

Who wins in the money game?

The case of KOSPI 200 futures

Abstract

This study investigates the information efficiency of each investor category (i.e., foreigners versus domestics) and further explores the performance of foreign investors according to their types and nationalities in the KOSPI 200 futures market. We study the nine most recent years of all transaction data including all phases of Korean stock markets. To evaluate information efficiency, we use position and trading gains as well as total gains, and develop adjusted VWAP measures consistent with trading gains. Our empirical findings support the information efficiency of foreign investors over domestics. A joint analysis of investor types and nationalities reveals that securities and investment companies in the U.K., Hong Kong, and Singapore have information efficiency over other groups of foreign investors. Such a phenomenon could be explained, with caution, by the inter-relation of foreign investors among the U.K., Hong Kong, and Singapore and their spot trading in Korea.

Key words: Foreign investors, Position gain, Trading gain, Total gain, Adjusted VWAP
JEL classification: G14, G15

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Who wins in the money game? The case of KOSPI 200 futures

As the world capital markets become more integrated, the information efficiency of each investor category (i.e., foreigners versus domestics) is an important issue from the viewpoint of local regulators as well as academics. Generally speaking, local regulators are reluctant to accept the possibility that foreign investors make a lot of money with exclusive information and investment technology, even though their local capital markets are fully liberalized. In the sense of protecting national wealth from greedy foreign investors, such a concern is widespread particularly in emerging capital markets. In countries like the U.S., the U.K., Hong Kong, and Singapore which are highly developed in the sense of capital markets, this is not a relatively significant issue. On the other hand, foreign institutional investors are always seeking new investment opportunities (i.e., new capital markets) to both enhance their investment returns and reduce their investment risks. If there are too many restrictions and regulations against their investment objectives in a local country, they will have no incentive to invest there because they are rational. If they invest in a local country, they will trade using all the information and investment technology available to achieve their objectives.

In an academic sense, foreign institutional investors' trading activities could make local capital markets more efficient than before liberalization. As a consequence, listed firms are able to raise required capital more easily than before at a lower cost. [See Bekaert and Harvey (2000) for details.] Despite numerous positive effects, local regulators and practitioners may be afraid of foreign investment, perhaps because they are concerned about losing their market control power. As a local capital market becomes more internationalized or globalized, regulators' concerns change to focus more on how to make their market more efficient, bigger, and more attractive to all participants who are trying to invest as well as all firms that are trying to raise capital. In this sense, foreign investors are not the enemy, but simply investors. Their superior profitability is a phenomenon to be studied and should not be treated as an evil.

While most foreign investors are institutions, domestic investors can be divided into two categories: individuals and institutions. Hence, investors are easily divided into three categories: individuals, foreigners, and institutions. A number of studies investigate the information efficiency of foreign investors over domestic investors. Grinblatt and Keloharju (2001) find that foreign investors have more information efficiency than domestic investors in Finland. Seasholes (2000) obtains the same findings in Taiwan. Froot and Ramadorai (2001) study the data of institutional equity flows from the U.S. to 25 countries, and find that foreign investors have better information than domestic investors. During the Asian financial crisis, Ghysels and Seon (2005) also find the information efficiency of foreign investors in KOSPI 200 futures market. Kamesaka et al. (2003) show the information efficiency of foreign investors in Japan. More recently Ko et al. (2007) find the information efficiency of foreign and domestic institutional investors in both Korea and Japan.

Meanwhile, Hamao and Mei (2001), Kim and Wei (2002), and Dahlquist and Robertsson (2004) find no evidence of foreign investors' informed trading in Japan, Korea, and Sweden, respectively. Furthermore, Choe et al. (2005) find some evidence that domestic individual investors have an edge over foreign investors from the viewpoint of volume-weighted average price (henceforth VWAP) in Korea; they study a very short-term side of information efficiency of investor categories. Dvorak (2005) measures information efficiency by real trading gains, and shows that domestic investors have higher gains than foreign investors in Indonesia. His analysis, however, has two shortcomings: first, he computes trading gains only, without considering position gains, i.e., gains from ownership position, and second, he uses per-transaction gains which are standardized by the number of transaction.¹ Large per-transaction gains do not imply large real trading gains. Thus, his findings are hard to interpret as evidence of foreign investors' information inefficiency.

The findings of Choe et al. (2005) and Dvorak (2005) are not consistent with those of Grinblatt and Keloharju (2001), Froot and Ramadorai (2001), Seasholes (2000), Ghysels and Seon (2005), Kamesaka et al. (2003), and Ko et al. (2007). This controversy requires more evidence on information asymmetry between domestic and foreign investors. For this purpose, we investigate all transaction data from a relatively long period (i.e., nine years from January 1998 through December 2006) in the Korean stock index futures market. Because the stock index futures market is driven by economy-wide information in a capital market, not by each firm's idiosyncratic events, our empirical results provide a more concrete conclusion than those of stock markets when an investor category has information efficiency over another. As suggested by Dahlquist and Robertsson (2001), we evaluate the information efficiency of each investor category in the sense of their total gains (i.e., performance) from KOSPI 200 futures contracts.² We decompose total gain into two parts, position gain and trading gain, for further analysis. The daily trading gain refers to profit/loss during a day generated from the daily trading while the daily position gain refers to that generated from the futures position at the end of the previous trading day. The daily total gain is simply a sum of the daily trading and position gains.

From the viewpoint of information efficiency, such decomposition sheds light on interpreting empirical findings. When it comes to futures trading, position gain could be a relatively mid-term profit/loss, while trading gain, a very short-term profit/loss. Suppose an investor category has an investment strategy based on its investment objective and information, that is, the investors are informed about capital markets. Their strategy could be either gradual buying or selling over a few months. In their trading process, implementation and completion of their investment strategy are much more important than buying or selling prices which are more or

¹ Because ownership data are not available, he could not compute position gain from ownership. His definition of trading gain is different from ours. His trading gain has a much longer horizon than ours which is less than one day.

² See the last paragraph on page 439 in Dahlquist and Robertsson (2001).

less disadvantageous to them. What is important are the positive economic gains generated from their ownership position, not just VWAPs. Position gain is obtained from an investor's mid-term or long-term information about capital markets.

The concept of VWAP ratio to the market is, to a certain extent, related to trading gains. Suppose that, during the previous nine days, foreigners have had no valuable market micro-information (i.e., micro-cash flow or market sentiment) and bought (sold) a small amount of stocks every day on a regular basis according to their trading strategies at higher (lower) prices than those of the market. Today, however, they have valuable market micro-information. They buy (sell) a huge amount of stocks today at much lower (higher) prices than those of the market. Consequently, during the most recent ten days, the trading gain could be positive in an economic and statistical sense although the average buy (sell) VWAP ratio of foreigners might be higher (lower) than that of domestic investors. In this case, despite the higher average buy (lower sell) VWAP ratio, one can say that foreigners have information efficiency or advantage. Which measure is better, VWAP or trading gain? We believe the answer is trading gain.

Combining the position and trading gains, we obtain a total gain and use it as an overall measure of information efficiency. Unlike Dvorak (2005), we compute the total gain (not per-transaction gain) of each investor category. VWAP ratios from a futures market are also computed and compared to those of Choe et al. (2005) from a spot market. We show why the average VWAP (or its ratios) is not consistent with the trading gain when being used as a measure of information efficiency. As an alternative, the adjusted VWAP measures are developed, which are consistent with the trading gain. In this regard, this study fills the void that previous studies overlook.

This study contributes three-fold to the previous studies. First, this study analyzes a relatively long period (i.e., nine years) of transaction data. An intraday analysis over a short period (i.e., one or two years) may produce sample or period-specific results. Our sample includes the periods of financial crisis, bubbles, collapses, and steady growth. Hence, our results are not specific period-dependent. Second, from the viewpoints of position and trading gains as well as total gains, the information efficiency of each investor category is evaluated. Adjusted VWAP measures are developed that are consistent with the trading gain, which complements the previous studies. Third, an exploratory analysis is conducted according to the types and nationalities of foreign investors. To our knowledge, this is the first such attempt in evaluating the performance of foreign investors.

This study is organized as follows. Section I introduces our data and measures for information efficiency. The relation between VWAP and the trading gain is simply derived and discussed from the definition of trading gain. Adjusted VWAP measures are also developed. Section II computes the gains of each investor category from KOSPI 200 futures trading, and evaluates their information efficiency. Empirical results of various VWAP

measures are shown and compared with those of trading gains. An exploratory analysis is conducted on the gains of foreign investors according to their types and nationalities in section III. Section IV concludes the paper.

I . Data and measures for information efficiency

A. Data

In May 1996, Korea Exchange (henceforth KRX) introduced KOSPI 200 futures.³ In terms of derivatives as of August 2007, ten futures and four options products are listed on the KRX. In the sense of trading volume, the KRX is a very successful options and futures exchange. Needless to say, KOSPI 200 futures is one of the most heavily traded stock index futures contracts in the world. Traders of KOSPI 200 futures consist of individuals, foreigners, institutions, and so forth. Abundant liquidity and various kinds of traders make the KOSPI 200 futures contracts most appropriate for evaluating the information efficiency of each investor category: individuals versus foreigners versus institutions, or foreigners versus domestics. This study uses a database from the KRX which covers nine years from January 1, 1998 through December 14, 2006 including all phases of Korean stock markets, periods of financial crisis, bubbles, collapses, and steady growth. Without an exception, all transaction data are analyzed during the sample period.

Because four KOSPI 200 futures contracts (March, June, September, and December contracts) are newly listed and expired each year, 36 contracts are analyzed in the sample period. Our database of transaction data provides a significant amount of information, including the date, code, sequential number of trades, various methods of trades, price, volume, time, brokerage or dealing, trader's nationality, trader's type, and so forth. To our knowledge, our database is one of the most detailed transaction information in the world.

In September 2001, spread trade was introduced. Spread trade refers to simultaneously buying a far-away futures contract and selling a near-by futures contract. For example, on a day in April 2005, if one buys a spread of 2005 September futures against 2005 June futures, it is the same as buying a September futures contract while simultaneously selling a June futures contract. Spread trade is an extremely useful way to rollover one's position from the near-by contracts to the far-away. Spread trades are also incorporated into our analysis.

Meanwhile, the minimum price change (i.e., a tick) of KOSPI 200 futures contract is 0.05 points, with 1 point of price change equal to exactly Korean won 500,000. When we assume that the rough average exchange rate of the Korean won in terms of the U.S. dollar is 1,000, 1

³ The KRX is the former Korea Stock Exchange. On January 27, 2005, the Korea Exchange (henceforth KRX) was newly established by consolidating three domestic exchanges: Korea Stock Exchange, KOSDAQ Market, and Korea Futures Exchange. Visit the KRX website, www.krx.co.kr, for details.

point change in the KOSPI 200 futures price is equal to a US \$500 gain/loss. See Ghysels and Seon (2005) for the details of KOSPI 200 futures contracts.

B. Participants in KOSPI 200 futures market

All participants are divided into four investor categories: individuals, foreigners, institutions, and the others. Foreigners can be further divided into resident and non-resident foreigners. Institutions include banks, securities companies (i.e., brokers, dealers, or underwriters of stocks and bonds), insurance companies, mutual funds, and other finance companies. Finally, the others consist of governments, local governments, and other companies.

Table I shows the trading volume and number of trades according to each investor category in the sample period. The trading volume (number of trades) of each investor category is an average of their short and long volume (number of trades). All figures are given by their proportions to the market figures except for the market volume and number of trades. In Panel A, the grand total trading volume is over 335 million contracts. Unlike the Nikkei 225 futures in the Osaka Stock Exchange, the trading volume of individuals averages nearly 50%.⁴ Individuals remain the most active participants although their proportion of trading volume has decreased since 2003. On the other hand, most foreigners are non-resident foreigners. Choe et al. (2005) defines foreigners as non-resident foreigners. We include, however, resident and non-resident foreigners in the definition of foreigners to consider all the participants' trades in the KOSPI 200 futures market.⁵ The proportion of both resident and non-resident foreigners' yearly trading volume has gradually and monotonically increased from 2.95% in 1998 to 24.77% in 2006. The proportion of institutions' yearly trading volume fluctuates between 27% and 47%. As the role of foreigners has increased, those of individuals and institutions have decreased in the KOSPI 200 futures market. The others have very small proportion of trading volume. The number of trades is shown in Panel B. As expected, the proportion of individuals' number of trades is somewhat higher than that of their trading volume because their per-transaction trading volume is relatively smaller than that of foreigners or institutions. The overall trend of the number of trades indicates a similar pattern to that of the trading volume.

[Table I inserted here!]

C. Measures for information efficiency

This study uses total gain as a measure of information efficiency of each investor category.

⁴ Some say that one of success factors of KOSPI 200 futures is the active participation of individual investors.

⁵ Resident foreigners become domestic investors after one year of legal residence in Korea. Even if only non-resident foreigners are included in the analysis, the results are very similar or even somewhat stronger for the conclusion of this paper.

As mentioned before, total gain is a sum of the position and trading gains. The daily trading gain is profit/loss during a day generated from the daily trading, whereas the daily position gain is profit/loss from the futures position at the end of the previous trading day. On day d , the daily total, position, and trading gains of an investor category i are defined as follows:

$$\text{Daily total gain}_{i,d} = \text{Daily position gain}_{i,d} + \text{Daily trading gain}_{i,d} , \quad (1)$$

$$\text{Daily position gain}_{i,d} = (f_d - f_{d-1})Q_{i,d-1} , \quad (2)$$

$$\text{Daily trading gain}_{i,d} = \sum_{t=1}^{T_{i,d}^+} (f_d - f_{i,t,d}^+) q_{i,t,d}^+ + \sum_{t=1}^{T_{i,d}^-} (f_{i,t,d}^- - f_d) q_{i,t,d}^- , \quad (3)$$

where f_d is the closing price of KOSPI 200 futures on day d ; $Q_{i,d-1}$ is investor category i 's net (long or short) KOSPI 200 futures position at the close of day $d-1$; $f_{i,t,d}^-$ ($f_{i,t,d}^+$) and $q_{i,t,d}^-$ ($q_{i,t,d}^+$) are the shot (long) price and short (long) volume of investor category i , respectively, at time t on day d ; and $T_{i,d}^-$ ($T_{i,d}^+$) is the number of short (long) trades of investor category i on day d . On a maturity day, f_d is the closing price of KOSPI 200 spot. $Q_{i,0} = 0$, and $Q_{i,d-1}$ is computed sequentially as follows:

$$Q_{i,d-1} = Q_{i,d-2} + \sum_{t=1}^{T_{i,d-1}^+} q_{i,t,d-1}^+ - \sum_{t=1}^{T_{i,d-1}^-} q_{i,t,d-1}^- . \quad (4)$$

While the overall information efficiency of each investor category can be measured by total gain, both position and trading gains have their own implications. Suppose that an investor has the ability to predict futures returns with his/her knowledge of economic factors and international cash flows as well as investment strategy. Another investor has the ability to trade futures at favorable prices with his/her market micro-information and trading skills. The former investor will be able to make high position gains, and the latter, high trading gains. Hence, both position and trading gains are also good measures for measuring information efficiency.

Meanwhile, VWAPs are computed as follows:

$$\text{VWAP}_{i,d}^+ = \sum_{t=1}^{T_{i,d}^+} f_{i,t,d}^+ \cdot q_{i,t,d}^+ / \sum_{t=1}^{T_{i,d}^+} q_{i,t,d}^+ , \quad (5)$$

$$\text{VWAP}_{i,d}^- = \sum_{t=1}^{T_{i,d}^-} f_{i,t,d}^- \cdot q_{i,t,d}^- / \sum_{t=1}^{T_{i,d}^-} q_{i,t,d}^- , \quad (6)$$

where $\text{VWAP}_{i,d}^+$ ($\text{VWAP}_{i,d}^-$) is buy or long (i.e., sell or short) VWAP of investor category i on day d , and the other notations are the same as in (1)~(3). Market VWAP is a weighted average of (5) and (6) across all investor categories.

As shown in (2), VWAP is not related to the position gain. Then, is there any relation between VWAP and the trading gain? To answer this question, the daily trading gain in (3) is re-

arranged as follows:

$$\begin{aligned}
\text{Daily trading gain}_{i,d} &= \sum_{t=1}^{T_{i,d}^+} (f_d - f_{i,t,d}^+) q_{i,t,d}^+ + \sum_{t=1}^{T_{i,d}^-} (f_{i,t,d}^- - f_d) q_{i,t,d}^- \\
&= (\sum_{t=1}^{T_{i,d}^+} f_d \cdot q_{i,t,d}^+ - \sum_{t=1}^{T_{i,d}^-} f_d \cdot q_{i,t,d}^-) + (\sum_{t=1}^{T_{i,d}^-} f_{i,t,d}^- \cdot q_{i,t,d}^- - \sum_{t=1}^{T_{i,d}^+} f_{i,t,d}^+ \cdot q_{i,t,d}^+) \\
&= f_d (\sum_{t=1}^{T_{i,d}^+} q_{i,t,d}^+ - \sum_{t=1}^{T_{i,d}^-} q_{i,t,d}^-) + (\text{VWAP}_{i,d}^- \cdot \sum_{t=1}^{T_{i,d}^-} q_{i,t,d}^- - \text{VWAP}_{i,d}^+ \cdot \sum_{t=1}^{T_{i,d}^+} q_{i,t,d}^+) \\
&= f_d (q_{i,d}^+ - q_{i,d}^-) + (\text{VWAP}_{i,d}^- \cdot q_{i,d}^- - \text{VWAP}_{i,d}^+ \cdot q_{i,d}^+) , \tag{7}
\end{aligned}$$

where $q_{i,d}^+ = \sum_{t=1}^{T_{i,d}^+} q_{i,t,d}^+$, $q_{i,d}^- = \sum_{t=1}^{T_{i,d}^-} q_{i,t,d}^-$, and the other notations are the same as in (1)~(6).

From (7), we know that the size and sign of daily trading gain on day d depend on $q_{i,d}^+$, $q_{i,d}^-$, and f_d as well as $\text{VWAP}_{i,d}^+$ and $\text{VWAP}_{i,d}^-$. Suppose that $\text{VWAP}_{i,d}^+ < \text{market VWAP}_d$ and $\text{VWAP}_{i,d}^- > \text{market VWAP}_d$ for investor category i , and vice versa for investor category j . In this case, one can say investor category i has information efficiency over investor category j on day d . Even for investor category i , the daily trading gain could be negative if f_d and $q_{i,d}^-$ are much bigger than long VWAP and $q_{i,d}^+$, respectively. If we average the daily VWAPs (or VWAP ratios) equally, then the comparison of the two averages between investor categories i and j may produce a strikingly different statistical conclusion from that of the trading gain. It is because the daily short and long volume varies across all days, and the daily closing price, f_d , is not considered. If $q_{i,d}^-$ and $q_{i,d}^+$ are the same across all days, VWAPs (or VWAP ratios) give the same conclusion as the daily trading gain. The daily short volume of each investor category is, generally, not equal to its long volume. This concludes the possibility of inconsistency between VWAP and the trading gain.

D. Adjusted VWAPs

To get a new VWAP measure (i.e., closing price, and short and long volume-adjusted VWAP) that is consistent with the trading gain, the daily trading gain in (3) is re-arranged again as follows:

$$\begin{aligned}
\text{Daily trading gain}_{i,d} &= \sum_{t=1}^{T_{i,d}^+} (f_d - f_{i,t,d}^+) q_{i,t,d}^+ + \sum_{t=1}^{T_{i,d}^-} (f_{i,t,d}^- - f_d) q_{i,t,d}^- \\
&= (f_d \sum_{t=1}^{T_{i,d}^+} q_{i,t,d}^+ + \sum_{t=1}^{T_{i,d}^-} f_{i,t,d}^- \cdot q_{i,t,d}^-) - (f_d \sum_{t=1}^{T_{i,d}^-} q_{i,t,d}^- + \sum_{t=1}^{T_{i,d}^+} f_{i,t,d}^+ \cdot q_{i,t,d}^+) \\
&= q_{i,d}^0 (\text{VWAP}_{i,d}^{*-} - \text{VWAP}_{i,d}^{*+}) , \tag{8}
\end{aligned}$$

$$\text{VWAP}_{i,d}^{*-} = (f_d \sum_{t=1}^{T_{i,d}^+} q_{i,t,d}^+ + \sum_{t=1}^{T_{i,d}^-} f_{i,t,d}^- \cdot q_{i,t,d}^-) / q_{i,d}^0 , \tag{9}$$

$$\text{VWAP}_{i,d}^{*+} = (f_d \sum_{t=1}^{T_{i,d}^-} q_{i,t,d}^- + \sum_{t=1}^{T_{i,d}^+} f_{i,t,d}^+ \cdot q_{i,t,d}^+) / q_{i,d}^0, \quad (10)$$

where $q_{i,d}^0 = q_{i,d}^+ + q_{i,d}^-$, and the other notations are the same as in (1)~(3).

We call $\text{VWAP}_{i,d}^{*-}$ ($\text{VWAP}_{i,d}^{*+}$) “adjusted short (long) VWAP of investor category i on day d .” Adjusted VWAPs in (9) and (10) have a direct relation to the trading gain. Suppose that $\text{VWAP}_{i,d}^{*+} < \text{VWAP}_{i,d}^{*-}$. From (8), the daily trading gain is positive on day d in this case. Hence, the adjusted VWAP (i.e., $\text{VWAP}_{i,d}^*$) measures are consistent with the daily trading gain on day d . Why does such phenomenon occur? From (9) and (10), we know that the adjusted VWAPs reflect offset-trades at the close on day d , but not conventional VWAPs in (5) and (6). Because the daily trading gain is computed with the assumption that all trades are offset by reverse trades at the close on day d , the adjusted VWAPs must be consistent with the daily trading gain, but not conventional VWAPs. That is, the difference of $\text{VWAP}_{i,d}^{*-}$ from $\text{VWAP}_{i,d}^{*+}$ has the same sign as the trading gain on day d . One can say that adjusted VWAP difference is a consistent measure with the trading gain for investor category i on day d .

When we are summing the daily trading gains across all days for statistical tests, we get the following:

$$\begin{aligned} \sum_{d=1}^T \text{daily trading gain}_{i,d} &= \sum_{d=1}^T q_{i,d}^0 (\text{VWAP}_{i,d}^{*-} - \text{VWAP}_{i,d}^{*+}) \\ &= \sum_{d=1}^T q_{i,d}^0 \times \left(\frac{\sum_{d=1}^T q_{i,d}^0 \cdot \text{VWAP}_{i,d}^{*-}}{\sum_{d=1}^T q_{i,d}^0} - \frac{\sum_{d=1}^T q_{i,d}^0 \cdot \text{VWAP}_{i,d}^{*+}}{\sum_{d=1}^T q_{i,d}^0} \right) \\ &= (\overline{\text{VWAP}_i^{*-}} - \overline{\text{VWAP}_i^{*+}}) \times \sum_{d=1}^T q_{i,d}^0, \end{aligned} \quad (11)$$

where $\overline{\text{VWAP}_i^{*-}}$ ($\overline{\text{VWAP}_i^{*+}}$) is a weighted average of $\text{VWAP}_{i,d}^{*-}$ ($\text{VWAP}_{i,d}^{*+}$) across all the days, and T is the number of all trading days. The weight is the relative short and long volume of investor category i on day d . We call $(\overline{\text{VWAP}_i^{*-}} - \overline{\text{VWAP}_i^{*+}})$ “average adjusted VWAP difference,” which could be used for a statistical test of the information efficiency of investor category i across all days. The average adjusted VWAP difference has an additional advantage over the trading gain measure because the former is independent of the magnitude of the total short and long volume, whereas the latter is not. This allows us to compare the information efficiency between any two investor categories. If we test the difference between the average adjusted VWAP differences of any two investor categories i and j , we are able to evaluate the information efficiency of investor category i over j .

II. Futures gains and VWAPs: Individuals, foreigners, and institutions

A. Futures gains and information efficiency

As discussed earlier, the information efficiency is evaluated by economic gains from trading

futures contracts. KOSPI 200 futures gains according to each investor category are given in Table II from January 1, 1998 through December 14, 2006. Panel A shows yearly gains divided into three parts: position gains, trading gains, and total gains. From the first column of Panel A, we know that individuals suffer significant losses in KOSPI 200 futures contracts. The large negative position gain during the nine years means that individuals lack economic and cash flow information. The negative trading gains throughout the almost nine years, except for 2005, reveal that they lack market micro-information and sentiment. As a consequence, individuals lose a total of 2.11 million points during the nine years. Because 1 point equals Korean won 500,000, their total loss is approximately US \$1.06 billion when we assume that the average exchange rate of Korean won in terms of U.S. dollar is roughly 1,000.

On the contrary, yearly trading gains of foreigners are, surprisingly, positive throughout the nine years. Furthermore, the sum of yearly position gains is much bigger than that of their yearly trading gains, although negative yearly position gains are observed four times. Needless to say, yearly total gains are very highly positive seven out of nine times. Foreigners gain a total of 2.07 million points from the KOSPI 200 futures trading during the nine years, which is approximately US \$1.04 billion. Interesting figures are also found for institutions. Despite a highly negative sum of position gains, their sum of trading gains is highly positive. The mixture of both gains produces just 186,578 points. Due to relatively small trading volume, the others do not show any remarkable figures.

[Table II inserted here!]

These results have, to our knowledge, economically meaningful implications on the information efficiency of each investor category. A somewhat hasty conclusion is that individuals are uninformed, and foreigners are informed in both the direction of the market price and the market micro-cash flow. As roughly half of the trading volume belongs to individuals in KOSPI 200 futures trading, one can say that domestics do not have any information efficiency over foreigners. Rather, some would say that foreigners have an information advantage. At this stage, to achieve a more scientific conclusion, statistical tests are required.

Panel B shows descriptive statistics and the t-test results of daily gains. Regarding the daily position gains, their values of skewness are close to zero, but those of kurtosis are much larger than 3. Hence, they are far from normal distributions. Unfortunately, due to extremely high values of maximum and minimum, their volatilities (or standard deviation) are very high across all investor categories. Consequently, the average position gains have no statistical significance at any level across all investor categories. For the case of position gains, it is very difficult to draw a conclusion in a statistical sense despite their economically meaningful figures.

When it comes to daily trading gains, however, t-tests give us a clear conclusion. Although

the values of skewness and kurtosis are similar to those of the daily position gains, their maximum and minimum values are not extremely high across all investor categories. Individuals have a statistically significant negative average daily trading gain, and foreigners and institutions have statistically significant positive average daily trading gains. The statistical significance of institutions is somewhat interesting.⁶ From the statistical results of daily trading gains, foreigners have information efficiency relative to individuals.

The statistical results of total gains provide an overall conclusion. The values of skewness, kurtosis, maximum, and minimum are similar to those of daily position gains across all investor categories. The volatilities of daily total gains are also very high. Nevertheless average total gains of individuals and foreigners have statistically significant negative and positive values, respectively. Those of institutions and the others are insignificant. From these results, we are able to say that foreigners have information efficiency, but individuals, institutions, and the others do not. Hence, it is concluded that foreigners have information efficiency over domestics in the KOSPI 200 futures market.

B. VWAPs and information efficiency

Choe et al. (2005) use an average VWAP ratio relative to the market as a measure of information efficiency in the Korean spot (stock) market. Here we repeat their methodology to determine whether their results still hold in the Korean stock index futures markets or not. The daily average VWAP ratio relative to the market is computed and shown across the nine years in Panel A of Table III. The left-hand side shows the case of short, and the right-hand side, the case of long. In the case of short, the daily average VWAP ratios of individuals move around 1.00 over the nine years, for a grand average of 0.999981. It seems that individuals short futures, on the average, at a slightly lower price relative to the market. Meanwhile the daily average VWAP ratios of foreigners are less than 1.00, except for 1998 and 2003, for a grand average of 0.999773, which is 2.08 bp less than that of individuals. From Panel B, we see that the difference (2.08bp) is statistically significant at the 5% level, even though it is much smaller than that of the spot market (16 bp) given in Choe et al. (2005).⁷ Meanwhile, unlike individuals and foreigners, institutions and the others short futures at higher prices relative to the market. The results of the t-tests in Panel B show that all differences between any two investor categories are statistically significant. In sum, foreigners short futures at a

⁶ To further investigate institutions, we divide institutions into securities companies, banks, insurance companies, mutual funds and so forth, and repeat the same procedure; the results are not reported here due to space limitations. We find that statistically significant positive average daily trading gain is generated from securities companies. By definition, most securities companies are brokers, dealers, or underwriters who have a myopic view of the market and trade very frequently. In other words, securities companies are short-term institutions. Our results are consistent with those of Yan and Zhang (2007); short-term institutions are better informed and trade actively to exploit their information advantage in the U.S. stock markets.

⁷ The smaller difference could be due to the lower volatility and the high leverage of KOSPI 200 futures than those of individual stocks.

lower price relative to the market, on the average, than individuals, institutions, and the others, which is consistent with the results of Choe et al. (2005). Moreover, institutions short futures at a higher price, on the average, than those of individuals and foreigners.

[Table III inserted here!]

The right-hand side of Panel A shows the case of long. The daily average VWAP ratios of individuals are greater than 1.00 except for 2001, for a grand average of 1.000031. On the average, individuals long futures at a slightly higher price relative to the market. The daily average VWAP ratios of foreigners are also greater than 1.00, except for 1998, for a total average of 1.000192, which is 1.62 bp higher than that of individuals. Panel B indicates that the difference (1.62 bp) is statistically significant at the 5% level. It is also much smaller than that of the spot market (21 bp) given in Choe et al. (2005). At any rate, foreigners long futures at a higher price than that of individuals on the average. The results of institutions and the others make such a phenomenon even clearer. The daily average VWAP ratios of institutions are less than 1.00 throughout the nine years, for a grand average of 0.999914, which is 2.78 bp less than that of foreigners. Institutions long futures 2.78 bp cheaper than foreigners on the average. The grand average VWAP ratio of the others is only slightly higher than 1.00, but much smaller than that of foreigners. As in the case of short, the results of the t-tests in Panel B show that all the differences between any two investor categories are statistically significant.

These results, regarding the average VWAP ratios, are consistent with those of the Korean spot market given in Choe et al. (2005). Hence, their results still hold in the KOSPI 200 futures market. One may interpret such findings as the information efficiency or advantage of (domestic) individuals and institutions over foreigners. However, this could be overlooking an important aspect of the results. As practitioners say, VWAP has important information. Without considering the short and long volume according to each investor category, however, the daily VWAP and VWAP ratio to the market cannot be used as information measures. Averaging the VWAPs or VWAP ratios equally across time does not necessarily result in an information measure because the trading volume varies across all the days. That is, the average VWAP ratios do not reflect different daily trading volume according to each investor category. Choe et al. (2005), in their cross-sectional trade value-weighted averaging process, weigh the daily price ratios across stocks on a given day using the value of the daily trades, so that more weight is given to stocks that each investor category trades more intensively when computing the average price ratio. However, they do not consider everyday changes in trading volume or size when they test the differences of the trade value-weighted average ratios. At any rate, VWAP or VWAP ratios, themselves, are very difficult to use as information measures unless the short and long volume of each investor category is considered together. Furthermore, the daily closing prices should be reflected in the analysis for the results to be consistent with the trading gain as shown in (8)~(11). Hence, the results

in Table III should not be interpreted as evidence of foreigners' information inefficiency at this stage.

C. Evidence of adjusted VWAP measures

For the VWAP measures to be consistent with the trading gain, we need to test the adjusted VWAP measures in (11). Panel A of Table IV presents the adjusted VWAP measures which vary according to the investor categories. For example, the foreigners' trading volume has monotonically increased since 1998. Their recent relatively high volume gives significant weight to recent high KOSPI 200 futures prices when we compute the adjusted VWAP measures. On the contrary, the recent relatively low volume of individuals gives low weight to recent high prices. This weighting process makes the foreigners' and individuals' adjusted VWAP measures high and low, respectively. Hence, their adjusted VWAPs cannot be compared directly.

The ratio or difference between the adjusted short and long VWAPs within an investor category is a meaningful measure for information efficiency. If the ratio of adjusted short VWAP over adjusted long VWAP is less than 1 for an investor category, it reveals that they short the KOSPI 200 futures low and long high, and vice versa. The third and fourth columns show the ratios and differences, respectively. We know that individuals short KOSPI 200 futures low and long high, and vice versa for foreigners, institutions, and the others. From these results, one can say that foreigners, institutions, and the others may have information efficiency, but not individuals. The average adjusted VWAP difference measures confirm the results of the ratio analysis in a statistical sense. Individuals have information inefficiency because they short KOSPI 200 futures low and long high in a statistical sense. Meanwhile, foreigners and institutions have information efficiency. No statistical conclusion emerges for the others. The total short and long volume is shown in the fifth column. From (11), we see that the average adjusted VWAP difference multiplied by the total short and long volume gives trading gain for the sample period. As expected, individuals suffer big trading losses, and the other investor categories make positive gains. The figures of trading gains in the last column are different from those of Panel A in Table II because only near-by KOSPI 200 futures contracts are considered here.

The average adjusted VWAP differences allow us to test information asymmetry between any two investor categories. Such a test is not possible for trading gain measures because trading gains could be affected by the total short and long volume, but not for the average adjusted VWAP difference. Panel B tests relative information efficiency between two investor categories using the average adjusted VWAP difference measures. The first row shows that foreigners, institutions, and the others have information efficiency over individuals in a statistical sense. From the results of the second row, we cannot determine that foreigners have information efficiency over institutions and the others. The last row gives no statistical evidence of information asymmetry between institutions and the others. In terms of the

average adjusted VWAP difference, we conclude that foreigners have information efficiency over individuals.

[Table IV inserted here!]

III. Exploratory analysis of foreign investors

The aggregate information efficiency of foreign investors does not necessarily indicate that all foreign investors have an information advantage. To study this issue further, an exploratory analysis of foreign investors is conducted according to their types and nationalities.

A. Analysis of nationality

Foreigners from more than twenty countries have invested in KOSPI 200 futures. Due to space limitations, we consider only the top ten countries in terms of trading volume over the sample period. The remaining countries are grouped into “the other countries.” Table V shows the results of the nationality analysis. Unlike the Korean spot (stock) market, the most active participant is the U.K., with 17.02% of the total volume over the sample period. Although U.S. investors play the most active role in the Korean stock markets, the U.S. is ranked sixth in the KOSPI 200 futures market.⁸ The top five countries, except for the U.K., are not that active in the spot market. Hence, it is very difficult to say that the Korean spot and futures markets have the same investor structure. The number of days indicates how long each country has invested in KOSPI 200 futures contracts. A small figure means a short investment history.

As shown in Table V, France, Luxembourg, and Germany have relatively short investment histories compared to the U.S., the U.K., Singapore, and Hong Kong. Some of the top ten countries, i.e., Bermuda, Ireland, and Cayman Island, can be treated as tax haven areas.⁹ Cash flow from such countries may originate from hedge funds or so-called pretended

⁸ Given below are the average proportions of stock ownership and the trading size of foreign investors according to their nationalities during the most recent nine years (1998~2006). Trading size is an average of buying and selling amounts. Each year’s figures are not much different from the averages. Due to round-off errors, the figures may not be exact.

Countries	U.K.	France	Louxe- bourg	Singapore	Germany	U.S.
Ownership	12.13%	0.85%	5.55%	4.17%	1.26%	54.58%
Trading	21.46%	1.48%	6.04%	5.62%	3.32%	34.11%
Countries	Hong Kong	Cayman Island	Ireland	Bermuda	The other countries	-
Ownership	0.77%	2.58%	2.41%	0.41%	15.25%	-
Trading	1.68%	6.65%	3.64%	0.84%	15.18%	-

Source: Financial Supervisory Service of Korea

⁹ The definition of a tax haven area is somewhat ambiguous because each country’s tax system is complicated and the degree of tax credit varies in each case.

foreign investors. Pretended foreign investors refer to Korean domestic investors who detour their money through tax haven areas to hide its source and lead or manipulate KOSPI 200 futures prices after their domestic trading.

[**Table V inserted here!**]

Yearly total gains show that the gains from foreigners do not spread proportionally to their degree of futures trading activities across all ten countries. Surprisingly, the most active participants, the U.K. investors, get the highest sum of yearly total gains despite negative total gains for 1999, 2001, and 2006. They earn 1,491,924 points over the nine years, or approximately US \$746 million. Hong Kong's yearly total gains are never negative during the nine years, and Singapore competes with Hong Kong. Most gains result from the foreign investors of the U.K., Singapore, and Hong Kong. The sum of their total gains (2,943,788 points) exceeds all foreign investors' total gain (2,072,691 points in Table II) by a sizable amount. They earn roughly US \$1,472 million over the nine 9 years.

The total gains of the U.K., Singapore, and Hong Kong could be inter-related because most U.K. financial institutions that invest in Asia have located their Asian headquarters in either Hong Kong or Singapore.¹⁰ If their cash flow information into Korea is revealed early enough to each other regardless of its legal aspects, they are able to long or short KOSPI 200 futures in advance of their own spot trading.¹¹ "Anticipated hedge" is one such activity. If foreign investors' behavior leads that of local investors in Korean stock markets, profit making is a natural consequence.¹² For this process to succeed, their spot trading is enough to lead Korean stock markets and be accompanied by accurate information.

Coincidentally, the stock trading proportion of U.K. investors is much higher than their stock ownership proportion in Korea. Their average stock trading proportion over the nine years is 21.46% while their average stock ownership proportion is just 12.13%. The case of the U.K. is a contrast to that of the U.S. The average U.S. stock trading proportion is only 34.11% while their average stock ownership proportion is 54.58%. In 2006, the U.K. stock trading proportion (25.69%) exceeds that of the U.S. (24.46%). Regarding Singapore and Hong Kong,

¹⁰ International practitioners say that a global financial investment group has generally two main headquarters in the U.S. and the U.K.. The U.S. headquarter is in charge of U.S. business, and the U.K. one is in charge of British and international business. Historically and traditionally, the U.K. has been strong in international business. In conducting its Asian business, the British group locates its Asian headquarter in either Hong Kong or Singapore, while the American group's Asian business is not active. Fidelity is a good example.

¹¹ If the revelation of cash flow information is based on accurate information and investment strategy, it should not be illegal. Even if not, it is almost impossible to find any evidence to prove the illegality of their trading.

¹² This study does not test the leading behavior of foreign investors in the Korean stock markets. An official says, however, that stock trading gains of foreign investors are huge over the sample period and most practitioners believe that foreign investors lead the Korean stock markets during the sample period.

their average stock trading proportions are slightly bigger than their average stock ownership proportions. The sum of trading proportions by the U.K., Singapore, and Hong Kong, is 28.75% while that of their ownership proportions is only 17.06%. If their trading activities are inter-related, they are able to lead Korean stock markets, and have market momentum power.¹³ Meanwhile, the average stock trading proportions of France, Luxembourg, and Germany are 1.48%, 6.04%, and 3.32%, respectively. Their aggregate stock trading is not very active in Korea, and there is no reason to imagine that they act together in Korea. Their small or even negative futures gains would be explained by the reasoning that low (high) spot trading volume relates to low (high) futures gains.

On the other hand, the investors from tax haven areas, except for Bermuda, experience negative total gains. The losses of Cayman Island and Ireland are remarkably high. This evidence contradicts the possibility that hedge funds make a lot of money from short-term stock index futures trading when we assume that many investors from tax haven areas are hedge funds. If many investors from tax haven areas are pretended foreign investors, the possibility of their superior profitability is also inconsistent with the results of total gains.

Regarding daily position gains, only the U.K. and Hong Kong have statistically significant positive gains. That is due to the high volatility of daily position gains. Statistically significant negative daily position gains are not found among any of the countries. When it comes to daily trading gains, Singapore and Bermuda have statistically significant positive gains, but Germany has a statistically significant negative gain. The U.K. shows a marginally insignificant positive daily trading gain. The daily total gains indicate that only foreign investors from the U.K. and Hong Kong experience statistically significant positive gains among all the countries.

B. Analysis of investor type

We will now investigate futures gains of foreign investors based on their types. Foreign investors are divided into six types: securities companies, banks, general companies, investment companies, the other institutions, and individuals. As mentioned earlier, securities companies are brokers, dealers, or underwriters of stocks and bonds. General companies refer to non-financial companies. The other institutions include insurance companies and pension funds as well as international organizations. Because their role is not important in the KOSPI 200 futures market, they are combined into a single type. Investment companies include mutual funds, hedge funds, and so forth.

Table VI shows the results according to foreign investors' types. The two most active participants are securities companies (36.85%) and investment companies (39.22%). When we consider the low stock ownership (2.13%) of securities companies in the spot market,

¹³ Their activities may be either legal or illegal. However, we are not interested in that issue here.

their futures trading volume is extremely high.¹⁴ Their relatively high trading size of stocks could relate to their high futures trading volume. Banks' futures trading proportion is relatively small to their high stock ownership (23.04%), which could also relate to their relatively low stock trading proportion (6.50%). Although investment companies are the most active participant in the KOSPI 200 futures market, their proportion of futures trading is relatively lower than their stock ownership and trading proportion. It seems that they focus primarily on stock (spot) markets and not so much on futures markets. As expected, the trading proportion (1.67%) of the other institutions is extremely small because they consist primarily of insurance companies, pension funds, and international organizations. The stock ownership (trading) proportions of foreign insurance companies and pension funds are 3.13% (3.23%) and 9.78% (8.93%), respectively. Compared to their moderate role in stock markets, their participation is almost negligible. Unlike Korean individuals, foreign individuals are never active in the KOSPI 200 futures market.

[Table VI inserted here!]

Most foreigners' total gains originate from securities companies and investment companies. The sum of their total gains is 1,561,779 points, or roughly US \$781 million. Their sizable total gains might relate to their own spot trading. The sum of their spot trading proportions reaches as high as 70.62%, which means that they might have market momentum power under specific circumstances. Suppose, for example, that they are planning to enlarge the proportion of the Korean stock market for the upcoming one or two months because Korean companies are expecting high growth and the Korean portion in MSCI or FTSE indices is getting increasingly higher. In this case, they long KOSPI 200 futures in advance before buying stocks. Stock prices will go up for one or two months until they stop their buying. In the opposite case (i.e., negative market circumstances), they short KOSPI 200 futures in advance, and stock prices will go down. This is an exactly anticipated hedge! Through these processes, they are able to be winners in the KOSPI 200 futures market. A difference between securities and investment companies is that generally the latter is restricted to maintain a stock position at a certain level, while the former is not. That is, the former is a short-term institution with a myopic view, while the latter is a long-term institution. Recently, Yan and Zhang (2007) find that short-term institutions are better informed and trade actively to exploit their information advantage in the U.S. stock markets. Consistent with Yan and Zhang (2007),

¹⁴ Given below are the average proportions of stock ownership and trading size of foreign investors according to their types during the most recent nine years (1998~2006). Trading size is an average of buying and selling amounts. Each year's figures are not much different from the averages. Due to round-off errors, the figures may not be exact.

Investor types	Securities companies	Banks	Insurance companies	Investment companies	Pension funds	Other institutions	Individuals
Ownership	2.13%	23.04%	3.13%	52.33%	9.78%	9.28%	0.30%
Trading	10.14%	6.50%	3.23%	60.48%	8.93%	10.14%	1.20%

Source: Financial Supervisory Service of Korea

securities companies make more money than investment companies in the KOSPI 200 futures market. On the other hand, there is no investor type that suffers remarkable losses, unlike the findings from the nationality analysis. General corporations experience the biggest loss (8,565 points) among all foreign institutional investors. As in the domestic case, the foreign individuals' sum of yearly total gains is negative.

No daily position gains are statistically significant in any of the investor types. However, statistically significant positive daily trading gains are found in securities and investment companies. Unfortunately, banks have statistically significant negative daily trading gains. Just from this finding, one can say that banks are not informed professional institutional traders in the KOSPI 200 futures market. Although not reported here, domestic Korean banks also have statistically significant negative daily trading gains. Daily total gain shows no statistically significant results in any investor type. However, that of securities companies is marginally insignificant. From these results, we conclude that most futures gains from foreign investors originate from securities and investment companies. In particular, securities companies (short-term institutions) are the winner among foreign investors in the KOSPI 200 futures market.

C. Joint analysis of investor types and nationalities

Based on the nationality analysis thus far, we see that most gains are generated by foreign investors in the U.K., Hong Kong, and Singapore. The analysis of investor types reveals that securities and investment companies enjoy the most gains among foreign investors. Then, do securities and investment companies of the U.K., Hong Kong, and Singapore have information efficiency over the other groups of foreign investors? Do they, not the others, make money in the KOSPI 200 futures market? Now we are going to analyze the joint effect of investor types and nationalities on total gains to answer the above question.

The first column of Panel A in Table VII shows the trading volume of foreign securities companies according to their nationalities. The U.K. plays the most active role in securities companies. Their proportion of trading volume to the market is 34.55%. The U.K. is followed by France, Ireland, and the U.S.. From the second column, we see that most of banks' trading volume is ascribed to Germany (67.15%) and France (28.61%). Most general companies come from Hong Kong, the U.S., and Germany. Among investment companies, a very high proportion is from Luxembourg and Singapore. Interestingly, all foreign investors from Luxembourg consist of investment companies only. We surmise that most of them are mutual funds (i.e., UCITS) listed in Luxembourg.¹⁵ It is notable that the proportion of the U.S. investment companies is negligible. Why is it so small? It may be because the U.S.

¹⁵ UCITS refers to Undertakings for the Collective Investment of Transferable Securities which are very similar to the U.S. mutual fund. If they are registered once in Luxembourg, they can be sold and redeemed freely within the European Union without any additional registration.

Investment Company Act of 1940 strongly restricts futures trading of mutual funds. The last column indicates that more than half of foreign individual investors are from the U.S.

Panel B represents the total gains of each investor type according to country. Below the total gains, the t-values of daily average total gains are given. As is expected from the analyses of investor types and nationalities, the total gains of securities companies from the U.K., Singapore, and Hong Kong are very high and statistically significant. Their sum is 1,337,178 points, which exceeds the sum of all securities companies' gains by more than 350,000 points. This strongly supports the idea that the total gain of foreign investors is largely generated by the securities companies of the U.K., Hong Kong, and Singapore. As discussed earlier, this finding is consistent with Yan and Zhang (2007), and the scenario of anticipated hedge of the U.K., Hong Kong, and Singapore investors. Unfortunately, France and Ireland lose 177,931 and 236,381, respectively, despite their high KOSPI 200 futures trading volume. With caution, we say that their low stock trading volume could be related to the futures losses. Their futures trading seems to be independent of their own stock trading.

[Table VII inserted here!]

In the case of banks, France gains 180,518 points which offsets the loss of its securities companies. German banks suffer the biggest loss (284,677 points) among all the countries. General companies of Singapore enjoy a gain of 295,707 points, which is not statistically significant.

As in the case of securities companies, investment companies from the U.K., Hong Kong, and Singapore make very big gains of 502,705, 312,255, and 164,960 points, respectively, but only Hong Kong's gain is statistically significant. The losses of Cayman Island are remarkable, and the gains of other tax haven areas (i.e., Ireland and Bermuda) are relatively small or even negative, and statistically insignificant. These facts support the aforementioned allegation that the profitability of hedge funds and pretended foreign investors from futures trading is not true if they trade KOSPI 200 futures as investment companies.

In the case of the other institutions, no particular phenomena are found except for the statistically significant positive total gain of Hong Kong. As found in the domestic case, individuals from most countries, generally, suffer losses from KOSPI 200 futures trading.

IV. Conclusions

This study investigates the information efficiency of each investor category and further explores the performance of foreign investors according to their types and nationalities in the KOSPI 200 futures market. Our empirical findings support the information efficiency of foreign investors over domestic investors, which is consistent with Grinblatt and Keloharju (2001), Seasholes (2000), Froot and Ramadorai (2001), Ghysels and Seon (2005), Kamesaka

et al. (2003), and Ko et al. (2007). To explain why our findings are not consistent with Choe et al. (2005), we derive a simple relation between VWAPs and trading gains, and develop adjusted VWAP measures consistent with trading gains. We also attempt to ascribe the total gains of foreign investors to their types and nationalities.

Our findings are summarized as follows. First, when we evaluate information efficiency by total gains, foreign investors demonstrate information efficiency over domestics, particularly individuals. Second, although the results of VWAP ratios are similar to those of Choe et al. (2005), we show that VWAP measures could not be used for the evaluation of information efficiency because they ignore daily short and long volume and closing prices. Our adjusted VWAP measures produce the same findings consistent with the trading gains. Because the average adjusted VWAP differences do not depend on the total short and long volume, they allow us to compare information efficiency between any two investor categories directly. Adjusted VWAP measures indicate that foreigners, institutions, and the others have information efficiency over individuals, but they do not provide any statistical evidence of information asymmetry among foreigners, institutions, and the others. Third, the nationality analysis indicates that most gains of foreign investors result from the U.K., Hong Kong, and Singapore, while the type analysis indicates that securities and investment companies which are the two most active participants, generate most futures gains of foreign investors. These phenomena could be explained, with caution, by the inter-relation of foreign investors among the U.K., Hong Kong, and Singapore and their spot trading in Korea. The joint analysis supports the findings of nationality and type analyses. Finally, we find that the profitability of hedge funds and pretended foreign investors is not true for the KOSPI 200 futures.

Our findings strongly support the information efficiency of foreign investors over domestics in an economic and statistical sense. While our results provide strong evidence in the KOSPI 200 futures market, an important thing to note is that our findings are not necessarily generalized to all the Korean derivatives. And foreign investors' information efficiency does not necessarily continue forever.¹⁶ As the local market is becoming more advanced, globalized, and efficient, the superior profitability of foreign investors over domestics will disappear, we believe.¹⁷ This study documents the gains of foreign investors and attempts to explain why they succeed in an emerging stock index futures market using an exploratory analysis. Further analysis is expected in the near future to complement our findings and explanations.

¹⁶ From the total gains of 2005 and 2006 in Table II, it seems that the information efficiency of foreign investors becomes weak.

¹⁷ Japan would be a good example. In Japan, foreigners' profitability is not more severe than in Korea as shown in Ko et al. (2007).

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Table I**Trading volume and the number of trades: January 1, 1998 ~ December 14, 2006**

This table shows trading volume and the number of trades according to investor category. Trading volume (number of trades) is the average of short and long volume (number of trades) of each investor category. Except for market volume (number of trades), all other figures are represented in percentage of market volume (number of trades). The figures in each year represent those for the sum of four KOSPI 200 futures contracts whose maturities belong to that year. Due to round-off errors, the figures may not be exact.

Panel A: Trading volume

	Market	Individuals	Resident foreigners	Non-resident foreigners	Institutions	The others
1998	16,848,478	50.90%	0.66%	2.29%	44.67%	1.49%
1999	17,538,353	47.35%	0.63%	2.63%	46.93%	2.46%
2000	19,534,059	52.10%	0.85%	4.75%	41.99%	2.31%
2001	30,500,470	50.66%	1.42%	8.43%	37.32%	2.17%
2002	42,231,633	52.73%	0.40%	10.55%	32.86%	3.46%
2003	62,196,503	55.35%	0.17%	16.11%	26.99%	1.33%
2004	55,275,686	48.36%	0.13%	22.08%	28.25%	1.18%
2005	44,138,258	44.33%	0.20%	23.69%	29.99%	1.78%
2006	47,590,742	40.51%	0.13%	24.64%	32.37%	2.35%
Sum	335,854,182	48.95%	0.39%	15.84%	32.83%	1.99%

Panel B: Number of trades

	Market	Individuals	Resident foreigners	Non-resident foreigners	Institutions	The others
1998	3,607,612	60.53%	0.39%	1.55%	36.31%	1.22%
1999	5,232,365	58.92%	0.36%	1.82%	36.63%	2.25%
2000	5,910,206	61.08%	0.49%	3.73%	32.60%	2.11%
2001	7,807,802	64.22%	0.80%	5.88%	27.33%	1.77%
2002	12,161,977	64.77%	0.30%	8.33%	23.75%	2.86%
2003	14,366,784	65.87%	0.16%	12.73%	19.96%	1.28%
2004	14,596,085	59.66%	0.12%	17.27%	21.66%	1.29%
2005	13,494,764	53.34%	0.16%	19.02%	24.76%	2.73%
2006	16,833,740	48.23%	0.12%	20.03%	28.04%	3.59%
Sum	94,011,335	58.78%	0.26%	12.90%	25.81%	2.25%

Table II**KOSPI 200 futures gains according to investor category**

This table presents position, trading, and total gains. Total gain is the sum of position and trading gains represented in points of KOSPI 200 futures contracts. One point equals Korean won 500,000, which is approximately US \$500 assuming that the average exchange rate of Korean won in terms of US dollar is 1,000. Generally speaking, four KOSPI 200 futures contracts are traded simultaneously at any given time. Hence, all gains include those from four different (one near-by and three far-away) KOSPI 200 futures contracts during a specified calendar period. T-values are in parentheses. One and two asterisks denote statistical significance at the 10% and 5% levels, respectively. Due to round-off errors, the figures may not be exact. [Unit: points of contracts]

Panel A: Yearly gains

	Individuals	Foreigners	Institutions	The others
Volume	164,385,947 [48.95%]	54,532,070 [16.24%]	110,264,973 [32.83%]	6,671,193 [1.99%]
# of trades	55,255,980	12,372,174	24,266,908	2,116,274
# of days	2,255	2,255	2,255	2,255
Position gains				
1998	-58,743	16,200	101,643	-59,101
1999	686,244	-103,379	-605,330	22,466
2000	-1,301,166	841,748	465,393	-5,976
2001	25,764	-41,362	74,748	-59,150
2002	-236,493	-3,763	219,472	20,784
2003	216,376	220,162	-349,036	-87,503
2004	-404,978	409,393	28,179	-32,594
2005	76,031	323,651	-449,551	49,869
2006	130,450	-223,228	120,989	-28,211
Sum	-866,513	1,439,422	-393,492	-179,416
Trading gains				
1998	-228,078	116,465	88,947	16,666
1999	-248,581	142,574	124,435	-18,428
2000	-117,461	48,696	62,331	6,434
2001	-131,384	1,276	122,406	7,701
2002	-143,964	45,223	95,406	3,336
2003	-225,832	104,471	117,299	4,062
2004	-43,233	25,545	6,955	10,732
2005	12,997	19,010	-30,187	-1,820
2006	-127,743	130,010	-7,523	5,256
Sum	-1,247,279	633,270	580,070	33,939
Total gains				
1998	-280,820	132,665	190,591	-42,435
1999	437,663	39,194	-480,895	4,038
2000	-1,418,627	890,444	527,725	459
2001	-105,620	-40,086	197,154	-51,449
2002	-380,457	41,460	314,878	24,120
2003	-9,455	324,633	-231,737	-83,441
2004	-448,210	434,938	35,134	-21,862
2005	89,028	342,661	-479,737	48,049
2006	2,707	-93,218	113,465	-22,955
Sum	-2,113,792	2,072,691	186,578	-145,477

Panel B: Daily gains				
	Individuals	Foreigners	Institutions	The others
Daily position gains				
Average	-384 (-.72)	638 (1.38)	-174 (-.40)	-80 (-1.03)
Std. dev.	25,366	22,009	20,579	3,673
Maximum	199,713	136,864	154,866	27,204
Minimum	-251,500	-190,880	-112,298	-28,531
Skewness	-0.57	-0.04	0.30	-0.14
Kurtosis	12.39	8.26	7.66	13.19
Daily trading gains				
Average	-553 (-7.99)**	281 (3.70)**	257 (3.73)**	15 (1.28)
Std. dev.	3,286	3,602	3,273	557
Maximum	18,935	28,259	24,490	6,536
Minimum	-24,561	-21,167	-23,952	-3,373
Skewness	-0.56	0.96	-0.34	1.09
Kurtosis	8.04	9.28	9.27	15.22
Daily total gains				
Average.	-937 (-1.77)*	919 (2.00)**	83 (.19)	-65 (-.83)
Std. dev.	25,105	21,843	20,476	3,686
Maximum	184,375	141,199	147,683	28,750
Minimum	-255,338	-178,737	-114,841	-25,442
Skewness	-0.67	0.22	0.14	0.08
Kurtosis	12.52	7.88	7.39	12.70

Table III

Volume-weighted average price ratios and tests of their differences

This table shows daily average volume-weighted average price ratios of short and long trades to the market according to investor category. VWAP ratios are computed only for near-by KOSPI 200 futures contracts during a specified period. T-values are in parentheses. One and two asterisks denote statistical significance at the 10% and 5% levels, respectively.

Panel A: Daily average VWAP ratios relative to the market

	Short				Long			
	Individuals	Foreigners	Institutions	The others	Individuals	Foreigners	Institutions	The others
1998	0.999964	1.000172	0.999959	1.000802	1.000127	0.999864	0.999882	0.999447
1999	0.999882	0.999272	1.000143	1.000139	1.000059	1.000372	0.999936	0.999972
2000	0.999886	0.999470	1.000193	1.000007	1.000021	1.000655	0.999884	1.000413
2001	0.999966	0.999663	1.000131	1.000096	0.999978	1.000338	0.999928	1.000118
2002	1.000024	0.999473	1.000110	1.000030	1.000002	1.000354	0.999938	0.999848
2003	0.999982	1.000009	0.999984	1.000213	1.000013	1.000099	0.999895	1.000073
2004	1.000022	0.999923	1.000005	1.000020	1.000008	1.000019	0.999922	1.000138
2005	1.000044	0.999964	0.999956	0.999961	1.000018	1.000046	0.999909	1.000057
2006	1.000059	0.999949	0.999984	1.000028	1.000033	1.000038	0.999938	1.000085
1998~2006	0.999981	0.999773	1.000050	1.000154	1.000031	1.000192	0.999914	1.000008

Panel B: Tests of differences between VWAP ratios

	Short			Long		
	Foreigners	Institutions	The others	Foreigners	Institutions	The others
Difference from individuals	-0.000208 (-4.08)**	0.000069 (3.60)**	0.000172 (4.15)**	0.000162 (3.38)**	-0.000116 (-6.46)**	-0.000022 (-.54)
Difference from foreigners		0.000277 (5.27)**	0.000380 (6.14)**		-0.000278 (-5.69)**	-0.000184 (-3.06)**
Difference from institutions			0.000104 (2.41)**			0.000094 (2.19)**

Table IV**Adjusted VWAP measures and trading gains**

This table presents adjusted VWAP measures, total short and long volume, and trading gains. Because only near-by KOSPI 200 futures contracts are considered here, trading gains are somewhat different from those of Panel B in Table II. T-values are in parentheses. One and two asterisks denote statistical significance at the 10% and 5% levels, respectively. Due to round-off errors, the figures may not be exact.

Panel A: Adjusted VWAP measures, total short and long volume, and trading gains

	Average adjusted VWAP		Average adjusted VWAP ratio: Short/Long (A) / (B)	Average adjusted VWAP difference (A) - (B)	Total short and long volume (C)	Trading gain (C) x [(A) - (B)] [Unit: points of contracts]
	Short: $\overline{VWAP}_{i,d}^{*-}$ (A)	Long: $\overline{VWAP}_{i,d}^{*+}$ (B)				
Individuals	102.719316	102.723142	0.999963	-0.003826 (-7.04)**	326,851,966	-1,250,428
Foreigners	118.943134	118.937564	1.000047	0.005570 (2.42)**	104,572,050	582,416
Institutions	105.172641	105.169728	1.000028	0.002913 (4.04)**	218,265,777	635,852
The others	109.026322	109.023875	1.000022	0.002447 (1.15)	13,193,615	32,289

Panel B: Tests of relative information efficiency using average adjusted VWAP difference measures: $(\overline{VWAP}_i^{*-} - \overline{VWAP}_i^{*+}) - (\overline{VWAP}_j^{*-} - \overline{VWAP}_j^{*+})$

	Foreigners	Institutions	The others
Difference from individuals	0.009395 (3.98)**	0.006739 (7.46)**	0.006273 (2.86)**
Difference from foreigners		-0.002656 (-1.10)	-0.003122 (-1.00)
Difference from institutions			-0.000466 (-.21)

Table V

Gains of foreign investors according to their nationalities

This table shows the gains of foreign investors according to their nationalities. T-values are in parentheses. One and two asterisks denote statistical significance at the 10% and 5% levels, respectively. Na means “not applicable.” Due to round-off errors, the figures may not be exact. [Unit: points of contracts]

	U.K.	France	Luxembourg	Singapore	Germany	U.S.	Hong Kong	Cayman Island	Ireland	Bermuda	The other countries
Volume	9,282,901 [17.02%]	7,380,079 [13.53%]	7,189,076 [13.18%]	6,091,475 [11.17%]	5,337,202 [9.79%]	4,377,909 [8.03%]	3,650,737 [6.69%]	3,525,172 [6.46%]	2,742,547 [5.03%]	1,272,188 [2.33%]	3,682,784 [6.75%]
# of trades	1,517,021	2,147,859	1,654,737	1,425,450	891,653	1,025,383	839,777	924,184	597,414	349,598	999,098
# of days	2,255	2,047	1,122	2,255	1,782	2,255	2,255	2,247	2,224	2,254	2,254
Yearly total gain											
1998	168,466	892	Na	20,298	Na	-76,392	14,997	112,265	-269,109	17,623	143,630
1999	-81,075	9,569	Na	83,322	8,374	323	3,803	-30,103	8,323	38,408	-1,748
2000	683,404	56,190	30	105,748	11,354	53,609	70,483	-375	-39,480	16,207	-66,724
2001	-209,097	55,412	Na	131,839	35,796	-13,092	10,871	-22,439	10,932	23,725	-63,221
2002	66,808	-79,998	446	-2,996	-40,811	-50,782	14,692	53,146	-55,305	38,346	97,913
2003	188,269	14,563	20,343	122,195	-71,946	-71,692	41,483	-6,119	8,522	-57,664	136,679
2004	365,031	-18,580	-8,417	-11,798	90,579	92,428	45,631	-31,947	-63,204	13,280	-38,064
2005	471,964	-10,749	-10,045	402,025	-335,230	137,962	401,660	-641,616	-177,207	-142,241	246,138
2006	-161,844	-1,822	-15,524	-136,183	-7,897	53,610	133,797	-55,903	57,268	84,849	-43,569
Sum	1,491,924	25,477	-13,167	714,449	-309,781	125,159	737,415	-623,091	-519,262	32,533	411,035
Daily position gain											
Average	594 (1.95)*	10 (.10)	-56 (-1.03)	231 (1.09)	-122 (-.87)	64 (.51)	337 (2.51)**	-260 (-1.13)	-213 (-1.13)	-70 (-.63)	66 (0.47)
Std. Dev.	14,444	4,527	1,835	10,078	5,931	6,035	6,392	10,876	8,862	5,218	6,751
Daily trading gain											
Average	67 (1.54)	3 (.12)	44 (1.57)	86 (2.71)**	-52 (-2.05)**	-9 (-.36)	-10 (-.42)	-17 (-1.07)	-21 (-1.24)	84 (2.62)**	116 (3.42)**
Std. Dev.	2,087	1,152	950	1,506	1,072	1,157	1,163	751	799	1,523	1,611
Daily total gain											
Average	662 (2.20)**	12 (.12)	-12 (-.20)	317 (1.51)	-174 (-1.24)	56 (.44)	327 (2.45)**	-277 (-1.20)	-233 (-1.24)	14 (.13)	182 (1.30)
Std. Dev.	14,294	4,572	2,016	9,954	5,895	6,008	6,331	10,982	8,854	5,185	6,682

Table VI

Gains according to type of foreign investors

This table shows the gains according to type of foreign investors. T-values are in parentheses. One and two asterisks denote statistical significance at the 10% and 5% levels, respectively. Due to round-off errors, the figures may not be exact. [Unit: points of contracts]

	Securities companies	Banks	General companies	Investment companies	The other institutions	Individuals
Volume	20,097,624 [36.85%]	5,252,050 [9.63%]	6,756,060 [12.39%]	21,387,955 [39.22%]	745,265 [1.37%]	293,118 [0.54%]
# of trades	4,364,697	1,175,627	1,667,501	4,913,705	140,406	110,238
# of days	2,255	2,255	2,255	2,255	2,253	1,964
Yearly total gain						
1998	175,502	65,750	-285,909	193,436	-6	-17,107
1999	-165,093	10,324	12,345	179,298	-181	2,502
2000	767,377	4,020	-213,604	333,241	-311	-280
2001	1,935	60,975	-75,733	-30,557	3,254	39
2002	-249,870	72,301	78,137	129,902	17,558	-6,568
2003	139,054	-12,827	105,399	92,466	313	228
2004	335,654	30,043	-68,103	75,867	63,211	-1,733
2005	54,397	-192,118	284,437	-357,339	554,669	-1,386
2006	-75,263	-16,614	154,465	12,317	-166,518	-1,605
Sum	984,694	21,852	-8,565	628,632	471,989	-25,911
Daily position gain						
Average	312 (1.15)	41 (.50)	-3 (-.01)	92 (.26)	238 (1.35)	-10 (-1.40)
Std. Dev.	12,884	3,857	11,738	16,620	7,774	347
Daily trading gain						
Average	124 (2.18)**	-31 (-1.97)**	-1 (-.03)	187 (3.70)**	3 (.13)	-1 (-.99)
Std. Dev.	2,704	746	1,347	2,404	933	61
Daily total gain						
Average	437 (1.63)	10 (.12)	-4 (-.02)	279 (.80)	240 (1.38)	-12 (-1.58)
Std. Dev.	12,740	3,860	11,767	16,544	7,745	346

Table VII**Joint analysis of foreign investors' types and nationalities**

This table shows the total gains of foreign investors according to both types and nationalities. T-values of daily average gains are in parentheses below total gains in Panel B. One and two asterisks denote statistical significance at the 10% and 5% levels, respectively. Na means “not applicable,” which has the number of observations less than 100. Due to round-off errors, the figures may not be exact.

Panel A: Trading volume (average of short and long volume) from 1998 to 2006

	Securities companies	Banks	General companies	Investment companies	The other institutions	Individuals	<i>Sum</i>
U.K.	6,944,097 [34.55%]	6,073 [0.12%]	25,816 [0.38%]	1,995,637 [9.33%]	309,409 [41.52%]	1,872 [0.64%]	9,282,901
France	5,005,613 [24.91%]	1,502,393 [28.61%]	2 [0.00%]	860,787 [4.02%]	0 [0.00%]	11,285 [3.85%]	7,380,079
Luxembourg	0 [0.00%]	0 [0.00%]	0 [0.00%]	7,189,077 [33.61%]	0 [0.00%]	0 [0.00%]	7,189,076
Singapore	1,103,602 [5.49%]	6,597 [0.13%]	170,861 [2.53%]	4,765,452 [22.28%]	44,946 [6.03%]	19 [0.01%]	6,091,475
Germany	152,459 [0.76%]	3,526,744 [67.15%]	957,057 [14.17%]	700,754 [3.28%]	0 [0.00%]	190 [0.06%]	5,337,202
U.S.	2,270,551 [11.30%]	2,926 [0.06%]	1,846,433 [27.33%]	14,382 [0.07%]	85,134 [11.42%]	158,483 [54.07%]	4,377,909
Hong Kong	588,861 [2.93%]	3 [0.00%]	1,959,994 [29.01%]	976,652 [4.57%]	125,212 [16.80%]	16 [0.01%]	3,650,737
Cayman Island	749,955 [3.73%]	2,029 [0.04%]	156,536 [2.32%]	2,615,638 [12.23%]	1,000 [0.13%]	15 [0.00%]	3,525,172
Ireland	2,672,656 [13.30%]	0 [0.00%]	53,449 [0.79%]	16,439 [0.08%]	4 [0.00%]	0 [0.00%]	2,742,547
Bermuda	1,652 [0.01%]	0 [0.00%]	103,788 [1.54%]	1,166,748 [5.46%]	0 [0.00%]	0 [0.00%]	1,272,188
The other countries	608,179 [3.03%]	205,287 [3.91%]	1,482,126 [21.94%]	1,086,392 [5.08%]	179,561 [24.09%]	121,239 [41.36%]	3,682,784
Sum	20,097,624 [100.00%]	5,252,050 [100.00%]	6,756,060 [100.00%]	21,387,955 [100.00%]	745,265 [100.00%]	293,118 [100.00%]	54,532,070

Panel B: Total gains from 1998 to 2006 [Unit: points of contracts]

	Securities companies	Banks	General companies	Investment companies	The other institutions	Individuals	<i>Sum</i>
U.K.	897,760 (2.03)**	67,501 (2.54)**	7,525 (.29)	502,705 (1.37)	23,877 (.26)	-7,444 (-1.01)	1,491,924 (2.20)**
France	-177,931 (-.98)	180,518 (1.69)*	-3 (Na)	25,591 (.42)	0 (Na)	-2,698 (-.82)	25,477 (.12)
Luxembourg	0 (Na)	0 (Na)	0 (Na)	-13,167 (-.19)	0 (Na)	0 (Na)	-13,167 (-.20)
Singapore	278,566 (1.65)*	-6,824 (-2.45)**	295,707 (1.36)	164,960 (.56)	-17,978 (-.52)	18 (Na)	714,449 (1.51)
Germany	-8,263 (-.10)	-284,677 (-1.32)	-19,841 (-.27)	2,991 (.22)	0 (Na)	9 (Na)	-309,781 (-1.24)
U.S.	121,446 (.46)	-5,848 (-1.09)	-41,608 (-.35)	-969 (-.37)	62,222 (.78)	-10,083 (-.95)	125,160 (.44)
Hong Kong	160,852 (1.66)*	0 (Na)	143,738 (.94)	312,255 (1.95)*	120,577 (1.87)*	-7 (Na)	737,415 (2.45)**
Cayman Island	-12,105 (-.09)	-1,368 (Na)	-20,514 (-.84)	-610,334 (-1.34)	21,320 (Na)	-90 (Na)	-623,091 (-1.20)
Ireland	-236,381 (-1.44)	0 (Na)	-298,292 (-.78)	15,466 (1.25)	-55 (Na)	0 (Na)	-519,262 (-1.24)
Bermuda	-486 (Na)	0 (Na)	37,278 (.79)	-4,258 (-.02)	0 (Na)	0 (Na)	32,534 (0.13)
The others	-38,765 (-.19)	72,551 (1.61)	-112,555 (-.49)	233,393 (1.15)	262,026 (1.33)	-5,615 (-1.77)*	411,035 (1.30)
<i>Sum</i>	984,694 (1.63)	21,852 (0.12)	-8,565 (-.02)	628,632 (.80)	471,989 (1.38)	-25,911 (-1.58)	2,072,691 (2.00)**