumulated during a one-hour period starting at 8:00 a.m. in order to maximize the volume of executed trades based on the orders submitted during the hour before the market opens each day. In addition, a ten-minute closing batch auction that begins at 2:50 p.m. determines the closing price of each listed stock at 3:00 p.m.

A special feature of the Korean stock market is that daily price limits are imposed during trading hours. Until June 14, 2015, all stocks were subject to daily limits of a 15 percent increase or decrease from the previous day's closing price. These limits were expanded to 30 percent beginning on June 15, 2015. In a later section, we use sub-period analysis to determine whether our empirical results are sensitive to the two daily price limits that were in effect during our sample period and find that our main results do not change based on whether the 15 percent or 30 percent limit was in effect.

2.2. Transaction data

We acquired a proprietary dataset compiled by the Korea Exchange (KRX) through Koscom Corporation to compare the performance of the three types of investors during the most recent three-year period. Specifically, our dataset contains details of all transactions that occurred from June 1, 2013, through May 31, 2016 (736 trading days). The transaction data include the date and time of the transaction, a stock identifier, the type of traders (which classifies the seller or the buyer into domestic

individual, domestic institution, or foreign institution[8]), the stock's transaction price, and the number of shares traded.

Our raw data contain 4,257.6 million observations of executed trades, from which we construct 1,427,792 stock-day observations on 2,396 distinct stocks that were listed either on the main board or the KOSDAQ during the sample period.

Since our main objective is to investigate the short-term trading skills of three investor groups, we select a sample of stocks that should be of interest to all three groups of investors. Given the liquidity constraints and agency costs institutional and professional investors face, domestic and foreign institutions will shy away from trading small stocks, as it is economically inefficient to analyze small stocks because of concerns about low liquidity and the resulting market impact costs. We implement several filters to screen out small stocks that do not attract attention from foreigners and institutions and make our sample stocks comparable to those examined in prior studies.

The first set of filters is implemented at the stock-day level and the second set at the stock level. For the filters at the stock-day level, we exclude any stock-day observation (on day *t*) that shows a market capitalization less than 300 billion Korean Won (smaller than US$300 million) at the end of day *t-1*, that has a stock price less than 5,000 Won (less than US$5) at the end of day *t-1*, that records trading frequency less than forty times during day *t*, or whose trading volume is less than 1,000 shares during day *t*. Then we remove the stocks that were traded for less than 400 of the 736 trading

[8] Besides the three groups (individuals, domestic institutions, and foreign institutions), other identifiers, such as "non-financial institution" and "government" are included in our dataset. We removed these groups because their trading motives may be different from typical institutions due to institutional constraints or other objectives that are not directly related to trading profits. In addition, we exclude foreign individuals in order to focus on the relative performance between domestic institutions and foreign institutions. The portion of trades executed by foreign individuals is trivial, so our results would not change even if we included foreign individuals in the "foreigners" type.

days in our sample period. Our filtering process produced a sample of 357 stocks and 238,462 stock-day observations. The number of our sample stocks on each trading day varies between 280 and 354.[9]

Table 1 reports summary statistics for our final sample. For each day, we measure four variables for each stock: size (i.e., market capitalization) of the stock, closing price, number of trades during the day, and trading volume (i.e., the number of shares traded) during the day. Then we take the time-series averages of the four variables over our sample period for each stock. The figures reported in Table 1 are the cross-sectional averages of the stock-wise time-series averages of the variables for all 357 stocks in the entire sample and across the 119 stocks in each size tertile. The average firm size is 3.5 trillion Korean Won (about US$3 billion), the average number of trades per day is 7,308, and the average number of shares traded is 413,630. As expected, all of the sample statistics show the highest figures for the largest tertile. Even the stocks in the smallest tertile show average daily trades of 3,469 and an average of 153,971 shares traded per day. In general, our sample stocks appear to be fairly liquid.

2.3. Investor Interaction

Our data provide the records that allow us to identify the exact investor types of a transaction's buyer and seller. This feature of the data allows us to measure the volume of trading that occurs between and within investor groups (i.e., types). Table 2 quantifies the average proportion of trading by each investor group in each stock and the number of the trading interactions among investor groups. Panel A reports the average proportion of trading volume by individuals (i.e., households), institutions, and foreigners. For each stock, we first take the time-series average of the daily trading volume by each investor group. Then we report the cross-sectional averages across all stocks in the entire sample or in each size tertile. Panel A shows that, across all stocks, individuals account for the

[9] Our filters seem to be effective in removing small stocks that are traded mostly by individual investors: For the small stocks removed from the raw sample, the time-series means of the average proportion of trading volume by each group based on stock-day observations are 77.43 percent for individuals, 12.10 percent for institutions, and 6.50 percent for foreigners. As of May 31, 2016, our final sample accounts for 84.43 percent of the total market capitalizations of all stocks listed on the main board and the KOSDAQ.

largest proportion of trading, as individuals' average trading volume explains 51.01 percent of all trades, while institutions and foreigners engage in only 21.51 percent and 19.83 percent, respectively. The remaining proportions of total trading are related to trades executed by governments, non-financial institutions, and foreign individuals. Panel A also shows that institutions and foreigners tend to focus more on trading large stocks than small stocks. In the smallest tertile, institutions and foreigners are involved in only 16.79 percent and 13.69 percent of trades, respectively, as compared to 62.62 percent involvement by individuals. However, individuals' presence diminishes significantly in the largest tertile, accounting for only 36.76 percent, while institutions' and foreigners' trades represent 25.51 percent and 28.84 percent, respectively, of trades.

Panel B of Table 2 reports the interactions among the three investor groups, as well as within-group trading activities. We form a 3×3 matrix and report proportional trading, trading within each group, and trading interactions between two investor types. We first calculate the proportion of trading volume executed between and within investor groups on each day for each stock. Then we calculate the time series average for each stock. The figures reported in Panel B are the cross-sectional averages of the time-series averages across stocks in each element of the matrices, representing trading pairs within and between investor groups, and the corresponding standard errors.

Focusing on the trading within each group, we find substantial amounts of trading between two individuals, as 32.31 percent of trading in the whole sample occurred between individuals. In the smallest tertile, nearly half of trading (45.03%) is accounted for by trading between two individuals, while only 17.36 percent of trading is made between two individuals in the largest tertile, suggesting that institutional and foreign investors are more active in this tertile.

The results reported in Panel B of Table 2 suggest that within-group and between-group trades are most widely spread in the case of the largest tertile, making this sub-sample our best choice for examining interactions between investor groups and within each group. In the next two sections, we use linear regression models to analyze the relative trading skills of each type of investor, with the

main independent variables measuring trading interactions between two groups. Statistically, the more dispersed the values of our independent trade variables are, the more reliable are the results. Keeping this statistical issue in mind, we first perform our regression tests for the whole sample. Then we pay special attention to the largest tertile because, in this particular sample, pairwise interactions of two different types formed from the three types of investors are most widely spread. To determine whether our results from the whole sample are robust, we perform a separate round of tests using only the sample of stocks in the largest tertile (see Tables 5 and 6).

3. Daily Horizon Analyses

3.1. Contemporaneous Daily Returns and Investor Interaction

Following Stoffman (2014), we first investigate how the trades between two types of investors determine contemporaneous stock prices. We estimate the following regression equation:

$$R_{i,t} = \alpha_i + \beta_{HH}[H,H]_{i,t} + \beta_{HI}[H,I]_{i,t} + \beta_{HF}[H,F]_{i,t} + \beta_{IH}[I,H]_{i,t} + \beta_{II}[I,I]_{i,t} + \beta_{IF}[I,F]_{i,t} + \beta_{FH}[F,H]_{i,t} + \beta_{FI}[F,I]_{i,t} + \beta_{FF}[F,F]_{i,t} + \sum_{k=1}^{3} \gamma_k R_{i,t-k} + \sum_{k=0}^{3} \delta_k TURNOVER_{i,t-k} + \log(SIZE_{i,t}) + \varepsilon, \quad (1)$$

where $R_{i,t}$ denotes return of stock *i* on day *t*; the main variable $[A,B]_{i,t}$ denotes the ratio of volume of trading between buyers of investor type A and sellers of investor type B relative to the total trading volume of stock *i* on day *t*; and the investor types "*H*", "*I*", "*F*" indicate households (individuals), institutions, and foreigners, respectively. For example, the notation "[*H,I*]" represents a case of all trades executed with a domestic individual as the buyer and a domestic institution as the seller of stock *i* on day *t*. For each stock *i* on day *t*, we calculate the trade variable $[A,B]_{i,t}$ for each of the nine buyer-seller combinations.

Unlike Stoffman (2014), who had to estimate the main trade variables because of limitations in the data set used, we can precisely measure our trade variables and classify the investor type of each trade's seller and buyer thanks to the richness of the proprietary dataset we acquired. Following Stoffman (2014), we include as control variables three lags of daily returns of stock *i*, and abnormal turnover of stock *i* (*TURNOVER*, the daily turnover divided by its trailing forty-day average) on day *t*, and its three lags. Finally, we add as another control variable the size (i.e., the natural log of the market capitalization) of stock *i* on day *t*, which is not included in Stoffman (2014).[10]

We estimate regression (1) following Fama and MacBeth (1973), running a cross-sectional regression for each day and then averaging the coefficients from these regressions and testing the coefficients' significance.

Table 3 presents coefficient estimates for regression model (1). The table presents the results from 693 daily cross-sectional regressions.[11] We report the average estimates of the coefficients and the *t*-statistics. We report our results in a 3×3 matrix form, with average coefficients and the *t*-statistics of the within-group trade variables and figures that represent the effects of inter-group trade variables. "*H*," "*I*," and "*F*" indicate the specific buyer group. A positive (negative) and significant coefficient means that trades made by the corresponding buyer-seller combination affect contemporaneous daily stock return positively (negatively). In sum, Table 3 reports the results from our tests to determine how different combinations of buyer-seller groups for daily trades affect stock price movements during the same day.

Consider intragroup trading cases first. The results are presented in Table 3. The coefficient for $[H,H]_{i,t}$, β_{HH}, is 0.0018, which is positive and significant. However, compared to other coefficient

[10] As in Stoffman (2014), our main trade variables do not sum to 1 since, in constructing our main variables, we excluded the trades made by government funds and non-financial institutions. Therefore, there is no problem of perfect multicollinearity in our regression model.

[11] Since we need the previous forty days to calculate the *TURNOVER* variable, the data from the first forty trading days of our sample period are not used in the regressions. We also lose three more days in order to include three lags of *Turnover* variable as independent variables. Thus, we end up with a total of 693 (=736-40-3) regressions.

estimates reported in Table 3, this coefficient is low in absolute terms, suggesting that trading between individuals is less important than other combinations in determining contemporaneous stock returns. Although more than 30 percent of all trading is made by households trading with other households, price movements are not strongly associated with trading among individual investors.

The negative but insignificant coefficients of $[I,I]_{i,t}$, β_{II} show that trading within the institutional investor group is weakly related to contemporaneous stock returns. Similar results are obtained in the case of trading among foreigners, except that we find a small negative, yet significant coefficient for $[F,F]_{i,t}$, β_{FF}.

In the case of trading between institutions and individuals, the coefficient for $[I,H]_{i,t}$, β_{IH}, is 0.0598. This estimate is highly significant, with a *t*-statistic of 62. The estimate suggests that stock prices tend to increase by about 0.0598 percent when the proportional volume of trading between institutional buyers and individual sellers increases by one point. For trades in which individuals are the buyers and institutional investors are the sellers, the coefficient for $[H,I]_{i,t}$, β_{HI}, is -0.0665. This estimate is significant and comparable with the results obtained from trades in which individuals sell stocks to institutions. These findings suggest that there is a possibility that when they trade with households, institutions can make profits because stock prices move in their direction. Our results are broadly consistent with Stoffman (2014), who shows that stock prices move in the direction that benefits institutions, regardless of whether institutions buy from or sell to households.

Next, we examine our results for trades made between foreigners and individuals. The estimates for β_{FH} and β_{HF} show results that are similar to those obtained from trades between domestic institutions and households in terms of the signs of coefficients and their statistical significance, albeit with a smaller numbers (in terms of absolute value) for the coefficients. The coefficient for $[F,H]_{i,t}$, β_{FH}, is positive and highly significant at 0.0519. The results show that, when foreign institutions purchase stocks from individuals, stock prices tend to increase significantly on the same

day. The coefficient for $[H,F]_{i,t}$, β_{HF}, is negative and significant at -0.0504. When foreign institutions sell stocks to households, our results indicate that the stocks' prices tend to decrease. Therefore, when foreign investors trade with domestic individuals, they may be able to profit from trading since stock prices move in their direction.

As for trades between domestic institutions and foreign institutions, our definition of foreign investors includes only *foreign institutional* investors, so our analysis can shed light on the comparative advantages of domestic institutions vs. foreign institutions when these two groups trade with each other. When foreigners purchase stocks from domestic institutions, stock prices tend to increase, as demonstrated by a positive and significant coefficient for $[F,I]_{i,t}$, β_{FI}, of 0.0080. When foreigners sell stocks to institutions, stock prices tend to decrease, as shown by a negative and significant coefficient for $[I,F]_{i,t}$, β_{IF} of -0.0036. However, the magnitude of the coefficients and the size of the *t*-statistics are much smaller than those foreigners obtain from trades with households. In summary, when domestic institutions trade with foreigners, stock prices tend to move in the direction of foreigners, albeit to a lesser extent than when individuals trade with foreigners.

The results from Table 3 clearly indicate that price changes are heavily influenced by the interactions between individuals and institutions and by the interactions between individuals and foreign investors. To a lesser degree, prices are also significantly determined by interactions between domestic institutional and foreign investors. In summary, we find significant evidence that, when domestic institutions or foreigners buy (sell) stocks from individuals, stock prices increase (decrease) on the same day, suggesting that prices move in a favorable direction for institutional investors when they trade with households. When foreigners trade with domestic institutions, stock prices move in the direction that benefits foreigners only, although their impact on the contemporaneous stock returns is much weaker than the impact of trading between foreigners and households.

One would be tempted to infer, based on these findings, that foreigners have an edge over domestic households and institutions and that domestic institutions have an edge over domestic households. However, such definitive inferences are too simplistic. A shortcoming of regression model (1) as a model for measuring the performance of various types of investors is that it does not reflect the actual prices the three different investor groups pay or receive for their trading but only relates contemporaneous movements of prices to their trading activities. In other words, it is possible that foreigners and institutions do not make profits even when contemporaneous stock prices appear to move in the direction that benefits them.

As Stoffman (2014) states, one possible explanation is that the results reported in this section are just a reflection of momentum strategies employed by foreigners and institutions. For example, if these institutional groups (both domestic and foreign) use a simple momentum strategy of buying winners (selling losers), they are likely to buy (sell) certain stocks after observing price increases (decreases) at a certain point in a trading day. If they observe an increase (decrease) in price near the closing time of a day and immediately enter the market, it is likely that a positive (negative) relationship between the stock's daily returns and these investor groups' purchasing (selling) activities will result. However, these institutions may actually pay a higher (receive a lower) intraday price—or get a similar price—than the closing price if the increasing (decreasing) trend in price ceases or a slight reversion in price occurs at the end of the day. Therefore, in this example, although the close-to-close return is positive or negative because the price moves in the direction of their trades, the question concerning whether they can earn positive returns cannot be answered by the results from regression model (1).

Another possibility is that the empirical findings in this section may result from the market impact costs that emanate from foreigners' and institutions' large-scale trades (Chan and Lakonishok, 1993; Hendershott and Menkvel, 2014). For instance, when institutional investors (both domestic and foreign) want to purchase (sell) a large number of shares of a stock quickly, their bidding (asking) for

immediate execution naturally increases (decreases) the stock price as they attempt to encourage buyers (sellers) to act promptly. In the process, it is possible that the price increase (decrease) that is induced by the market impact cost still affects the day's closing price in such a way that the current day's closing price is higher (lower) than that of the previous day. In that case, our dependent variable, daily return, will show a positive (negative) relationship with institutional investors' purchasing (selling) activities on that day. However, the institutional investors could have paid a higher (lower) price than—or a similar price—the closing price, resulting in their not seeing a positive return. In other words, even if the prices move in the direction that favors the institutional investors, there is no guarantee that their trading actually results in superior performance over that of their counterparty group. Therefore, regression model (1) cannot distinguish the effect of foreigners' and institutions' market impact cost from their short-term timing skills because the dependent variable, daily stock return, does not reflect the actual purchase prices the institutional investors paid.

To address this issue, in the next section we define performance measures for each type of investors that can reflect the actual prices each investor type pays or receives. Then we use the new return measures as our dependent variables in the regression analyses. This improved approach enables us to gauge the trading skills of each investor group against its counterparty group on an equal footing.

3.2. Trading skills at a daily horizon

We redo the regression analysis by replacing the dependent variable with a type of investor's performance measures that take into account the actual prices the group pays or receives. Using this approach, we can determine whether the price movements that appear to be favorable to both domestic institutions and foreigners (as reported in Table 3) do, indeed, reflect their superior ability to predict stock returns at a daily horizon.

We assume VWAP to be the representative trade price for each trader group's purchases or sales of stock *i* summarizing all transaction prices experienced by the traders who belong to a specific trader group in purchasing (or selling) stock *i* on day *t*. Specifically, we define the *purchase* VWAP of investors of type A for stock *i* on day *t* by

$$VWAP(P)_{it}^{A} = \frac{\sum_k Q_{it}^k P_{it}^k}{\sum_k Q_{it}^k}, \quad (2)$$

where Q_{it}^k is the quantity *purchased* by type A investor at price P_{it}^k for trade *k* on day *t*. $VWAP(P)_{it}^{A}$ is a reasonable proxy for the average actual purchase price for stock *i* on day *t* paid by investors of type A. Similarly, we define the *sale* VWAP of investors of type A for stock *i* on day *t* by

$$VWAP(S)_{it}^{A} = \frac{\sum_k Q_{it}^k P_{it}^k}{\sum_k Q_{it}^k}, \quad (3)$$

where Q_{it}^k is the quantity *sold* by type A investor at price P_{it}^k for trade k on day t. $VWAP(S)_{it}^{A}$ is our proxy for the average actual sale price for stock *i* on day *t* received by investors of type A.

Using the purchase VWAP, we then define *net purchase return (NPR) of an investor type A* for stock *i* on day *t* as

$$NPR_{i,t}^{A} = \frac{P_{i,t} - VWAP(P)_{it}^{A}}{VWAP(P)_{it}^{A}}, \quad (4)$$

where $P_{i,t}$ is the closing price of stocks *i* on day *t*. Similarly, we define *net sale return (NSR) of an investor type A* for stock *i* on day *t* as

$$NSR_{i,t}^{A} = \frac{P_{i,t} - VWAP(S)_{it}^{A}}{VWAP(S)_{it}^{A}}. \quad (5)$$

Whereas the NPR of traders in group A measures their average trading profit or loss from the time they bought stock *i* on day *t* until the close of the same day, the NSR of traders in group A estimates the average change in prices of stock *i* from the time they liquidated some of their positions in stock *i*

on day *t* to the close of the same day. If short-selling is allowed, a negative value of NSR represents an investor type's profit on the sell side. By using these measures, we can accurately estimate each investor group's short-term trading performance on each day.

Using the refined performance measures NPR and NSR as our new dependent variables, we then perform regression analyses based on Stoffman (2014). Our choice of independent variables remains the same as that used in section 3.1. Table 4 reports the coefficient estimates for each of the four regression models. As in Table 3, the reported figures are the averages of the coefficients from 693 daily cross-sectional regressions, following Fama and MacBeth (1973).

Table 4's Panel A reports which trade variable goes farthest to explain institutional investors' NPR. When we use institutional investors' NPR as the dependent variable, the coefficient for $[I,H]_{i,t}$, β_{IH}, is 0.0127. This estimate is comparatively large and highly significant. It suggests that at the end-of-day stock prices tend to increase by about 0.0127 percent from the average price institutional buyers pay to purchase the stock when the proportional volume of trading between institutional buyers and individual sellers increases by 1 percent point during the day. Therefore, institutions' daily profit tends to increase when they purchase stocks from households. When institutions buy stocks from foreigners, the coefficient for $[I,F]_{i,t}$, β_{IF}, is -0.0062, a highly significant and negative figure that suggests that institutions' NPR is negatively associated with their activities in purchasing stocks from foreigners.

Next, we turn to the effectiveness of foreigners' timing of purchases. As Table 4's Panel B shows, when foreigners purchase stocks from individuals, foreign investors' NPR is positively and significantly related to the volume of trading in this category. The estimate for β_{FH} is 0.0059. Although the coefficient estimate for $[F,H]_{i,t}$ is much lower than that for $[I,H]_{i,t}$ (in Panel A), it is highly significant. Therefore, when foreigners purchase stocks from households, their trading profits tend to increase. As for what happens when foreigners purchase stocks from domestic institutions,

Table 4's Panel B shows that the coefficient for $[F,I]_{i,t}$, β_{FI}, is positive and significant, so foreigners' profits also tend to increase when they buy stocks from institutions.

In summary, the results presented in Table 4's Panels A and B indicate that, at a daily horizon, domestic institutions tend to gain from households and lose to foreigners when they are at the buy side of a transaction, while foreigners gain from both institutions and households when they are at the buy side.

We now turn to cases in which institutions and foreigners sell stocks to other investor groups. Table 4's Panels C and D report regression results using institutional investors' NSR or foreigners' NSR as the dependent variables.

The coefficient for $[H,I]_{i,t}$ of Panel C, β_{HI} is estimated from daily cross-sectional regressions with the NSR of institutions as the dependent variable to be -0.0068. This coefficient is highly significant. The negative coefficient indicates that institutions' NSR decreases when they sell stocks to households, which suggests that stock prices tend to decline after institutions intensify their selling activities. This evidence suggests that institutions can time their sales well when they trade with individuals.

As for foreigners, we use foreign investors' NSR as the dependent variable and show in Panel D that the coefficient for $[H,F]_{i,t}$, β_{HF}, is significant at -0.0074. The coefficient for $[I,F]_{i,t}$, β_{IF}, is also negative and significant at -0.0086. Therefore, if short sales are allowed, foreigners' profit tends to increase when they intensify their selling of stocks to either individuals or institutions.

In summary, we find a tendency for domestic institutions' profits to increase when they trade with households and to decrease when they trade with foreigners. Foreigners' profits tend to increase whether they trade with individuals or institutions. These findings suggest that foreigners exhibit the best trading skills at a daily horizon, while individuals appear to provide liquidity to both foreigners and institutions without gaining profits.

3.3. Robustness Check: Largest Tertile Only

As Table 2's Panel A shows, average daily trading volume is reasonably well spread across the three investor types in the largest tertile, while the trading volume of households dominate in other tertiles. We determine whether the results obtained from the whole sample hold in the largest tertile alone. The results, reported in Tables 5 and 6, resemble those reported in Tables 3 and 4 in all respects. The main findings remain intact: We find a tendency for stock prices to move in the direction favorable to both institutions and foreigners when they trade with households, and when foreigners trade with institutions, stock prices tend to move only in the direction of foreigners, although the effect is weaker. Further, when we regress net purchase returns or net sales returns on the trade variables, we find that domestic institutions gain from households, while foreigners gain from both households and institutions.

3.4. Robustness Check: Sub-period Tests

In this section, we determine whether our results are sensitive to the period considered. We divide our sample period into three sub-periods: from June 3, 2013, to May 31, 2014; from June 1, 2014, to June 14, 2015; and from June 15, 2015, to May 31, 2016. The second and third of these sub-periods are determined by the date on which daily price limits were expanded from 15 percent per day to 30 percent per day. Daily price limits of 15 percent upward or downward price movements were in effect until June 14, 2015, while expanded daily price limits of 30 percent were applied thereafter.

Tables 7A, 7B, and 7C show the results. For brevity, we report only the results that use net purchases or sales returns for institutions and foreigners as the dependent variables.[12]. The results are remarkably consistent across the three sub-periods and mirror our earlier reported results from the whole sample period. The fact that the results from the periods before June 15, 2015, are similar indicates that the expanded daily price limits of 30 percent do not affect our results. Our sample

[12] Our results remain the same when we use daily stock return as the dependent variable.

stocks' daily price movements are not bound by the regulatory daily price limits, suggesting that only very small stocks might be sensitive to the change in these price limits.

4. Weekly Analysis

So far, we have examined the three investor groups' short-term trading skills at a daily horizon. In this section, we expand our horizon to a week to determine whether our results at a daily horizon hold at a weekly horizon.

Table 8 reports the regression results at a weekly horizon based on equation (1). This test determines the association between price changes and the investor groups' trading interactions over a week.

Table 8 shows the within and between group trading results. We find that coefficients for within group coefficients are much smaller than those for intergroup trading variables. As the highly significant positive coefficients for $[I,H]_{i,t}$ and $[F,H]_{i,t}$ and the highly significant negative coefficients for $[H,I]_{i,t}$, and $[H,F]_{i,t}$ show, weekly price changes are predominantly related to trading between institutions and households and that between foreigners and households. When institutions or foreigners purchase stocks from households, prices increase, and when they sell stocks to households, prices decrease. These results are consistent with those reported in the daily horizon analyses shown in Table 3.

We find insignificant or weak associations between foreigners' trades with domestic institutions and contemporaneous stock price movements over a week. In contrast to our daily results (Table 3), weekly prices do not move in foreigners' direction. If anything, when foreigners sell, prices increase, which is the opposite result as that shown in Table 3. In summary, the results reported in Table 8 indicate that, at a weekly horizon, stock prices move most when institutions or foreigners trade with households. We find no significant relationship between weekly stock price movements

and domestic institutions' trades with foreigners. This finding is not consistent with the results from the daily horizon analysis.

Although the results shown in Table 8 may suggest that domestic and foreign institutions' are superior to those of households, they cannot be regarded as reliable evidence of trading skills because our dependent variable is simply a weekly close-to-close return that does not reflect actual trading prices each type of investor pays or receives.

In the next round of tests, we estimate average purchase (selling) price paid (received) by each investor group for each stock during each week and calculate the average weekly return that could have been realized if an investor group purchases (sells short) the stock at the average purchase (selling) price and sells (buy) at the closing price of the week. The estimated return is just a weekly version of daily NPR (NSR), which is defined in section 3.2. We refer to the estimated return as *weekly* NPR (NSR) to distinguish it from the daily NPR defined in section 3.2.

Table 9 presents the results from four regressions run with institutions' and foreigners' weekly NPR or NSP as the dependent variable. All variables are measured over a week.

We infer the weekly trading skills of each investor group based on the results shown in Table 9. Panel A shows regression results when institutions' NPR is used as the dependent variable. When domestic institutions are the buyer group, their net purchase returns over a week are significantly positively related to their trading with households. Institutions' NPR is not significantly related to trading among institutions, but domestic institutions' NPR tends to decrease when they buy stocks from foreigners.

As Panel B of Table 9 reports, foreigners' weekly NPR increases when they buy from households or domestic institutions. The *t*-statistics of the coefficients for both [*F*,*H*] and [*F*,*I*] strongly support foreigners' weekly trading returns' tendency to rise when they buy from either households or institutions.

Panel C reports the regression results with institutions' NSR as the dependent variable. We confirm that domestic institutions time their sales of stocks well when they sell stocks to households and that their net sales return is significantly negatively associated with their selling volume to households. However, when they sell to foreigners, their net sales returns tend to increase, indicating that their timing is not good, although the coefficient for [*F,I*] is only marginally significant.

As Panel D shows, when foreigners sell stocks to other investor groups, the associated coefficients are negative and significant, suggesting that stock prices tend to decrease between the time of their sales and the close of the week.

In summary, domestic institutions can draw profits from trading with households, but they lose when they trade with foreigners, although this effect is much smaller. On the other hand, foreigners can make profits regardless of whether they trade with households or domestic institutions.

The case of trades between institutions and foreigners is particularly interesting because foreigners manage to gain even if the weekly prices do not move in the direction that favors them. As the results of Table 8 show, prices do not move in foreigners' direction over a weekly horizon when foreigners trade with domestic institutions. This finding does not suggest that foreigners' trading skills are superior to those of domestic institutions, but it is not in line with what we find in our daily horizon analysis, as reported in Section 3.1. However, when we replace the dependent variables with a performance measure that reflects the actual prices foreigners pay and receive, the trades between foreigners and domestic institutions appear to let foreigners garner trading gains over a week (Table 9).

In summary, we document compelling evidence that prices consistently move in institutions' and foreigners' direction at a weekly horizon when they trade with households. Moreover, given such favorable price movements, both domestic institutions and foreigners make positive weekly profits from trading with households. When foreigners trade with domestic institutions, foreigners gain

weekly profits, despite the absence of weekly price movements that are beneficial to them. Overall, we conclude that foreigners have the best timing skills among the three investor groups. Domestic households perform worst, so they provide liquidity to both domestic and foreign institutions.

5. Conclusion

This paper evaluates the short-term trading skills of individuals, institutions, and foreigners by using a dataset that identifies which types of investors execute each trade as buyers and sellers. Based on the model of Stoffman (2014), we first investigate the direction of price changes when two investor types trade with each other as counterparties. We find strong evidence that whenever domestic institutions or foreigners buy (sell) stocks from (to) individuals, stock prices significantly increase (decrease) at both daily and weekly horizons. Next, employing as the dependent variable a short-term return measure that reflects actual purchase (sales) prices paid (received) by each investor type for each stock, we investigate whether each type of investors makes profits given price changes at a daily or weekly horizon. This regression setup enables us to estimate each investor type's *relative* short-term performance over that of other investor types. We find robust evidence that individuals display poor trading skills and end up providing liquidity to both institutions and foreigners. This evidence is consistent with the consensus view that individual investors are uninformed, noise traders. When domestic institutions trade with foreign institutions, foreigners generally show superior trading skills at both daily and weekly horizons. This finding may reflect the explicit and implicit constraints that are imposed on domestic institutions (such as pension funds) and that foreign institutions take advantage of these constraints to improve their trade prices.

Several studies (Ivkovic, Sialm, and Weisbenner 2008; Seru, Shumway, and Stoffman 2009) present evidence that a small subset of individual investors is more informed or skilled than institutional investors are. Our study in no way denies the existence of smart individual investors;

instead, it documents evidence based on *average* performance at short horizons. Identifying special traits of investor types that lead to superior investment performance will be a fruitful avenue for future research.

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Table 1
Descriptive Statistics

This table reports descriptive statistics. The sample is constructed from daily transaction data of all stocks traded on the KRX (KOSPI and KOSDAQ markets combined) between June 1, 2013 and May 31, 2016 (a total of 736 trading days). Our screening procedure is explained in the text of the paper. Our final sample contains 238,462 daily observations for 357 sample stocks. For each day, we first measure four variables for each stock: size (market capitalization), closing price, the number of trades during the day, and trading volume during the day. We then take time-series averages of the four variables for each stock over the whole sample period. The figures reported in Table 1 are the cross-sectional averages of the time-series averages of the four variables across all sample stocks or the sample stocks in each size tertile. *N* is the number of unique stocks that are contained in the whole sample or each size tertile at least once during the whole sample period.

		Cross-sectional average of:			
	N	Size (Billion Korean Won)	Close price /day (Korean Won)	Trades /day (Number)	Trading volume/day (Shares)
All stocks	357	3,543.04	102,107.41	7,308.11	413,630.24
Smallest tertile	119	467.79	45,540.09	3,469.12	153,971.41
Middle tertile	119	1,049.57	74,382.22	5,824.41	251,973.21
Largest tertile	119	8,375.70	181,192.64	11,912.77	441,281.56

Table 2
Interaction among Households, Institutions, and Foreigners

This table reports the average daily relative trading volume of the three types of investors: households (domestic individuals), domestic institutions, and foreigners. The sample includes all transaction data of sample stocks traded on the KRX (covering both KOSPI and KOSDAQ markets) between June 1, 2013 and May 31, 2016, covering a total of 736 trading days. It involves 238,462 observations from 357 distinct sample stocks. For each stock, we first take the time-series average of daily relative trading volume by each investor group. Then, we calculate and report the cross-sectional averages across stocks and size tertiles. Panel A of Table 2 reports the average proportion of trading volume by households, institutions, and foreigners. Panel B of Table 2 reports interaction among three investor groups: households, institutions, and foreigners. Standard errors are reported in parentheses.

Panel A: Percentage of trading

	Households	Institutions	Foreigners
All firms	51.01	21.51	19.83
	(1.03)	(0.52)	(0.53)
Smallest tertile	62.62	16.79	13.69
	(1.51)	(0.90)	(0.50)
Largest tertile	36.76	25.51	28.84
	(1.35)	(0.59)	(0.93)

Panel B: Interaction

	Households	Institutions	Foreigners
All firms			
Households	32.31		
	(1.14)		
Institutions	20.29	5.85	
	(0.39)	(0.22)	
Foreigners	17.11	11.03	5.76
	(0.22)	(0.39)	(0.31)
Smallest tertile			
Households	45.03		
	(1.89)		
Institutions	19.25	4.01	
	(0.81)	(0.35)	
Foreigners	15.93	6.30	2.58
	(0.38)	(0.45)	(0.19)
Largest tertile			
Households	17.36		
	(1.22)		
Institutions	19.86	7.10	
	(0.52)	(0.30)	
Foreigners	18.95	16.95	10.89
	(0.32)	(0.61)	(0.67)

Table 3
Contemporary Daily Returns along with Trade Interaction

This table reports the results of Fama-MacBeth regressions:

$$R_{i,t} = \alpha_i + \beta_{HH}[H,H]_{i,t} + \beta_{HI}[H,I]_{i,t} + \beta_{HF}[H,F]_{i,t} + \beta_{IH}[I,H]_{i,t} + \beta_{II}[I,I]_{i,t} + \beta_{IF}[I,F]_{i,t} + \beta_{FH}[F,H]_{i,t} + \beta_{FI}[F,I]_{i,t} + \beta_{FF}[F,F]_{i,t} + \sum_{k=1}^{3}\gamma_k R_{i,t-k} + \sum_{k=0}^{3}\delta_k TURNOVER_{i,t-k} + \ln(SIZE_{i,t}) + \varepsilon,$$

where the notation $[A,B]_{i,t}$ denotes the ratio of trading volume between buyers of investor type A and sellers of investor type B relative to the total trading volume of stock *i* on day *t*. The investor types "*H*", "*I*", and "*F*" indicate households (individuals), institutions, and foreigners, respectively. Control variables include three lags of daily returns of stock *i* ,R_i, and abnormal turnover of stock *i* (*TURNOVER*, the daily turnover divided by its trailing 40-day average) on day *t*, and its three lags, and the natural log of the market capitalization (*ln(SIZE)*). The sample includes complete daily trading data of sample stocks traded on the KRX (covering both KOSPI and KOSDAQ markets) between June 1, 2013 and May 31, 2016, covering a total of 736 trading days. It involves 238,462 observations from 357 distinct sample stocks. The average coefficients from a total of 693 daily cross-sectional regressions of the form shown above in the spirit of the Fama-MacBeth regression approach are reported in the form of a 3 x 3 matrix. Each column heading represents specific seller group. We link each column of this table to three rows with notations of "*H*", "*I*", and "*F*", each representing a specific buyer group. *t*-statistics are reported in parentheses.

Coefficient of *[Buyer, Seller] (Buyer = H, I, F , Seller = H, I, F)* (*N = 693*)			
	Seller		
	H	*I*	*F*
Buyer			
H	0.0018	-0.0665	-0.0504
	(2.62)	(-61.57)	(-52.57)
I	0.0598	-0.0016	-0.0036
	(61.72)	(-1.91)	(-3.93)
F	0.0519	0.0080	-0.0033
	(53.90)	(9.34)	(-4.11)

Table 4
Net Purchase (Sale) Returns along with Trade Interactions at a Daily Horizon

This table reports the results of Fama-MacBeth regressions of the form run in Table 3, replacing only the dependent variables by net purchase (sale) returns for either institutions or foreigners (*NPR (NSR) of Foreign (or Domestic) Institutions).* Independent variables are the same as those used in the regressions run in Table 3. The dependent variables, *NPR (NSR) of Foreign (or Domestic) Institutions* are defined in equations (4) and (5) in the text. Each panel reports the average coefficients from Fama-MacBeth regressions as shown above with different dependent variables: NPR of domestic institutions, NPR of foreign institutions, NSR of domestic institutions, and NSR of foreign institutions, respectively. The title of each panel indicates which dependent variable is used in the regressions. Each column heading represents specific seller group. We link each column of this table to three rows with notations of "*H*", "*I*", and "*F*", each representing a specific buyer group. *t*-statistics are reported in parentheses.

Coefficient of *[Buyer, Seller] (Buyer = H, I, F , Seller = H, I, F)* (*N* = 693)			
	Seller		
Buyer	*H*	*I*	*F*
Panel A: Dependent variable = NPR of domestic institutions			
I	0.0127	0.0010	-0.0062
	(32.22)	(2.46)	(-14.25)
Panel B: Dependent variable = NPR of foreign institutions			
F	0.0059	0.0067	-0.0013
	(13.28)	(15.38)	(-3.04)
Panel C: Dependent variable = NSR of domestic institutions			
H		-0.0068	
		(-17.75)	
I		-0.0089	
		(-19.21)	
F		0.0045	
		(9.76)	
Panel D: Dependent variable = NSR of foreign institutions			
H			-0.0074
			(-17.54)
I			-0.0086
			(-19.39)
F			-0.0003
			(-0.66)

Table 5
Contemporary Daily Returns along with Trade Interaction: Largest Tertile

This table reports the results of the same Fama-MacBeth regressions of the form shown in Table 3 applied to the largest tertile sample only. For each day, we first sort cross-sectional observations of the day based on market capitalizations and then allocate the sorted data into tertiles. We then apply the Fama-MacBeth regressions of the same form shown in Table 3 to the largest tertile for each day. The sample includes daily trading data of the stocks in the largest tertile that are traded on the KRX (covering both KOSPI and KOSDAQ markets) between June 1, 2013 and May 31, 2016. The average coefficients from a total of 693 daily cross-sectional regressions of the form shown in Table 3 in the spirit of the Fama-MacBeth regression approach are reported in the form of a 3 x 3 matrix. Each column heading represents specific seller group. We link each column of this table to three rows with notations of "*H*", "*I*", and "*F*", each representing a specific buyer group. *t*-statistics are reported in parentheses.

Coefficient of *[Buyer, Seller] (Buyer = H, I, F , Seller = H, I, F)* (*N =693*)

	Seller		
	H	*I*	*F*
Buyers			
H	0.0020	-0.0836	-0.0593
	(1.72)	(-50.96)	(-38.81)
I	0.0844	-0.0069	-0.0050
	(50.57)	(-4.50)	(-3.94)
F	0.0612	0.0074	-0.0023
	(42.35)	(5.81)	(-2.14)

Table 6
Net Purchase (Sale) Returns along with Trade Interaction at a Daily Horizon: Largest Tertile

This table reports the results of the same Fama-MacBeth regressions of the form shown in Table 3 applied to the largest tertile sample only, replacing only the dependent variables by net purchase (sale) returns for either institutions or foreigners (*NPR (NSR) of Foreign (or Domestic) Institutions).* Independent variables are the same as those used in the regressions run in Table 3. The dependent variables, *NPR (NSR) of Foreign (or Domestic) Institutions*$_{i,t,}$ are defined in equations (4) and (5) in the text. Each panel reports the average coefficients from Fama-MacBeth regressions as shown above with different dependent variables: NPR of domestic institutions, NPR of foreign institutions, NSR of domestic institutions, and NSR of foreign institutions, respectively. The title of each panel indicates which dependent variable is used in the regressions. Each column heading represents specific seller group. We link each column of this table to three rows with notations of "*H*", "*I*", and "*F*", each representing a specific buyer group. *t*-statistics are reported in parentheses..

Coefficient of *[Buyer, Seller] (Buyer = H, I, F , Seller = H, I, F)* (*N* = 693)			
	Seller		
Buyer	*H*	*I*	*F*
Panel A: Dependent variable = NPR of domestic institutions			
I	0.0145	0.0007	-0.0042
	(23.08)	(0.93)	(-6.97)
Panel B: Dependent variable = NPR of foreign institutions			
F	0.0074	0.0090	-0.0005
	(11.89)	(15.07)	(-0.92)
Panel C: Dependent variable = NSR of domestic institutions			
H		-0.0070	
		(-11.16)	
I		-0.0072	
		(-8.80)	
F		0.0075	
		(11.46)	
Panel D: Dependent variable =NSR of foreign institutions			
H			-0.0070
			(-12.44)
I			-0.0055
			(-9.17)
F			-0.0007
			(-1.34)

Table 7A
Net Purchase (Sale) Returns along with Trade Interaction at a Daily Horizon: Sub-period 1 (20130603 ~ 20140531)

This table reports the results for Sub-period 1 from June 3, 2013 to May 31, 2014. We run Fama-MacBeth regressions of the form shown in Table 3, replacing only the dependent variables by net purchase (sale) returns for either institutions or foreigners (*NPR (NSR) of Foreign (or Domestic) Institutions)*. Independent variables are the same as the independent variables used in the regressions run in Table 3. The dependent variables, *NPR (NSR) of Foreign (or Domestic) Institutions*$_{i,t,}$ are defined in equations (4) and (5) in the text. Each panel reports the average coefficients from Fama-MacBeth regressions as shown above with different dependent variables: NPR of domestic institutions, NPR of foreign institutions, NSR of domestic institutions, and NSR of foreign institutions, respectively. The title of each panel indicates which dependent variable is used in the regressions. Each column heading represents specific seller group. We link each column of this table to three rows with notations of "*H*", "*I*", and "*F*", each representing a specific buyer group. *t*-statistics are reported in parentheses.

Coefficient of *[Buyer, Seller] (Buyer = H, I, F , Seller = H, I, F)* (*N* = 245)

	Seller		
Buyer	*H*	*I*	*F*
	Panel A: Dependent variable = NPR of domestic institutions		
I	0.0102	0.0001	-0.0048
	(20.54)	(0.09)	(-6.44)
	Panel B: Dependent variable = NPR of foreign institutions		
F	0.0076	0.0072	-0.0011
	(11.68)	(9.80)	(-1.81)
	Panel C: Dependent variable = NSR of domestic institutions		
H		-0.0053	
		(-8.60)	
I		-0.0083	
		(-11.87)	
F		0.0044	
		(5.67)	
	Panel D: Dependent variable = NSR of foreign institutions		
H			-0.0074
			(-10.27)
I			-0.0081
			(-10.74)
F			-0.0017
			(-2.55)

Table 7B
Net Purchase (Sale) Returns along with Trade Interaction at a Daily Horizon: Sub-period 2 (20140601 ~ 20150614)

This table reports the results for Sub-period 2 from June 1, 2014 to June 14, 2015. We run Fama-MacBeth regressions of the form shown in Table 3, replacing only the dependent variables by net purchase (sale) returns for either institutions or foreigners (*NPR (NSR) of Foreign (or Domestic) Institutions)*. Independent variables are the same as the independent variables used in the regressions run in Table 3. The dependent variables, *NPR (NSR) of Foreign (or Domestic) Institutions*$_{i,t,}$ are defined in equations (4) and (5) in the text. Each panel reports the average coefficients from Fama-MacBeth regressions as shown above with different dependent variables: NPR of domestic institutions, NPR of foreign institutions, NSR of domestic institutions, and NSR of foreign institutions, respectively. The title of each panel indicates which dependent variable is used in the regressions. Each column heading represents specific seller group. We link each column of this table to three rows with notations of "*H*", "*I*", and "*F*", each representing a specific buyer group. *t*-statistics are reported in parentheses.

Coefficient of *[Buyer, Seller] (Buyer = H, I, F , Seller = H, I, F)* (*N* = 238)

	Seller		
Buyer	*H*	*I*	*F*
	Panel A: Dependent variable = NPR of domestic institutions		
I	0.0141	0.0015	-0.0056
	(21.63)	(2.28)	(-7.67)
	Panel B: Dependent variable = NPR of foreign institutions		
F	0.0061	0.0064	-0.0005
	(7.78)	(8.57)	(-0.79)
	Panel C: Dependent variable = NSR of domestic institutions		
H		-0.0062	
		(-10.40)	
I		-0.0081	
		(-11.32)	
F		0.0044	
		(5.69)	
	Panel D: Dependent variable =NSR of foreign institutions		
H			-0.0068
			(-9.28)
I			-0.0074
			(-9.90)
F			0.0011
			(1.63)

Table 7C
Net Purchase (Sale) Returns along with Trade Interaction at a Daily Horizon: Sub-period 3 (20150615 ~ 20160531)

This table reports the results for Sub-period 3 from June 15, 2015 to May 31, 2016. Up until June 14, 2015, all stocks were subject to daily limits of a 15% increase or decrease from the previous day's closing price. The 15% daily limits were expanded to 30% daily limits from June 15, 2015 onwards. Sub-period 3 covers a sample period during which 30% daily price limits are in effect. We run Fama-MacBeth regressions of the form shown in Table 3, replacing only the dependent variables net purchase (sale) returns for either institutions or foreigners (*NPR (NSR) of Foreign (or Domestic) Institutions)*. Independent variables are the same as the independent variables used in the regressions run in Table 3. The dependent variables, *NPR (NSR) of Foreign (or Domestic) Institutions*$_{i,t,}$ are defined in equations (4) and (5) in the text. Each panel reports the average coefficients from Fama-MacBeth regressions as shown above with different dependent variables: NPR of domestic institutions, NPR of foreign institutions, NSR of domestic institutions, and NSR of foreign institutions, respectively. The title of each panel indicates which dependent variable is used in the regressions. Each column heading represents specific seller group. We link each column of this table to three rows with notations of "*H*", "*I*", and "*F*", each representing a specific buyer group. *t*-statistics are reported in parentheses.

Coefficient of *[Buyer, Seller] (Buyer = H, I, F , Seller = H, I, F)* (*N* = 253)			
	Seller		
Buyer	*H*	*I*	*F*
Panel A: Dependent variable = NPR of domestic institutions			
I	0.0133	0.0015	-0.0078
	(16.55)	(1.79)	(-9.95)
Panel B: Dependent variable = NPR of foreign institutions			
F	0.0045	0.0066	-0.0020
	(5.55)	(8.47)	(-2.30)
Panel C: Dependent variable = NSR of domestic institutions			
H		-0.0062	
		(-10.40)	
I		-0.0081	
		(-11.32)	
F		0.0044	
		(5.69)	
Panel D: Dependent variable = NSR of foreign institutions			
H			-0.0078
			(-10.70)
I			-0.0100
			(-12.46)
F			-0.0003
			(-0.40)

Table 8
Contemporary Weekly Returns along with Trade Interaction

This table reports the weekly results of Fama-MacBeth regressions:

$$R_{i,t} = \alpha_i + \beta_{HH}[H,H]_{i,t} + \beta_{HI}[H,I]_{i,t} + \beta_{HF}[H,F]_{i,t} + \beta_{IH}[I,H]_{i,t} + \beta_{II}[I,I]_{i,t} + \beta_{IF}[I,F]_{i,t} + \beta_{FH}[F,H]_{i,t} + \beta_{FI}[F,I]_{i,t} + \beta_{FF}[F,F]_{i,t} + \sum_{k=1}^{3}\gamma_k R_{i,t-k} + \sum_{k=0}^{3}\delta_k TURNOVER_{i,t-k} + \ln(SIZE_{i,t}) + \varepsilon,$$

where the notation $[A,B]_{i,t}$ denotes the ratio of trading volume between buyers of investor type A and sellers of investor type B relative to the total trading volume of stock *i* during week *t*. The investor types "*H*", "*I*", and "*F*" indicate households (individuals), institutions, and foreigners, respectively. Control variables include three lags of weekly returns of stock *i*, R_i, and abnormal turnover of stock *i* (*TURNOVER*, the weekly turnover divided by its trailing 8-week average), and its three lags, and the natural log of the market capitalization (*ln(SIZE)*). Each column heading represents specific seller group. We link each column of this table to three rows with notations of "*H*", "*I*", and "*F*", each representing a specific buyer group. *t*-statistics are reported in parentheses.

	Coefficient of *[Buyer, Seller] (Buyer = H, I, F , Seller = H, I, F)* (*N =146*)		
	Seller		
	H	*I*	*F*
Buyers			
H	0.0021	-0.2257	-0.1514
	(0.49)	(-31.53)	(-25.15)
I	0.1892	-0.0200	0.0128
	(30.53)	(-3.31)	(2.09)
F	0.1129	0.0043	-0.0167
	(19.47)	(0.73)	(-3.13)

Table 9
Net Purchase (Sale) Returns along with Trade Interaction at a Weekly Horizon

This table reports the weekly results of Fama-MacBeth regressions of the form run in Table 3, replacing only the dependent variables by net purchase (sale) returns for either institutions or foreigners (*NPR (NSR) of Foreign (or Domestic) Institutions)*. Independent variables are the same as the independent variables used in the regressions run in Table 3. The dependent variables, *NPR (NSR) of Foreign (or Domestic) Institutions*$_{i,t,}$ are defined in equations (4) and (5) in the text. Each panel reports the average coefficients from Fama-MacBeth regressions as shown above with different dependent variables: NPR of domestic institutions, NPR of foreign institutions, NSR of domestic institutions, and NSR of foreign institutions, respectively. The title of each panel indicates which dependent variable is used in the regressions. Each column heading represents specific seller group. We link each column of this table to three rows with notations of "*H*", "*I*", and "*F*", each representing a specific buyer group. *t*-statistics are reported in parentheses.

Coefficient of *[Buyer, Seller] (Buyer = H, I, F , Seller = H, I, F)* (*N* = 146)

	Seller		
Buyer	*H*	*I*	*F*
	Panel A: Dependent variable =NPR of domestic institutions		
I	0.0559	0.0009	-0.0065
	(19.07)	(0.30)	(-2.06)
	Panel B: Dependent variable = NPR of foreign institutions		
F	0.0226	0.0159	-0.0046
	(6.87)	(4.84)	(-1.60)
	Panel C: Dependent variable = NSR of domestic institutions		
H		-0.0594	
		(-20.09)	
I		-0.0259	
		(-9.25)	
F		0.0065	
		(1.95)	
	Panel D: Dependent variable = NSR of foreign institutions		
H			-0.0445
			(-13.51)
I			-0.0160
			(-4.83)
F			-0.0077
			(-2.55)