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# The profitability of day trading: An empirical study using high-quality data

## ABSTRACT

This study investigates the profitability and characteristics of day trading in the KOSPI 200 futures market, one of the largest and most remarkable index futures markets in the world. By using a high-quality data set that classifies various investors into a number of key categories and provides detailed information on their identity, we find that domestic individuals face substantial losses from day trading and that individual day traders who trade more frequently and heavily are more likely to suffer such losses. In contrast to individual day traders, who account for the largest portion of total day trading activity but perform poorly, domestic money managers and foreign institutional investors generally make substantial profits through day trading, which is noteworthy in that their day trading activity accounts for only a small portion of total day trading activity in the futures market.

## 1. INTRODUCTION

Day trading refers to a type of trading activity in which investors repeatedly buy and sell the same financial assets throughout a trading day and is generally known as an extremely short-term investment strategy purely for making profits. Day trading is typically based on the technical analysis of short-run movements of asset prices, not on the fundamental analysis or acquisition of private information on specific firms, which helps investors to predict long-run and permanent price movements. Further, the day trading strategy requires the minimization of any unnecessary overnight inventory positions for avoiding risks associated with changes in asset prices during non-trading hours.

With the advent of convenient online trading and computerized trading systems, day trading has become popular not only among professional investors but also among novices as well as individual investors. The IT bubble and the rapid propagation of the Internet and diverse online resources (since the late 1990s) continue to lower cost barriers to day trading for all types of investors. The increasing accessibility of information on real-time quotes and trades and the widespread use of the home trading systems (HTSs) attract considerable attention from investors and provide many opportunities for intraday (day) trading, inducing investors worldwide (many of whom are unsophisticated and undercapitalized) to engage in day trading (Koski, Rice, and Tarhouni, 2008).

Day trading accounts for an increasingly large share of total trading volume in global financial markets, and thus, the profitability of day trading and the behavior of day traders have become topics of special interest in

global financial communities. Market practitioners have traditionally been interested in day trading and its effectiveness because day trading can dramatically increase their trading profits if they are able to predict short-term movements of asset prices. Academicians' interest in day trading focuses on checking the validity of market efficiency. The existence of a certain group of day traders who consistently exhibit profitable performance would provide clear evidence against the efficient market hypothesis (EMH). In other words, if a day trading strategy based on technical analysis is successful, then the academicians cannot claim that market efficiency holds even in its weak form. Governments and regulators pay closer attention to day trading activity and its impact on domestic financial markets because excessive speculation by heavy day traders can increase the volatility of asset prices and destabilize financial markets. In addition, they may be concerned about substantial losses incurred by unsophisticated traders through excessive day trading. In such situations, they may attempt to regulate excessive day trading activity in their domestic markets.

Despite the growing academic and practical interest in day trading, few studies examine day trading activity because it is very difficult to obtain high-quality data on intraday transactions. To determine whether a specific trader is a day trader and to measure his or her performance, we need to examine all records of his or her intraday transactions, and this process requires detailed information on who submitted each order. However, securities firms, which often engage in day trading for profits, are reluctant to reveal their day trading strategy, and brokerage firms are not willing to provide access to day trading records of their clients (Barber and Odean, 2001). For these reasons, few studies provide an in-depth analysis of day trading.

To close this gap in the literature, the present study investigates the profitability and characteristics of day trading in the KOSPI 200 index futures market, which is one of the most remarkable and important index derivatives markets in the world but has excited little academic interest. By analyzing extremely high-quality data on intraday transactions (which classify futures

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traders by investor type and nationality and include exact information on the identity of the investor for each transaction), we conduct an in-depth examination of the performance of day traders and identify their characteristics. To the author's knowledge, this study is the first to provide a thorough analysis of day trading by using high-quality data containing all records of intraday transactions for an emerging derivatives market.

As we discuss in the next section, most of the previous studies on the profitability of day trading focus on equity markets. However, considering index futures markets may be more effective for the following reasons. Profit-seeking traders in index futures markets typically depend on analyses of short-run price dynamics and/or real-time responses to publicly available news releases because they tend to focus on short-run investment performance (Kang and Ryu, 2010; Ryu, 2012). This stands in sharp contrast to the case of equity markets, in which superior and/or informed traders are usually defined as investors with private (inside) information or as those who can successfully conduct a fundamental analysis. Such investors are likely to show long-term investment performance and have a long-term information advantage. Given that day traders' information advantage tends to come from their ability to process information quickly, their superior trading skills, and/or an elaborate technical analysis, it may be more appropriate to discuss the profitability of superior day trading strategies for index futures markets than for stock markets. Furthermore, the information advantage of investors in Korea's index derivatives markets (including the KOSPI 200 futures market) tends to erode very quickly (Ahn, Kang, and Ryu, 2010; Kang and Ryu, 2010). Therefore, to fully and effectively exploit their information and trading advantage, the investors are likely to leave no overnight inventory by closing all their positions before the end of each trading day. This behavior of profit-seeking investors in the index futures market better reflects the definition and convention of day trading.

There are other important reasons why we choose the KOSPI 200 futures market for our analysis of day trading activity. First, the market's ample liquidity and extremely low transaction costs can attract more day traders.<sup>1</sup> Second, the substantial leverage effect of futures trading and the high volatility of futures prices are attractive to day traders. Third, the Korean government has recently made attempts to regulate day trading in Korea's index derivatives markets, but many concerns and conflicts related to such attempts remain.

Proponents of regulations insist that many domestic individual investors cannot outperform foreign investors and that only brokerage firms and institutions

benefit through substantial commissions collected from large numbers of domestic individual day traders. They also suggest that superior foreign day traders' huge profits are likely to result in losses for domestic individual investors (who are typically not as sophisticated as their foreign counterparts and have little trading experience) because the transaction of futures contracts essentially reflects a "zero-sum game."

On the other hand, opponents claim that even individual investors can make sizable profits if they have the ability to analyze price movements and that many individual day traders actually make profits through research and strategic trading in the KOSPI 200 futures market. They add that the government's unnecessary intervention is likely to constrict futures trading and that this may cause Korea's index derivatives markets to lose their global prominence. In this regard, there is an urgent need for investigating to what extent futures trading can be explained by day trading; who wins and who loses from day trading activity; and the extent of losses in the KOSPI 200 futures market.

Fourth, although market practitioners generally believe that technical trading and program trading, which are closely related to day trading, are prevalent in the KOSPI 200 futures market, little is known about the effectiveness and proportion of day trading across investor classes in the index futures market. The KOSPI 200 futures market's world-class stature and global investors' keen interest in the market make the present study a timely and useful effort. This claim is more persuasive in that KOSPI 200 futures transactions have considerable influence on both domestic and global economies.

The findings in this study indicate that day trading prevails in the KOSPI 200 index futures market and that most of the day trading activity can be explained by domestic individual investors' trades. However, domestic individuals generally incur losses, and their losses tend to increase with their day trading activity (in terms of both trading frequency and trading volume). On the other hand, domestic money managers and foreign institutional investors make substantial profits through day trading, although their day trades account for only a small fraction of total day trading volume in the KOSPI 200 index futures market.

The rest of this paper is organized as follows: Section 2 provides a brief literature review focusing on day trading and its profitability. Section 3 discusses the characteristics of the KOSPI 200 futures market, and Section 4 explains the data and methodology. Section 5 presents and discusses the empirical results, and Section 6 concludes this study.

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<sup>1</sup> Concrete figures and explanations are provided in Section 3.

## 2. LITERATURE REVIEW

Although the profitability of corporate insiders or investors possessing private information is well documented,<sup>2</sup> few studies examine the validity of the day trading strategy and the profitability of technical day traders. Further, previous studies on day trading report inconsistent results.

Harris and Schultz (1998) are the first to provide a rigorous analysis of the profitability of day trading by using the intraday transaction records of day traders. They find that day traders using NASDAQ's Small Order Execution System (SOES) tend to make small profits. However, their finding does not represent the overall investment performance of day traders because they draw conclusions based on the trading history of just two brokerage firms. Garvey and Murphy (2005a) examine 96 000 transactions by 15 proprietary day traders and find that day traders generally make profits. They insist that such profits result mainly from day traders' strategic order submission, which involves placing orders inside NASDAQ dealers' quotes.

In a follow-up study, Garvey and Murphy (2005b) find that 1 386 day traders make profits over a two-month period. Seasholes and Wu (2007) analyze day trading activity in the Shanghai Stock Exchange and report that extremely active day traders make substantial profits. On the other hand, Jordan and Diltz (2003) have a skeptical view of the effectiveness of the day trading strategy. By analyzing data on day trades obtained from seven branches of a national securities firm in the U.S. specializing in day trading, they find that more than two thirds of day traders lose money.

Previous studies' mixed findings concerning the profitability of day trading may be due to the use of restrictive data. Because most of the earlier studies examine a small segment of investors or transactions for each financial market, they provide only a partial understanding of day trading. Recognizing this problem, several recent studies re-examine the profitability and pattern of day trading by employing complete data sets that include each trader's account information, which enables researchers to determine the identity of every day trader who submits an order.

Linnainmaa (2005) attributes the poor performance of day traders to their physiological bias and insists that individual day traders are reluctant to close losing day trades and that this "disposition effect" weakens the investment performance of day traders in the Finnish stock market. Lee, Park, and Jang (2007) analyze the profitability of day trading for the Korean stock market by using data on transactions over a four-month period

and find that, although some day traders make profits, most lose money because of high transaction costs.

Based on the "learning model," which describes the behavior of individual day traders, Barber, Lee, Liu, and Odean (2010) find that unprofitable day traders tend to stop their trades and that most day traders begin with relatively small transactions and increase their trading volume as they make profits. However, inconsistent with their learning model, they recognize that the aggregate investment performance of day traders is negative. Barber, Lee, Liu, and Odean (2011) also report that day trading is prevalent in the Taiwan Stock Exchange but that only a small number of day traders make profits.

Although these recent studies of day trading are well designed and make use of high-quality data (including information on the identity of traders), the profitability and effectiveness of day trading remain controversial. In addition, these studies are limited to stock markets (i.e., stock markets in Finland, Korea, and Taiwan). Thus, little is known about day trading activity in emerging derivatives markets, although there is growing interest in such markets among investors. The next section introduces the KOSPI 200 futures market and explains why there is a need for an empirical analysis of day trading for this important market.

## 3. KOSPI 200 FUTURES MARKET AND DAY TRADING

Although the KOSPI 200 index futures market, introduced in May, 1996, by the Korea Exchange (KRX), attracts only major domestic institutions and a few professional individuals supported by financial institutions in the early stages, increasing numbers of ordinary individual investors and foreign institutional investors are now actively trading the index futures contracts. Since the new millennium, the KOSPI 200 futures market has grown dramatically to become one of the largest index futures markets in the world, and as of 2003, its average daily trading volume exceeds 200 000 contracts.

Table 1 presents the global top five derivatives exchanges ranked based on their total futures and options trading volume and the top five index futures contracts based on their trading volume. The KRX ranks first in terms of futures and options trading volume in 2006, the most recent year covered by this study's sample period. Further, approximately 47 million KOSPI 200 futures contracts are traded in global exchanges in that year. This indicates that KOSPI 200 futures contracts rank fifth among global index futures contracts, following E-mini S&P 500 futures of the Chicago Mercantile Exchange (CME), DJ Euro STOXX 50 futures of the Eurex, E-mini NASDAQ 100 futures of the CME, and S&P CNX Nifty futures of the Indian National Stock Exchange. Table 2, which provides more specific information on trading activity in

<sup>2</sup>Previous studies on the profitability of insider trading include Seyhun (1986, 1988, 1992), Rozeff and Zaman (1988), Lin and Howe (1990), Eckbo and Smith (1998), and Mordant and Muller (2003).

the KOSPI 200 futures market of the KRX, shows the trend in trading volume in terms of the number and value (in millions of Korean Won (KRW)) of contracts for the 2000-2007 period.

The KOSPI 200 futures market assumes its current position in the global economy for the following reasons. First, the synergy between the futures market and the KOSPI 200 index options market<sup>3</sup> plays an important role in promoting futures transactions. In the Korean market, program trading, speculative trading, and hedging strategies are generally implemented by the simultaneous trading of index futures and options contracts. Thus, the market's active options trading activity naturally induces active futures trading.

Second, the Korean government has implemented many policies to boost index futures trading. For example, it has imposed no tax on capital gains and abolished many barriers to induce investments by foreigners. In addition, the government has effectively lowered the required level of margin accounts. With the government's implicit consent, futures traders are allowed to use stocks or any other financial assets instead of cash to maintain their margin accounts. This increases the leverage effect and induces more speculative trading in the futures market.

Third, although domestic individual investors' accessibility and concerns with respect to derivatives trading have increased sharply with the introduction of the HTS and lower transaction costs, only two types of derivatives products (i.e., KOSPI 200 futures and options) are offered before 2006.<sup>4</sup> This results in the extreme concentration of derivatives trading in the futures and options market.

Fourth, the speculative trading activity of individual investors, together with an increase in institutional investors' demand for hedging, facilitates the development of the KOSPI 200 futures market. Recently, the Korean government, the KRX, and related financial institutions have organized a committee to turn Korea into a leading financial hub in Asia. Recognizing the importance and global stature of Korea's index derivatives markets, they are attempting to develop the markets by focusing on the KOSPI 200 futures and options markets, and this is expected to help the KOSPI 200 futures market to grow even more.

In addition to the KOSPI 200 futures market's ample liquidity and global recognition, there are other unique characteristics that make this market more valuable for research on day trading. First, transaction costs

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<sup>3</sup>The KOSPI 200 options market ranks first in the world in terms of trading volume.

<sup>4</sup>Other derivatives are rarely traded in the Korean financial market. Equity-linked warrants, which are actively traded nowadays, have been traded since 2006.

associated with futures trading in this market are much lower than those in Korea's stock markets as well as in other developed countries' futures markets. Table 3 shows the transaction costs incurred by individual and institutional investors when they trade stocks or futures on the KRX. Commissions are calculated based on the minimum level of online trading during the sample period.<sup>5</sup> Futures trading entails much lower transaction costs than stock trading. For day traders, transaction costs are critical because they must trade more frequently than long-term investors. Further, no taxes are imposed on transactions and capital gains for KOSPI 200 futures, whereas many countries (e.g., the U.S., Japan, the U.K., France, and Brazil) continue to impose taxes on capital gains from derivatives. This represents a major benefit to profit-seeking day traders in the KOSPI 200 futures market.

Second, the KOSPI 200 futures market exhibits unique investor participation rates. In contrast to financial markets in developed countries, where institutional traders are dominant market players, the KOSPI 200 futures market tends to attract domestic individual investors, who are typically uninformed, irrational, and speculative traders. This is supported by Table 4, which shows participation rates by investor type (domestic and foreign investors by year). Domestic traders are further classified into individual investors, domestic money managers (securities and futures firms, investment trusts, pension funds, and other firms), and domestic banks (commercial banks, merchant banks, and insurance firms). As shown in Table 4, although foreign traders' trading volume increases steadily as a result of Korea's open-door policy on investments by foreign investors, domestic individual investors' trading volume still accounts for more than one third of total transactions. Given that individuals, not institutions, account for much of day trading activity,<sup>6</sup> the higher participation rate for (domestic) individual investors, who are more likely to show behavioral biases as well as speculative motivation, provides an ideal setting for a thorough examination of the effectiveness and profitability of day trading in the KOSPI 200 futures market.

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<sup>5</sup>If a trader does not use a "cost efficient" online trading system, then the actual commission is higher. KOSPI 200 futures traders typically enjoy far lower commissions than equity traders because many brokerage and asset management firms in Korea tend to impose substantially lower commissions on online futures traders.

<sup>6</sup>See, for example, Lee, Park, and Jang (2007) and Barber, Lee, Liu, and Odean (2011).

Table 1: The global top five derivatives exchanges and index futures contracts (2006)

Rank	Exchange	No. of contracts	Index futures	No. of contracts
1	<b>Korea Exchange</b>	<b>2 474 593 261</b>	E-mini S&P 500 futures	257 926 673
2	CME Group	2 209 148 447	DJ Euro Stoxx 50 futures	213 514 918
3	Eurex	1 526 751 902	E-mini Nasdaq 100 futures	79 940 222
4	Euronext.Liffe	730 303 126	S&P CNX Nifty futures	70 286 227
5	Chicago Board Options Exchange	675 213 772	<b>KOSPI 200 futures</b>	<b>46 611 008</b>

Source: [www.futuresindustry.org](http://www.futuresindustry.org)

Table 2: Trading volume of KOSPI 200 futures

Year	No. of contracts		Trading Value (mil.KRW)	
	Total	Daily avg.	Total	Daily avg.
2000	19 666 518	81 604	859 711 142	3 567 266
2001	31 379 866	127 560	1 124 045 301	4 569 290
2002	42 462 216	174 025	1 979 940 091	8 114 509
2003	61 556 063	249 215	2 649 357 978	10 726 146
2004	54 825 244	220 182	2 935 960 767	11 791 007
2005	43 020 684	172 774	2 987 042 301	11 996 154
2006	45 612 214	184 665	3 985 969 575	16 137 529
2007	46 862 948	190 500	5 174 122 467	21 033 018

Source: The Korea Exchange ([www.krx.co.kr](http://www.krx.co.kr))

Table 3: Components of transaction costs (%)

		Commission	Member fee	Exchange fee	Tax	Total
Individual investors	KRX stocks	0,14	0	0	0,3	0,44
	KOSPI 200 futures	0,01	0	0	0	0,01
Institutional members	KRX stocks	0	0,0065	0,0044	0,3	0,3109
	KOSPI 200 futures	0	0,0006	0,00024	0	0,00084

Table 4: Futures trading activity by investor group (%)

Year	Individuals	Domestic money managers				Domestic banks			Foreign	Total
		Securities & Futures	Invest Trusts	Pension	Others	Banks	Merchant	Insurance		
1999	45,29	41,71	5,47	0,00	2,51	1,03	0,73	0,20	3,06	100,00
2000	50,75	32,56	6,37	0,11	2,25	2,58	0,36	0,21	4,81	100,00
2001	50,56	32,72	4,36	0,18	2,09	0,82	0,29	0,50	8,49	100,00
2002	53,06	26,33	4,72	0,11	3,39	0,78	0,32	0,54	10,76	100,00
2003	55,05	22,09	3,68	0,24	1,37	0,79	0,08	0,34	16,36	100,00
2004	48,62	22,94	3,36	0,43	1,14	0,80	0,06	0,35	22,29	100,00
2005	43,97	25,64	2,67	0,69	1,76	1,29	0,02	0,24	23,71	100,00
2006	40,16	28,10	2,89	0,35	2,19	1,05	0,01	0,19	25,06	100,00
2007	35,87	32,71	2,48	0,23	1,81	0,74	0,01	0,35	25,78	100,00

Source: The Korea Exchange ([www.krx.co.kr](http://www.krx.co.kr))

Third, in the KOSPI 200 futures market, only the nearest maturity contracts are actively traded (even the second nearest maturity contracts are rarely traded). The maturity months for KOSPI 200 futures are March, June, September, and December. The second Tuesday of each maturity month is the settlement date for KOSPI 200 index futures contracts. Although all four types of futures contracts (i.e., futures

contracts with four different maturity dates) are traded on each trading day, those with the nearest maturity always account for the vast majority of total trading volume. For example, even on the maturity date, when the trading volume of the nearest-to-maturity futures contracts tends to drop sharply and that of the second nearest-to-maturity futures contracts increases dramatically, the trading volume of the nearest-to-

maturity futures contracts is approximately 3 times the combined volume of longer-maturity futures contracts. Further, the trading volume of the nearest-to-maturity futures contracts is approximately 20 times the combined volume of longer-maturity futures contracts even one day before the maturity date. The difference for other trading days is far greater.<sup>7</sup> This indicates that the “roll-over” phenomenon, which is often found in other futures markets, is not clearly observed in the KOSPI 200 futures market and that the futures trading activity in this market is influenced mainly by speculative and profit-seeking motives, not by hedging or asset management needs.

Fourth, KOSPI 200 futures transactions entail a substantial leverage effect. To open an account for futures trading, the trader is usually required to make a deposit equal to 15% of the futures price (initial margin). The minimum margin requirement is just 10% of the current futures price (maintenance margin). Although these are still low enough to induce large numbers of speculative traders with highly leveraged positions, many financial intermediaries implicitly allow some investors to freely trade futures contracts regardless of the level of their margin account if the investors provide their financial assets as collateral. This provides day traders with more attractive investment opportunities because they do not have to sell their long-term assets to obtain seed money for futures (day) trading.

The KOSPI 200 futures market is classified as a purely order-driven market in which there are no designated market makers and all transactions are made through the automated trading mechanism. Normal trading hours are from 9:00-15:15, Monday to Friday. Orders from traders are typically processed using a continuous double-auction system, but there exists an hour-long pre-opening call auction market and a 10-minute-long closing call market at the end of each trading day. The futures price is equal to the KOSPI 200 index price multiplied by KRW 500 000. The minimum tick size is 0.05 index point (KRW 25 000). The daily price limit is set to 10% of the previous day's closing price. If this price limit is violated, then the “side car” is activated, and all transactions are halted for 10 minutes.

#### 4. DATA AND EMPIRICAL METHODOLOGY

This study's data on intraday KOSPI 200 futures transactions contain not only detailed information on the date, price, volume, time, and trade direction (buy and sell indicators) of each transaction but also high-quality information on the nationality and types of investors. Using this demographic information, we classify futures traders into the following three investor classes: domestic individual investors, domestic

institutional investors, and foreign institutional investors. Trades by foreign individual investors or government-owned firms are excluded because their trades explain only a negligible portion of total trading volume.

Domestic institutional investors are further classified into two subgroups (domestic money managers and domestic banks) because their convention, behavior, and trading cost related to day trading are known to be quite different from one another. Most domestic money managers trade KOSPI 200 futures by using their own accounts and thus do not pay any commissions. Instead, they pay member and exchange fees for their transactions. However, these fees are minimal, and thus, money managers tend to actively trade futures contracts for short-term profits. On the other hand, it is generally known that domestic banks are long-term investors and seldom engage in day trading just for short-term profits.

The data also include encrypted codes that identify the account of the investor associated with each transaction. These special codes allow for the determination of each investor's intraday transactions and the identity of day traders in the futures market.<sup>8</sup> Among global derivatives markets, only the KOSPI 200 futures market provides a whole market transaction data set with such special codes. The advantage of this data set is more apparent when it is compared with intraday data sets from financial markets in other developed countries, which typically include no information on the trade direction and the identity and types of investors.<sup>9</sup>

The data cover a relatively long period from January 2, 2003, to October 31, 2006.<sup>10</sup> We select this period for

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<sup>8</sup>The account number for each trader is newly encoded as a special character code on each trading day. Although each encrypted account is indexed according to the nationality of the trader and his or her type, it is possible that one trader uses multiple accounts to trade futures contracts. Because of these discontinuities and limitations with respect to our data set, we cannot trace the transaction history of a given day trader over successive days. However, we can fully trace intraday trading records for specific accounts and thus can accurately measure the profitability of day trading and investment performance by each investor type.

<sup>9</sup>In terms of U.S. data sets, to determine whether a certain trade is initiated by a buy or sell order, one needs to estimate or deduce the trade direction of each trade by using restricted information (e.g., Lee and Ready, 1991). Even in the case of special data on day trading activity in the U.S. market, there is only partial information on some futures traders' day trading activity.

<sup>10</sup>This study selects a sample period considerably longer than those typically considered in previous studies (for example, Lee, Park, and Jang (2007) consider only a four-month period). We exclude five trading days from the data because of a minor flaw in the raw data.

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<sup>7</sup>Detailed information is available from the author upon request.

the following reasons. First, the trading volume of KOSPI 200 futures contracts has increased sharply since 2003, and the number of average daily transactions is approaching approximately 250 000 contracts (see Table 2). Practitioners believe that this is caused by an increase in speculative trading activity, particularly day trading activity. Second, foreign investors, who today compose one of the most important and leading investor groups, are inactive participants in futures trading before 2003, when their transactions account for less than 10% of total trading volume (see Table 4). Third, motivated by the market's recovery since 2003, individual traders, who usually account for a dominant portion of total day trading activity in many financial markets worldwide, start to participate in day trading. Until the early 2000s, most of the "individual" day traders whom the KRX classifies as domestic individuals do not have features of typical individual investors. Most are professional day traders temporarily hired by financial institutions, and they actively engage in day trading in the guise of ordinary individual investors.<sup>11</sup>

In this study, we consider only the nearest-to-maturity futures contracts because other maturity contracts are not actively traded (i.e., day traders seldom buy or sell longer-term maturity contracts). We analyze all intraday transaction records for the nearest-to-maturity futures contracts, including those for transactions in the pre-opening and closing call markets. Any split trades originating from one large order are treated as a single trade. Based on this processed data set, we identify all day trades by tracing all intraday transactions for each investor.

This study follows a strict definition of day trading to examine the unmixed effect of day trading on investment performance for each type of investor. We recognize a trade on a given day by an investor as part of day trading only if the investor buys and sells an "exactly equal" number of futures contracts during the day. If a trade satisfies this strict condition, then the trade is always counted as a day trade even in the case in which the first trade of the investor is a sell trade (not a buy trade). This is because, unlike in stock markets, where submitting sell orders without holding assets is quite restrictive (i.e., short-sale restriction), in the futures market, investors can freely place sell orders (take short positions) without any restriction.

We define the profitability of day trading as the (dollar-based) net trading profit from day trading over the sample period. The dollar-based daily profit<sup>12</sup> is calculated as follows:

<sup>11</sup>These views and the reasons mentioned earlier are based on analytic reports related to Korea's financial industry and based on opinions of market experts in leading firms and banks.

<sup>12</sup>To measure the profitability of the day trading strategy for stock markets, researchers often calculate "average returns" and

$$\text{Profit} = \sum (P_S V_S - P_B V_B) - TC * (P_S V_S + P_B V_B) \quad \dots (1)$$

Here  $P_B$  ( $P_S$ ) denotes the transaction price of each buy (sell) trade, and  $V_B$  ( $V_S$ ) denotes the size of the buy (sell) trade. In the case of separately recorded trades originating from a single large order, we replace the price and the size with size-weighted average transaction prices and the size of the original order, respectively. Further,  $TC$  indicates the (proportional) transaction cost, which generally includes commissions, member fees, exchange fees, taxes, and other costs. Because no taxes are imposed on transactions and capital gains,  $TC$  is equal to the sum of commissions and member/exchange fees in the futures market.

For domestic individual investors, we apply the lowest level of commissions for the sample period: 0.01% of the total trading value ( $P_S V_S + P_B V_B$ ).<sup>13</sup> Because these investors pay no member/exchange fees, the value of  $TC$  for these investors is equal to 0.0001. Most domestic money managers (particularly futures and securities firms) pay no commissions but pay member (0.0006%) and exchange (0.00024%) fees. Of course, some domestic money managers trade futures contracts through other financial institutions, and in such cases, they may pay commissions. However, even those money managers often negotiate the size of the commission and reduce it to a level similar to the minimal transaction cost imposed on other futures and securities firms (i.e., 0.00084%<sup>14</sup>). Foreign institutions and domestic banks also receive preferential treatment when paying commissions to intermediary firms. They typically pay 0.001% of the trading value as commissions when trading KOSPI 200 futures.

Based on the measure of profitability described by Equation (1), we evaluate the empirical performance of the day trading strategy and investigate its

"risk-adjusted (excess) returns" because the size of initial investment and the market condition (e.g., a bear or bull market) can have considerable influence on the profitability of the trading strategy. However, in the case of KOSPI 200 index futures trading, it is more appropriate to measure the profitability of the trading strategy by directly gauging the amount of money that the traders implementing the strategy earn (lose) over the sample period. The size of the trader's initial investment in futures trading is determined by the size of his or her margin account, which is relatively very small. In addition, futures traders can freely take a short position in futures contracts if they expect the market to decline because there is no short-sale restriction in the futures market. Thus, we adopt the dollar-based performance measure for this study.

<sup>13</sup>This lowest commission rate is applied only when the investor uses the cost-efficient online trading system provided by major asset management firms such as Mirae Asset or SK Securities to trade KOSPI 200 futures. Phone-based or off-line trading generally entails higher transaction costs.

<sup>14</sup>This value is equal to the sum of member (0.0006%) and exchange (0.00024%) fees.



characteristics for four types of investors: domestic individuals, domestic money managers, domestic banks, and foreign institutions. We also determine whether the profitability of day trading varies according to trade size and/or trading frequency. The next section presents the empirical results.

5. EMPIRICAL FINDINGS

Table 5 presents the summary statistics for day trading activity, providing interesting insights into day trading behavior in the KOSPI 200 futures market. The table also reports the average daily values (with standard deviations in parentheses) for the number of investors, the number of transactions, and day trading volume (contracts) for each of the four investor types (domestic individuals, domestic money managers, domestic banks, and foreign institutions). Despite our strict definition of day trading, the results confirm that day trading is a widespread phenomenon in the index futures market. More than half (56,7%) of the market participants can be considered day traders, and nearly half (49,4%) of all transactions can be explained by day trading.<sup>15</sup> When day trading activity is measured as the number of contracts, although its proportion decreases slightly, day trading still explains more than one third (35,7%) of total trading volume, which implies that our strict definition of day trading does not severely limit the scope of day trading.

As clearly shown in Table 5, a large portion of day trading is explained by domestic individual investors. Specifically, 91,2% of day traders are domestic individuals, and their day trading activity explains 85,9% and 72,6% of total day trading activity measured as the number of transactions and the number of contracts, respectively.<sup>16</sup> Foreign institutional day traders tend to trade more frequently and heavily than their domestic counterparts. On average, foreign traders make 38,8 trades (392,3 contracts) per day, whereas domestic individual day traders make just 10,4 trades (40,1 contracts) per day. Domestic institutional day traders' daily trading volume lies between that for domestic individual day traders and that for foreign institutional day traders. Among domestic institutions, domestic banks make fewer than six trades per day, but their average day trading volume is considerable (approximately 112,2 futures contracts per day). This means that these banks do not make frequent day trades but that the size of each transaction is relatively large.

<sup>15</sup>These figures are calculated as follows:  
56,7%=51,69%+4,46%+0,35%+0,18% and  
49,4%=42,38%+6,16%+0,16%+0,66%.

<sup>16</sup>These figures are calculated as follows:  
91,2=51,69/(51,69+4,46+0,35+0,18),  
85,9=42,38/(42,38+6,16+0,16+0,66), and  
72,6=25,91/(25,91+8,37+0,46+0,96).

Table 6, which shows the distribution of the day traders and their profitability by investor type and trading frequency, confirms these findings. Each day trader is classified into one of the four investor categories, and trading frequency refers to the number of transactions for each trading day. The minimum number of transactions is set to two because at least one buy trade and one sell trade are required to complete a day trade. Panel A, which shows the relative proportion of day trading for each interval by trading frequency and investor type, indicates that more than a quarter of all day trades (i.e., 28,1%) are composed of a single pair of one buy trade and one sell trade and that more than two thirds of all day trades (i.e. 72,2%) are composed of fewer than 10 transactions per day. By contrast, the top 0,62% of day traders engage in extremely frequent day trading, making more than 101 trades per day.

Panel B of Table 6 presents the distribution of each investor type across trading frequency intervals. Although a majority of investors make less frequent day trades, significant portions of domestic money managers and foreign institutions make extremely frequent day trades. For instance, during a single day, 2,3% of domestic money managers and 10,1% of foreign institutions make more than 100 transactions to implement the day trading strategy. By contrast, only small portions of domestic individuals and domestic banks (0,45% and 0,02%, respectively) are involved in such frequent trades.

Panel C of Table 6 presents the amount of money that day traders earn or lose during the sample period by investor type (see the "Sum" column of Panel C). Overall, day traders incurred a loss of 718 305 points (i.e., KRW 359 billion). Most of this loss is attributed to the low profitability of uninformed and noisy individuals. In other words, domestic individual day traders are generally net losers in the KOSPI 200 futures market, whereas domestic money managers and foreign institutions make net profits from day trading. The total amount of losses incurred by domestic individuals is 774 431 points (KRW 387 billion), and the total amount of profits from day trading is 38 014 points (KRW 19 billion) for domestic money managers and 31 430 points (KRW 16 billion) for foreign institutions. The amount of money that these institutional investors earn through day trading is substantial, and in particular, the investment performance of foreign institutional day traders is remarkable in that only a small portion of these traders make day trades and their trades explain a very small portion of total day trading volume in the KOSPI 200 futures market.<sup>17</sup> Panel D, which shows the relative

<sup>17</sup>As shown in Table 5, foreign institutions (domestic money managers) account for 0,32% (7,86%) of the total number of day traders, and their day trading activity accounts for 1,34% (12,48%) and 2,69% (23,45%) of total day trading activity

profitability of day trading according to the number of day traders for each frequency interval,<sup>18</sup> provides clear evidence of the proficiency of foreign day traders (see the “Sum” column of Panel D). On the other hand, domestic banks incur net losses from day trading. However, it is widely believed that banks rarely make day trades just for short-term profits and that they trade futures contracts mainly for hedging and portfolio management purposes.<sup>19</sup> Thus, instead of concluding that domestic banks are inferior investors, we attribute the low profitability of banks’ day trading activity to differences in motives for day trading between money managers and banks. For example, despite short-term losses from their futures positions, domestic banks may initiate large intraday futures transactions to rebalance their portfolios or to hedge their positions in the stock and options markets. Such intraday transactions can be detected as their day trades.

Panels C and D of Table 6 describe the relationship between the day trading profits and trading frequency. Domestic individual investors who trade more frequently are more likely to incur losses, which implies that they are generally uninformed and noisy traders. By contrast, extremely frequent day trades by money managers and foreign institutions result in substantial profits, which suggests that their day trading activity for short-term profits is effective and that these investors are efficient at technical analysis.

We now examine the effect of trading volume on day trading activity and its profitability. If a day trader is confident in his or her information advantage and/or trading skills, he or she is likely to trade as much as possible during the trading day to maximize profits. This is plausible because the size of the required initial investment for day trading is relatively small in the futures market. On the other hand, if large day trades are mainly by irrational and unskillful day traders who simply enjoy excessive trading, then the profitability of such trades is likely to be poor. Thus, examining the volume effect on the profitability of day trading should provide important insights into the characteristics of day trading.

Table 7 presents the distribution of day trading by daily trading volume and describes the relationship between the profitability of day trading and the size of day trades. We consider the pair of one buy contract and one sell contract as the unit size of day trades. Panel

A, which shows the relative proportion of day trading for each interval by trading volume and investor type, confirms that small day trades are dominant in the futures market. Nearly one fifth of day trades (i.e., 19,6%) consist of a pair of one buy contract and one sell contract, and more than half of the day trades (52,8%) are composed of fewer than four buy and sell contracts. On the other hand, the top 0,34% of day traders make extremely large volume of day trades, trading more than 1 000 buy and sell contracts per day.

Panel B of Table 7, which presents the distribution of each investor type across trading volume intervals, confirms that institutional day traders are more likely than individual day traders to be heavy day traders. During a single day, 31,0% of foreign institutional day traders trade more than 100 contracts, whereas only 2,2% of domestic individual day traders are involved in such heavy day trades. In the case of domestic institutional day traders, the proportion of such heavy day traders is more than 10%.

Panels C and D of Table 7 directly show the relationship between the profitability of day trading and the volume of day trades. In the case of foreign institutional day traders and domestic money managers, who can be regarded as superior day traders based on their day trading profits, their profits tend to increase with their day trading volume.<sup>20</sup> This implies that foreign day traders and money managers are generally better equipped in terms of their wealth, sophistication, specialty, and trading experience than ordinary individual day traders. On the other hand, in the case of domestic individual day traders, who are net losers and can be regarded as inferior investors as a result, their net losses increase monotonically with their day trading volume. This suggests that higher market impact costs are imposed on the large individual day traders and provides evidence that they are uninformed investors who tend to be overconfident.

measured as the number of transactions and the number of contracts, respectively.

<sup>18</sup>To calculate each element in Panel D, we divide each element in Panel C by the corresponding element in Panel A.

<sup>19</sup>This is the reason why we further classify domestic institutions into domestic money managers and banks. This claim is based on the opinions of financial analysts and executive directors of leading banks.

<sup>20</sup> However, foreign day traders incur losses through the “extremely” large day trading (i.e. more than 1 000 contracts per day).

Table 5: Summary statistics

		Day trading				Non-day trading			
		Individual	Manager	Bank	Foreign	Individual	Manager	Bank	Foreign
No. of investors	avg.	2 632,5	227,0	17,7	9,2	1 812,4	284,7	46,0	63,1
	std.	(570,0)	(98,1)	(6,5)	(4,6)	(420,6)	(59,8)	(11,4)	(17,4)
	%	51,69%	4,46%	0,35%	0,18%	35,59%	5,59%	0,90%	1,24%
No. of transactions	avg.	27 280,1	3 966,6	103,1	424,8	17 391,1	6 434,0	713,7	8 051,5
	std.	(7 857,4)	(2 405,4)	(75,3)	(504,2)	(4 618,3)	(2 932,1)	(547,9)	(3 034,4)
	%	42,38%	6,16%	0,16%	0,66%	27,02%	10,00%	1,11%	12,51%
Trading volume (in contracts)	avg.	107 326,8	34 681,7	1 907,3	3 973,5	95 219,7	88 170,4	6 915,4	75 972,5
	std.	(40 529,6)	(18 193,0)	(1 098,3)	(5 120,4)	(42 012,8)	(31 522,2)	(3 796,1)	(26 749,6)
	%	25,91%	8,37%	0,46%	0,96%	22,99%	21,29%	1,67%	18,34%
No. of transactions per investor	avg.	10,4	16,7	5,8	38,8	9,7	22,6	15,7	128,4
	std.	(2,1)	(5,2)	(3,2)	(41,4)	(2,2)	(8,9)	(11,7)	(35,7)
Trading volume per investor (in contracts)	avg.	40,1	173,2	112,2	392,3	51,9	317,1	150,7	1 286,2
	std.	(9,2)	(113,5)	(65,2)	(484,0)	(16,3)	(116,4)	(76,7)	(536,6)

Table 6: Distribution and net profitability of day trading by trading frequency

Panel A. Proportion of day trading in each interval (%)								
No. of transactions	2	3~5	6~10	11~25	26~50	51~100	101+	Sum
Domestic individuals	25,79	18,16	22,40	16,96	5,85	1,64	0,41	91,20
Domestic money managers	1,95	1,48	1,72	1,55	0,70	0,29	0,18	7,86
Domestic banks	0,26	0,16	0,12	0,06	0,01	0,00	0,00	0,61
Foreign institutions	0,07	0,05	0,06	0,05	0,03	0,02	0,03	0,32
Total	28,07	19,85	24,30	18,62	6,59	1,95	0,62	100,00
Panel B. Proportion of day trading by investor type (%)								
No. of transactions	2	3~5	6~10	11~25	26~50	51~100	101+	Sum
Domestic individuals	28,27	19,91	24,56	18,60	6,41	1,79	0,45	100,00
Domestic money managers	24,83	18,78	21,87	19,69	8,91	3,67	2,25	100,00
Domestic banks	42,13	26,33	19,33	9,98	1,94	0,27	0,02	100,00
Foreign institutions	22,31	17,00	18,03	15,79	9,47	7,31	10,08	100,00
Panel C. Net profits from day trading by investor type (points)								
No. of transactions	2	3~5	6~10	11~25	26~50	51~100	101+	Sum
Domestic individuals	54 292	-9 625	-78 412	-64 267	-276 676	-182 633	-217 111	-774 431
Domestic money managers	21 795	4 957	8 418	-3 843	-7 137	310	13 515	38 014
Domestic banks	-858	-2 994	282	-6 054	-4 234	379	161	-13 317
Foreign institutions	-2 475	4 440	19 372	-2 334	4 245	410	7 772	31 429
Total	72 754	-3 222	-50 341	-76 497	-283 802	-181 534	-195 663	-718 305
Panel D. Profitability of day trading based on the relative proportion of day traders (=Panel C / Panel A)								
No. of transactions	2	3~5	6~10	11~25	26~50	51~100	101+	Sum
Domestic individuals	2 105	-530	-3 500	-3 788	-47 333	-111 624	-528 314	-8 491
Domestic money managers	11 163	3 357	4 896	-2 482	-10 182	1 073	76 275	4 834
Domestic banks	-3 320	-18 540	2 382	-98 872	-356 421	229 458	1 098 254	-21 713
Foreign institutions	-34 855	82 054	337 621	-46 430	140 856	17 617	242 259	98 752
Total	2 592	-162	-2 072	-4 107	-43 077	-93 103	-315 399	-7 183

Notes: One index point (the unit of the trading value) indicates KRW 500 000.

Table 7: Distribution and net profitability of day trading by trading volume

Panel A. Proportion of day trading in each interval (%)									
Trading volume (in contracts)	1	2~4	5~10	11~25	26~50	51~100	101~1000	1001+	Sum
Domestic individuals	18,87	31,33	20,27	12,09	4,48	2,14	1,80	0,22	91,20
Domestic money managers	0,71	1,75	1,75	1,48	0,83	0,57	0,67	0,11	7,86
Domestic banks	0,02	0,07	0,15	0,11	0,11	0,08	0,07	0,00	0,61
Foreign institutions	0,02	0,03	0,04	0,05	0,04	0,04	0,09	0,01	0,32
Total	19,62	33,18	22,22	13,73	5,46	2,82	2,63	0,34	100,00

Panel B. Proportion of day trading by investor type (%)									
Trading volume (in contracts)	1	2~4	5~10	11~25	26~50	51~100	101~1000	1001+	Sum
Domestic individuals	20,69	34,35	22,23	13,26	4,91	2,34	1,97	0,25	100
Domestic money managers	9,08	22,20	22,32	18,84	10,52	7,19	8,51	1,35	100
Domestic banks	3,20	11,08	24,71	17,66	18,68	13,39	11,11	0,17	100
Foreign institutions	6,08	10,89	13,13	15,32	12,44	11,09	27,91	3,13	100

Panel C. Net profits from day trading by investor type (points)									
Trading volume (in contracts)	1	2~4	5~10	11~25	26~50	51~100	101~1000	1001+	Sum
Domestic individuals	6 523	-20 570	-68 922	-115 539	-75 083	-64 032	-179 765	-257 043	-774 431
Domestic money managers	-280	-2 825	-372	10 894	4 118	24 276	-19 272	21 474	38 014
Domestic banks	69	-7	-835	-1 005	2 993	-4 147	-8 365	-2 021	-13 317
Foreign institutions	-23	-3	353	462	949	2 935	34 417	-7 661	31 429
Total	6 288	-23 405	-69 776	-105 188	-67 023	-40 967	-172 985	-245 251	-718 305

Panel D. Profitability of day trading based on the relative proportion of day traders (=Panel C / Panel A)									
Trading volume (in contracts)	1	2~4	5~10	11~25	26~50	51~100	101~1000	1001+	Sum
Domestic individuals	346	-657	-3 399	-9 553	-16 760	-29 972	-99 889	-1 145 599	-8 491
Domestic money managers	-392	-1 618	-212	7 355	4 981	42 915	-28 799	202 951	4 834
Domestic banks	3 510	-103	-5 512	-9 273	26 123	-50 491	-122 736	-1 968 268	-21 713
Foreign institutions	-1 206	-93	8 452	9 472	23 970	83 141	387 437	-768 215	98 752
Total	321	-705	-3 140	-7 659	-12 273	-14 530	-65 878	-718 829	-7 183

Notes: One index point (the unit of the trading value) indicates KRW 500 000.

6. CONCLUSION

Although we use minimum transaction costs to measure the net profitability of day trading, the empirical results suggest that day trading is generally not profitable and that day traders engaging in frequent and large day trades are more likely to face losses. In particular, domestic individual traders incur substantial losses by implementing the day trading strategy and their losses clearly increases with their trading frequency and volume. This implies that most of the domestic day traders are less informed and sophisticated than what has been suggested in many success stories. By contrast, foreign institutions, whose day trading explains only a small portion of total day trading activity, make substantial profits from day trading. These empirical findings provide support for the market lore among practitioners that foreign day traders and skillful domestic day trading firms exploit domestic individual day traders.

The results of this study suggest three policy implications. First, the results provide support for the recent regulations proposed by government agencies and the claims of civic groups arguing that day trading in the KOSPI 200 futures market should be properly regulated and monitored by the Financial Supervisory Service (FSS) to protect domestic traders from foreign predators. Second, the results highlight the need for imposing transaction fees and taxes on day traders to reduce excessive day trading activity in the futures market. Third, the results provide partial support for market practitioners' view that excessive day trading in the futures market is beneficial only to brokerage and asset management firms, who typically enjoy substantial profits by imposing brokerage and transaction fees on individual day traders who use their trading system. Given that these firms are likely to advertise only the effectiveness of day trading and success stories about professional day traders while assuming no risk associated with day trading outcomes, such marketing activity should be regulated. In this regard, future research should further

investigate these issues. Meanwhile, it will be the worthwhile attempts to thoroughly examine the possible links between the low performance of the individual day traders and their physiological bias such as disposition effect or investors' overconfidence.

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