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Two Essays on Short Selling

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Abstract

Two Essays on Short Selling

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This thesis investigates the short selling activities of domestic individual investors and foreign investors in the Korean stock market. I examine the short selling of domestic individual investors at the transaction level and the short selling of foreign investors at the daily level. In the first part of this paper, I use an account level dataset of individual short sales to investigate individual investors' short selling profitability in the Korean stock market from August 1, 2007, to May 31, 2010. Individual short sellers made an average profit of 12,660 Korean won (roughly USD 11.5) per trade per day. Moreover, about 31% of shorted trades were covered within a day (i.e., shorting and covering on the same day) and about 21% were covered the following day. Short selling profitability decreased as the number of days to cover increased, which suggests that

mispricing was corrected very quickly, in less than two weeks, on average. I also find that profitable short sale trades are associated with high volatility, a narrow spread, high trading turnover, small firms, and firms with a low book to market, the most strongly associated characteristic being volatility. In account-level analysis, short sellers who trade more firms make higher profits than those who trade fewer firms. Finally, short sellers earn persistent positive abnormal returns. These results suggest that individual short sellers have superior information and employ short-term trading strategies.

The second part of this paper investigates the daily short selling of foreign investors and their impact on stock prices, liquidity, and volatility in the Korean stock market from January 1, 2006, to May 31, 2010. I find that the majority of short sales were conducted by foreign rather than domestic investors and that foreign short sellers are contrarian investors, whose large numbers of short sales predict future short-run returns. I also find that foreign investors' sell short when buying pressure is high but this does not improve stock liquidity. Furthermore, I find that foreign investors' short selling does not increase volatility, providing evidence against the destabilizing role of foreign investors in emerging markets.

Keywords: Short selling; short cover; foreign investor; individual investor; emerging market; Korean stock market

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I. Introduction

1.1 Research Background and Objectives

Short selling is a trading strategy involving the sale of stocks that are not owned and repurchasing (covering) them in the future. Short sellers profit if they sell short at a higher price and repurchase the stocks at a lower price. On the contrary, short sellers incur a loss when they trade in the opposite direction (i.e., selling at a low price and buying at a high price). Since naked short selling is prohibited, to sell stocks short one must borrow the stock in advance, thus ensuring the delivery of the shorted stock.

A large body of literature shows that short sellers are informed investors (e.g., Desai et al. (2002), Géczy et al. (2002), Asquith et al. (2005), Boehmer et al. (2008), Diether et al. (2009a)). They use either daily short flow data or monthly short interest data to show that short sales have return predictability. While few studies provide evidence that short sellers are uninformed (Brent et al. (1990), Richardson and Tuna (2005)), even fewer directly investigate the profitability of short selling and the strategies of short sellers. In other words, what short sellers specifically do is unknown. In addition, despite the vast amount of research on short selling in the U.S. market, only a few studies examine short selling activity in the rest of the world (Chang et al. (2007), Bris et al. (2008), Saffi and Sigurdsson (2011), Jung et al. (2013)).

Filling these gaps, this thesis contributes to the literature by investigating the following research questions. First, although a large body of research investigates the

informedness of short selling, its profitability is of greater interest. In the first part of this paper, I use actual shorting and covering prices to identify short sale profits in terms of dollars, considering all transaction costs arising from the trades. Another important issue relates to the strategies short sellers implement. While short sellers tend to short stocks following positive returns (Diether et al. (2009a)), when short sellers cover their short positions or how long they tend to hold the short positions are unknown. Research using lending loan contracts in the stock lending market to proxy for the number of days shorted assumes that short sales are covered at the end of the contract (Reed (2007)) and may therefore overestimate the actual number of days shorted. The first part of this paper investigates whether short sellers make a profit. Furthermore, I observe the actual number of days to cover short sales positions to investigate short position holding periods and show how number of days to cover relate to short trade profit.

Second, short sellers are considered a sophisticated investor group, capable of predicting negative future returns on stocks (Boehmer et al. (2008), Diether et al. (2009a)). Furthermore, there has been much debate on the informational advantage of foreign investors over domestic investors in the overseas market (e.g., Brennan and Cao (1997), Froot, O'Connell, and Seasholes (2001), Choe, Kho, and Stulz (2005)). The empirical evidence in the literature is mixed. If foreign short sellers are informed, their short sales trading should have return predictability. Therefore, examination of foreign short selling activity may provide evidence of the informational (dis)advantage of foreign investors. I provide a wide range of foreign investors' short selling activities

by investigating the following questions: First, how much of the daily short selling is carried out by foreign investors in emerging markets? Second, are foreign investors the major traders in the Korean short selling market? Third, what short selling trading strategies are used by foreign investors in emerging markets? Fourth, do foreign short sales have return predictability? Fifth, do foreign short sellers provide liquidity and do they destabilize stock prices through their short selling activities?

I focus on the Korean stock market for the following reasons. First, Korea has the most developed financial market among emerging markets in which many foreign investors can actively trade under less binding regulations. For example, the legal limitation on share ownership by foreign investors was abolished in the Korean market before the sample period began.[1] Second, the Korea Exchange (KRX) provides high-quality high-frequency data for a relatively long period. My sample period covers two years and nine months for the first part of the paper and five and a half years for the second parts. In addition, the database provides detailed information identifying investor type, account numbers, and short sales and short cover. The high-frequency data enable the study of daily short sales activities and their relations with other variables of interest. Another advantage of my dataset is that it distinguishes each trade by trader type and denotes each trade as having been initiated by a domestic individual investor, a domestic institutional investor, or a foreign institutional investor. Hence, my

[1] The limits to foreign ownership were lifted May 25, 1988. However, some public corporations and sectors still had restrictions, such as telecommunications (33%), airlines (50%), media (49%), and electricity (30%).

data provide a good opportunity to examine different trading behaviors according to different investor types. The most prominent and unique feature of my dataset is hat the sequence number and direction of each trade are indicated, denoting whether it was buyer or seller initiated, rendering Lee and Ready's (1991) algorithm for obtaining order imbalance data unnecessary for my sample stocks. This allows the construction of buy-order imbalance data while avoiding the issue of the validity of Lee and Ready's algorithm (Ellis, Michaely, and O'Hara (2000), Odders-White (2000)).

The first part of this paper focuses on individual short sellers for the following reasons. First, individual investors in the Korean stock market actively participated in trading from 2006 to 2010, their trading volume and trading value accounting for 83.86% and 53.43% of the market, respectively. In addition, since the late 1990s, home trading has been prevalent in the Korean stock market, so the investment decisions are actively made by the investors themselves. Thus, by examining the short sales of individual investors, I can provide the implication on whether individual short sellers are informed or not. Second, individual investors are generally regarded as noise traders (Odean (1999), Barber and Odean (2000), Barber et al. (2009), Foucault, Sraer, and Thesmar (2011)). However, several authors argue that at least some individual investors trade based on private information and their trading activities may improve price efficiency (Coval et al. (2005), Dhar and Zhu (2006), Griffin and Zhu (2006), Nicolosi, Peng, and Zhu (2009), Kaniel et al. (2012)). Furthermore, if people sell short based upon private information (Boehmer et al. (2008)), investigating the profitability of the short selling strategies of individual investors may yield a better understanding

of their informedness. Third, Boehmer et al. (2008) find that nearly 75% of shares in the New York Stock Exchange (NYSE) are shorted by institutions, while less than 2% are shorted by individual investors. In contrast, about 15% of the total short volume in the Korean stock market was executed by individuals during my sample period, with domestic institutions and foreign investors accounting for 15% and 70%, respectively. Unlike in the United States, individual short sellers are an active trade group in the Korean stock market.

This paper's findings are as follows. By analyzing the trading profits and strategies of individual short sellers, I find that individual short sellers make a profit, on average, with a net profit obtained by individual short sellers of 12,660 Korean won per trade per day, or approximately 2.022% in terms of daily return. Moreover, I find that individuals' short sale profits increase as the number of days to cover decrease, suggesting that individual short sellers adopt a short-horizon trading strategy and presumably have superior information. I also find individual short sellers exhibit contrarian behavior, which is consistent with the behavior of foreign short sellers shown in the second part of this paper. In account level analysis, trading more companies earn higher profits than trading less. This implies that short sellers who trade more stocks may be more sophisticated in processing information and thus obtain higher profits than non-sophisticated traders do. I also test whether individual short sellers can persistently make a profit. Using both regression and portfolio approaches, I find individual short sellers who earned positive returns in the past also make profits in

the future. These results suggest that at least some individual short sellers possess superior information about firm fundamental values.

Related to foreign investors' short selling, the second part of this thesis, and consistent with evidence for the U.S. market (e.g., Diether et al. (2009a)), I find that foreign short sellers in the Korean stock market are contrarian investors and that foreign investors' short selling activities predict future returns. In addition, foreign investors' short selling activities do not destabilize the stock market or provide stock liquidity. The result is consistent with Choe, Kho, and Stulz (1999), who find no evidence of a destabilizing role of foreign investors during the Asian financial crisis.

1.2 Research Organization

The rest of this paper proceeds as follows. Chapter II discusses the trading profits and trading strategies of individual short sellers. Section 2.1 describes the research objective and motivation for investigating individual short selling activities. Section 2.2 discusses the previous research in detail. Section 2.3 briefly discusses individual short sales in the Korean stock market. Section 2.4 describes the research design and data. Section 2.5 presents the summary statistics of short sales at the stock, account, and trade levels. Section 2.6 presents evidence of the profitability and strategies of individual short sellers. Section 2.7 analyzes account-level data and provides evidence of the persistency of individual short sellers' profits. Section 2.8 analyzes the normal

purchases and sales of short selling accounts. Section 2.9 provides evidence of daily profits and Section 2.10 concludes the paper.

Chapter III investigates foreign short selling activities in the Korean stock market. Section 3.1 outlines the motivation of studies of foreign short sellers. Section 3.2 illustrates the general features of the Korean short selling market. Section 3.3 describes the data and the sample screening procedure. Section 3.4 investigates the short selling behavior of foreign investors in the Korean stock market, focusing on whether they are contrarian or momentum traders. Section 3.5 examines whether foreigners predict future returns and whether they have an opportunity to obtain profits based on their short selling strategies. Section 3.6 investigates whether foreign investors' short sales plays a destabilizing role and whether it provides liquidity to the market. Section 3.7 discusses the empirical results based on the extended sample. Section 3.8 concludes the paper.

II. Do Individual Investors Make Money? Evidence from Short Selling Account Data

2.1 Introduction

Do short sellers make profits through short selling trades? This issue is related to a large body of research providing evidence that short sellers possess superior information about firm value (e.g., Desai et al. (2002), Géczy et al. (2002), Asquith et al. (2005), Boehmer et al. (2008), Diether et al. (2009)).[2] However, none of the research investigates whether short sellers *indeed* make profits and what strategies short sellers *actually* implement to make positive returns. In other words, whether short sellers have superior information or whether they can perceive mispriced stocks has not been adequately tested. This is largely due to the lack of short cover data at the account level. To study this unaddressed issue in the literature, this paper examines whether short sellers make profits through their short selling trades by providing *direct* evidence on this important issue using a *unique* account dataset. The dataset distinguishes each trade at the individual investor's account level, along with short covering transactions.[3] With this dataset, I identify the short selling profits by matching each short sale price with its respective short covering price at the individual trade and account levels. Additionally, the trade- and account-level dataset helps

[2] More recent papers are those of Christophe et al. (2010) and Boehmer and Wu (2013).

[3] The KRX requires individual investors to disclose buy orders intended to cover short positions, while institution investors and foreign investors are not.

identify when each short position is covered. Specifically, in this paper I investigate the following questions: First, do short sellers really profit from short selling trades? Second, what strategies do short sellers adopt to make profits? For example, do short selling strategies tend to be short term or long term? Third, if short sellers can recognize mispriced stocks, as suggested in the literature,[4] then how long does it take to adjust the mispricing? To the best of my knowledge, this is the first paper to *directly* investigate short selling activities together with short covering transactions at the account level.

It is important to investigate the profitability of short selling because these profits have implications on whether short sellers have superior information on firm value. In my dataset, each trade is identified by an account number, enabling me to identify short selling profits by matching each transaction's short sale price with its short covering price at the transaction and account levels. At the same time, by tracking short sellers' shorting and short covering transactions at the account level, I can test whether they make consistent profits, allowing me to identify whether individual short sellers have superior information on fundamental values. Furthermore, number of days to cover are another important issue that is not developed in the literature. A study of the number of days to short covering is critical for the following reasons. First, the number of days to cover reveal the actual strategies that short sellers implement. Second, since short sellers trade based on overpriced stocks (Miller (1977), Jones and Lamont (2002),

[4] See Boehmer et al. (2008) and Diether et al. (2009a).

Lamont and Thaler (2003), Kot (2007)), the number of days to cover their short positions could provide implications on the speed of mispricing correction. Reed (2007) finds that the median number of days to cover short position is three and the mode is only one day. Diether et al. (2008) show that in 2005 the average number of days to cover in the U.S. stock market is four to five. However, the authors use either length of equity lending contracts or a proxy for the holding period of short positions. In this paper, I use *actual* days to cover to investigate the issue.

I focus on *individual* investors in the Korean stock market for the following reasons. First, individual investors are generally known as noise traders (Odean (1999), Barber and Odean (2000), Barber et al. (2009), Foucault, Sraer, and Thesmar (2011)). However, several authors argue that at least some individual investors trade based on private information and their trading activities might improve price efficiency (Coval et al. (2005), Dhar and Zhu (2006), Griffin and Zhu (2006), Nicolosi, Peng, and Zhu (2009), Kaniel et al. (2012)). Furthermore, people sell short based upon private information (Boehmer et al. (2008)), so it would be a good experiment to investigate the profitability of the short selling strategies of individual investors to better understand how informed they are. Second, Boehmer et al. (2008) find that nearly 75% of shorted shares in the NYSE are executed by institutions, while less than 2% are performed by individual investors. In contrast, about 15% of the total short volume is executed by individuals in the Korean stock market during my sample period, while domestic institutions and foreign investors account for 15% and 70%, respectively. Unlike in the United States, individual short sellers play an important role in the

Korean stock market. Third, previous research argues that short selling activities are motivated by tax benefits, overpricing, and arbitrage perspectives (Diamond and Verrechia (1987), Brent, Morse, and Stice (1990), Dechow (2001)). Arbitrage is largely executed through program trades, especially index arbitrage. Because individual investors are less likely to use program trades in Korea,[5] arbitrage may not be the primary motive of individual investors' short selling.[6] In addition, Kot (2007) provides evidence that tax benefits are not the motive of short selling. Therefore it is reasonable to believe that individual short sellers' activities are motivated only by overpricing. By examining individual investor's short selling activities, I can readily distinguish between noise trades and information-based trades. Fourth, the KRX provides the entire history of transactions at the individual investor account level for all stocks listed in the Korea Composite Stock Price Index (KOSPI) and the Korea Securities Dealers Automated Quotation (KOSDAQ) markets for a relatively long period (i.e., 26 months). The dataset contains detailed information on short selling trades, such as execution time, shorting prices, traded shares, and short covering information from August 1, 2007, to May 31, 2010.[7] With this dataset, I can investigate short selling profits and number of days to cover. My contribution is finding the link between profitability and number of days to cover of individual investors' short sales, an issue not covered in the

[5] In the Korean stock market, program trading is carried out by foreign investors and domestic institution investors. Individual investors account for only a trivial portion.

[6] According to the KRX, individual investor trades based on hedging or arbitrage are very rare.

[7] The sample includes the short selling ban period, from October 1, 2008 to May 31, 2010. My analysis excludes the ban period.

literature. Moreover, I address the persistence in short selling profitability at the individual account level, another neglected issue in the literature.

If short sellers have superior information on the fundamental values of stocks, they would exploit such information to earn positive abnormal returns. Prior studies focus on potentially profitable strategies (e.g., Desai et al. (2002), Boehmer et al. (2008), Diether (2008), Diether et al. (2009a)) and test the returns of portfolio formed based on shorting flow or shorting cost and examine the short-run horizon of a long–short strategy (i.e., selling a heavily shorted group and buying a lightly shorted group). Nevertheless, these studies do not examine short selling profits with execution and covering prices (Boehmer et al. (2008)). The paper closest to mine is that of Boehmer et al. (2008), who study the informativeness of short selling trades in the NYSE. While they identify different types of short traders and examine which types possess information, they do not, however, investigate short covering transactions and short selling profits.

Using an intraday short selling dataset at the individual account level, I find individual short sellers make profits, on average, with the average net profit (after accounting for transaction costs) earned by short seller being 12,660 Korean won per trade per day (roughly USD 11.5),[8] approximately 2.022% in terms of daily returns. Moreover, I find short sale profits from individual investors increase as the number of days to cover short positions decreases, suggesting that individual short sellers adopt a

[8] One U.S. dollar is approximately 1,100 Korean won.

short-horizon trading strategy and presumably have superior information. This finding is consistent with the work of Shleifer and Vishny (1990), who argue that investors have to borrow securities to implement their short selling trades (i.e., naked short selling is not allowed) and short sellers must pay lenders *per-period* fees. As a result, the fee structure generally drives short selling trades toward shorter horizons. This finding complements earlier work by Reed (2007) and Diether et al. (2009a), who examine the trading strategies of short selling. Diether et al. (2009a) suggest that short sellers trade based on overpriced stocks and thereby predict negative future returns in the short term, but they do not examine the speed of adjustment. Diminishing profits due to prolonged short covering, empirically found in this paper, suggests that mispricing is corrected very quickly.

I find several interesting characteristics of individual short covering transactions. In the sample period, about 30.37% of total short sale trades are covered within a day and over 21.14% of total short sale trades are covered the following day. Jones (2012) provides evidence that short-lived shorts were prevalent in the early 1930s, when average daily in-and-out shorting (i.e., shorting and covering on the same day) accounted for 4.488% of total volume. The results are in line with Jones's (2012), suggesting short-lived shorts are also widespread in the Korean stock market. With respect to number of days to cover, I find that in-and-out shorting and short selling covered the following day earn daily returns of 9.42% and 1.788%, respectively. Short sales covered after more than 15 days and 20 days yield daily returns of -0.12% and -0.084%, respectively. This result provides evidence that individual short selling

corrects mispricing within two weeks. Additionally, in line with the results of the second paper of this thesis, I find that foreign short sellers in the Korean stock market are contrarian investors and that individual short sellers are also negative feedback (i.e., contrarian) traders in the Korean stock market.

In account level analysis, trading more companies earns higher profits than trading fewer companies. The daily returns of traders trading a single firm average approximately 1.278%, compared with 5.466% for those trading more than 30 firms, for a difference of over 4.188% in terms of daily returns. I posit that investors who trade more stocks may be more sophisticated at processing information. This result implies that sophisticated traders earn higher profits than non-sophisticated traders do. Finally, since the unique dataset identifies individual short sellers at the account level, individual short sellers' shorting and covering activities can be tracked over time. Using this dataset, I test the hypothesis that short sellers persistently earn positive returns. The sample period is divided into two to examine whether account holders who earn positive abnormal returns in the earlier period also earn positive abnormal returns in the subsequent period. Evidence supports the hypothesis that individual short sellers consistently earn profits. In other words, individual short sellers *indeed* have superior information.

The remainder of this paper is organized as follows. Section 2.2 discusses the previous research in detail. Section 2.3 briefly discusses individual short sales in the Korea stock market. Section 2.4 describes my research design and data. Section 2.5

shows the summary statistics of short selling at the stock, account, and trade levels. Section 2.6 presents evidence of the profitability and strategies of individual short sellers. Section 2.7 analyzes account-level data and provides evidence of the persistence of individual short sellers' profits. Section 2.8 analyzes normal purchases and sales in short selling accounts. Section 2.9 provides evidence of daily profits and Section 2.10 concludes the paper.

2.2 Literature Reviews

Short selling activities reflect pessimistic opinions about firms' future fundamental values. Miller (1977) suggests that short selling constraints impede negative information from being incorporated into stock prices. The author argues that short selling constraints can lead to overpricing, because stock prices under the constraints reflect only optimistic opinions. On the other hand, Diamond and Verrecchia (1987) suggest that short selling constraints eliminate certain informed traders and reduce price efficiency. The authors argue that if traders have rational expectations, then short sale constraints will not lead to overpricing. All of these theoretical models assume short sellers are better informed about firm fundamental values.

Academics generally view short sellers as informed traders (Figlewski (1981), Senchack and Starks (1993), Asquith and Meulbroek (1995), Géczy et al. (2002), Asquith et al.(2005)). Recently, Diether et al. (2009a), using daily short selling data, found that short sellers predict low future abnormal returns for both NYSE stocks and

NASDAQ stocks. Akbas et al. (2008) directly test the difference between the overpricing hypothesis (Miller (1977)) and the information hypothesis (Diamond and Verrecchia (1987)). They conclude that evidence found in short selling activity supports the overpricing hypothesis, as suggested by Miller (1977). Christophe, Ferri, and Angel (2005) and Christophe, Ferri, and Hsieh (2010) use earnings announcements and analyst downgrade events to study whether the volume of short selling activities increases before information events. They find short sellers can anticipate negative earnings surprise and analyst downgrades. More recently, transaction-level data have been used to examine short selling activity and future abnormal returns. Boehmer et al. (2008), using intraday short sale data, examine the informativeness of different types of investors and find non-program institutional short sellers to be the most informed.

In spite of the vast evidence on the informed trading of short sellers, few studies provide evidence that short sellers are uninformed. Brent, Morse, and Stice (1990) argue that people have different reasons for going short, involving tax benefits or speculative, hedging, and arbitrage perspectives. Daske, Richardson, and Tuna (2005) analyze stocks listed on the NYSE from April 1, 2004, through March 31, 2005, and find no evidence that short sale transactions are concentrated prior to bad news events. More recently, Kot (2007) and Hwang, Liu, and Xu (2013) provide evidence that short sellers trade based not only on the *over*-pricing hypothesis but also on hedging motives. This implies short sellers help correct the mispricing of stocks.

Other research uses proxies for short selling constraints or direct shorting costs to find the link between short selling and future stock returns. The proxies include dispersion in analysts' earnings forecasts (Diether, Malloy, and Scherbina (2002)), mutual fund holdings (Cheng, Hong, and Stein (2002)), and institutional ownership (Nagel (2005)). Research using direct shorting costs includes the studies of D'Avolio (2002), Géczy, Musto, and Reed (2002), Jones and Lamont (2002), Cohen, Diether, and Malloy (2007), and Reed (2007), all of who find that higher demand for short selling a stock leads to lower subsequent abnormal returns.

If short sellers are informed, then they should make profits from their short selling trades. As discussed, previous studies focus on the predictability of short selling activities and not the profits from short selling trades (i.e., short selling profits from matching shorting prices with covering prices). Furthermore, none of the studies investigate short covering transactions. In this paper, I address the profitability of short selling trades and study issues about short covering transactions.

Turning to individual investors' trading, the finance literature typically assumes that their trades are not based upon fundamental information (i.e., they are noise traders).[9] Individual investors do not have an impact on prices or improve price efficiency. Recently, researchers have argued that at least some of the individual trading activities are information driven, contributing to price efficiency and stabilizing

[9] See Lee et al. (1991), Odean (1998, 1999), Kumar and Lee (2006) Barber et al. (2008), Kaniel et al. (2008), Barber et al. (2009), Foucault, Sraer, and Thesmar (2011).

stock markets. For example, Coval, Hershleifer, and Shumway (2005) use a set of data from large discount brokerages from January 1990 through November 1996 and find some individual investors have superior information and beat the market, outperforming by 12–15 basis points per day. Further, Dhar and Zhu (2006) investigate the disposition effect at the individual investor level and find investors who have more trading experience and are employed in a professional occupation reduce disposition effects by about 10–20%. Kaniel et al. (2012) argue that individual investors are less constrained than institutions, at least with regard to short selling. Therefore, if individual investors possess private information, they exploit it in short sale trades with fewer restrictions. The authors examine the informed trades of individual investors through upcoming information events (i.e., earnings announcements). They find a large portion of positive abnormal returns are followed by intensive individual investor buys and the abnormal returns are attributed to private information. In the next section, I introduce my dataset and conduct the empirical analysis.

2.3 Individual Short Sales in Korean Stock Market

Individual short sales in the Korean stock market began in February 1969, when margin transactions were allowed. At first, individual investors' borrowing shares were not active traded compared to buy shares on margin. In May 1986, the Korean government banned margin trades of the Korea Securities Finance Corporation (KSFC) because of the speedy rise of the Korean stock market. As a result, the ban restricted

individual investors from borrowing stocks and individual investors who wanted to borrow stocks could do so only from brokerage houses. This rule is binding only for individual investors because institutional and foreign investors are able to borrow the stocks in the over-the-counter market.[10] They could borrow and lend from each other and the terms of each contract were customized by borrowers and lenders on a case-by-case basis.[11]

Before 2000, naked short selling was prohibited, but there was no way to determine whether short sellers were in violation of the rule. The Financial Supervisory Service (FSS) of Korea began to strengthen short selling regulations after the WooPung Credit Union case in March 2000.[12] Since then, the FSS requires all short sales orders and execution data to be tagged *margin sell* and reinforces regulations on short sales with no borrowing of stocks.

Brokerage houses and the KSFC are the two main channels of lending stocks to individual investors. The conditions under which individual investors can borrow stocks are as follow. First, individual investors who want to borrow stocks should have a margin account. The shares are ultimately provided by the KSFC or by brokers who own the shares. Second, the borrowing period is restricted to 30 days to 180 days, depending on the brokerage house. Third, the individual investors do not incur any fees

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[10] Since 2008, the FSS has allowed individual investors certified as professional investors to borrowing stocks in the over-the-counter market.

[11] The ban was lifted on January 21, 2008.

[12] The WooPung Credit Union sold short 350,000 shares of Sungdo Eng stocks and failed to deliver on the settlement date.

for the borrowing stocks but, instead, when they execute a short trade and a short covering trade, their brokers receive 0.1% of the total trading amount (both shorting and covering). The costs incurred in short selling transactions are very large, approximately seven times those in regular trading activities.[13] Fourth, according to the margin transaction terms established by the Financial Services Commission (FSC), the statutory authority responsible for the government's financial policy and its supervision, individual investors are required to put all short sale proceeds in a collateral account and receive 0.5% to 1% annually of the return on the collateral, depending on the brokerage house.

2.4 Data and Methodology

2.4.1 Data

I use a *unique* dataset to investigate the profitability of individual investor short selling activity and to determine how profitable the strategies of individual investors are. It is meaningful to study the profitability of the short sale strategies of individuals because it can provide implications on how informed investors are. The unique dataset provides clues about this issue. The main data used in this paper are from the KRX. I obtained all of the order history and trade transaction data from August 1, 2007, to May 31, 2010, for all stocks listed in the KOSPI. The data provide detailed information on

[13] The transaction cost of normal trading is only 0.015% when using a home trading system.

individual investors' accounts, the time of each trade, the trading price, trading shares, whether the trade was a buy or a sell, and identifies short selling and short covering.[14] Using this dataset, I identify the short sale price, the short covering price, and the number of days to cover (*DTC*) for each short selling trade. I also obtain high-frequency data for the market index (i.e., the KOSPI 200 index) to calculate abnormal short selling returns. I obtain daily returns, market capitalization, book-to-market ratios, trading volume, outstanding shares, and foreign ownership data from the Fn Data guide, Fn Data being one of the largest financial data providers in Korea.

Initially there are 351,651 observations with 12,132 individual investors' accounts and 300 stocks. I exclude observations in which a short sale occurs before a stock split or merger and is covered afterward. Since no trading occurred during the last 10 minutes for each trading day, that is, 14:50–15:00, I also exclude short selling transactions executed in the last 10 minutes.[15] Therefore, the final sample consists of 326,625 observations, with 11,841 accounts and 299 stocks.

2.4.2 Methodology

To profit from a short selling trade, a short seller borrows a stock and sells it, hoping the stock price will drop by the time of repurchase. For example, a short seller sells short at the price of 100 at 10:15 and subsequently repurchases at the price of 90 at

[14] The account number is coded to hide personal information protected by Korean law. Therefore, I do not know the account characteristics such as the name, gender, address, or assets.

[15] In the last 10 minutes, the orders are collected for batch auction to determine the closing price.

12:15 the same day. The short seller then makes a profit of 10 from the short selling trade. As mentioned the transaction cost of short selling is 0.5%: 0.2% for round-trip transaction costs and 0.3% for transaction taxes on the sell side. The net profit of this short trade is then

$$\text{Net Profit} = 10 - (100 \times 0.1\% + 90 \times 0.1\% + 100 \times 0.3\%) = 10 - 0.49 = 9.51$$

Since the short seller must post initial proceeds for the value of the shorted stock in an interest-bearing collateral account, the short seller makes additional profits of 0.5–1% annually as the initial proceeds from short selling generate interest income. The net profits of short selling should include the returns on the collateral account, which is defined in this paper as follows:

$$return\ on\ collateral\ account = short\ \ proceed \times \left(\frac{1\%}{365} \times DTC \right) \tag{2.1}$$

$$\text{Net profit} = \text{Profit} - \text{Transaction costs} + \text{Return on collateral account} \tag{2.2}$$

If one can make money without spending any, then the return is infinity; however, this is not the case in short selling. The maximum return of a short sale is limited to 100%, because short sellers owe lenders stocks when they make short trade (i.e., naked short selling is prohibited). In other words, short sellers have a liability. However, it is basically the same case as a short seller investing the initial proceeds, because the liability needs to be paid back in the future, which is why short sale returns are limited to 100%.

In addition to net profit, I also use the rate of return as a profit measure, defined as follows:

$$Rel\ profit_j(\%) = \frac{Net\ profit_j}{Short\ value_j} \tag{2.3}$$

where j is a short sales trade. To compare different short selling trades that have different number of days to cover (*DTC*), I also use the following three methods:

$$Rel\ profit / DTC_j(\%) = \frac{rel\ profit_j}{DTC_j} \tag{2.4}$$

$$Short\ trade\ return\ (STR)_j = \left[\sum_{i=1}^{n} (1 + weighted\ ret_i)^{\frac{1}{total\ elapsed\ hour_i}} - 1 \right] \times -1 \tag{2.5}$$

$$Abnormal\ STR(AbSTR)_j = STR_j - Market\ return_j \tag{2.6}$$

where i is the buy trade for j's short sell trade, the market return is the KOSPI 200 return corresponding to the each trade, and *DTC* is number of days to cover, which is the average number of days to cover for short selling trades. The *DTC* variable is important in this paper and I calculate it as follow. Short trades covered on the same day (i.e., day trading) are known as in-and-out shorting and, in such cases, the number of days to cover (*DTC*) are zero. If a short sell trade is covered by several trades across a few days, then I average the days as days to cover (*DTC*) for the short position. A detailed example of the calculation is shown in the Appendix A. The other variables

used in this paper—such as volatility, spread, and share turnover—are defined as follows. Volatility is intraday volatility, computed as

$$volatility_{i,t} = \frac{Highest\ price_{i,t} - Lowest\ price_{i,t}}{Highest\ price_{i,t}} \tag{2.7}$$

where $highest\ price_{i,t}$ and $lowest\ price_{i,t}$ are the highest and lowest intraday prices on date t for stock i, respectively. Spread is the proportional spread, defined as

$$Proportional\ spread_{i,t} = \frac{\sum_{j=1}^{n} \frac{Ask_{i,t,j} - Bid_{i,t,j}}{\left(Ask_{i,t,j} + Bid_{i,t,j}\right)/2}}{N} \tag{2.8}$$

where, on date t for stock i, $\mathrm{Ask}_{i,t,j}$ denotes an ask price for trade j, $\mathrm{Bid}_{i,t,j}$ denotes a bid price for trade j. n is the total number of bid–ask spreads. Share turnover (tv) is defined as the daily number of traded shares divided by shares outstanding on day t for each stock i.

2.5 Summary Statistics for Short Selling

This section details the characteristics of short selling activities using sample stocks. After presenting the characteristics of sample and out-of-sample stocks, I analyze the different short selling profit measures and characteristics in three dimensions, at the stock, individual account, and individual trade levels, respectively.

2.5.1 Summary Statistics of Short Selling Characteristics and Profit at Stock Level

Figure 2.1 shows the KOSPI 200 index during the sample period. As in Figure 2.1, the sample period includes an up market and a down market period. In addition, due to the 2008 global financial crisis, also known as the U.S. subprime mortgage crisis, short selling was banned from October 1, 2008, to May 31, 2009 (gray area in Figure 2.1). To avoid results affected by market conditions, I divide the sample into two periods, before the short selling ban (from August 1, 2007, to September 30, 2008) and after the ban (from June 1, 2009, to May 31, 2010).

Table 2.1 shows summary statistics of sample and out-of-sample stocks, showing six different characteristics by year. Size is measured at the end of June each year for each stock and then averaged across stocks. The book-to-market ratio is book equity divided by market equity the previous year-end. Volatility is daily volatility, defined as in Eq. (2.7), and spread is proportional spread, computed as in Eq. (2.8).[16] Turnover is the daily trading volume divided by outstanding shares. Price is the daily closing price in Korean won. As shown in Table 2.1, my sample stocks tend to large firms, growth stocks, and firms with narrow spread, high turnover, and high stock prices compare to out-of-sample stocks. There is no clear pattern to volatility, which may be due to the fact that my sample period includes the global financial crisis. Therefore, the volatility

[16] In an order-driven market, such as the Korean stock market, there is no difference between the effective and proportional spreads because trades are always executed at the quoted bid or ask prices.

of all of the stocks listed in the Korean stock market would have been very high. The sample stocks tend to be large and liquid because the KSFC provides their stocks to have such characteristics. The KSFC chooses stocks that are actively traded and for which the KSFC has a sufficient number of shares as collateral. So stocks provided by the KSFC tend to be large and liquid (Jung et al. (2013)). Furthermore, in line with Dechow et al. (2001), short sellers target stocks with a low book-to-market ratio, which is known to yield lower returns (Fama and French (1992), Laknoisk, Shleifer, and Vishny (1994)).

Table 2.2 shows summary statistics of the daily short selling activities of sample firms. During the sample period, 299 stocks were traded and 2,578 shares were shorted daily, on average. As shown in the second paper of this thesis (in Table 3.3), individual short sellers account for a very small portion of the short sales compared to the total trading volume. The average daily short value is 28.86 billion won, for an average of 246 accounts traded. Since short selling is costly, it is possible that only a few informed traders engage in such trades.

It is also possible that short selling is concentrated in a few stocks and during specific months. Therefore I report the distribution of the sample firms' short selling activity in Table 2.3 and the monthly distribution of short selling activity in Figure 2.2. In Table 2.3, I first compute the proportion of daily shorted shares, by stock, on day *t* as a fraction of total daily shorted shares the same day. I then compute the cross-sectional mean of the time-series average. The majority sample firms' average daily short selling

portion are less than 3% , suggesting that the short selling shares of the sample stocks are quite evenly distributed. Figure 2.2 presents monthly short selling activity by individual investor over time. In each panel, the shaded area denotes the short selling ban period. Panel A presents the total number of short sale shares and value by individual investor over time. Panel B reports the monthly average number of shorted trades and trading days. Panel C shows the monthly number of shorted stocks and the number of accounts over time. Panel D shows the monthly number of traded accounts over time. Figure 2.2 shows a gradual increase in the number of shorted shares, short value, the number of short trades, the number of accounts, and the number of shorted stocks. These trends imply that individual investors consider short selling an important trading strategy.

As shown in Table 2.1, my sample firms tend to be large and liquid but they nonetheless exhibit large cross-sectional variations in firm characteristics. Therefore, in Table 2.4 I analyze the sample by firm characteristics. All groups are determined by the 33rd- and 67th percentile of all 682 stocks listed in the KOSPI market during the sample period. I present shorted shares, short value, and various short selling profit measures. Among the profit measures, *profit, net profit, and rel profit* are not adjusted to the holding period of the short position (i.e., *DTC*), so, to compare short trades of different holding periods, I only analyze *net profit/DTC* and, for day trading, I assume *DTC* is one.

The total number of trades is high among large firms and high-priced firms but the number of shorted shares is low. The *net profit/DTC* of short trades is also high among small firms and low-priced firms, suggesting that individual short sellers who earn the profits target firms with high information asymmetry. Consistent with my prediction, short sellers are more likely to short stocks with low book to market, high volatility, a narrow spread, and high turnover. The *net profit/DTC* is also high for stocks with high book to market, low volatility, a wide spread, and high turnover. The result implies that individual investors who engage in short sales may have private information on firms with high information asymmetry and also prefer high-liquidity stocks.

2.5.2 Profitability of Individual Short Selling at the Account and Trade Levels

In this section, I analyze the profitability of individual short selling at the account and trade levels. In Table 2.6, I report the mean and median of *profit*, *net profit*, *net profit/DTC*, *rel profit*, *STR*, *AbSTR*, shorted shares, short amounts, the number of days to cover (*DTC*), the number of trades, and the number of firms traded for each short selling trade account. I define these profit measures as in Eqs. (2.2) to (2.6). All these variables are first computed as the pooled average of these values for each account and then the average of these values is computed across short selling accounts. As presented in Figure 2.1, my sample includes both up market and down market periods, to avoid my results from being driven by specific event; I divide the sample period into two periods, before and after the short selling ban. Panel A reports the simple average

of account profits. *Profit* and *net profit* show a loss for the entire period and the two subperiods, but their medians are positive, except that of *net profit* in the second period. However, *profit* and *net profit* do not take the holding period of the short position into consideration. If the holding period of the short position (*DTC*) is taken into account and expressed as *net profit/DTC*, then the measures are all positive for the entire period and the two subperiods, which suggests that individual short sellers indeed make profits, even after transaction costs are considered. For short trade returns (*STR*), defined as in Eqs. (2.5) and (2.6), individual accounts in the sample earn hourly returns of 0.337% and abnormal returns of 0.376%, on average, which is equivalent to daily returns of 2.022% and 2.256%, respectively. The mean and median *STR* values are economically significant at the 1% level. The *STR* of 0.337% and *AbSTR* of 0.376% in the sample appear significant, compared to the results of Diether et al. (2009a), who form portfolios based on relative short selling on day *t* and compute the returns for day *t* + 2. For the high short selling group, the returns are -0.037% and -0.042% for the NYSE and NASDAQ, respectively. The earlier subsample period shows higher *net profit/DTC* than the later one. The earlier period may exhibit down-market characteristics due to the financial crisis, yielding higher profits than the later period. Panel B shows the price-weighted average of profits. Using the closing price at the end of the previous month as the weighting factor, I compute the pooled average of price-weighted profits. The results are shown in Panel A.

The mean and median *DTC* values are five days and two days, respectively. This suggests that short-lived shorts are prevalent in my sample and covered within one

week, on average. This result is consistent with the work of Jones (2012), who points out that in the early 1930s, short-lived shorts were prevalent in the United States. The result is also consistent that of Reed (2007), who finds that the mean and median holding periods for a loan contract in the equity lending market are ten days and three days, respectively. However, since the author assumes that short sales are covered at the end of the lending contract, short sales covered before the end of the lending contract period are not identified. Additionally, Coval, Hirshleifer, and Shumway (2005) use brokerage data to examine individual investor trading and find an average holding period of 378.11 days for regular trading positions. In comparison, my results for individual short sellers' trading are based upon very short horizons. Furthermore, my result for the number of days to cover (*DTC*) is consistent with the work of Shleifer and Vishny (1990), who suggest that short sellers have short horizons for short positions. Since short sellers pay lender borrowing fees each lending period, they tend to keep their investment horizons shorter. The results in Table 2.6 lead me to conclude that individual short sellers *actually* make profits and some individual investors *indeed* have superior information.

One interesting question is how many individual investors earn a profit through their short selling trading. Figure 2.3 shows the distribution of account profits. I first compute the pooled average of the relative short selling profit (*rel profit*), which is defined as in Eq. (2.3), for each account and then divide the accounts into 14 groups based on their *rel profit* values. In Figure 2.3, the number of accounts is the total number of accounts that corresponds to each profit group. Panel A shows the results for

all sample periods and Panels B and C show the results for the two subperiods, respectively. As evident from the figure, most of the accounts earn a *rel profit* between -2.5% and 2.5% and the number of accounts with a positive profit is slightly higher than the number of those with a negative profit.[17]

Figure 2.4 shows the distribution of short selling trade profits. In Figure 2.4, as in Figure 2.3, I first compute the relative short selling profit for each short trade (*rel profit*), defined as in Eq. (2.3), and then divide short trades into 14 groups based on their *rel profit* values. The results are more pronounced than those in Figure 2.3, meaning that winners trade more frequently than losers do, with 202,665 trades that made a profit and 123,960 trades that incurred a loss.

2.6 Evidence on Profitability and Individual Short Selling Strategies

In this section, I provide empirical evidence of the profitability of individual short sellers' short sale strategies with characteristics of profitable short selling. I examine the profitability of short selling at the trade level (a detailed analysis at the account level is presented in Section 2.7). Moreover, I analyze the returns of short positions with different number of days to cover (*DTC*) and determine what factors affect *DTC*. Finally, I confirm the relations between profitability and the characteristics of short selling trades in a regression framework.

[17] A total of 6,119 accounts made a profit and 5,722 incurred a loss during my sample period.

2.6.1 Characteristics of Short Selling Trades and Short Selling Accounts

Table 2.7 presents the characteristics of short sales profitability at both the trade and account levels. Panel A reports the trade-level results. I categorize short selling trades into profit quintiles based on *STR*. For each quintile, I pooled the average profit measures, number of shorted shares, short value, and *DTC* values of the short trades across stocks and accounts. The large-*STR* group has an average *STR* of 4.39%, while the small-*STR* group has an average of -2.00%. The short selling profits almost monotonically increase as *STR* increases, suggesting that the profit quintile based on *STR* is consistent with profit measures. Motivated by Barclay and Warner (1993) and Chakravarty (2001) arguing that medium-sized orders are the most informed, I also investigate the trade sizes of short sales to examine which sizes of short sales transactions are related to private information. The result shows that short selling transactions with large numbers of shorted shares appear to have higher profits than those with small numbers of shorted shares. This suggests that individual short sellers with information trade aggressively. This result is consistent with Boehmer et al. (2008), who show that, in the NYSE, shorting with large number of shares reveals information. One possible explanation for this result is that, since short sale trades are costly, a higher trading frequency incurs a high trading cost and consequently reduces profit. Another explanation is that trading large numbers of shares ensures profitability, since short sellers of such possess short-term information and cannot afford to be patient when executing their orders.

There is no clear relation between *STR* and short value. The results of shorted shares and short value together imply that the profitability of short selling is due to low-priced stocks. This is consistent with Table 2.4, in which low-priced stocks yield more profit than high-priced stocks. Panel A of Table 2.4 also shows that short trades are more profitable when the number of days to cover (*DTC*) is less. The large- and small-*STR* groups show, on average, 0.36 day and 2.49 days to cover short trades, respectively. This suggests that short sellers who implement short-term strategies earn high profits. Panel B reports the result at the account level. I compute the pooled averages of profit measures, shorted shares, short value, and *DTC* values for each account and form quintile groups based on their *STR* values. The results reveal a pattern identical to that in Panel A. The pattern also prevails in both subperiods.

2.6.2 Number of Days to Short Cover (DTC)

One of the most important topics for academic researchers and practitioners is the timing with which short sellers cover their positions. This section provides evidence on this topic. Figure 2.5 shows the distribution of short trades by days to cover (*DTC*). For each short selling trade, I compute the *DTC* and show the pooled number of trades based on the *DTC* group. The *DTC* equals zero if a short trade is covered on the same day as the short and equal one if covered the following day. The other *DTC* group is defined similarly. The number of short trades monotonically decreases as *DTC* increases. Figure 2.5 suggests that most short traders implement short-horizon

strategies and are indeed often limited to intraday horizons (i.e., the day trading group has the highest number of shorted trades). Table 2.8 presents the results on the relation between *DTC* and profit measures. As in Figure 2.5, short selling trades are divided into several groups based on their *DTC*. Over 77% of total short trades are covered within one week. Specifically, about 30.38% of total short selling trades involve in-and-out shorting and 21.14% of total short selling trades are covered the following day. This result shows that the day trading or short-horizon trading of individual short sellers is prevalent in the Korean stock market. Chung et al. (2009) show that about 23.7% of daily total trades in the Korean stock market from 1999 to 2000 were day trades. This finding is also in line with the work of Barber et al. (2004), who investigate the Taiwan stock market from 1995 to 1999 and find that day traders account for 20% of all trading and individual investors execute more than 97% of all day trading.

Table 2.8 shows the different profit measures. No matter the profit measure used, profits are almost monotonically decreasing as *DTC* increases. The *net profits* of short sales covered within 5 days and after 20 days are 27,930 and -271,970 won, respectively. In-and-out shorting exhibits an *STR* of 1.570%, while trades with over 20 *DTC* yield an *STR* of -0.014%. This means that profitable short trades usually adopt a short-horizon strategy. The differences between the group with *DTC* less than 5 days and the group with *DTC* over 20 days are positive and highly significant for all profit measures. This suggests that short sellers engaging in short-term strategies possess superior information. Table 2.8 shows the returns of shorts with over 15 days to cover

are negative (the profits over 10 days are also negative). This result suggests that mispricing is corrected very quickly, on average, in under two to three weeks. It can be inferred that individual short sellers are not noise traders and that some of them indeed have superior information about firm fundamental values. This interpretation is in line with Jung, Kim, and Lee (2013), who suggest that some individual investors are capable of bringing private information to the market via their short sales.

For each *DTC* group, I also present the number of covered shares and the covered values of short trades. The number of covered shares monotonically decreases as *DTC* increases, which suggest that short trades with large number of shorted shares are covered very quickly. Past returns (i.e., $r_{-5,-1}$) are computed based on the number of days to cover. The past return is negative for *DTC* over 10 days, consistent with the notion that short sellers exhibit contrarian patterns, that is, they buy stocks when stock prices go down. This result is consistent with second paper of this thesis, which investigates foreign short sellers in the Korean stock market and shows they are contrarian traders. Moreover, for the group with *DTC* under 5 days, the return for the past five days is positive, but this does not mean that short sellers are momentum traders. The short investment horizon (i.e., in which shorting and covering transactions are completed within 5 days) may result in a biased interpretation of this variable. I discuss the contrarian issue later, in the regression analysis.

I now discuss volatility, spread, and share turnover on the short covering day. The volatility is intraday volatility, defined as in Eq. (2.7); spread is the proportional spread,

computed as in Eq. (2,8); and turnover is daily turnover, defined as daily total traded shares scaled by outstanding shares for each stock each day. The shorter-*DTC* group with a higher-*STR* tends to have greater volatility than the longer-*DTC* group with a negative *STR*. The volatility is 0.056 for *DTC* under 5 days and 0.046 for *DTC* over 20 days, a highly significant difference. The greater volatility suggests that individual short sellers make profits from the intraday price change. This is more obvious for the group with zero *DTC*, which has the highest volatility among the *DTC* groups. The bid–ask spreads, a well-known liquidity measure, for the groups with *DTC* under 5 days and *DTC* over 20 days are 0.272 and 0.280, respectively. The difference between these two groups is highly significant (*t*-value is -8.63). The result is consistent with the notion that short sellers who want to earn profits from instantaneous price changes should be able to short and buy easily. So they prefer high-liquidity stocks and this pattern is more pronounced in day trader groups. The share turnover (*tv*), a proxy for liquidity, has a similar pattern as the bid–ask spread. The analysis result shows that short sales with *DTC* under 5 days have a higher turnover than short sales with *DTC* over 20 days (3.89% versus 2.23%). This finding also suggests that short sellers who earn higher profits prefer to trade high-liquidity stocks for easier shorts and buys.

Due to the global financial crisis, short selling bans prevailed around the world. The FSS in Korea also prohibited the short sale of all stocks listed on the KOSPI market from October 1, 2008, to May 31, 2009. Since the sample period includes the global financial crisis, some may argue that the results in this paper are driven by the crisis. To prove they are not affected by this specific event, I divide short selling trades

into two groups, based on their *DTC* before and after the ban period. The result is similar for both periods. The result shows that the short selling behavior of individual investors is not driven by specific events such as the financial crisis.

2.6.3 Determinant of the Number of Days to Short Cover (DTC)

As shown in Tables 2.7 and 2.8, number of days to cover (*DTC*) appear to be the most important factor affecting individual short sellers' profits. In this section, I examine the factors that potentially affect *DTC*. Using the natural logarithm of 1 + *DTC* as the dependent variable, I include *STR*, volatility one day before the covering day, and change in spread as independent variables. Change in spread is calculated as the difference in the shorting and covering spreads.[18] The regression results are presented in Table 2.9. To ensure that my results are not affected by market conditions, I also divide the sample into two periods, as in previous analysis. I employ the pooled regression method and for any potential correlation in the residual, I report *t*-statistics based on heteroskedasticity-consistent standard errors, as proposed by White (1980). Panel A of Table 2.9 shows the results of ordinary least squares (OLS). The variable *STR* is negatively associated with *DTC*, suggesting that a high *STR* leads to fewer *DTC*. In addition, volatility is also negatively related to *DTC*, which is consistent with the previous finding, that short sellers tend to profit from intraday price changes, so that

[18] These two spreads are taken 10 seconds before the actual execution of the shorting and covering transactions.

high volatility is negatively related to *DTC*. Changes in spread have a positive relation with *DTC*, which is also consistent with the results in Table 2.8. Table 2.8 shows that the wide spread leads to a lower *STR* and a low *STR* tends to lead to more *DTC*. The results also hold before and after short sale ban periods, but it seems that *STR* in the earlier period has a greater effect than in the later period, with a higher coefficient and *t*-value in the earlier period. Using the inverse trade frequency of each stock as a weighting factor, I re-estimate the regression in Panel A. The results are equivalent to those shown in Panel A. In conclusion, *STR*, volatility, and spread are important factors in determining days to cover.

As shown in Table 2.8, more than 30% of all shorted trades consist of in-and-out shorting, which means the *DTC* is zero for one-third of the sample. Therefore, for a robustness check, I also present a Tobit regression in Table 2.10 with the same variables. Panel A shows the Tobit regression and Panel B uses the inverse trade frequency of each stock as a weighting factor. The results still hold and even have greater significance than for the pooled OLS regression.

2.6.4 The Finding of Days to Short Cover (DTC) in the Context of the Disposition Effect

In the previous section, I find an inverse relation between profit and *DTC*, which raises the interesting question of whether these investors hold loser stocks too long and sell

winner stocks too soon. Such behavior is known as the disposition effect.[19] Odean (1998) demonstrates the existence of the disposition effect with empirical evidence from a large sample of individual investors in the U.S. stock market. Eom (2007) also finds that individual investors are more prone to the disposition effect than institutional and foreign investors in the Korean future market.[20] It is possible that individual short sellers also exhibit the disposition effect in the short selling market. However, on the contrary, numerous studies provide evidence that more sophisticated investors are less likely to exhibit the disposition effect (Grinblatt and Keloharju (2001), Shapira and Venezia (2001), Shumay and Wu (2005), Dhar and Zhu (2006)). Since short sellers are often regarded as sophisticated investors ((Figlewski (1981), Diamond and Verrecchia (1987), Senchack and Starks (1993), Asquith and Meulbroek (1995), Géczy, et al. (2002), Asquith et al. (2005), Christophe, Ferri, and Angel (2005), Christophe, Diether et al. (2009a), Ferri and Hsieh (2010)), in Sections 2.7 and 2.8 I show that short sellers who are more active (using trading frequency as a proxy for activity) earn more positive return than those who are less active. Therefore, the results of Table 2.8 are less likely to be subject to the disposition effect.

In addition, I provide evidence (in Table 2.9) that volatility and the bid–ask spread affect *DTC*. Short sellers hope for large downward price changes to make a profit. In

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[19] The disposition effect was suggested by Shefrin and Statman (1985).

[20] Odean (1998), Weber and Camerer (1998), and Shapira and Venezia (2001) demonstrate the existence of the disposition effect in the United States and Grinblatt and Keloharju (2000), Shapira and Venezia (2001), and Eom (2007) provide the evidence of such in markets outside the United States.

Table 2.8, high volatility is accompanied by few *DTC* and it can be assumed that the negative relation between profit and *DTC* is not caused by the disposition effect but, rather, by the volatility effect. This argument is also relevant to the bid–ask spread, which shows narrow bid–ask spread tends to have few *DTC*. It is interesting to directly test the disposition effect using an account-level dataset, but testing for the disposition effect in individual short sellers is beyond the scope of this paper and this research question is left for further research.

2.6.5 Regression Analysis of Short Selling Profitability and Strategies at Trade Level

I use regression analysis to examine the kinds of short selling strategies individual investors employ. According to Boehmer et al. (2008), the fact that large numbers of shares are used for each short trade implies the trade's informational content. Hence, I include the number of shorted shares in the regression. In addition, previous studies find short sellers to be contrarian traders (Diether et al. (2009a)), who are generally informed (Jegadeesh (1990), Lehmann (1990), Jegadeesh and Titman (1993)). Accordingly, I add the past five days' return to test whether individual short sellers are contrarian investors. According to Tables 2.7 and 2.8, a profitable short trade tends to be covered very rapidly. So, I use number of days to cover (*DTC*) to test whether the findings (high profits with a low number of *DTC*) in Tables 2.7 and 2.8 also hold in the regression analysis. In the previous section, I find that high-volatility, narrow-spread,

small firm, and growth stocks tend to earn higher profits than low-volatility, wide-spread, large firm, and value stocks. Therefore I also include the volatility, spread, size, and book-to-market ratio in the analysis. Table 2.11 reports the results of regressing abnormal short trade returns (*AbSTR*) on the variables above.

To examine the relations between *STR* and the variables of interest, I employ a pooled regression method and for any potential correlation in the residual, I report *t*-statistics based on heteroskedasticity-consistent standard errors, as proposed by White (1980). The regression equation is as follows:

$$AbSTR_j = \alpha + \beta_1 \times \ln(shorted\ share_j)\ or\ \ln(short\ value_j) + \beta_2 \times DTC_j + \beta_3 \times r_{j,-5,-1} + \varepsilon \tag{2.9}$$

$$AbSTR_j = \alpha + \beta_1 \times \ln(shorted\ share_j)\ or\ \ln(short\ value_j) + \beta_2 \times DTC_j + \beta_3 \times r_{j,-5,-1} + \beta_4 \times volatility_j + \beta_5 \times Spread\_intraday_j + \beta_6 \times \ln(size) + \beta_7 \times \mathrm{B/M} + \varepsilon \tag{2.10}$$

where *j* represents each short trade, *AbSTR* is the hourly abnormal return for each short selling trade *j*, shorted share is the number of shorted shares per trade, days to cover (*DTC*) is the average number of days to cover a short position, $r_{-5,-1}$ is the average daily return for days *t* - 1 to *t* - 5, and day *t* is the short selling trade day. I also include a firm dummy in Eq. (2.9) and include volatility, the intraday spread, firm size, and the book to market ratio in Eq. (2.10). Volatility is defined as in Eq. (2.7). The intraday spread is the bid–ask spread scaled by the midpoint of the bid–ask spread and I use the spread obtained 10 seconds before the actual execution of the short. Size is the stock's

capitalization at the end of June each year and the book to market is the firm's book equity divided by market equity at the end of the previous year. As with the previous test, I also show the regression results both before and after the short selling ban to demonstrate that the results are not driven by global financial crisis events.

Panel A of Table 2.11 reports the OLS results, which show that the numbers of shorted shares are positively related to *STR*. This relation still holds when I add a firm dummy. The result is inconsistent with the work of Blau et al. (2009), who show that small short sales are the most informed. However, the results are consistent with previous works (Boehmer et al. (2008)) and the number of shares traded is positively related to trading returns. The coefficient of shorted value is 0.059 with a *t*-value of 3.59 for the regression without a firm dummy and the coefficient is 0.074 with a *t*-value of 4.15 for the regression with a firm dummy. The most important variable is days to cover (*DTC*). *DTC* have an inverse relation with *STR*, both with and without a firm dummy (-0.030 with a *t*-value of -23.87 and -0.027 with a *t*-value of -28.21), which means the fewer days to cover the short position, the larger the profits. This result is consistent with Tables 2.7 and 2.8. It is also in line with Diether et al. (2009a), who show that short sellers earn abnormal returns for a short period (i.e., three days) by forming portfolios in such a way that they sell highly shorted stocks and buy fewer shorted stocks in the past. The past five days' return ($r_{-5,-1}$) is positively related to short trade return. The coefficient of $r_{-5,-1}$ is 0.157 with a *t*-value of 14.75 for the regression without a firm dummy and the coefficient is 0.119 with a *t*-value of 11.03 for the regression with a firm dummy. This finding shows that short trades using stocks with

high past returns lead to lower future returns (i.e., short sellers make profits), suggesting that individual short sellers are contrarian investors and are able to predict low future returns. This result also suggests that individual short sellers time their short sale trades based on previous short-term price trends. This is also consistent with the large body of previous research that finds short sellers and individual investors to be contrarian.[21] For regressions with and without a firm dummy, the short value is positive and significantly related to *STR*. In Eq. (2.10), I add four control variables: volatility, spread, size, and book to market. As shown in Table 2.11, high volatility, narrow bid–ask spreads, small sizes, and low book to market values lead to a high *STR*. Panel B reports the WLS results, using the inverse trade frequency of each stock as a weighting factor. The results are similar to the OLS results in Panel A, but the spread and size are no longer significant.

The subperiod results are shown in Table 2.12 and the results are similar throughout the entire period, except for the intraday spread. The intraday spread is not more significant in the earlier period and even becomes positive for the WLS regression. One explanation for the positive spread is that, for liquidity reasons, short sellers tend to trade stocks with a narrow bid–ask spread, but a wide bid–ask spread provides opportunities to sell at a high price and buy at a low price.

[21] Deither et al. (2009a) report short sellers are contrarian investors. Choe, Kho, and Stulz (1999), Grinblatt and Keloharju (2000, 2001), Goetzmann and Massa (2002), Griffin et al. (2003), Jackson (2004), Richards (2005), and Kaniel, Saar, and Titman (2008) report individual investors have contrarian tendencies in the stock market.

As a robustness check, I first employ the pooled regression for each stock and then average coefficients across stocks. I required sample stocks to have at least 20 trades during my sample period. The regression equation is defined as follows:

$$AbSTR_j = \alpha + \beta_1 \times \ln(shorted\ share_j)\ or\ \ln(short\ value_j)\ or\ relss_j + \beta_2 \times DTC_j + \beta_3 \times r_{j,-5,-1} + \beta_4 \times volatility_j + \beta_5 \times Spread\_intraday_j + \varepsilon \quad (2.11)$$

The regression results are shown in Table 2.13. The results are identical to those of Table 2.11 for all periods and Table 2.12 for both subperiods, except for the spread results. The intraday spread results somewhat contradict previous results. The coefficients are positive and significantly related to *AbSTR* for all the periods. This finding can be interpreted as short sellers prefer high-liquidity stocks (Table 2.4) but see trading opportunities with wide-spread stocks, hoping to sell at a high price and repurchase at a low price. I also include relative short selling, *relss*, which is defined as the number of shorted shares divided by the daily trading volume for each trade. Consistent with Diether et al. (2009a) and Boehmer et al. (2008), *relss* has a positive coefficient of high significance, suggesting that short sellers can predict future returns.

2.7 Account Level Evidence of Profitability

The previous section analyzes short selling profits and strategies at the trade level. It would be interesting to study the individual investors' short selling profits and strategies. Therefore, in this section, I provide evidence of individual investors' short

selling at the account level and determine how profitable individual accounts are and the strategies they implement.

2.7.1 Profitability and Number of Firms Traded at the Account Level

In this section, I provide empirical results of short selling activity at the account level. In Table 2.14, I calculate the pooled average profit measures of short selling trades for each account and divide all accounts into several groups, based on the number of shorted firms per account. I also present weighted profit measures, using stock price as weighting factors. Account short trade return (Acc*STR*) or profits monotonically increase as the number of traded firms increases. Traders with more firms (over 30) show higher *AccSTR* than those trading with only one firm (0.911% vs. 0.213%) and the *t*-statistics of the two groups are significant (*t*-value 5.35). When I compare traders trading more firms (over 30) with those trading fewer firms (one to five), the same result holds, regardless of which profit measures are used.

I conjecture that traders trading more firms are skilled and, accordingly, earn higher profits than those trading fewer firms. To prove that the results are not driven by different market conditions, I divide the sample into two parts. The results show a pattern identical to that for the whole sample period. I conclude that at least some individual investors are skilled in analyzing information and make profits by properly exploiting it.

2.7.2 Account Level Regression Analysis

To investigate the behavior of individual investors' short selling activities at the account level, I regress account level short trade returns on the number of shorted shares, short value, days to cover (*DTC*), and the number of firms traded. I presume that account holders who trade more shorted shares and more firms are relative skilled and obtain higher profits. Table 2.15 provides evidence of this assumption. The dependent variable is the account's abnormal short trade return (*AccAbSTR*). The regression equation is as follows:

$$\begin{aligned} AccAbSTR_j = \alpha + \beta_1 \times \ln(shorted\ shares_j)\ or\ \ln(short\ value_j) + \\ \beta_2 \times DTC_j + \beta_3 \times firms_j + \varepsilon \end{aligned} \tag{2.12}$$

where *AccAbSTR* is the abnormal short trade return of the short selling account. The number of shorted shares (short value) are the average numbers of shorted shares (short value) for account *j*. The variable *DTC* is the average number of days to cover for account *j* and firms are the average number of firms traded by account *j*. I first compute *STR* defined as Eq. (2.5). Then I pooled the average returns of *STR* across stocks for each account. The variable shorted shares is the pooled average number of shorted shares for each account, short value is the pooled average shorted price times the number of shorted shares for each account, and days to cover (*DTC*) is the number of days to cover a short trade and the pooled average for each account. The variable firms is the number of stocks shorted for each account over the sample period. The dependent variable in Panel A of Table 2.15 is the simple pooled average of *AccAbSTR*.

Panel A of Table 2.14 shows that accounts shorting larger numbers of shares have higher profits. The coefficient of shorted shares is 0.110 and the *t*-value is 5.67. *DTC* is also consistent with previous results, which show an inverse relation with profits. The coefficient of *DTC* is -0.013 with a highly significant *t*-value of -6.09, which means short selling accounts with fewer average days to cover earn higher profits than accounts with longer holding periods. The number of traded firms is also positively related to a short selling account's returns. The coefficient of the number of traded firms is 0.129 with a *t*-value of 3.18. This finding suggests that traders with more experience in short trading are relatively skilled and, accordingly, obtain higher profits. The short value, as for the other trade level results, is also positively related to *AccAbSTR*.

The *AccAbSTR* in Panel A of Table 2.14 are the simple pooled averages of *AbSTR*; however, prices can affect short trade returns. I therefore use stock price the previous month-end as a weighting factor to calculate an account's short trade returns. The results are shown in Panel B and are consistent with those of Panel A for all periods, as well as for the two subperiods.

2.7.3 Profit Persistent at the Account Level

An important yet neglected research question is whether short sellers are able to persistently earn positive returns. My dataset allows me to identify individual short sellers at the account level. I therefore track individual short sellers' shorting and

covering activities over time. To analyze whether short sellers persistently earn positive returns, I divide the sample into two periods, before the short selling ban and after. Each subperiod covers about one year. I examine whether individual short sellers who earn positive returns in the earlier period also make a profit in the later period. I first identify how many accounts are traded in both two periods and find that only 1,332 accounts were traded in both periods. Using this limited sample, I run the following regression:

$$AccAbSTR\_p2_j = \alpha + \beta_1 \times AccAbSTR\_p1_j + \beta_2 \times \ln(shorted\ share_j)\ or \\ \ln(short\ value_j) + \beta_3 \times DTC_j + \beta_4 \times firms_j + \varepsilon \quad (2.13)$$

$$rk\_AccAbSTR\_p2_j = \alpha + \beta_1 \times rk\_AccAbSTR\_p1_j + \beta_2 \times \\ \ln(shorted\ share_j)\ or\ \ln(short\ value_j) + \\ \beta_3 \times DTC_j + \beta_4 \times firms + \varepsilon \quad (2.14)$$

where $AccAbSTR\_p2_j$ is the abnormal short trade return of account j in the later period and $AccAbSTR\_p1_j$ is the abnormal short trade return of account j in the earlier period. Since the shorting flow is skewed (Boehmer and Wu (2013)), to ensure that my results are not affected by distributional issues, I use quintile ranks instead of a continuous variable in the second regression (Eq. (2.14)). I form the quintile portfolios based on the two periods of *AccAbSTR* and use this variable in the second regression. Consistent with my expectations, Table 2.16 shows that traders who earn positive returns in the earlier period also earn positive returns in the later period. The coefficient of *AccAbSTR_p1* is 0.168 and the *t*-value of 2.13, suggesting short sellers are able to

persistently make a profit. If I use a rank variable instead of a continuous variable, the main finding is even stronger: Accounts ranked higher in terms of previous account profits are associated with significantly greater profits in the later period. This implies that at least some individual investors are informed and have abilities to make profits persistently.

One concern of this analysis is survivorship bias. Someone may argue that short sellers who earn positive returns stay in the market and losers leave the market. In addition, individual investors can have two or more accounts (at different brokerages) to trade interchangeably. For example, a brokerage house may provide three months of no trading fees to first-time individual investors who open a trading account. One of the disadvantages of this dataset is that I cannot identify persons with two or more accounts. In other words, if a person has two accounts, the accounts are regarded as belonging to two different persons. To alleviate survivorship bias, I use a portfolio approach instead of a regression approach, as in Table 2.16, and examine the persistence of profits at both the stock and account levels.

The details of the portfolio formation process as follows. I form the portfolios of short selling stocks (accounts) on three-month–lagged (one-month–lagged) returns and estimate their performance, replicating the methodology of Carhart (1997). Specifically, in a given month *t*, I compute the stock level daily average *rel profit* for the past three months. I then form quintile monthly short selling portfolios based on this average profit and measure the average daily *rel profit* of the five groups each month. I require

that stocks have at least four months of average daily *rel profit* data. The stock level daily average *rel profit* is computed as the sum of all short trade profits on day *t* divided by the total short value that day. Panel A of Table 2.17 shows the stock-level results. Consistent with Table 2.16, this table shows strong persistence in profitability. The portfolio with higher past profits has a short selling daily return of 0.485%, for a profit difference of 1.726%, with a *t*-value of 10.36, compared to the portfolio with lower past profits. The results are also consistent across the two subperiods.

The results in Panel A indicate strong persistence at the stock level. In Panel B of Table 2.17, I use profitability at the individual account level instead of at the stock level. The methodology is similar to that of the stock level analysis. For each account, I compute the daily average *rel profit* for the past month and form the quintile monthly portfolio based on this average *rel profit*. I recompute the daily average *rel profit* for the five groups each month. Individual accounts must have two months of trading records to be included in this analysis. Panel B of Table 2.17 reports the results for the accounts' profit portfolios. The account-level results are similar to those at the stock level and past profitability is a strong predictor of future predictability. The portfolio with high past profits earns a short selling return of 1.495% and the difference between high and low profits is 1.337%, with a high significance (*t*-value is 5.07). As for the two subperiods, the persistence of profitability holds only for the later subperiod.

Despite the many different methods of examining whether short sellers earn profits persistently, they are not free of the survivorship bias issue. My analysis provides some

insights on the persistence in individual investors' short selling profitability. In particular, I provide evidence of persistent profitability at the individual account level, which implies that some individual investors have superior trading ability to consistently make profits via short selling. Furthermore, the analysis mitigates concerns of survivorship bias problems throughout this paper (except in Tables 2.14 and 2.15), because it is conducted at the trade level and, even if people use different two accounts to trade, their trading strategies are not different across their different accounts.

2.8 Regular Buys and Sells in Short Selling Accounts

So far, I analyze only accounts that executed short sales. I wonder, however, whether these short sellers are professional or amateur short sellers. If individual short sellers are professional investors, they must have some skill in processing information and earn positive returns. Nicolosi, Peng, and Zhu (2008) show that trading experience helps investors obtain better investment performance. In this paper, I use the number of short trades as trading experience. I define professional short sellers as traders who only short the stocks in their accounts during the sample period. Amateur short sellers are defined as traders who execute short trades as well as regular buys and sells in their account. In this section, I first examine the regular buying and selling activities in accounts that carry out short trading and then investigate whether professional and amateur short sellers exhibit different behaviors. I hypothesize that professional short

selling investors are more likely to have superior trading ability and make higher profits than those engaging in both short selling and regular buy or sell trading. I identify regular buys and sells for each account in my sample during the sample period and investigate the differences between regular and short selling trading. The first part of the results is shown in Table 2.18.

Table 2.18 shows the summary statistics of regular buys and sells in short selling accounts. Panels A to C show regular buy trading, regular sell trading, and short selling trading, respectively. During the sample period, the daily average numbers of buy and sell traded shares are roughly three times the daily average numbers of shorted shares (1,628.75 vs. 499.89). While the trading volumes are similar, this result confirms that my sample stocks tend to be high priced (Table 2.1). The number of trade firms shows a large disparity between regular trading and short sale trading. One possible explanation is that the information advantage of short sellers is due to a few stocks.

During the sample period, 520 of the 11,841 accounts are defined as professional short selling traders. These 520 accounts are engaged only in short selling activity. I present the profit measures of the professional and amateur accounts. As shown in Table 2.19, except for *STR* (*wSTR*) and *AbSTR* (*wAbSTR*), all of profit measures are higher for professional traders than for amateur traders and the differences between these two groups are highly significant. If I divide the sample into two periods, then the results hold only for the later period. As shown in Figure 2.1, considering the fact that the second period is up market, the result suggests that professional traders do not

inadvertently make profits but *indeed* have trading ability superior to that of amateur traders. In addition, the numbers of shorted shares are larger for professional traders, which is consistent with earlier results showing that short trades with large numbers of shorted shares earn higher returns.

2.9 Evidence of Profitability in Daily Analysis

Up to now, I investigated the strategies and profits of individual short sellers at the trade and account levels. It is interesting that see what factors affect short selling profits at the daily level. For each day *t*, I aggregate short selling profits and compute the weighted daily *rel profit*. The detailed computation is as follows:

$$Daily\ rel\ profit(\%) = \sum_{j=1}^{n} w_{j,i,t} \times \frac{rel\ profit_{j,i,t}}{DTC_{j,i,t}} \tag{2.15}$$

$$w_{j,i,t} = \frac{short\ volume_{j,i,t}}{short\ volume_{i,t}}$$

for the short selling trade *j*, stock *i*, and day *t*. To compare each trade, I adjust the number of shorted days when I compute the daily *rel profit*. For the right-hand side, I use variables similar to those in Table 2.11. I add relative short selling, *relss*, defined as the daily number of shorted shares by individual investors divided by daily traded shares. The daily bid–ask spread is the daily average bid–ask spread as defined in Eq. (2.8). Kim and Mehrotra (2003) show that a stock's profitability decreases as the

number of market makers increases. I also include the number of trades to test whether the authors' findings are also valid in the short selling market. Table 2.20 shows the results.

Unlike the trade level results, short value, shorted shares, and *relss* are negatively related to profit. A possible explanation is that, at the daily level, large amounts of shorts may hurt profits due to the many competitors in the short selling market. The interpretation of the findings for shorted shares and *relss* is similar to that for short value. As predicted, the number of trades is negatively associated with short selling profit, which is consistent with Kim and Mehrotra's (2003) finding that the more competitors in the market, the less profit each investor can earn. The results for the other variables, such as volatility, size, and book to market, are consistent with the previous findings that short selling profits are related to firms with high volatility, small firms, and firms with a low book to market. Boehmer et al. (2008) and Diether et al. (2009a) find that short sellers are contrarian investors and the authors predict negative stock returns. My results also support the view that the past one day's return is positive and highly significant, suggesting that short sellers sell stock when the previous return is high and subsequently earn positive returns.[22]

To ensure that the precision of my results is not overstated due to some unknown error correlation, I use a Fama–MacBeth (1973) regression in the analysis of trades in Table 2.21. Rather than pooling all the data over the sample period together in one

[22] Deither et al. (2009a) use the past five days' return. I also use the past five days' return and the results are similar to those when using the previous day's returns.

regression, I estimate short selling profits cross-sectionally by firms and then examine the mean coefficients of the variables. The results are very similar to those in Table 2.20.

2.10 Conclusion

The short selling activity in the stock markets is universal today and a large body of research finds that short selling has return predictability and improves market price efficiency. However, few studies *directly* investigate different types of strategies and the profitability of trades involving short sales. Do individual investors really make money from short selling trades? If they do, then how much do they earn from a return perspective? In addition, an interesting question is whether winning trading strategies tend to be profitable in the long or short run. My contribution is to provide direct evidence on these undeveloped topics.

Using short selling and short covering transactions with both a trade level and account level dataset, I find that individual investors *indeed* make profits through short sale trades. In addition, short sellers are generally short-lived traders, with 30.38% of all short trades involving in-and-out shorting and 21.14% of all short trades being covered the following day. Moreover, profit decreases monotonically with increasing number of days to cover and trade size (i.e., trade share). This finding suggests that winning trading strategies tend to be short run (i.e., on average, covering shorts within

one day). I also find profitable trades tend to have fewer days to cover, higher past returns, higher volatility, smaller size, and a lower book to market than non-profitable trades, which suggests individual investors are contrarians (i.e., selling short when the past return is high and covering when the price is low). The inverse relation between days shorted and profits may reflect the disposition effect, which is the tendency to hold losers too long and let go of realized profits too soon. A large number of studies find empirical regularity in the stock market (e.g., Odean (1998), Grinblatt and Keloharju (2001), Dhar and Zhu (2006)). The interesting question of whether short sellers exhibit the disposition effect remains to be further researched.

In account level analysis, I show that traders who trade more stocks earn more profits than those who trade fewer stocks. I conjecture that traders who tend to trade more stocks may be relatively skilled. They process better information and earn higher profits accordingly. Finally, to test whether short sellers consistently earn positive returns, I use a portfolio approach and regression analysis. The results show that traders who earn positive returns in an earlier period also earn positive returns in later periods.

Overall, these findings help understand short selling profits and days to cover, which are not covered in the literature. The overall findings lead me to conclude that individual short sellers have superior information and employ a short-term strategy. The limitation of this paper is I cannot observe the short covering transactions of foreign investors. Since foreign investors account for 70% of all short selling trades, it

would be interesting to investigate their short selling activities and trading profits. I would like to pursue this topic in my next research.

III. Are Foreign Short-Sellers to Blame? Evidence from Daily Short-Selling in Korea Stock Exchange

3.1 Introduction

"As someone once said: "Politicians and people who lose money always need someone to blame." So who is to blame now? According to the guardians of our economy, it's the short sellers, those investors who believe certain stocks are overvalued for fundamental reasons."

- *Wall Street Journal*, September 22, 2008

"All these countries have spent 40 years trying to build up their economies and a moron like Soros comes along with a lot of money to speculate and ruin thing." (Mahathir Mohamad, prime minister of Malaysia, January 1998)

- *Foreign Affairs*, March/April, 2000

People blame short-sellers. At the same time, as seen in many statements regarding the destabilizing role of foreign investors in emerging markets, people also blame foreign investors. In this paper, I investigate whether foreign short-sellers are to blame by investigating short-selling activities by foreign investors and their impact on stock price, liquidity, and volatility in the Korean stock market.

Despite the vast amount of studies on short-selling in the US market, only a few studies examine short-selling activity in the global financial markets other than in the US (Bris, Goetzmann, and Zhu, 2007; Chang, Cheng, and Yu, 2007; Saffi and

Sigurdsson, 2011). Hence, general features of foreign investors' short-selling trading and its impact on stock characteristics have not been given due attention. Filling this gap, I contribute to the literature by investigating the following wide range of research questions: How much daily short-selling is carried out in emerging markets? Are foreign investors bigger players in short-selling markets than domestic investors, or vice versa? What short-selling trading strategies, on average, are used by foreign investors in emerging markets? Can I find evidence that foreign investors are informed or naïve, uninformed trend- chasers through their short-selling activity? Do foreign short-sellers provide liquidity? Do foreign investors destabilize stock prices through their short-selling activity?

I focus on the Korean stock market for the following reasons. First, Korea has the most developed financial market among emerging markets in which many foreign investors can actively trade under less binding regulations on foreign investors. For example, the legal limitation on share ownership by foreign investors was abolished in the Korean market before our sample period begins. Second, the Korea Exchange (KRX) provides high-frequency data with good quality for a relatively long period of time; Our sample period covers five and a half years, while Diether, Lee, and Werner (2009a) use only a one-year sample period. In addition, the presence of high-frequency data enables us to study daily short-selling activity and its relation with other variables of interests. Another benefit of our dataset is that it distinguishes each trade by traders' type. That is, each trade is flagged to denote whether it was initiated by domestic individual investors, domestic institutional investors, or foreign institutional investors.

Hence, our data provides a good opportunity to examine different trading behaviors according to different investor types.[23] The most prominent and unique feature of our dataset may be that each trade is flagged with order sequence number and the direction of trade, which shows whether it was buyer- or seller-initiated, rendering Lee and Ready's (1991) algorithm for obtaining order imbalance data unnecessary for our sample stocks. This provides benefit of constructing buy-order imbalance data without being engaged in the argument about the validity of Lee and Ready algorithm (Ellis, Michaely, and O'Hara, 2000; Odders-White 2000).

In Korean stock market, short-selling is not so frequent compared to that in the US market. According to Diether, Lee, and Werner (2009a), 24% and 31% of daily trading volume is generated from short-selling trading in New York Stock Exchange and in Nasdaq, respectively, in 2005. However, for 761 stocks in Korean stock market, before any screening, we find that the cross-sectional mean of average daily short-selling is only 0.53% of daily trading volume over the sample period from January 1, 2006 to May 31, 2010, excluding October 1, 2008, to May 31, 2009, when short-selling was banned in Korea by regulation. Moreover, for 24 percent of stocks, average short-selling is zero and 92% of stocks have an average short-selling of less than 2% of trading volume. Legal restrictions during our sample period on hedge funds, which

[23] Boehmer, Jones, and Zhang (2008) investigate short-selling activity by investor types, separating individuals and institutions in the US market. Diether, Lee, and Werner (2009a), lacking investor type data, used trade size as a proxy for investor type to distinguish trades by individual investors from trades by institutional investors in an earlier version of their paper.

often use short sales to carry out long–short strategies, may contribute to this small percentage of short-selling relative to trading volume in the Korean stock market.[24] Given the rarity of short-selling in the Korean stock market, I restrict our sample to fifty stocks that are mostly actively engaged in short-selling over the sample period, in order to perform meaningful analyses for short-sale trading activity.[25] The average market capitalization of the fifty sample stocks is 380,920 billion Korean won (roughly USD 346 billion)[26], reflecting 47.8% of total market capitalization of all stocks listed in Korean stock market. In our sample, the mean short-selling volume in the Korean market is 3.16% of the daily trading volume.

Interestingly, I find that the major portion of short sales is performed by foreign investors, whereas domestic investors, both individuals and institutions, are rarely engaged in short-selling trading in Korean stock market. Short-selling by individual and institutional domestic investors constitutes 0.05% and 0.24%, respectively, of daily trading volume while that by foreign investors is 2.87%, which is roughly ten to sixty times larger than the numbers for domestic investors. More strikingly, I find that about 88% of shorted shares are carried out by foreign investors, showing sharp contrasts with only 5% and 7% of short-selling by individual and

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[24] The 12 hedge funds with over 150 billion Korean won came into operation, for the first time in Korea, in December 23, 2011. These hedge funds were operated by nine major Korean financial institutions.

[25] In a robustness section, we discuss empirical results based on the extended sample that consists of 104 stocks. Instead of selecting fifty stocks with the highest average short-selling record over the sample period, we construct sample year-by-year. Empirical results are similar.

[26] One USD is approximately to 1,100 Korea won.

institutional domestic investors, respectively. Considering that foreign investors are institutional investors, this pattern is consistent with Boehmer, Jones, and Zhang (2008), who find that about 75% of all short sales in the US market are executed by institutions, while less than 2% are performed by individual investors. Since the largest portion of short sales is executed by foreign investors, who have been shown to prefer large stocks in foreign markets (Kang and Stulz, 1997), it is not surprising to see that the short-selling activity in Korean stock market mostly involves large stocks rather than small stocks. Specifically, relative short-selling, which is defined as the number of shorted shares divided by the number of traded shares, is 1.22% for large stocks, while the number is only 0.02% and 0.19% for small stocks and for medium-cap stocks, respectively, in Korean stock market (before any screening). By examining the cross-sectional variation in relative short-selling in our sample, I find that short-selling is more concentrated for large-cap stocks, growth (i.e., low book-to-market) stocks, high-priced stocks, and stocks with low institutional ownership.

During our sample period, relative short-selling by foreign investors has been growing over time from 1.18% in January 2006 to 4.00% in May 2010 (except for short-selling ban period). The relative short-selling by foreign investors is highest, 6.42%, in August, 2008, possibly reflecting increased pessimism among investors before the 2008 subprime mortgage crisis. The dominance of short-selling by foreign investors over short-selling by domestic investors is persistent over time in the Korean stock market. Specifically, about 80–90% of shorted shares are coming from foreign investors consistently over time. This finding may justify our exclusive focus on short

sales by foreign investors throughout the paper to draw meaningful conclusions about short-selling in emerging markets.

By examining short-selling activity of foreign investors, our paper also contributes to the literature on trading behavior and the informational (dis)advantage of foreign investors in emerging markets. It is interesting to see that previous research shows that the trading behavior of foreign investors and that of short-sellers are not similar each other. The recent study on short-selling in the US market by Diether, Lee, and Werner (2009a) shows that short-sellers are negative feedback (i.e., contrarian) traders, whereas Brennan and Cao (1997), Grinblatt and Keloharju (2000), and Griffin, Nardari, and Stulz (2007) show that foreign investors use positive feedback (i.e., momentum) trading strategy due to their informational disadvantage relative to domestic investors. Unlike previous studies on foreign investors' trading activity, which are mostly based on changes in foreign investors' equity holdings, this paper is the first one to investigate the issue through foreign investors' daily short-selling. Specifically, we investigate whether foreign short-sellers are momentum traders or contrarian traders in this paper.

There has been much debate on the informational advantage of foreign investors over domestic investors in overseas markets, with some arguing that foreign investors are informed (Froot, O'Connell, and Seasholes, 2001; Froot and Ramadorai, 2008) and with others arguing that they are not (Brennan and Cao, 1997; Kang and Stulz, 1997; Choe, Kho, and Stulz, 2005; Dvorak, 2005). If foreign short-sellers are

good at timing the short-term trends of stock prices (i.e., if foreign short-sellers are informed), their increased short-selling should be negatively related to future stock prices. The availability of daily short-selling data in the Korean stock market allows us to examine whether the short-selling activity of foreign investors is related to the future decline of the return of stocks sold short. According to Avramov, Chordia, and Goyal (2006), trading by contrarian traders is informed and thus related to lower future volatility. Hence, investigation of a trend-chasing short-selling strategy can be naturally extended to the on-going argument of whether foreign investors destabilize financial markets in emerging market countries. This paper contributes to the literature by adding evidence on the destabilization issue in terms of short-selling.

One of the perceived benefits of allowing cross-border investments by foreign investors is on their liquidity-providing role. Short-selling provides liquidity to the market if it is performed to absorb excessive buying pressure. That is, foreign investors provide liquidity through short-selling when they bet on short-run price reversals, considering that the past days' positive returns are due to temporary buying pressure. Hence, if short-sellers provide liquidity, then an increase in short-selling should coincide with contemporaneous buy–order imbalance and will be related to future decreases in bid-ask spread. Diether, Lee, and Werner (2009a) find that short-sellers in the US market provide liquidity by shorting shares when the buy–order imbalance is high. On the other hand, according to Kyle (1986), increased presence of informed traders is linked to decrease in stock liquidity due to market maker's request of larger compensation for potential losses that may arise from trading against informed traders.

Hence, it is possible that foreign investors' short-selling, if informed, may adversely affect stock liquidity. I test whether the liquidity providing role is empirically supported by daily short-selling data in the Korean stock market. This paper is also the first to investigate the liquidity-providing role of foreign investors in terms of their short-selling trading in emerging markets.

I report some interesting findings about foreigners' short-selling in this paper. Consistent with evidence for the US market as in Diether, Lee, and Werner (2009a), I find that foreign short-sellers in the Korean stock market are contrarian investors (e.g. negative feedback traders). Specifically, I find that foreign short-sellers increase short-selling when a stock's past performance is positive. The finding of negative feedback trading strategy by foreign short-sellers provides us deeper and comprehensive understanding of trading strategy employed by foreign investors since previous studies, which focus on foreign investors' long-side trading, show that foreign investors are mostly engaged in a positive feedback trading (Brennan and Cao, 1997; Grinblatt and Keloharju, 2000; Griffin, Nardari, and Stulz, 2007). Our subsequent analysis to examine whether foreign investors' short-selling helps destabilize stock prices shows that foreign investors' short-selling is not significantly related to future volatility, consistent with Choe, Kho, and Stulz (1999), who find no evidence of a destabilizing role of foreign investors in the Korean stock market.

Regressions of daily stock returns on lagged foreign investors' short-selling show that foreign investors' short-selling activity predicts future returns. This return

predictability, however, holds only for stocks with high short-selling, implying that the relation between short-selling activities and future stock returns are nonlinear. The evidence of informedness of short-selling by foreign traders is also supported by additional empirical analysis in this paper, which investigates the potential profits of a long–short trading strategy based on the level of foreign investors' short-selling. I find that a long–short trading strategy based on short-selling generates both statistically and economically significant daily abnormal returns of 0.13% (about 38% annually) after adjusting for size and book-to-market. These findings are consistent with the literature that argues that short-sellers are informed (Boehmer, Jones, and Zhang, 2008; Diether, Lee, and Werner, 2009a), and that foreign investors have informational advantage over domestic investors (Froot, O'Connell, and Seasholes, 2001; Froot and Ramadorai, 2008).

Turning to liquidity, we find that foreign short-sellers increase short-selling when a stock is under large contemporaneous buy–order imbalance. However, regressions of stock's daily bid-ask spread on the lag of foreign investors' short-selling show that the lagged short-selling is not significantly related to stock spread, implying that the amount of increase in short-selling may not be sufficient to significantly resolve the buying pressure of a given stock.

The rest of paper is organized as follows. In Section II, I illustrate the general features of Korean short-selling markets. Section III describes the data together with the sample screening procedure. Section IV investigates the short-selling behavior of

foreign investors in the Korean stock market, focusing on whether they are contrarian or momentum traders. Section V examines whether foreigners predict future returns and whether they have an opportunity to obtain profits based on their short-selling strategy. Section VI investigates whether foreign investors' short-selling has a destabilizing role and whether it provides liquidity. In Section VII, I discuss empirical results based on the extended sample. Section VIII concludes the paper.

3.2 Short-sales in Korean stock market

In 1969, margin transaction is allowed in the Korean stock market, which made short-selling possible. Initially, only individual investors are allowed to perform short-selling, but the restriction for short-selling is removed for institutional investors in September, 1996, and for foreign investors in July 1998. The up-tick rule is first introduced in 1996 in Korean stock market. The institutional (individual) short-sellers are required to cover their short position within six (three) months, but the security lenders have a right to recall the shares five days after lending. The collateral values were required to be 90% to 110% of the market value of borrowed stocks and the loan fee, which is a direct cost of short-selling, was about 2.5% to 6%, on average. In Korea, the main security lenders are pension fund, banks, insurance companies and asset management companies.

The Financial Supervisory Service (FSS) in Korea begins to strengthen the regulation for short-selling after the so-called WooPung credit union event in March

2000.[27] Since then, FSS prohibits naked short-selling and requests all short-selling orders and executions to be tagged as 'margin sell.' The Korea Exchange (KRX) is launched in January 2005 by consolidating KOSPI (Korea Composite Stock Price Index) market, KOSDAQ (Korea Securities Dealers Automated Quotation) market, and derivative market together. Due to the financial crisis of 2008, the FSS prohibited short-selling for all stocks that are listed on KOSPI and KOSDAQ for October 1, 2008 to May 31, 2009. In this period, the FSS also builds up rules on short-selling regarding intensively shorted stocks, the collateral requirement, and disclosure. FSS adapted the "cooling period system" that prohibits a stock from being sold short for ten days when the shorted amount for a given stock exceeds 5% (3%) of total trading amount in the KOSPI (KOSDAQ) during the most recent 20 days; The collateral requirement increases to 140% of market value of borrowed stocks; From June 23, 2008, the KRX is required to disclose on a daily basis the list of shares sold short together with the amount sold short.

3.3 Data and sample construction

I collect intra-daily short-selling data for common stocks listed in the KOSPI market, which is a part of the Korea Exchange (KRX), for January 1, 2006 to May 31, 2010. I obtain daily return, market capitalization, book-to-market ratio, and institutional

[27] In March 29, 2000, WooPung credit union sold short 350,000 shares of SUNGDO ENG stocks. On settlement date, however, it failed to deliver the stocks to buyers.

ownership data from FnGuide. At the initial stage, I have a total of 761 firms with 746,692 stock–day observations. To avoid any potential confounding effects on the empirical results, I exclude the period from October 1, 2008 to May 31, 2009, during which short-selling was banned by regulation.[28] I exclude financial firms from the sample and drop a stock-day observation if return data is missing. I drop stock-year observations if market capitalization or book-to-market ratio data are not available that year, or the previous year-end stock price falls below 1,000 Korean won (roughly one USD). For our measure of daily short-selling activity, I define relative short-selling (*relss*) as a ratio of the number of shorted shares to the daily share trading volume, as in Diether, Lee, and Werner (2009a):

$$relss_{i,t} = \frac{N\ of\ shorted\ share_{i,t}}{N\ of\ traded\ share_{i,t}} \tag{3.1}$$

Table 2.1 shows the distribution of stock-day observations of *relss* for 761 stocks in KOSPI market. I see that 78% of stock-day observations have zero *relss* and 20% has *relss* that is positive but less than 10%. Panel B shows that average short-selling is zero for 24% of stocks (182 firms) and that 92% of stocks (621 firms) have an average short-selling of less than 2% of trading volume. The average market capitalization for stocks whose *relss* is larger than 2% is 7,598 billion Korean won (roughly, USD 6.9 billion) or bigger, while that for stocks whose *relss* is smaller than 1% is 471 billion Korean won (USD 0.4 billion) or smaller. Hence, it is clear that the short-

[28] In the ban period, however, a small amount of short-selling was made if the purpose of the trade is to provide liquidity or to hedge underlying positions.

selling activity is performed much more for large stocks than for small stocks in Korean stock market. In an unreported exercise, I find that *relss* is 1.22% for large stocks, while the number is only 0.02% and 0.19% for small stocks and for medium-cap stocks, respectively, for 761 stocks in KOSPI universe.

Given the rarity of short-selling in the Korean stock market, I restrict our sample to fifty stocks that are mostly actively engaged in short-selling over the sample period, in order to perform meaningful analyses for short-sale trading activity. Specifically, I sort stocks by the average *relss* over the sample period and select the fifty stocks with the highest average *relss*. Our final sample consists of fifty stocks and 42,981 stock-day observations among which 26% of stock-day observations have zero short-selling. To examine the potential sampling bias issue, I build a sample by selecting fifty stocks *every year* based on annual average of *relss* and repeat the empirical analyses based on this extended sample, which consists of 104 stocks. As I mention in the robustness section, empirical results based on the extended sample are similar.

Table 2.2 shows the list of fifty sample stocks together with other relevant firm characteristics such as market capitalization, book-to-market ratio, share turnover, institutional ownership, and foreign ownership, in descending order by the average *relss*. Our sample covers stocks with large capitalization and active trading volume such as Samsung Electronics, POSCO, Korea Electric Power, LG Electronics, KT, and Hyundai Motor. Average daily relative short-selling varies from 2.09% to 6.98% in our

sample stocks. The aggregate average market capitalization of sample stocks is 380,920 billion Korean won, reflecting 47.8% of total market capitalization of all stocks listed in the KOSPI market.

Table 2.3 shows descriptive statistics of short-selling by different subperiods (panel A) and by investor types and subperiods (panel B). For the overall sample period of 2006:01–2010:05, the mean number of shorted shares is 29,564.50. Overall short-selling relative to the daily trading volume in the Korean market is small compared to that in the US market - The mean *relss* comprises 3.16% in our sample, while it is 24% and 31% for NYSE and Nasdaq, respectively, in Diether, Lee, and Werner (2009a). I conjecture that legal restrictions on hedge funds during our sample period, which often use short sales to carry out long–short strategies, may be responsible for this relatively small amount of short sales in the Korean stock market.

It is notable to see that a major portion of short-selling is carried out by foreign investors rather than by domestic investors in the Korean stock market. While *relss* by individual and institutional domestic investors comprises 0.05% and 0.24%, respectively, that by foreign investors is 2.87%, which is roughly ten to sixty times larger. Out of a 29,565 average shorted shares, 25,984 shares are from short-selling by foreign investors. That is, about 88% of short-sold shares are from foreign investors, while only 5% and 7% are from individuals and institutional domestic investors, respectively. This shows that, in Korea, institutional traders with large short-selling bets tend to be foreign investors, while domestic institutions are minor players in short-

selling at best. Considering that foreign investors are institutional investors, this pattern may be consistent with Boehmer, Jones, and Zhang (2008), who find in the US market that about 75% of all short sales are executed by institutions, with less than 2% carried out by individual investors. Given this finding, I focus exclusively on short sales by foreign investors to draw meaningful conclusions about short-selling in Korean stock market.

$$relss_{i,t}^{F} = \frac{N\ of\ shorted\ share\ by\ foreign\ investors_{i,t}}{N\ of\ traded\ share_{i,t}} \tag{3.2}$$

Relative short-selling also shows time variation across different subperiods in our sample. I divide our sample period into two subperiods using short-selling ban period as cutoff. The average relative short-selling is 3.24% for the earlier subperiod (2006:01–2008:09), but smaller, 2.98%, in the later subperiod (2009:06–2010:05). This may be due to increased pessimism before and during the 2008 subprime mortgage crisis.

Panel A of Figure 2.1 shows short-selling activity relative to trading volume in the Korean stock market. During our sample period, *relss* by foreign investors, $relss^F$, is growing over time from 1.25% to 4.13% (except for short-selling ban period, the shaded area) and is much larger than that by domestic investor groups. The relative short-selling is at the highest, 6.33%, in August, 2008, possibly reflecting increased pessimism among investors before the 2008 subprime mortgage crisis. Panel B of Figure 2.1 shows that the dominance of short-selling by foreign investors over short-

selling by domestic investors is persistent over time in the Korean stock market. It shows that about 80–90% of shorted shares are coming from foreign investors consistently over time, except for the short-selling ban period. Figure 1 also may justify our exclusive focus on short sales by foreign investors.

To examine cross-sectional variations in short-selling, I report a short-selling statistic (*relss*) for different groups of stocks in Panel C of Table 2.3.[29] Based on market capitalization at the end of June of each year, I sort stocks into small, medium, and large stock groups, with the 33rd and 67th percentiles of all 761 stocks in the KOSPI market as cutoffs. I also group stocks based on book-to-market ratio (*B/M*), which is defined following Fama and French (1993). Like market cap, low and high *B/M* values are associated with the 33rd and 67th percentile of all KOSPI stocks, respectively. A stock is considered a low- or high-priced stock based on its closing price at the end of each day, again, using the 33% and 67% cutoffs. Lastly, I group stocks based on institutional ownership at the end of each year. No institutional ownership denotes stocks with zero institutional ownership, while high institutional ownership refers to stocks with institutional ownership above the median (I compute the median institutional ownership after excluding stocks with zero institutional ownership).

[29] The availability of put options may provide alternative trades to short-selling. However, we do not report relative short-selling by groups of stocks with or without put options in the table, since availability and activity in the trading of put options for individual stocks are very low in the Korean stock market. The average cumulative trading volume and trading value of put options are only 23.92 contracts and 3.7 million won (approximately US$3,400) in our sample period, respectively.

Panel C of Table 2.3 shows that all of shorted shares are large stocks with no shorted shares in small stock-tercile. Since a large portion of short-selling is executed by foreign investors, who prefer large stocks in foreign markets (Kang and Stulz, 1997), it is not surprising to see that average relative short-selling is mostly done for large stocks in the Korean market. This preference for large stocks in short-selling is also consistent with the previous literature (D'Avolio, 2002; Jones and Lamont, 2002; Diether, Lee, and Werner, 2009a). I find evidence of more short-selling for stocks with low book-to-market ratio than for those with high book-to-market ratio, as for the NYSE in Diether, Lee, and Werner (2009a). Consistent with Cohen, Diether, and Malloy (2007), where less short-selling is expected for low-priced stocks due to their high collateral costs, I see *relss* is 3.23% for high-priced stocks and 2.07% for low-priced stocks. Contrary to D'Avolio (2002), who shows that stocks with high institutional ownership are easier to be engaged in short-selling because of heightened willingness of lending stocks by institutions, I find that short-selling is more concentrated for stocks with no institutional ownership than for those with high institutional ownership in Korean stock market. I conjecture that under-developed short-selling infrastructure in Korea does not provide institutions with sufficient incentive to lend shares. More importantly, given that large portion of institutional ownership is de facto controlling shares in Korea, lack of institutional ownership may contribute to increased short-selling by increasing the number of floating shares available for trades. The next section investigates the short-selling trading behavior of foreign investors in a regression framework.

3.4 Are foreign short-sellers contrarian or momentum traders?

The key research questions in this section are whether foreign investors' short-selling strategies are based on short-run price trends and whether they could earn positive abnormal returns based on such a trading strategy. Brennan and Cao (1997) provide a theoretical model together with empirical evidence that foreign investors act as momentum traders due to their informational disadvantage compared to domestic investors. Grinblatt and Keloharju (2000) and Griffin, Nardari, and Stulz (2007) provide supporting evidence of this positive feedback trading of foreign investors. On the other hand, Diether, Lee, and Werner (2009a) provide evidence that short-sellers are contrarian traders in the US market. Since contrarian traders trade against past stock performance, while momentum traders trade following past stock returns, I regress the foreign investors' relative short-selling on past cumulative stock returns along with other control variables to find a specific trend-chasing pattern. The regression is performed with stock and day fixed effects, and standard errors are clustered by both stock and date (Thompson, 2011). If foreign short-sellers are contrarian (momentum) traders, *relss* by foreign investors, $relss^F$, may be significantly and positively (negatively) related to past cumulative stock returns.

According to Diether, Lee, and Werner (2009a), short-selling may arise from opportunistic risk-bearing motivation during periods of high uncertainty – i.e., periods with high intraday volatility. If high uncertainty comes from high level of asymmetric information, short-selling activity may coincide with wide spread (Kyle, 1985). On the

contrary, if high uncertainty comes from high level of differences of opinion, short-selling activity may coincide with low spread. Hence, I include in the regression intraday volatility, which is defined as the difference between daily highest price and lowest price, divided by the daily highest price, as well as daily proportional spread, which is defined as a bid-ask spread scaled by bid-ask midpoint, averaged across quotes for a given stock on that date.

It is possible that high past cumulative returns are actually caused by temporary buying pressures, hence following Diether, Lee, and Werner (2009a), I control buy-order imbalance in the regression. Focusing on buy-side price pressure, I specifically define positive buy-order imbalance, oib_t^+, as equal to oib_t if $oib_t > 0$, and zero otherwise, where oib_t is a stock's daily buy–order imbalance, computed as the daily price-setting buy volume minus the daily price-setting sell volume, divided by the daily trading volume. Similarly, $oib^+_{-5,-1}$ is defined as equal to $oib_{-5,-1}$ if $oib_{-5,-1} > 0$, and zero otherwise, where $oib_{-5,-1}$ is the average of oib_t from days t-5 to t-1.

Table 3.4 shows the results of the regression of daily foreign investors' relative short-selling, $relss^F$, on a stock's past cumulative returns, $r_{-5,-1}$, which is computed based on returns from days t-5 to t-1, for the full sample period as well as for the two subperiods, as denoted in the column headings. In the first specification, I include contemporaneous returns, r_t, in the regressions to control for positive return autocorrelation. I also include the past five days of relative short-selling by foreign investors, $relss^F_{-5,-1}$, and turnover, $tv_{-5,-1}$, which is computed as the sum of traded shares

for days t-5 to t-1 divided by the number of shares outstanding at the end of the previous year in the regressions because it is possible that each of short-selling and trading volume is positively autocorrelated. I see that the coefficient of past cumulative returns is 0.0155 with a t-value of 2.26, which is significant at the 5% level. This is evidence that foreign short-sellers are contrarian traders, a finding consistent with Diether, Lee, and Werner (2009a). The significant result for $r_{-5,-1}$ is, however, present only to the most recent subperiod; The coefficient of $r_{-5,-1}$ is 0.0279 with a t-value of 2.29 in 2009:06-2010:05, but are not statistically significant (t-value of 1.63) though positive in 2006:01-2008:09.

Contrarian trading behavior in short-selling may not necessarily be symmetric. That is, the short-selling strategy can be different when the trading is based on positive or negative past cumulative returns. To observe this nonlinearity in short-selling for winner/loser stocks, I define a dummy variable for losers (winners), Loser (Winner), that equals one if a stock is in the lowest (highest) quartile based on $r_{-5,-1}$, and zero otherwise.[30] We see that the contrarian short-selling strategy is present only for the winner dummy. The coefficient of the winner dummy variable is 0.2065, with a t-value of 2.20, while the coefficient of the loser dummy is not significant. Consistent with the results in the first specification, the coefficient of the winner dummy is significant in the more recent subperiod, while it is not in the earlier subperiod.

Previous research shows that order imbalance is significantly related to stock

[30] The results are similar when we define Winner/Loser based on either tercile or quintile.

returns through price pressure caused by the serial correlation of order imbalance (Chordia and Subrahmanyam, 2004). In our analysis, order imbalance may therefore be related to $r_{-5,-1}$. By including order imbalance into the regressions, I can also test whether foreign short-sellers act as liquidity providers in the Korean stock market. Foreign investors provide liquidity through short-selling when they bet on short-run price reversals, where the past days' positive returns are considered to be due to temporary buying pressure. In addition, because short-selling activity in the KOSPI market is under the uptick rule during our sample period, short-sellers may tend to act as passive liquidity providers (Diether, Lee, and Werner, 2009b). Consistent with Diether, Lee, and Werner (2009a), I find a positive and significant (at 1% level) coefficient of contemporaneous buy–order imbalance in the overall sample period as well as in two different subperiods. For the full sample period, oib_t^+ has a coefficient of 1.2667, which is highly significant with a *t*-value of 11.46. This finding implies the liquidity provision by foreign short-sellers in that they increase short-selling when the buying pressure is high.

Interestingly, we find that contemporaneous spread and volatility are all negative and significant, suggesting that foreign short-sellers increase short-selling when the liquidity is high (low spread) and the volatility is low. This result contrasts with Diether, Lee, and Werner (2009a), who find positive and significant results for both variables, implying that short-sellers are opportunistic risk bearers in periods of elevated uncertainty caused by information asymmetry. Our finding provides evidence of new aspect of foreign short-sellers' trading strategy in that foreign short-sellers are

not opportunistic risk bearers in Korean stock market.

Overall, our findings so far show that foreign short-sellers time their short-sale trades based on short-term price trends, provide evidence on liquidity-providing, but do not provide evidence in support of risk-bearing role of foreign short-sellers in the Korean stock market.

3.5 Are foreign short-sellers informed?

In the previous section, I have established that foreign short sellers are contrarian. In this section I investigate whether foreign investors' contrarian short-selling can predict the future returns. Table 2.5 shows the results of regressing t + 2 day returns on the relative short-selling by foreign investors on day t, $relss^F_t$, to see whether their short-selling predicts future stock returns.

In the first specification, I regress future returns on relative short-selling and past cumulative returns, including stock and day fixed effects. In the second specification, I add more control variables such as spread, order-imbalance, volatility and turnover. The coefficients of relative short-selling by foreign investors are not significant in any subperiod. The sign of $relss^F_t$ is negative but is not statistically significant. However, there is no reason to believe that returns and $relss^F_t$ are linearly related. Hence, in the third specification, I explore asymmetric and nonlinear relationship of relative short-selling with future returns. In doing so, I define dummy variables, $relss^F\_Low$ and $relss^F\_High$, based on $relss^F_t$; $relss^F\_Low$ ($relss^F\_High$) has a

value of one if a stock is in the lowest (highest) quartile based on $relss^F_t$. Similarly, I define a Winner (Loser) to have a value of one if a stock is in the highest (lowest) quartile based on $r_{-5,-1}$. The results in specification (3) show that large short-selling activity of foreign investors is a significant predictor of future returns in the overall sample period and in the earlier subperiod, implying that foreign investors' heavy short-selling activities are based on information. I conjecture that the insignificant coefficient on $relss^F\_High$ in the later subperiod may come from the possibility that short-selling after the subprime mortgage crisis might be more engaged in index arbitrage rather than information-based trading. The predictability of short-selling trades by foreign investors is consistent with the US market findings of Diether, Lee, and Werner (2009a).

Profitability based on this nonlinear relationship between $relss^F_t$ and future returns is also confirmed in Table 3.6, in which I investigate whether foreign investors can materialize abnormal profits based on their contrarian short-selling strategy. On day *t*, based on $relss^F$ on a previous day, I divide the sample into three groups: small, medium, and large $relss^F$ groups. Then, I compute the daily returns of each equally weighted portfolio for days $t + 2$, $t + 3$, $t + 4$, and $t + 5$ (I skip a day to avoid bid–ask bounce). Abnormal returns are computed from characteristic-adjusted returns using 25 value-weighted size–*B/M* portfolios as in Fama and French (1993). Although I report the results based on equally-weighted portfolios, but the results are qualitatively similar in the case of a market value-weighted portfolio. Table 3.6 shows the results over full sample period and the subperiods before and after the short-selling ban in different

panels.

The column ‘Small-Large’ shows abnormal returns from long–short portfolios formed by taking a long position on portfolios with small short-selling and by simultaneously taking a short position on portfolios with large short-selling. I see that in the full period the long-short portfolio generates a significant abnormal return of 0.127 and 0.076 (*t*-value of 4.05 and 2.47) at day $t + 2$ and $t + 3$, respectively. Moreover, the numbers in the full sample period at day $t + 2$ and $t + 3$ are monotonically distributed across short-selling portfolios. Profitability of long-short portfolio is also persistent in different subperiods. Contrasting the previous research that shows informational disadvantage of foreign investors relative to domestic investors (Dvorak, 2005; Choe, Kho, and Stulz, 2005), our findings in this section provide new, supporting evidence through foreign investors’ short-selling of their informational advantage in overseas markets.

3.6 Does foreign short-selling destabilize the stock price and liquidity?

It is widely accepted among stock market participants in emerging market countries, though rarely supported in academic literature, that foreign investors could destabilize the stock market through a swift repackaging of their large portfolios across borders. However, it might be paradoxical to see that many countries have actually tried to reduce the restriction on cross-border capital flows, largely to exploit the benefit of the abundance of liquidity provided by foreign capital. If cross-border investment flows

are to blame, it might be more so for short-selling. This section investigates the effect of foreign investors' short-selling on stock volatility and liquidity and provides new evidence on the argument on destabilization through short-selling activity.

I regress daily volatility of the stock returns on days $t + 1$ and $t + 2$, σ_{t+1} and σ_{t+2}, respectively, on a short sale by foreign investors on day t. The variable σ_t is computed as the daily highest price minus the lowest price, scaled by the highest price on day t. If short-selling trades by foreign investors destabilize stock prices, short-selling on day t should be positively and significantly related to future volatility. Table 3.7 shows, however, that this is not the case. The variable $relss^F_t$ is not significant in any specification or in any subperiod in the table. The coefficient of relative short-selling is sometimes even negative, though insignificant. The result is consistent with Choe, Kho, and Stulz (1999), who show that the destabilizing role of foreign investors is not supported in the Korean stock market.

Table 2.8 revisits the issue of liquidity-providing role of foreign short-sellers. Recall that, in Table 2.4, we find evidence of liquidity providing role of foreign short sellers in that foreign investors increase short-selling when the buy-order imbalance is high. Then, the remaining issue will be whether such an increase in short-selling actually relieves liquidity constraint of a given stock. In Table 8, I examine the effect of foreign short-selling on stock liquidity, proxied by bid-ask spread. I regress the proportional spread on days $t + 1$ and $t + 2$ on foreign investors' short-selling on day t with other control variables. To control for serial correlation of dependent variables, I

include own lagged variables in the regressions in both panels.

If short-selling by foreign investors provides liquidity, then I should be able to observe significant and negative coefficients for $relss^F_t$ on future stock spreads. However, Table 2.8 shows that the coefficient of $relss^F_t$ is not significant. This is not surprising given small amount of short-selling in Korean stock market shown in Table 2.3. That is, though foreign short-sellers increase their short-selling when buy-order imbalance is high (Table 2.4), the amount of short-selling seems not sufficient to fully resolve buying pressure of a given stock or to increase liquidity.

3.7 Robustness

So far, our analyses are based on fifty sample stocks with most active short-selling in Korean stock market during the sample period. Specifically, we calculate average daily *relss* over the sample period and select fifty stocks with the highest average relative short-selling value. However, it is possible that screening based on average *relss* over the sample period may drop some stocks whose short-selling is concentrated on a certain period. To cope with potential issues arising from this sampling bias, I perform all analyses based on extended sample. That is, instead of selecting fifty stocks with high average short-selling record over the sample period, I construct sample year-by-year. Specifically, I select fifty stocks with high short-selling activity each year based on average daily *relss* in a given year. As a result, I could double the sample size – I now have a total of 104 stocks in our extended sample. Average relative short-selling in

our extended sample is 3.46%, slightly above 3.16% based on our current sample based on fifty stocks. Foreign investors' average $relss^F$ increases to 3.11% in the extended sample from 2.87% in our current sample, while average *relss*'s for individuals and domestic institutions in the extended sample, which are 0.06% and 0.29%, respectively, are similar to the numbers shown in Table 2.3. Similar to the case of our current sample, I see the highest *relss* in 2008 and 2010, 5.08% and 4.21%, respectively, which may be due to increased pessimism before and during the 2008 subprime mortgage crisis and 2010 European sovereign debt crisis. All other empirical results based on this extended sample are similar to those based on our current sample.

3.8 Conclusion

This paper investigates the daily short-selling activities of foreign investors in the Korean stock market from January 1, 2006, to May 31, 2010. Our research questions are extensive, covering the average amount of short-selling by different investor types, their short-selling strategy, its informedness, the role of liquidity provision, and the potential destabilizing effect of short-selling by foreign investors in the Korean stock market. I find that about 88% of short-selling, in terms of short-selling volume, are performed by foreign investors, while short-selling by domestic investors, both individuals and institutional, comprise only a negligible portion of the total amount of short-selling. In extensive empirical tests on the trading behavior of foreign investors through short-selling, I find that foreign investors use a contrarian trading strategy and

such a (negative) trend-chasing short-selling strategy is generally significantly related to short-run return predictability in nonlinear fashion. This informational advantage of foreign short-selling activity is also shown by the profitability of long-short portfolios formed based on daily relative short-selling by foreigners. In terms of liquidity provision, I find that foreign short-sellers increase their short-selling when there is a contemporaneous buying pressure for a given stock. However, it seems that such short-selling by foreign investors are not sufficient to fully resolve the buying pressure. Furthermore, I find that foreign investors' short-selling is not significantly related to future return volatility, providing evidence against the alleged destabilizing role of trading by foreign investors in emerging markets.

The findings in this paper help understand broad aspects of foreign investors' trading behavior and its impact on stock prices in an emerging market through short-selling. The overall findings show that foreign short-sellers are not to blame in the Korean stock market.

IV. Conclusion

This thesis investigates the short selling activity in Korean stock market. Specially, I examine the short selling activity at the account and daily levels of individual investors and foreign investors, respectively. The first paper, which related to individual's short selling activity, investigates the profitability of short selling and the strategies of domestic individual short sellers. I find that individual short sellers make profit on average, even accounting for a reasonable transaction costs. Also, individual short sellers tend to hold short-lived short position and on average they covered short selling position within one week (i.e. five days). The short sale profits increase as the number of days to cover short positions decrease. I also find profitable trades tend to have fewer days to cover, higher past returns, higher volatility, smaller size, and a lower book to market than non-profitable trades, which suggests individual investors are contrarians (i.e., selling short when the past return is high and covering when the price is low).

In account level analysis, trading more companies earns higher profits tan trading fewer companies, suggesting that short sellers who skilled in trading earn high profit than non-skilled traders. Finally, short sellers persistently earn positive abnormal return in both regression and portfolio approaches. These results suggest that at least some individual short sellers possess superior information about firm fundamental values.

It is possible that the inverse relationship between short selling profit and the number of days to short cover (*DTC*) represent to individual investors loss aversion. However, in this paper I focus on the profitability of short selling and the strategies of domestic individual short sellers. Therefore, the issue related to disposition effect of individual short seller remains to further research.

The second paper investigates the daily short-selling by foreign investors and their impact on stock price, liquidity and volatility in Korean stock market. This issue arises from whether foreign short-sellers are destabilized emerging stock market. Since short-sellers usually regard as mainly responsible for price decline especially in financial crisis period. Therefore combined these two issues, I examine whether foreign investors destabilized stock markets via their short-selling activity. I find that the majority of short-selling is performed by foreign investors and foreign short-sellers are contrarians whose large short-selling predicts short-run future return. I also find that foreign investors' short-selling is performed when buying pressure is high, but does not improve stock liquidity. Furthermore, I find that foreign investors' short-selling does not increase volatility, providing evidence against the foreign investors' destabilizing role in emerging market.

As first paper of this thesis, short-sellers are covered their short-position very quickly, so it is interesting to examine the intraday behavior of foreign short-sellers. Due to data limitation, I cannot observe short-covering of foreign short-sellers, but I

can examine shorting transaction using high frequency data. This issue will investigated in the further research.

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Table 2.1. Summary statistics of sample stocks versus out-of-sample stocks

This table reports summary statistics for the characteristics of sample stocks and out-of-sample stocks. Size (in millions of won) is market capitalization measured at the end of June each year for each stock; B/M is the book to market ratio measured as book equity divided by market equity at the end of the previous year; volatility is measured as the difference between the highest and lowest daily prices scaled by the highest price; spread is the daily proportional spread for day *t*, defined as the sum of the quoted intraday bid–ask spreads, scaled by the number of bid–ask spreads quoted on day *t*; *tv* (%) is turnover, defined as the daily trading volume divided by outstanding shares; and price (in won) is the daily closing price. The sample period is from August 1, 2007, to May 31, 2010.

Year	Size		B/M		Volatility		Spread		*tv*		Price		# of firms	
	Sample	Out-of-sample	Sample	Out-of-sample	Sample	Out-of-sample	Sample	Out-of-sample	Sample	Out-of-sample	Sample	Out-of-sample	Sample	Out-of-sample
2007	2,343.67	165.17	1.020	1.411	0.050	0.051	0.608	1.455	1.374	1.069	51,342.28	44,334.51	269	363
2008	2,305.08	145.86	0.796	1.128	0.054	0.055	0.710	2.076	1.136	0.888	40,148.16	33,378.30	281	362
2009	1,891.26	128.46	1.622	2.156	0.046	0.047	0.515	1.594	1.514	1.219	36,110.12	29,863.62	290	357
2010	2,368.86	168.24	1.000	1.554	0.036	0.042	0.472	1.263	1.243	1.196	41,057.46	33,129.01	291	356

Table 2.2. Summary statistics of daily short selling activity

This table reports summary statistics of the short selling activity of sample firms. In this table, the average number of trading days is the average number of short trading days for a stock, the average number of accounts is the average number of short selling accounts for a stock, the daily average number of trades is the daily average number of trades for a stock, the daily average shorted shares are the daily average number of shorted shares for a stock, and the daily average short value is the daily average short value for a stock, defined as the shorting price times the number of shorted shares (in millions of won). The sample consists of 299 stocks and the sample period is from August 1, 2007, to May 31, 2010 (excluding the short selling ban period from October 1, 2008, to May, 31, 2009).

	Mean	Min	Median	Max	St. dev.
		2007:08–2010:05			
Avg. number of trading days	117.57	1.00	76.00	485.00	123.88
Avg. number of accounts	246.12	1	98	2,667	371.47
Daily avg. number of trades	6.04	1.00	4.57	50.01	5.45
Daily avg. shorted shares	2,578.50	6.40	870.00	56,866.67	6,200.86
Daily avg. short value	28.86	0.01	14.21	383.94	43.25
Total number of stocks	299				
		2007:08–2008:09			
Avg. number of trading days	61.50	1.00	35.50	253.00	64.01
Avg. number of accounts	104.95	1	36	673	143.76
Daily avg. number of trades	4.81	1.00	3.83	26.75	3.69
Daily avg. shorted shares	2,450.69	10.00	721.25	79,143.96	7,803.95
Daily avg. short value	22.96	0.03	13.53	171.90	26.14
Total number of stocks	200				
		2009:06–2010:05			
Avg. number of trading days	85.27	1.00	69.00	247.00	72.39
Avg. number of accounts	203.3	1	98	2,209	287.422
Daily avg. number of trades	6.83	1.00	4.67	50.01	6.91
Daily avg. shorted shares	2,306.21	6.40	860.72	31,450.67	4,737.60
Daily avg. short value	34.78	0.01	14.62	478.30	58.90
Total number of stocks	268				

Table 2.3. Distribution of sample firms' short selling activity

This table shows the short selling distribution of the sample firms. I first calculate the proportion of short selling activity, defined as the sum of daily shares shorted by stocks on day *t* as a fraction of the sum of daily shorted shares the same day. Then I calculate the mean, minimum, median, and maximum values by stock. I divide the stocks into 12 groups based on mean proportion. Average trading days is the average number of trading days for stocks that correspond to each group. The sample consists of 299 stocks and the sample period is from August 1, 2007, to May 31, 2010 (excluding the short selling ban period from October 1, 2008, to May 31, 2009).

Short selling relative to total short selling	Mean	Min	Median	Max	# of firms	Avg. trading days
			2007:08–2010:05			
Proportion≤1%	0.35	0.13	0.01	4.85	213	106.37
1%< proportion≤2%	1.41	0.54	0.04	18.00	39	156.49
2%< proportion≤3%	2.43	0.79	0.01	28.11	19	145.79
3%< proportion≤4%	3.60	1.11	0.02	35.89	8	98.13
4%< proportion≤5%	4.33	1.93	0.19	50.70	4	171.75
5%< proportion≤6%	5.41	2.53	0.00	43.13	3	189.33
6%< proportion≤7%	6.35	2.91	0.01	46.19	1	147.00
7%< proportion≤8%	7.11	2.48	0.00	69.94	1	76.00
8%< proportion≤9%	8.15	4.20	0.01	58.99	2	283.00
9%< proportion≤10%	9.49	7.64	4.71	26.91	2	90.50
10%< proportion≤20%	11.64	7.28	1.27	48.63	6	61.83
Proportion >20%	22.84	6.20	0.00	93.18	1	243.00
			2007:08–2008:09			
Proportion≤1%	0.41	0.18	0.03	3.50	132	48.66
1%< proportion≤2%	1.54	0.65	0.01	17.40	29	91.31
2%< proportion≤3%	2.44	1.11	0.01	16.95	13	54.38
3%< proportion≤4%	3.45	1.00	0.16	33.68	8	86.75
4%< proportion≤5%	4.34	1.93	0.25	32.67	3	123.00
5%< proportion≤6%	5.49	1.63	0.00	54.16	4	143.50
6%< proportion≤7%	6.40	1.87	0.01	51.05	2	146.00
7%< proportion≤8%	7.06	2.91	0.00	63.30	1	231.00
8%< proportion≤9%	8.27	3.94	0.17	55.14	2	52.50
9%< proportion≤10%	9.39	6.50	0.14	32.37	1	34.00
10%< proportion≤20%	12.04	9.31	2.02	32.46	4	22.25
Proportion >20%	39.77	40.30	0.09	93.18	1	134.00
			2009:06–2010:05			
Proportion≤1%	0.31	0.11	0.01	3.88	208	83.36
1%< proportion≤2%	1.39	0.62	0.05	12.92	33	96.76
2%< proportion≤3%	2.38	0.68	0.01	24.29	9	74.33
3%< proportion≤4%	3.19	2.83	0.14	8.14	1	8.00
4%< proportion≤5%	4.21	2.07	0.10	26.94	4	50.75
5%< proportion≤6%	5.36	1.59	0.00	49.16	3	116.67
6%< proportion≤7%	6.31	3.87	0.02	35.46	2	164.00
7%< proportion≤8%	7.57	3.07	0.00	69.94	1	37.00
8%< proportion≤9%	8.36	2.83	0.01	54.69	1	87.00
9%< proportion≤10%	9.50	7.51	3.21	34.54	3	131.00

10%< proportion≤20%	11.03	5.18	0.01	62.97	3	82.33
Proportion >20%	0.00	0.00	0.00	0.00	0.00	0.00

Table 2.4. Summary statistics by characteristic

This table shows summary statistics by firm characteristic. Size is market capitalization at the end of June in year *t*, in millions of won; *B/M* is the book to market ratio, measured as book equity divided by market equity at the end of the previous year; volatility is measured as the difference between the daily highest and lowest prices, scaled by the highest price; spread (%) is the daily proportional spread on day *t*, defined as the sum of the quoted intraday bid–ask spreads, scaled by the number of bid–ask spread quoted on day *t; tv* (%) is turnover, defined as daily trading volume divided by outstanding shares; and price (in won) is the daily closing price. The small, 2, and large (Low, 2, and High, Narrow, 2, Wide) groups are determined by the 33rd and 67th percentile of all 682 stocks listed in the KOSPI market. The mean value is the average value corresponding to each variable; total trades is the total number of trades over the sample period; shorted shares are the pooled average of the daily number of shorted shares; the short value is the pooled average of the daily short value (millions of won); *profit* (thousands of won) is the pooled average of daily profit, defined as the short value minus the cover value; *net profit* (thousands of won) is the pooled average of daily profit after accounting for transaction costs; *net profit/DTC* is the pooled average of daily net profit per day, *DTC* is days to cover, which is the average number of days to cover for short sales; and *rel profit* (%) is relative profit, defined as net profit scaled by the short value. The sample period is from August 1, 2007, to May 31, 2010 (excluding the short selling ban period from October 1, 2008, to May 31, 2009).

	Mean value	Total trades	Shorted shares	Short value	Profit	Net profit	Net profit /*DTC*	Rel profit	*DTC*
				Size					
Small	45.43	8,215	14,825.87	33.20	417.66	351.68	375.71	1.785	4.50
2	137.27	29,223	5,692.94	19.29	320.50	282.25	209.80	0.800	4.64
Large	6,482.63	286,198	1,864.31	60.47	67.57	-53.31	148.59	0.113	5.33
				B/M					
Low	0.51	204,691	2,022.32	60.21	113.96	-6.35	171.15	0.245	5.26
2	1.25	95,523	3,852.24	50.13	93.24	-6.92	152.91	0.217	5.12
High	2.44	23,422	2,424.15	34.31	78.20	9.65	109.74	0.147	5.43
				Volatility					
Low	3.52	59,868	1,095.43	38.54	-7.19	-84.28	58.87	0.017	5.70
2	4.11	117,930	1,889.31	52.40	-36.06	-140.89	91.68	0.149	5.39
High	5.41	147,769	4,398.41	69.65	335.25	196.29	311.14	0.453	4.69
				Spread					
Narrow	0.27	289,294	2,489.96	57.56	98.73	-16.30	160.36	0.171	5.17
2	0.51	35,601	3,023.71	41.09	109.32	27.25	160.01	0.488	5.51
Wide	0.83	673	2,436.26	9.57	434.46	415.76	120.97	1.557	5.97
				tv					
Low	0.28	4,226	484.95	16.30	121.28	88.81	50.03	0.757	5.70
2	0.62	74,428	711.01	33.21	-28.89	-95.34	65.36	0.063	5.65
High	2.37	247,971	3,725.68	69.50	180.31	41.48	223.77	0.287	4.96
				Price					
Low	2,813.22	32,357	14,553.30	33.64	503.64	436.86	350.84	0.973	4.37
2	12,478.93	52,364	2,237.40	28.88	64.13	6.43	88.38	0.251	5.49
High	99,504.47	241,904	1,117.75	67.52	67.70	-67.27	165.33	0.114	5.24

Table 2.5. Correlations of profit variables

This table shows the correlation between profit variables. The variable *STR*, as a percentage, is the average of short trade returns, defined in Eq. (2.5); *AbSTR*, as a percentage, is the short trade return in excess of the market return (see Eq. (2.6)), *Rel profit*, as a percentage, is relative profit, defined as net profit scaled by the short value; *profit* (thousands of won) is the pooled average of daily profit, defined as the short value minus the cover value; *net profit* (thousands of won) is the pooled average of daily profit after accounting for transaction costs; *net profit/DTC* is net profit per day; *DTC* is days to cover, which is the average number of short covering days for a short selling trade; the short value is the number of shorted share times the short price for short selling accounts (millions of won); and shorted shares are the average number of shorted shares for short selling accounts. The sample consists of 299 stocks with 326,625 trades and the sample period is from August 1, 2007 to May 31, 2010. The short selling ban period (from October 1, 2008, to May 31, 2009) was excluded. The *p*-values are in parentheses.

	STR	AbSTR	Rel profit	Profit	Net profit	Net profit /*DTC*	Short value	Shorted shares
AbSTR	0.971							
	(0.000)							
Rel profit	0.043	0.038						
	(0.000)	(0.000)						
Profit	0.020	0.018	0.322					
	(0.000)	(0.000)	(0.000)					
Net profit	0.020	0.018	0.322	0.999				
	(0.000)	(0.000)	(0.000)	(0.000)				
Net profit/*DTC*	0.042	0.038	0.170	0.554	0.550			
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
Short value	0.005	0.006	-0.007	0.003	-0.035	0.088		
	(0.084)	(0.000)	(0.000)	(0.087)	(0.000)	(0.000)		
Shorted shares	0.008	0.008	0.012	0.031	0.017	0.077	0.372	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
DTC	-0.021	-0.020	-0.267	-0.087	-0.086	-0.028	-0.036	-0.025
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Table 2.6. Summary statistics of short selling account data

This table shows summary statistics of short selling based on the short selling accounts of individual investors. Panel A shows summary statistics of short selling profits, where *profit* (thousands of won) is the pooled average of daily profit, defined as the short value minus the cover value; *net profit* (thousands of won) is the pooled average of daily profit after accounting for transaction costs; *net profit/DTC* is the pooled average of daily net profit per day, *DTC* is days to cover, which is the average number of days to cover for short sales; *rel profit*, as a percentage, is relative profit, defined as net profit scaled by the short value; *STR*, as a percentage, is the average of short trade returns, defined in Eq. (2.5); and *AbSTR*, as a percentage, is the short trade return in excess of the market return (see Eq. (2.6)). Panel B shows the price-weighted results using the previous month's end closing price as the weighting factor. Panel C reports the characteristics of short selling accounts. Shorted shares are the average number of shorted shares for short selling accounts. The short value is the number of shorted share times the short price for short selling accounts (millions of won). All the variables in this table are first computed as a pooled average of all the variables for each account and then the average of these variables is computed across short selling accounts. The sample consists of 299 stocks with 11,841 accounts and the sample period is from August 1, 2007 to May 31, 2010. The short selling ban period (from October 1, 2008, to May 31, 2009) was excluded. The numbers in parentheses are the *p*-value for mean test and the median rank sign test. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Profit		Net profit		Net profit/*DTC*		Rel profit (%)		STR (%)		AbSTR (%)	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Panel A: Simple average of profits												
2007:08–2010:05	-18.64**	2.63***	-35.47***	0.58	12.66***	2.22***	-0.315***	0.088	0.337***	0.117***	0.376***	0.101***
	(0.044)	(0.000)	(0.000)	(0.640)	(0.000)	(0.000)	(0.000)	(0.635)	(0.000)	(0.000)	(0.000)	(0.000)
2007:08–2008:09	-9.06	8.25***	-26.72	4.86***	16.51***	3.95***	0.011	0.379***	0.384***	0.134***	0.375***	0.105***
	(0.609)	(0.000)	(0.133)	(0.000)	(0.000)	(0.000)	(0.880)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
2009:06–2010:05	-20.66**	1.50***	-37.25***	-0.23***	12.41***	1.85***	-0.439***	0.008***	0.353***	0.115***	0.416***	0.104***
	(0.030)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Panel B: Price-weighted average of profits												
2007:08–2010:05	-14.44	3.21***	-32.37***	0.81*	11.98***	2.16***	-0.319***	0.106	0.330***	0.110***	0.381***	0.096***
	(0.131)	(0.000)	(0.001)	(0.086)	(0.000)	(0.000)	(0.000)	(0.219)	(0.000)	(0.000)	(0.000)	(0.000)
2007:08–2008:09	-6.20	9.01***	-24.92	5.54***	15.07***	4.01***	-0.024	0.398***	0.354***	0.124***	0.353***	0.096***
	(0.738)	(0.000)	(0.180)	(0.000)	(0.002)	(0.000)	(0.751)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
2009:06–2010:05	-16.49*	2.10***	-34.09***	0.08**	12.08***	1.74***	-0.427***	0.042**	0.359***	0.106***	0.437***	0.096***
	(0.093)	(0.000)	(0.001)	(0.025)	(0.000)	(0.000)	(0.000)	(0.015)	(0.000)	(0.000)	(0.000)	(0.000)

Panel C: Summary statistic of accounts					
Shorted shares	Short value	*DTC*	Trade	Firms	# of accounts

	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
2007:08–2010:05	339.42	90.23	8.41	3.18	4.91	2.00	27.58	6.00	6.21	3.00	11,841
2007:08–2008:09	377.88	81.32	8.82	3.54	4.69	2.00	20.44	5.00	4.67	2.00	4,497
2009:06–2010:05	324.41	94.14	8.28	3.02	5.03	2.00	27.05	7.00	6.30	3.00	8,676

Table 2.7. Short selling profits by trade and account characteristics

This table reports the trade level (Panel A) and account level (Panel B) characteristics for quintiles formed based on trade and account levels *STR* values. In Panel A, *STR*, as a percentage, is the pooled average return of short trades, defined in Eq. (2.5); *profit* (thousands of won) is the pooled average of daily profit, defined as the short value minus the cover value; *net profit* (thousands of won) is the pooled average of daily profit after accounting for transaction costs; *net profit/DTC* is the pooled average of daily net profit per day, *DTC* is days to cover, which is the average number of days to cover for short sales; *rel profit*, as a percentage, is relative profit, defined as net profit scaled by the short value; shorted shares are the number of shorted shares for short trade; and the short value is the number of shorted shares times the shorted price (millions of won). The variables in Panel A are pooled averages across stocks and account for each *STR* group. In Panel B, the variables *STR*, *profit*, *net profit*, *net profit/DTC*, *rel profit*, shorted shares, short amounts, and *DTC* are first computed as the pooled average of these variables for each account and then the averages are computed across short selling accounts. The sample consists of 299 stocks with 326,625 trades and 11,841 accounts. The sample period is from August 1, 2007, to May 31, 2010. The short selling ban period (from October 1, 2008, to May 1, 2009) was excluded.

	2007:08–2010:05					2007:08–2008:09					2009:06–2010:05				
	Panel A: Trade-based characteristics														
	Low STR	2	3	4	High STR	Low STR	2	3	4	High STR	Low STR	2	3	4	High STR
STR (%)	-2.001	-0.045	0.104	0.412	4.390	-1.520	-0.038	0.122	0.421	3.663	-2.189	-0.047	0.097	0.408	4.674
Profit	-277.14	-165.87	147.77	186.45	165.38	-287.14	-102.87	184.61	205.50	199.46	-274.25	-189.37	133.77	177.99	152.42
Net profit	-291.09	-176.55	137.65	175.40	151.86	-300.49	-112.71	175.08	195.24	186.22	-288.46	-200.32	123.45	166.59	138.79
Net profit/*DTC*	-147.79	-17.96	24.84	87.96	140.63	-152.95	-14.42	29.18	89.35	160.93	-145.88	-19.15	22.99	87.57	132.59
Rel profit (%)	-5.178	-3.784	3.220	3.603	2.744	-5.021	-2.141	3.754	3.828	2.978	-5.269	-4.377	3.008	3.496	2.653
Shorted shares	301.91	186.68	189.28	260.12	444.96	323.41	198.20	202.94	296.32	515.57	293.00	180.90	188.19	243.34	417.39
Short value	6.84	5.25	5.14	5.62	6.84	6.53	4.87	4.86	5.23	6.72	6.96	5.38	5.23	5.79	6.89
DTC	2.49	13.06	6.96	1.86	0.36	2.07	10.13	6.49	1.87	0.42	2.69	14.08	7.25	1.85	0.34
	Panel B: Account-based characteristics														
	Low AccSTR	2	3	4	High AccSTR	Low AccSTR	2	3	4	High AccSTR	Low AccSTR	2	3	4	High AccSTR
STR (%)	-1.361	-0.052	0.121	0.403	2.574	-1.264	-0.045	0.137	0.415	2.682	-1.434	-0.049	0.119	0.405	2.727
Profit	-238.64	-233.12	109.22	160.07	109.38	-352.18	-215.35	178.47	188.56	155.38	-183.93	-254.89	87.18	144.50	103.94
Net profit	-254.90	-250.98	92.96	144.38	91.30	-369.46	-234.80	161.87	172.57	136.41	-199.72	-272.59	71.03	129.31	85.82
Net profit/*DTC*	-114.81	-29.12	32.49	74.79	100.00	-147.30	-29.30	45.67	84.36	129.24	-100.97	-29.44	29.32	70.30	92.92
Rel profit (%)	-2.568	-2.858	1.055	1.582	1.216	-3.166	-2.383	1.917	2.145	1.545	-2.391	-3.079	0.803	1.373	1.099
Shorted shares	304.17	270.73	259.64	299.44	563.13	366.09	321.99	237.34	297.65	666.52	278.97	253.93	271.41	311.40	506.37
Short value	8.01	8.81	8.19	7.92	9.10	8.47	9.62	8.39	8.09	9.56	7.80	8.72	8.12	7.66	9.11
DTC	2.03	9.97	7.21	3.82	1.52	2.11	9.84	6.70	3.53	1.27	2.06	10.38	7.38	3.83	1.53

Table 2.8. Characteristics of short selling trades by number of days to cover (*DTC*)

This table shows the characteristics of short selling trades by number of days to cover (*DTC*). Days to cover (*DTC*) are the average number of short covering days for a short selling trade. I formed groups based on each trade's *DTC* as shown in this table. The variable *STR*, as a percentage, is the average of short trade returns, defined in Eq. (2.5); *AbSTR*, as a percentage, is the short trade return in excess of the market return (see Eq. (2.6)); *profit* (thousands of won) is the dollar profit of the short trade, defined as the difference between the short selling value and the short covered value; *net profit* (thousands of won) is the short selling profit after accounting for transaction costs; *net profit/DTC* is the net profit per day; *rel profit*, as a percentage, is relative profit, defined as net profit scaled by the short value; covered shares are the number of covered shares for the short selling trade; the covered amount is covered shares times the covered price (in millions of won); $r_{-5,-1}$ is the average daily return from days t - 5 to t - 1; volatility is intraday volatility, computed as in Eq. (2.7); spread (%) is the proportional spread, which is defined as in Eq. (2.8); *tv* (%) is share turnover, computed as the total number of traded shares divided by outstanding shares; and trade is the total number of short selling trades. I compute the pooled average of variables in this table across stocks and accounts by *DTC* groups. The numbers in brackets are the percentages of trades for each *DTC* group. The last row shows the difference *t*-statistics of the two groups, with fewer than five *DTC* and over 20, respectively. The sample consists of 299 stocks with 326,625 trades. The sample period is from August 1, 2007, to May 31, 2010 and the short selling ban period (from October 31, 2008, to May 31, 2009) was excluded.

	STR	AbSTR	Rel profit	Profit	Net profit	Net profit /*DTC*	Covered shares	Covered value	$r_{-5,-1}$	Volatility	Spread	*tv*	Trade	
2007:08–2010:05														
0≤*DTC*≤5	0.738	0.728	0.669	40.49	27.93	23.71	300.50	6.26	0.596	0.056	0.272	3.89	252,203	[77.21]
DTC=0	1.570	1.586	0.664	50.45	35.48	35.48	422.32	7.46	0.531	0.066	0.268	5.86	99,227	[30.38]
DTC=1	0.346	0.298	0.638	32.00	20.04	23.02	247.20	5.97	0.705	0.051	0.270	2.93	69,046	[21.14]
DTC=2	0.106	0.095	0.738	40.30	29.84	15.56	211.73	5.21	0.635	0.048	0.274	2.31	34,443	[10.55]
DTC=3	0.064	0.050	0.613	42.40	32.84	10.93	186.31	4.76	0.608	0.049	0.274	2.37	22,948	[7.03]
DTC=4	0.059	0.052	0.729	31.50	21.10	4.95	200.51	5.19	0.528	0.048	0.281	2.42	15,306	[4.69]
DTC=5	0.049	0.042	0.725	13.52	3.18	0.59	193.66	5.16	0.438	0.047	0.282	2.27	11,233	[3.44]
5<*DTC*≤10	0.029	0.027	0.517	10.40	0.62	0.20	186.31	4.89	0.005	0.047	0.275	2.11	30,565	[9.36]
10<*DTC*≤15	0.004	0.006	-0.613	-33.91	-43.50	-3.48	196.41	4.81	-0.141	0.048	0.273	2.14	13,905	[4.26]
15<*DTC*≤20	-0.002	-0.001	-1.137	-86.04	-95.44	-5.37	201.42	4.75	-0.251	0.049	0.284	2.03	8,549	[2.62]
DTC>20	-0.014	-0.006	-5.921	-262.86	-271.97	-7.63	205.89	4.69	-0.024	0.046	0.280	2.23	21,403	[6.55]
Diff. *t*-value (0≤*DTC*≤5 -*DTC*>20)	24.22	22.90	62.85	19.85	19.50	31.76	11.87	14.07	62.47	54.83	-8.63	43.55		
2007:08–2008:09														
0≤*DTC*≤5	0.660	0.590	0.672	46.35	34.79	27.77	330.83	5.75	0.248	0.055	0.262	2.22	72,973	[79.38]

DTC=0	1.420	1.361	0.633	44.39	30.40	30.40	484.79	6.97	-0.045	0.064	0.264	3.54	27,091	[29.47]
DTC=1	0.381	0.246	0.591	44.65	33.57	38.38	274.18	5.52	0.334	0.051	0.257	1.63	20,302	[22.08]
DTC=2	0.099	0.064	0.723	56.71	47.50	23.60	216.22	4.58	0.516	0.049	0.261	1.39	10,780	[11.73]
DTC=3	0.071	0.038	0.742	73.14	64.50	21.72	205.17	4.28	0.492	0.050	0.267	1.27	7,216	[7.85]
DTC=4	0.064	0.035	0.980	27.68	17.07	3.79	211.10	5.29	0.473	0.049	0.265	1.19	4,269	[4.64]
DTC=5	0.043	0.019	0.783	4.80	-4.99	-1.16	220.06	4.89	0.414	0.048	0.263	1.13	3,315	[3.61]
5<*DTC*≤10	0.039	0.020	0.973	35.85	25.87	3.04	219.14	4.97	0.024	0.049	0.259	1.27	8,680	[9.44]
10<*DTC*≤15	0.019	0.009	0.431	50.31	40.21	3.39	214.34	5.02	-0.209	0.050	0.254	1.04	3,819	[4.15]
15<*DTC*≤20	0.020	0.007	1.523	53.44	42.94	2.62	184.84	5.23	-0.365	0.050	0.273	1.12	2,387	[2.60]
DTC>20	0.008	-0.001	-0.076	-84.55	-94.44	-2.75	232.07	4.99	-0.422	0.049	0.251	1.00	4,070	[4.43]
Diff. *t*-value														
(0≤*DTC*≤5 -*DTC*>20)	36.67	32.76	3.39	3.79	3.73	14.46	3.52	3.75	30.65	16.79	4.50	41.36		
						2009:06–2010:05								
0≤*DTC*≤5	0.770	0.785	0.667	38.10	25.14	22.05	288.15	6.46	0.737	0.056	0.276	4.564	179,230	[76.37]
DTC=0	1.626	1.671	0.676	52.73	37.39	37.39	398.87	7.64	0.747	0.067	0.270	6.729	72,136	[30.74]
DTC=1	0.331	0.320	0.657	26.73	14.40	16.62	235.96	6.15	0.860	0.051	0.276	3.471	48,744	[20.77]
DTC=2	0.109	0.109	0.745	32.83	21.79	11.89	209.69	5.50	0.689	0.048	0.280	2.725	23,663	[10.08]
DTC=3	0.060	0.056	0.553	28.31	18.32	5.99	177.65	4.98	0.662	0.048	0.278	2.874	15,732	[6.70]
DTC=4	0.057	0.059	0.631	32.98	22.65	5.40	196.41	5.15	0.550	0.048	0.287	2.900	11,037	[4.70]
DTC=5	0.052	0.052	0.701	17.17	6.60	1.33	182.60	5.28	0.448	0.047	0.290	2.752	7,918	[3.37]
5<*DTC*≤10	0.025	0.030	0.337	0.31	-9.40	-0.93	173.29	4.85	-0.003	0.047	0.282	2.443	21,885	[9.32]
10<*DTC*≤15	-0.002	0.004	-1.008	-65.79	-75.19	-6.08	189.63	4.73	-0.116	0.048	0.280	2.549	10,086	[4.30]
15<*DTC*≤20	-0.011	-0.004	-2.168	-140.07	-149.05	-8.47	207.84	4.56	-0.207	0.048	0.289	2.382	6,162	[2.63]
DTC>20	-0.020	-0.007	-7.293	-304.73	-313.66	-8.77	199.74	4.62	0.070	0.045	0.286	2.518	17,333	[7.39]
Diff. *t*-value														
(0<*DTC*≤5 -*DTC*>20)	18.32	17.79	68.48	20.13	19.76	27.22	1257.00	14.17	60.53	52.98	-10.51	43.57		

Table 2.9. Determinants of *DTC*

This table shows the results of the regression of days to cover (*DTC*) on *STR*, volatility, and spread. The dependent variable is log(1 + *DTC*). Days to cover (*DTC*) are the average number of short covering days for a short selling trade. Panel A reports the OLS results. The variable *STR*, as a percentage, is the average of short trade returns, defined in Eq. (2.5); volatility is intraday volatility, computed as in Eq. (2.7); $volatility_{t-1}$ is volatility one day before the short covering day; spread (%) is the proportional spread, defined as the quoted spread normalized by the midpoint of the bid and ask prices; △spread is the difference between the short trade spread and the short covering spread, defined as $\log(1 + spread_{covering}) - \log(1 + spread_{shorting})$. Panel B shows the weighted least squares (WLS) results. The sample consists of 299 stocks with 326,625 trades. The sample period is from August 1, 2007, to May 31, 2010 and the short selling ban period (from October 1, 2008 to May 31, 2009) was excluded. The *t*-statistics are in parentheses and are based on White's (1980) heteroskedasticity-consistent standard errors. The superscripts *, **, and *** denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: OLS			
	2007:08–2010:05	2007:08–2008:09	2009:06–2010:05
Intercept	1.459***	1.395***	1.482***
	(410.93)	(223.63)	(346.76)
STR	-0.003*	-0.023***	-0.003*
	(-1.76)	(-11.08)	(-1.67)
$Volatility_{t-1}$	-0.071***	-0.064***	-0.073***
	(-111.94)	(-61.14)	(-98.67)
△Spread	0.091***	0.050***	0.112***
	(19.53)	(6.97)	(18.70)
R^2	4.00	4.52	4.08
Adj.-R^2	4.00	4.51	4.08
Obs.	325,319	91,753	233,566
Panel B: WLS			
Intercept	1.384***	1.382***	1.409***
	(51.29)	(39.41)	(55.05)
STR	-0.003***	-0.019***	-0.003**
	(-2.41)	(-6.20)	(-2.29)
$Volatility_{t-1}$	-0.071***	-0.066***	-0.078***
	(-20.75)	(-15.36)	(-22.20)
△Spread	0.073***	0.101***	0.078***
	(2.96)	(3.01)	(2.66)
R^2	5.56	7.04	5.60
Adj.-R^2	5.56	7.04	5.60
Obs.	325,319	91,753	233,566

Table 2.10. Determinants of *DTC*: Tobit regression

This table shows the results of the Tobit regression of days to cover (*DTC*) on *STR*, volatility, and spread. The dependent variable is *DTC*. Days to cover (*DTC*) are the average number of short covering days for a short selling trade. Panel A reports the Tobit results. The variable *STR*, as a percentage, is the average of short trade returns, defined in Eq. (2.5); volatility is intraday volatility, computed as in Eq. (2.7); Volatility_{t-1} is volatility one day before the short covering day; spread (%) is the proportional spread, defined as the quoted spread normalized by the midpoint of the bid and ask prices; △Spread is the difference between the short trade spread and the short covering spread, defined as $\log(1 + \text{spread}_{\text{covering}}) - \log(1 + \text{spread}_{\text{shorting}})$. Panel B shows the weighted Tobit results. The sample consists of 299 stocks with 326,625 trades. The sample period is from August 1, 2007, to May 31, 2010 and the short selling ban period (from October 1, 2008 to May 31, 2009) was excluded. The *t*-statistics are in parentheses. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Tobit			
	2007:08–2010:05	2007:08–2008:09	2009:06–2010:05
Intercept	5.907***	5.161***	6.167***
	(134.63)	(74.04)	(113.45)
STR	-0.039***	-0.314***	-0.032***
	(-21.5)	(-31.13)	(-16.56)
Volatility_{t-1}	-0.751***	-0.596***	-0.794***
	(-93.45)	(-46.76)	(-79.73)
△Spread	1.193***	0.572***	1.493***
	(23.08)	(7.97)	(22.07)
Log likelihood	-954,038	-258,094	-692,421
Obs.	325,319	91,753	233,566
Panel B: Weighted Tobit			
Intercept	5.086***	5.107***	5.346***
	(132.90)	(81.56)	(110.41)
STR	-0.039***	-0.246***	-0.034***
	(-26.83)	(-36.86)	(-19.83)
Volatility_{t-1}	-0.703***	-0.618***	-0.803***
	(-109.84)	(-61.23)	(-92.29)
△Spread	0.841***	0.928***	1.006***
	(28.16)	(20.28)	(24.57)
Log likelihood	-889,817	-243,628	-652,393
Obs.	325,319	91,753	233,566

Table 2.11. Regression of short trade returns (*STR*)

This table reports the pooled regression of short trade returns. The dependent variable is the abnormal short trade return (*AbSTR*); *STR*, as a percentage, is the average of short trade returns, defined in Eq. (2.5); and *AbSTR*, as a percentage, is short trade returns (*STR*) in excess of the market return, defined in Eq. (2.6). Panel A reports the OLS results. The short value is the number of shorted shares times the shorted price for each short trade; shorted shares are the number of shorted shares for each short trade; days to cover (*DTC*) are the average number of short covering days for each short selling trade; $r_{-5,-1}$ is the daily average return on days *t* - 5 to *t* - 1; volatility is intraday volatility, computed as in Eq. (2.7); spread_intraday (%) is the proportional spread before the execution of the short sale, which defined as the quoted spread normalized by the midpoint of the bid and ask prices; size is the market capitalization at the end of June in year *t*; and B/M is the book-to-market ratio measured as book equity divided by market equity at the end of the previous year. Panel B reports the WLS results. The sample consists of 299 stocks with 326,625 trades. The sample period is from August 1, 2007, to May 31, 2010, and the short selling ban period (from October 1, 2008, to May 31, 2009) was excluded. The *t*-statistics are in parentheses and are based on White's (1980) heteroskedasticity-consistent standard errors. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: OLS						
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.294***	-0.191	0.724***	0.035	0.682**	0.351
	(9.34)	(-0.93)	(2.73)	(0.10)	(2.20)	(0.99)
Ln(shorted shares)	0.100***		0.068***		0.049***	
	(6.53)		(3.85)		(3.53)	
Ln(shorted value)		0.059***		0.074***		0.068***
		(3.59)		(4.15)		(3.97)
DTC	-0.029***	-0.030***	-0.027***	-0.027***	-0.025***	-0.025***
	(-23.97)	(-23.87)	(-28.26)	(-28.21)	(-22.36)	(-23.18)
$r_{-5,-1}$	0.151***	0.157***	0.121***	0.119***	0.110***	0.108***
	(13.80)	(14.75)	(11.29)	(11.03)	(9.62)	(9.42)
Volatility					0.117***	0.117***
					(10.57)	(10.68)
Spread_intraday					-0.012*	-0.012*
					(-1.86)	(-1.84)
Ln(size)					-0.055***	-0.086***
					(-2.99)	(-4.19)
B/M					-0.068*	-0.057
					(-1.83)	(-1.54)
Firm dummy	No	No	YES	YES	No	No
R^2	0.11	0.09	0.31	0.32	0.19	0.19
Adj.-R^2	0.11	0.09	0.22	0.22	0.19	0.19
Obs.	326,625	326,625	326,625	326,625	323,629	323,629
Panel B : WLS						
Intercept	0.467**	-0.170	0.530*	-0.907	-0.452	-0.693
	(2.29)	(-0.17)	(1.65)	(-1.29)	(-0.41)	(-0.55)
Ln(shorted shares)	0.125**		0.142***		0.071	
	(2.09)		(2.69)		(1.21)	
Ln(shorted value)		0.083		0.155***		0.082
		(1.08)		(2.97)		(1.17)

DTC	-0.045***	-0.047***	-0.046***	-0.046***	-0.039***	-0.039***
	(-7.94)	(-7.74)	(-12.78)	(-12.66)	(-8.14)	(-8.15)
$r_{-5,-1}$	0.077	0.080	0.180***	0.177***	0.041	0.039
	(1.10)	(1.13)	(7.80)	(7.59)	(0.63)	(0.61)
Volatility					0.108***	0.109***
					(2.76)	(2.76)
Spread_intraday					-0.011	-0.011
					(-1.20)	(-1.17)
Ln(size)					0.009	-0.038
					(0.15)	(-0.71)
B/M					0.259***	0.254*
					(1.75)	(1.70)
Firm dummy	No	No	YES	YES	No	No
R^2	0.12	0.10	3.75	3.75	0.21	0.21
Adj.-R^2	0.12	0.10	3.66	3.66	0.21	0.21
Obs.	326,625	326,625	326,625	326,625	323,629	323,629

Table 2.12. Regression of short trade returns (*STR*) by subperiod

This table reports the pooled regression of short selling trade returns by subperiod. The dependent variable is abnormal short trade returns (*AbSTR*); *STR*, as a percentage, is the average of short trade returns, defined in Eq. (2.5); and *AbSTR*, as a percentage, is short trade returns (*STR*) in excess of the market return, defined in Eq. (2.6). Panel A reports the OLS results. The short value is the number of shorted shares times the shorted price for each short trade; shorted shares are the number of shorted shares for each short trade; days to cover (*DTC*) are the average number of short covering days for each short selling trade; $r_{-5,-1}$ is the daily average return on days *t* - 5 to *t* - 1; volatility is intraday volatility, computed as in Eq. (2.7); spread_intraday (%) is the proportional intraday spread before the execution of the short sale, which is defined as the quoted spread normalized by the midpoint of the bid and ask prices; size is market capitalization at the end of June in year *t*; and B/M is the book-to-market ratio measured as book equity divided by market equity at the end of the previous year. Panel B reports the WLS results. The sample consists of 299 stocks with 326,625 trades. The sample period is from August 1, 2007, to May 31, 2010, and the short selling ban period (from October 1, 2008, to May 31, 2009) was excluded. The *t*-statistics are in parentheses and are based on White's (1980) heteroskedasticity-consistent standard errors. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: OLS												
	2007:08–2008:09						2009:06–2010:05					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.632***	0.232***	-1.183**	-0.224	-0.008	0.293	-0.041	0.318***	0.069	0.746***	0.465	0.791**
	(-5.30)	(11.26)	(-2.25)	(-0.44)	(-0.03)	(1.17)	(-0.15)	(7.06)	(0.17)	(2.74)	(1.01)	(1.99)
Ln(shorted value)	0.088***		0.087***		0.068***		0.049**		0.072***		0.067***	
	(9.89)		(8.88)		(7.77)		(2.19)		(2.92)		(2.82)	
Ln(shorted shares)		0.113***		0.082***		0.053***		0.091***		0.062**		0.047**
		(14.63)		(8.47)		(6.90)		(4.32)		(2.53)		(2.36)
DTC	-0.032***	-0.031***	-0.027***	-0.027***	-0.026***	-0.026***	-0.030***	-0.029***	-0.026***	-0.026***	-0.025***	-0.025***
	(-30.47)	(-30.68)	(-29.13)	(-29.16)	(-32.07)	(-32.07)	(-18.82)	(-18.82)	(-24.45)	(-24.42)	(-19.16)	(-18.17)
$r_{-5,-1}$	0.078***	0.079***	0.072***	0.074***	0.107***	0.108***	0.185***	0.179***	0.140***	0.141***	0.114***	0.114***
	(5.77)	(5.87)	(5.66)	(5.82)	(7.58)	(7.64)	(12.71)	(11.66)	(9.59)	(9.79)	(6.24)	(6.34)
Volatility					0.145***	0.145***					0.108***	0.108***
					(11.02)	(10.96)					(6.92)	(6.88)
Spread_intraday					0.003	0.003					-0.013*	-0.013*
					(0.20)	(0.19)					(-1.88)	(-1.89)
Ln(size)					-0.078***	-0.045***					-0.087***	-0.056**
					(-5.72)	(-3.09)					(-3.29)	(-2.37)
B/M					0.026	0.010					-0.073	-0.084*

					(0.65)	(0.26)					(-1.54)	(-1.77)
Firm dummy	No	No	YES	YES	No	No	No	No	YES	YES	No	No
R^2	0.56	0.75	2.26	2.25	1.82	1.80	0.08	0.09	0.29	0.29	0.15	0.15
Adj.-R^2	0.56	0.75	2.04	2.03	1.81	1.79	0.08	0.09	0.18	0.17	0.14	0.14
Obs.	91,929	91,929	91,929	91,929	91,864	91,864	234,696	234,696	234,696	234,696	231,765	231,765
Panel B : WLS												
Intercept	-0.522	0.208	-1.617**	-0.296	-0.545	-0.605	0.018	0.581***	-0.971	0.496	-1.422	-1.126
	(-0.65)	(1.37)	(-2.10)	(-0.59)	(-0.41)	(-0.50)	(0.02)	(2.62)	(-1.32)	(1.52)	(-1.19)	(-1.08)
Ln(shorted value)	0.109**		0.119***		0.097*		0.065		0.158***		0.057	
	(1.98)		(2.81)		(1.90)		(0.81)		(2.88)		(0.75)	
Ln(shorted shares)		0.189***		0.108***		0.112**		0.084		0.143***		0.038
		(4.57)		(2.59)		(2.57)		(1.24)		(2.59)		(0.58)
DTC	-0.059***	-0.057***	-0.057***	-0.057***	-0.048***	-0.048***	-0.040***	-0.039***	-0.038***	-0.039***	-0.032***	-0.032***
	(-8.04)	(-8.22)	(-8.16)	(-8.15)	(-6.49)	(-6.57)	(-7.21)	(-7.57)	(-11.26)	(-11.40)	(-8.21)	(-8.16)
$r_{-5,-1}$	0.128***	0.130***	0.139***	0.142***	0.158***	0.158***	0.050	0.047	0.143***	0.147	-0.017	-0.015
	(3.50)	(3.54)	(5.35)	(5.48)	(4.26)	(4.27)	(0.55)	(0.52)	(5.02)	(5.19)	(-0.23)	(-0.20)
Volatility					0.156***	0.153***					0.118**	0.118**
					(4.45)	(4.38)					(2.35)	(2.40)
Spread_intraday					0.014**	0.014**					-0.019	-0.019
					(2.45)	(2.51)					(-1.43)	(-1.45)
Ln(size)					-0.068	0.004					0.032	0.058
					(-1.11)	(0.06)					(0.55)	(1.01)
B/M					0.123	0.120					0.313*	0.313*
					(0.51)	(0.50)					(1.89)	(1.90)
Firm dummy	No	No	YES	YES	No	No	No	No	YES	YES	No	No
R^2	0.75	1.08	6.87	6.86	1.82	1.86	0.06	0.07	3.65	3.65	0.16	0.16
Adj.-R^2	0.75	1.08	6.67	6.65	1.82	1.86	0.06	0.07	3.54	3.53	0.16	0.16
Obs.	91,929	91,929	91,929	91,929	91,864	91,864	234,696	234,696	234,696	234,696	231,765	231,765

Table 2.13. Robustness check: Regression of short trade returns

This table shows the results of the time-series regression and cross-sectional average of coefficients. The dependent variable is the abnormal short trade return (*AbSTR*); *STR*, as a percentage, is the average of short trade returns, defined in Eq. (2.5); and *AbSTR*, as a percentage, is short trade returns (*STR*) in excess of the market return, defined in Eq. (2.6). Panel A reports the OLS results. The short value is the number of shorted shares times the shorted price for each short trade; shorted shares are the number of shorted shares for each short trade; *relss* (%) is relative short selling, defined as the number of short shares for a short trade divided by the number of trading shares on day *t*; days to cover (*DTC*) are the average number of short covering days for each short selling trade; $r_{-5,-1}$ is the daily average return on days *t* - 5 to *t* - 1; volatility is intraday volatility, computed as in Eq. (2.7); and spread_intraday (%) is the proportional intraday spread before the execution of the short sale, which is defined as the quoted spread normalized by the midpoint of the bid and ask prices. The sample consists of 299 stocks with 326,625 trades. The sample period is from August 1, 2007, to May 31, 2010, and the short selling ban period (from October 1, 2008, to May 31, 2009) was excluded. The *t*-statistics are in parentheses and are based on White's (1980) heteroskedasticity-consistent standard errors. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	2007:08–2010:05			2007:08–2008:09			2009:06–2010:05		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Intercept	-0.943**	-2.259***	-0.647*	-0.418	-1.336	-0.315	-0.617	-1.568*	-0.435
	(-2.06)	(-2.93)	(-1.67)	(-1.02)	(-1.51)	(-1.19)	(-1.25)	(-1.87)	(-1.01)
Ln(shorted value)	0.120***			0.046			0.087*		
	(2.84)			(0.82)			(1.88)		
Ln(shorted shares)		0.129***			0.067			0.096**	
		(3.18)			(1.19)			(2.15)	
Relss			2.475***			1.544***			2.835***
			(3.00)			(2.64)			(2.71)
DTC	-0.063***	-0.063***	-0.065***	-0.092***	-0.090***	-0.093***	-0.054***	-0.054***	-0.055***
	(-4.66)	(-4.68)	(-4.88)	(-6.48)	(-6.35)	(-6.72)	(-3.55)	(-3.57)	(-3.72)
$r_{-5,-1}$	0.147***	0.143***	0.141***	0.115***	0.114***	0.099***	0.123**	0.120**	0.122**
	(3.30)	(3.33)	(3.03)	(3.08)	(3.03)	(2.58)	(2.39)	(2.41)	(2.27)
Volatility	0.138***	0.137***	0.153***	0.123***	0.125***	0.124***	0.127***	0.125***	0.139***
	(4.61)	(4.62)	(4.64)	(3.22)	(3.27)	(3.15)	(4.13)	(4.12)	(4.07)

Spread_intraday	2.022***	2.032***	2.010***	2.707***	2.717***	2.629***	1.619***	1.616***	1.607***
	(5.82)	(5.88)	(5.97)	(4.82)	(4.86)	(4.72)	(3.77)	(3.76)	(3.81)
R^2	8.19	8.21	7.76	11.60	11.60	10.92	7.41	7.43	7.06
Adj.-R^2	5.08	5.11	4.62	7.70	7.71	6.93	4.31	4.32	3.93
N	253	253	253	151	151	151	231	231	231

Table 2.14. Average number of firms by account

This table shows the profit measures by group based on trading firms at the account level. The variable *AccSTR*, as a percentage, is the average short trade return (*STR*) by account; *AccAbSTR*, as a percentage, is the average abnormal short trade return (*AbSTR*) of the short selling account; *STR*, as a percentage, is the average return of the short selling trade, defined as in Eq. (2.5); *AbSTR*, as a percentage, is the average abnormal return of short selling, defined as in Eq. (2.6); *profit* (thousands of won) is the profit of the short trade, defined as the difference between the short sale value and the short covered value; *net profit* (thousands of won) is the short selling profit after accounting for transaction costs; *net profit/DTC* is net profit per day; *rel profit*, as a percentage, is relative profit, defined as net profit scaled by the short value; shorted shares are the number of shorted shares for each short trade; the short value is the number of shorted shares times the shorted price for each short trade; days to cover (*DTC*) are the average number of short covering days for a short selling trade; and *wAccSTR*, *wAccAbSTR*, *wRel profit*, *wProfit*, *wNet profit*, and *wNet profit/DTC* are weighted by the previous month-end stock price. I first pool the averages of all variables shown in this table by account and then take the average across accounts. Here # of trades are the average number of trades per stock for each account, averaged across accounts. The sample consists of 299 stocks and 11,841 accounts. The sample period is from August 1, 2007, to May 31, 2010, and the short selling ban period (from October 1, 2008, to May 31, 2009) was excluded. The difference *t*-statistics of the two groups are in parentheses.

	Firms=1	1<firms≤5	5<firms≤10	10<firms≤20	20<firms≤30	Firms>30	Diff-*t*	Diff-*t*
	(1)	(2)	(3)	(4)	(5)	(6)	(6)-(1)	(6)-(2)
				2007:08–2010:05				
AccSTR (%)	0.213	0.252	0.445	0.558	0.701	0.911	(5.35)	(5.34)
AccAbSTR (%)	0.301	0.260	0.510	0.557	0.705	0.939	(3.72)	(5.06)
Rel profit (%)	10.75	4.33	21.60	26.89	25.85	28.90	(6.22)	(7.54)
Profit	-39.36	-31.69	2.66	27.99	24.21	30.88	(2.41)	(5.46)
Net profit	-57.55	-48.39	-14.59	13.40	9.64	17.21	(2.57)	(5.89)
Net profit/*DTC*	-0.576	-0.438	-0.072	0.178	0.219	0.256	(2.23)	(4.33)
wAccSTR (%)	0.211	0.274	0.424	0.486	0.649	0.844	(3.90)	(3.66)
wAccAbSTR (%)	0.299	0.290	0.536	0.491	0.653	0.886	(2.94)	(3.51)
wRel profit (%)	-0.563	-0.443	-0.080	0.162	0.175	0.180	(2.19)	(4.08)
wProfit	-38.08	-29.30	10.69	39.20	37.03	32.38	(2.38)	(4.48)
wNet profit	-56.26	-47.19	-8.34	22.68	20.23	15.94	(2.45)	(4.72)
wNet profit/*DTC*	11.02	2.37	21.38	25.67	29.51	30.30	(5.51)	(6.48)
Shorted shares	379.63	324.65	317.45	291.94	336.44	429.54		
Short value	9.07	8.33	8.63	7.31	7.30	6.85		
DTC	5.11	5.07	4.55	4.39	4.61	4.89		

# of trades	2.57	2.93	3.62	4.25	4.96	6.22		
# of accounts	3,441	4,599	1,791	1,275	395	340		
				2007:08–2008:09				
AccSTR (%)	0.298	0.329	0.559	0.632	0.547	0.943	(2.46)	(2.10)
AccAbSTR (%)	0.298	0.323	0.529	0.615	0.489	0.873	(2.24)	(2.37)
Rel profit (%)	14.57	7.31	29.91	40.62	38.30	37.97	(5.21)	(5.37)
Profit	-65.64	-2.74	52.61	65.81	65.21	61.57	(2.43)	(2.17)
Net profit	-84.78	-20.41	36.66	49.77	53.25	46.69	(2.57)	(2.45)
Net profit/*DTC*	-0.290	-0.124	0.543	0.685	1.040	1.061	(1.22)	(1.89)
wSTR (%)	0.298	0.298	0.482	0.599	0.427	0.733	(2.12)	(2.33)
wAbSTR (%)	0.298	0.309	0.465	0.570	0.371	0.739	(1.86)	(2.05)
wRel profit (%)	-0.276	-0.190	0.510	0.614	0.984	0.843	(1.07)	(4.22)
wProfit	-64.47	-5.03	72.46	71.09	77.04	69.11	(2.43)	(2.03)
wNet profit	-83.60	-23.84	54.46	52.25	62.37	49.74	(2.51)	(2.20)
wNet profit/*DTC*	14.70	3.81	27.56	38.81	58.23	37.75	(4.04)	(1.77)
Shorted shares	411.68	363.36	326.09	380.31	349.23	580.35		
Short value	9.54	8.83	8.00	8.05	6.01	7.47		
DTC	4.92	4.82	4.33	3.85	4.29	4.47		
# of trades	2.81	2.79	3.29	4.60	6.27	11.28		
# of accounts	1,532	1,855	599	373	98	40		
				2009:06–2010:05				
AccSTR (%)	0.225	0.256	0.451	0.597	0.910	0.851	(3.73)	(3.70)
AccAbSTR (%)	0.353	0.275	0.553	0.600	0.954	0.882	(2.48)	(3.67)
Rel profit (%)	13.14	2.96	22.55	22.42	20.22	30.67	(4.26)	(5.11)
Profit	-24.97	-39.23	-10.47	21.47	11.58	22.73	(1.53)	(4.96)
Net profit	-42.83	-55.63	-27.84	6.97	-2.58	10.26	(1.71)	(5.47)
Net profit/*DTC*	-0.679	-0.562	-0.271	0.112	0.037	0.029	(1.94)	(4.12)
wSTR (%)	0.224	0.296	0.463	0.502	0.871	0.857	(3.23)	(2.97)
wAbSTR (%)	0.351	0.329	0.618	0.513	0.924	0.904	(2.36)	(2.98)
wRel profit (%)	-0.665	-0.541	-0.251	0.110	-0.043	0.041	(1.88)	(5.07)
wProfit	-23.69	-36.02	-2.21	30.19	17.58	25.56	(1.57)	(4.34)
wNet profit	-41.54	-53.58	-21.20	14.03	1.69	10.81	(1.68)	(4.68)
wNet profit/*DTC*	13.45	2.05	22.60	21.68	19.89	31.37	(4.28)	(3.78)

Shorted shares	348.73	314.38	310.56	296.41	324.96	415.63
Short value	8.91	8.18	8.68	7.26	7.09	6.25
DTC	5.22	5.26	4.68	4.34	4.67	5.20
# of trades	2.48	3.02	4.02	4.40	4.98	5.38
# of accounts	2,448	3,363	1,410	940	297	218

Table 2.15. Regression of account abnormal short trade returns (*AccAbSTR*)

This table reports the results of the regression of account short trade returns. The dependent variable is the abnormal short trade return on the short selling accounts of individual investors; *AccSTR*, as a percentage, is the pooled average of short trade returns by accounts; *AccAbSTR*, as a percentage, is the pooled average of abnormal short trade returns by accounts; *STR*, as a percentage, is the average return of short selling trades, defined as in Eq. (2.5); and *AbSTR*, as a percentage, is the average abnormal return of short selling, defined as in Eq. (2.6). Panel A shows the simple pooled average of *AccAbSTR*. The short value is the number of shorted shares times the shorted price (in millions of won); shorted shares are the average number of shorted shares of the short selling trade; and days to cover (*DTC*) are the average number of short covering days for a short selling trade. Panel B shows the stock price-weighted pooled average of *AccAbSTR*. I first calculate this value for each short trade and then average it by accounts. In this table, # of firms is the number of short traded firms by accounts over the sample period. The sample consists of 299 stocks and 11,841 accounts. The sample period is from August 1, 2007, to May 31, 2010, and the short selling ban period (from October 1, 2008, to May 31, 2009) was excluded. The *t*-statistics are in parentheses and are based on White's (1980) heteroskedasticity-consistent standard errors. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	2007:08–2010:05		2007:08–2008:09		2009:06–2010:05	
	(1)	(2)	(1)	(2)	(1)	(2)
Panel A: Simple average of AccAbSTR						
Intercept	-0.967**	-0.166*	-1.012	-0.218	-1.190**	-0.202*
	(-2.37)	(-1.77)	(-1.40)	(-1.10)	(-2.31)	(-1.89)
Ln(short value)	0.087***		0.088**		0.105***	
	(2.96)		(2.03)		(2.78)	
Ln(shorted shares)		0.110***		0.124***		0.132***
		(5.67)		(3.90)		(5.26)
DTC	-0.013***	-0.013***	-0.009***	-0.009***	-0.014***	-0.014***
	(-5.99)	(-6.09)	(-2.72)	(-2.84)	(-5.32)	(-5.40)
log(# of firms)	0.151***	0.129***	0.133***	0.106**	0.145***	0.121**
	(3.76)	(3.18)	(2.79)	(2.23)	(2.75)	(2.26)
R^2	0.42	0.54	0.52	0.82	0.42	0.55
Adj.-R^2	0.42	0.51	0.45	0.75	0.38	0.51
Obs.	11,841	11,841	4,497	4,497	8,676	8,676
Panel B: Weighted average of AccAbSTR						
Intercept	-1.009**	-0.126	-0.896	-0.180	-1.248**	-0.169
	(-2.14)	(-1.30)	(-1.23)	(-0.90)	(-2.14)	(-1.51)
Ln(short value)	0.090***		0.079*		0.111***	
	(2.72)		(1.82)		(2.64)	
Ln(shorted shares)		0.106***		0.112***		0.133***
		(5.05)		(3.47)		(4.77)
log(*DTC*)	-0.013***	-0.013***	-0.008***	-0.008***	-0.015***	-0.015***
	(-6.16)	(-6.32)	(-2.68)	(-2.78)	(-5.65)	(-5.77)
log(# of firms)	0.130***	0.110***	0.110**	0.086*	0.127**	0.103*
	(3.22)	(2.69)	(2.26)	(1.76)	(2.39)	(1.92)
R^2	0.34	0.42	0.39	0.63	0.36	0.46
Adj.-R^2	0.32	0.40	0.33	0.56	0.32	0.42
Obs.	11,841	11,841	4,497	4,497	8,676	8,676

Table 2.16. Persistence in profits: Regression

This table shows the regression results of persistence in profits. The regression equation is defined as follows:

$$AccAbSTR\_p2_j = \alpha + \beta_1 \times AccAbSTR\_p1_j + \beta_2 \times \ln(shorted\ share_j)\ or\ \ln(short\ value_j) + \beta_3 \times DTC_j + \beta_4 \times firms_j + \varepsilon \quad (2.13)$$

$$rk\_AccAbSTR\_p2_j = \alpha + \beta_1 \times rk\_AccAbSTR\_p1_j + \beta_2 \times \ln(shorted\ share_j)\ or\ \ln(short\ value_j) + \beta_3 \times DTC_j + \beta_4 \times firms_j + \varepsilon \quad (2.14)$$

I divide the sample into two periods: before the short selling ban (period 1) and after the short selling ban (period2). Period 1 is from August 1, 2007, to September 30, 2008, and period 2 is from June 1, 2009, to May 31, 2010. The variable *AccSTR*, as a percentage, is the pooled average short trade return (*STR*) by accounts; *AccAbSTR*, as a percentage, is the pooled average abnormal short trade of short selling accounts; *STR*, as a percentage, is the average return of a short selling trade, defined as in Eq. (3.5); and *AbSTR*, as a percentage, is the average abnormal return of short selling, defined as in Eq. (3.6). Shorted shares are the average number of shorted shares of the short selling trade; the short amount is the number of shorted shares times the shorted price (in millions of won); and days to cover (*DTC*) are the average number of short covering days for the short selling trade. I first calculate these variables for each short trade and then pool the average by accounts. # of firms is the number of short traded firms by accounts over the sample period. In the second equation (2.14), I first rank the accounts by average *AccAbSTR* and then divide the ranking into quintiles for each period. The sample consists of 299 stocks and 11,841 accounts. The sample period is from August 1, 2007, to May 31, 2010, and the short selling ban period (from October 1, 2008 to May 31, 2009), was excluded. The *t*-statistics are in parentheses and based on White's (1980) heteroskedasticity-consistent standard errors. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	AccAbSTR_p2		rk_AccAbSTR_p2	
	(1)	(2)	(1)	(2)
Intercept	-1.045	-0.027	1.131***	1.105***
	(-1.34)	(-0.12)	(2.95)	(9.01)
AccAbSTR_p1	0.168**	0.164**		
	(2.13)	(2.13)		
rk_AccAbSTR_p1			0.287***	0.280***
			(10.72)	(10.49)
Ln(shorted value)	0.116**		0.020	
	(2.21)		(0.80)	
Ln(shorted shares)		0.160***		0.073***
		(2.99)		(3.53)
DTC	-0.040***	-0.038***	-0.029***	-0.028***
	(-5.03)	(-5.05)	(-8.11)	(-8.01)
# of firms	0.006	0.004	0.018***	0.018***
	(0.61)	(0.38)	(4.72)	(4.67)
R^2	4.77	5.20	15.28	16.00
Adj.-R^2	4.49	4.91	15.02	15.75
# of accounts	1,332	1,332	1,332	1,332

Table 2.17. Persistence in profits: Portfolio approach

This table shows the profitability of short selling by the past profitability at the account and stock levels. Panel A reports the stock level analysis. For each account, I calculate the average daily *rel profit* in month *t*. Then I divide the sample into five groups, based on daily relative profits in month *t* - 1, and compute the average *rel profit* in month *t*. The variable *rel profit* (%) is the relative short selling return, defined as net profit divided by the short value, as in Eq. (3.3). Panel B shows the account level analysis. I calculate the average daily *rel profit* in month *t* for each stock. I then divide the sample stocks into five groups based on average daily *rel profits* from months *t* - 3 to *t* - 1 and compute the average *rel profit* in month *t*. The sample consists of 299 stocks and 11,841 accounts. The sample period is from August 1, 2007, to May 31, 2010 (excluding the short selling ban period from October 1, 2008, to 31 May, 2009). The *t*-statistics are in parentheses and the superscripts *, **, and *** denote significance at the 1%, 5%, and 10% levels, respectively.

	2007:08–2010:05		2007:08–2008:09		2009:06–2010:05	
Panel A: Profit persistence at the stock level						
	Daily rel profit (%)	*t*-Value	Daily rel profit (%)	*t*-Value	Daily rel profit (%)	*t*-Value
Low	-1.240***	(-9.86)	-0.401*	(-1.67)	-1.524***	(-10.37)
2	-0.085	(-1.22)	0.394***	(2.88)	-0.259***	(-3.23)
3	-0.164***	(-2.76)	0.396***	(3.59)	-0.375***	(-5.35)
4	0.115	(1.64)	0.895***	(6.26)	-0.165**	(-2.10)
High	0.485***	(4.42)	1.314***	(6.23)	0.182	(1.42)
High-Low	1.726***	(10.36)	1.715***	(5.35)	1.706***	(8.78)
Panel B: Profit persistence at the account level						
Low	0.158	(1.19)	0.989***	(4.58)	-0.144	(-0.90)
2	0.307**	(2.36)	0.964***	(5.04)	-0.002	(-0.01)
3	0.404***	(2.93)	1.067***	(5.51)	0.110	(0.63)
4	0.545***	(4.37)	1.151***	(5.44)	0.238	(1.58)
High	1.495***	(6.56)	1.579***	(4.91)	1.442***	(4.63)
High-Low	1.337***	(5.07)	0.590	(1.52)	1.587***	(4.53)

Table 2.18. Regular buys and sells of short trade accounts

This table presents the regular trading activities of short trade accounts in my sample. Panels A to C show the results for regular buy trading, regular sell trading, and short sale trading, respectively. The shares are the daily average number of traded shares for each account; value is the daily average traded value by account (millions of won); trading days are the average number of days traded for each account; and traded firms are the average number of firms traded by each account over the sample period. The sample period is from August 1, 2007, to May 31, 2010, and the short selling ban period (from October 1, 2008, to May 31, 2009) was excluded from Panel C.

	Shares		Value		Trading days		Traded firms		Number of accounts
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
Panel A: Regular buy trading									
2007:08–2010:05	1,628.75	592.14	16.16	6.19	3.94	2.73	58.36	39.00	11,293
2007:08–2008:09	1,274.62	453.70	15.38	6.04	3.42	2.44	34.60	21.00	7,528
2008:10–2009:05	1,736.20	536.53	16.36	5.59	3.11	2.20	34.59	21.00	9,872
2009:06–2010:05	1,706.15	547.50	15.10	5.55	3.18	2.33	31.50	19.00	8,044
Panel B: Regular sell trading									
2007:08–2010:05	1,716.53	600.56	16.17	6.20	3.66	2.52	58.58	39.00	11,242
2007:08–2008:09	1,345.02	471.29	15.70	6.20	3.11	2.23	35.04	21.00	7,571
2008:10–2009:05	1,797.09	538.50	16.49	5.59	2.83	2.03	34.66	21.00	9,761
2009:06–2010:05	1,826.68	549.16	15.12	5.46	3.01	2.20	31.29	18.00	7,917
Panel C: Short sale trading									
2007:08–2010:05	499.89	121.78	11.65	4.48	1.82	1.33	6.21	3.00	11,841
2007:08–2008:09	578.28	107.00	12.31	4.93	1.74	1.25	4.67	2.00	4,497
2009:06–2010:05	464.27	126.00	11.46	4.26	1.84	1.33	6.30	3.00	8,676

Table 2.19. Professional versus amateur traders

This table shows summary statistics for professional and amateur traders. During my sample period, 520 of 11,841 accounts are professional traders, which means these accounts only engaged in short selling trades and no regular buy or sell trading activity. The other 11,321 accounts are amateur traders, who engage in both short selling and regular trades. The variable *STR*, as a percentage, is the average return of the short selling trade, defined as in Eq. (3.5); *AbSTR*, as a percentage, is the average abnormal return of short selling, defined as in Eq. (3.6); *profit* (thousands of won) is the profit of the short trade, defined as the difference between the short selling value and the short covered value; *net profit* (thousands of won) is the short selling profit after accounting for transaction costs; *net profit/DTC* is net profit per shorted day; days to cover (*DTC*) are the average number of short covering days for each short selling trade; *rel profit*, as a percentage, is the relative profit, defined as net profit scaled by the short value; and *wAccSTR*, *wAccAbSTR*, *wRel profit*, *wProfit*, *wNet profit*, and *wNet profit/DTC* are weighted by the stock price. Shorted shares are the number of shorted shares for each short trade and the short value is the number of shorted shares times the shorted price for each short trade. I first pool the average of all variables (shown in this table) by account and then average it across accounts. The sample consists of 299 stocks and 11,841 accounts. The sample period is from August 1, 2007, to May 31, 2010, and the short selling ban period (from October 1, 2008, to May 31, 2009) was excluded. The difference *t*-statistics of the two groups are in parentheses.

	2007:08–2010:05			2007:08–2008:09			2009:06–2010:05		
Account return	Pro.	Amateur	Diff. *t*-value	Pro.	Amateur	Diff. *t*-value	Pro.	Amateur	Diff. *t*-value
STR (%)	0.367	0.390	(-0.20)	0.392	0.425	(-0.18)	0.426	0.412	(0.09)
AbSTR (%)	0.354	0.432	(-0.68)	0.358	0.411	(-0.32)	0.415	0.480	(-0.43)
Rel profit (%)	0.699	-0.269	(2.55)	0.163	0.070	(0.13)	1.019	-0.402	(3.25)
Profit	276.27	-20.39	(2.58)	34.14	6.48	(0.11)	376.70	-27.56	(3.45)
Net profit	250.64	-43.59	(2.57)	3.08	-17.91	(0.08)	353.29	-50.48	(3.47)
Net profit/*DTC*	71.91	19.83	(2.17)	57.13	29.71	(0.41)	83.57	15.81	(3.35)
wSTR (%)	0.343	0.374	(-0.25)	0.274	0.383	(-0.54)	0.442	0.407	(0.22)
wAbSTR (%)	0.333	0.429	(-0.80)	0.261	0.380	(-0.68)	0.426	0.492	(-0.42)
wRel profit (%)	0.537	-0.304	(2.61)	-0.034	0.013	(-0.06)	0.887	-0.429	(2.94)
wProfit	298.33	-15.33	(2.72)	103.86	8.96	(0.37)	378.12	-25.60	(3.34)
wNet profit	271.77	-39.83	(2.71)	73.50	-16.73	(0.36)	353.21	-49.75	(3.35)
wNet profit/*DTC*	77.10	18.17	(2.41)	66.51	25.60	(0.62)	85.62	14.26	(3.31)
Shorted shares	953.64	479.05	(3.53)	1,173.56	557.46	(1.62)	888.86	444.87	(4.21)
Short value	12.95	11.59	(1.13)	15.55	12.20	(1.25)	11.89	11.44	(0.35)
# of accounts	520	11,321		152	4,345		379	8,297	

Table 2.20. Regression of daily profits

This table shows the pooled regression results of daily profits. The dependent variable is the daily shorted volume-weighted average abnormal profit, which is defined as *rel profit* divided by *DTC* and subtracted from the market return, as in Eq. (2.15). The short value is the daily average number of shorted shares times the shorted price for each short trade; shorted shares are the daily number of shorted shares; *relss* is relative short selling, which is the number of daily shorted shares divided by the number of daily traded shares for each stock; volatility is intraday volatility, defined as in Eq. (2.7); spread (%) is the proportional spread, computed as in Eq. (2.8); *tv* (%) is turnover, which is measured as the number of trading shares on day *t* divided by outstanding shares; r_{t-1} is the daily return on day *t* - 1; trade is the number of trades on day *t* for each stock; size is market capitalization at the end of June in year *t* for each stock; and B/M is the book-to-market ratio, measured as book equity divided by market equity at the end of the previous year for each stock. The sample consists of 299 stocks with 35,153 firm–day observations and the sample period is from August 2007 to May 2010. The short selling ban period (from October 1, 2008, to May 31, 2009) was excluded. The *t*-statistics are in parentheses and are based on White's (1980) heteroskedasticity-consistent standard errors. The superscripts *, **, and *** denote significance at the 1%, 5%, and 10% levels, respectively.

	2007:08–2010:05				2007:08–2008:09				2009:06–2010:05			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Intercept	0.324***	0.128***	0.068**	0.740***	0.524***	0.229***	0.250***	1.564***	0.310***	0.070*	-0.024	0.676***
	(3.30)	(2.73)	(2.33)	(5.27)	(2.67)	(3.67)	(4.67)	(4.96)	(2.85)	(1.81)	(-0.73)	(4.52)
Ln(short value)	-0.017***			-0.014**	-0.019			-0.010	-0.022***			-0.017**
	(-2.63)			(-2.08)	(-1.49)			(-0.79)	(-3.07)			(-2.26)
Ln(shorted shares)		-0.015***				0.004				-0.023***		
		(-2.68)				(0.36)				(-3.63)		
relss			-0.059***				0.052				-0.096***	
			(-2.78)				(1.10)				(-4.26)	
Volatility	0.076***	0.077***	0.086***	0.071***	0.066***	0.065***	0.066***	0.058***	0.071***	0.073***	0.071***	0.066***
	(10.95)	(11.02)	(10.87)	(9.92)	(5.35)	(5.22)	(5.32)	(4.51)	(9.08)	(9.36)	(9.11)	(8.12)
Spread	0.051	0.083	0.111*	0.035	0.017	0.258	-0.015	-0.226*	0.164**	0.202***	0.248***	0.152**
	(0.82)	(1.32)	(1.71)	(0.53)	(0.14)	(0.22)	(-0.11)	(-1.72)	(2.37)	(2.92)	(3.50)	(2.08)
tv	0.020***	0.021***	0.020***	0.018***	0.014*	0.014*	0.015*	0.007	0.025***	0.027***	0.025***	0.023***
	(5.56)	(5.82)	(5.60)	(4.90)	(1.78)	(1.75)	(1.80)	(0.88)	(6.18)	(6.51)	(6.20)	(5.50)
r_{t-1}	0.039***	0.039***	0.039***	0.039***	0.028***	0.028***	0.028***	0.027***	0.048***	0.048***	0.048***	0.048***
	(12.03)	(12.02)	(12.04)	(11.93)	(4.99)	(4.98)	(4.99)	(4.82)	(12.83)	(12.82)	(12.90)	(12.75)
Ln(trade)	-0.049***	-0.055***	-0.064***	-0.045***	-0.052**	-0.079***	-0.079***	-0.041*	-0.034***	-0.039***	-0.052***	-0.031**
	(-4.18)	(-5.52)	(-7.70)	(-3.76)	(-2.35)	(-4.03)	(-4.67)	(-1.82)	(-2.52)	(-3.45)	(-5.62)	(-2.31)
Ln(size)				-0.026***				-0.073***				-0.026***
				(-3.53)				(-4.60)				(-3.11)

B/M				-0.073***				0.007				-0.054***
				(-5.16)				(0.14)				(-3.54)
R^2	2.55	2.55	2.55	2.63	1.37	1.35	1.36	1.53	3.53	3.54	3.56	3.60
Adj.-R^2	2.54	2.54	2.54	2.61	1.32	1.31	1.31	1.47	3.50	3.52	3.53	3.57
Obs.	35,149	35,149	35,149	34,846	12,300	12,300	12,300	12,277	22,849	22,849	22,849	22,569

Table 2.21. Robustness check: Regression of daily profits

This table shows the Fama–Macbeth (1973) regression results of daily profits. The dependent variable is the daily shorted volume-weighted average abnormal profit, which is defined as *rel profit* divided by *DTC* and subtracted from the market return, as in Eq. (2.15). The short value is the daily average number of shorted shares times the shorted price for each short trade; shorted shares are the daily number of shorted shares; *relss* is relative short selling, which is the daily number of shorted shares divided by the daily number of traded shares for each stock; volatility is intraday volatility, defined as in Eq. (2.7); spread (%) is the proportional spread, computed as in Eq. (2.8); *tv* (%) is turnover, which is measured as trading shares on day *t* divided by outstanding shares; r_{t-1} is the daily return on day *t* - 1; trade is the number of trades on day *t* for each stock; size is market capitalization at the end of June in year *t* for each stock; and B/M is the book-to-market ratio, measured as book equity divided by market equity at the end of the previous year for each stock. The sample consists of 299 stocks with 35,153 firm–day observations and the sample period is from August 1, 2007 to May 31, 2010. The short selling ban period (from October 1, 2008, to May 31, 2009) was excluded. The *t*-statistics are in parentheses and are based on White's (1980) heteroskedasticity-consistent standard errors. The superscripts *, **, and *** denote significance at the 1%, 5%, and 10% levels, respectively.

	2007:08–2010:05				2007:08–2008:09				2009:06–2010:05			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Intercept	0.195	0.086	-0.052	0.665	-0.036	0.085	-0.091	0.445	0.445***	0.086	-0.009	0.905***
	(1.01)	(0.87)	(-0.38)	(1.28)	(-0.10)	(0.47)	(-0.35)	(0.45)	(3.35)	(1.53)	(-0.18)	(4.86)
Ln(short value)	-0.009			-0.027	0.010			-0.030	-0.029***			-0.024***
	(-0.84)			(-1.56)	(0.48)			(-0.92)	(-3.81)			(-3.00)
Ln(shorted shares)		-0.016				-0.008				-0.024***		
		(-1.48)				(-0.41)				(-3.30)		
relss			-0.595*				-1.045*				-0.105**	
			(-1.90)				(-1.75)				(-2.51)	
Volatility	0.0450***	0.059***	0.075***	0.058**	0.058*	0.071**	0.102**	0.078	0.041***	0.046***	0.046***	0.036***
	(3.00)	(3.23)	(3.18)	(2.22)	(1.90)	(2.10)	(2.31)	(1.58)	(3.99)	(4.46)	(4.47)	(3.47)
Spread	0.536**	0.613**	0.984**	0.545	0.703	0.805*	1.486	0.759	0.354***	0.404***	0.437***	0.312***
	(2.16)	(2.55)	(2.07)	(1.50)	(1.50)	(1.76)	(1.64)	(1.09)	(4.49)	(5.10)	(5.52)	(3.82)
tv	-0.015	-0.040	-0.089	-0.006	-0.062	-0.112	-0.202	-0.040	0.036***	0.038***	0.034***	0.030***
	(-0.38)	(-0.57)	(-1.08)	(-0.08)	(-0.83)	(-0.83)	(-1.28)	(-0.27)	(5.34)	(5.38)	(4.84)	(3.93)
r_{t-1}	0.050***	0.040***	0.046***	0.042***	0.046***	0.026	0.040***	0.033*	0.053***	0.054***	0.053***	0.052***
	(7.15)	(4.41)	(5.48)	(4.45)	(3.68)	(1.57)	(2.55)	(1.86)	(11.03)	(11.31)	(10.98)	(10.53)
Ln(trade)	-0.024	-0.016	-0.022	0.021	-0.036	-0.008	-0.007	0.043	-0.011	-0.024*	-0.039***	-0.004
	(-1.34)	(-0.70)	(-1.16)	(0.56)	(-1.12)	(-0.19)	(-0.19)	(0.62)	(-0.79)	(-1.87)	(-3.70)	(-0.24)

Ln(size)				-0.016				-0.002				-0.032***
				(-0.56)				(-0.04)				(-3.34)
B/M				-0.109**				-0.147				-0.068***
				(-2.15)				(-1.53)				(-3.55)
R^2	23.14	23.00	23.05	28.74	30.57	30.23	30.36	38.46	15.06	15.15	15.11	18.16
Adj.-R^2	7.81	7.60	8.07	8.79	6.99	6.50	7.45	7.92	8.69	8.78	8.73	9.71
Obs.	526	526	526	526	274	274	274	274	252	252	252	252

Table 3.1. Distribution of average relative short-selling

Panel A shows the number of stock-day observations with the daily *relss* that belongs to the range that is specified in the first column. *relss*(%) is the number of shorted shares divided by the number of traded shares for a stock each day. Panel B shows the number of stocks with the average over the sample period of daily *relss* that belongs to the range that is specified in the first column. Market cap.(in billions of won) shows the cross-sectional average for firms in the given range of time-series means of market capitalization over the sample period. There are 761 firms in the sample and the sample period is from January 1, 2006, to May 31, 2010, excluding the short-selling ban period, in which a short-selling is prohibited by law. (October 1, 2008, to May 31, 2009).

Panel A: Distribution of stock-day observations		
range	N of stock-day obs.	%
relss =0%	495,514	78.46
0% < *relss* ≤ 10%	128,071	20.28
0% < *relss* ≤ 1%	70,247	11.12
1% < *relss* ≤ 2%	20,543	3.25
2% < *relss* ≤ 3%	11,814	1.87
3% < *relss* ≤ 4%	7,734	1.22
4% < *relss* ≤ 5%	5,542	0.88
5% < *relss* ≤ 6%	3,925	0.62
6% < *relss* ≤ 7%	3,002	0.48
7% < *relss* ≤ 8%	2,235	0.35
8% < *relss* ≤ 9%	1,685	0.27
9% < *relss* ≤ 10%	1,344	0.21
10% < *relss* ≤ 20%	6,065	0.96
20% < *relss* ≤ 30%	1,492	0.24
relss > 30%	415	0.07
Total	631,557	100.00

Panel B : Distribution of firm observations			
range	N of stocks	%	Market cap.
relss = 0%	182	23.91	56.10
0% < *relss* ≤ 1%	439	57.69	470.55
1% < *relss* ≤ 2%	76	9.99	2,202.58
2% < *relss* ≤ 3%	40	5.26	7,598.37
3% < *relss* ≤ 4%	18	2.36	7,654.08
relss > 4%	6	0.79	6,435.68
Total	761	100.00	

Table 3.2. Sample stocks and the stock characteristics

The table shows the list of fifty sample stocks (sorted by the average over the sample period of relative short-selling) together with the averages of short-selling activity and other characteristics over the sample period. Shorted shares show the number of shorted shares for a stock, and the short amount shows the average amount of shorted stocks in millions of Korean won. *relss*(%) is the number of shorted shares divided by the number of traded shares for a stock each day. Market cap. (in billions of won) is the average of market capitalization of a given firm at the end of June of each year and *B/M* is an average book-to-market ratio at the end of previous year that is defined similarly as in Fama and French (1993). *tv*(%) is average daily trading volume, measured as the daily traded shares divided by the number of shares outstanding at the end of the previous year. Foreign ownership (%) is the average of daily foreign ownership as a fraction of the number of shares outstanding. The sample period is from January 1, 2006, to May 31, 2010, excluding October 1, 2008–May 31, 2009, when short-selling was prohibited by law.

Company Name	Shorted shares	Short amount	*relss* (%)	Market cap.	B/M	*tv* (%)	Foreign Ownership (%)
LG Household&Healthcare., LTD	3,343.14	550.43	6.98	2,671.20	0.05	0.31	46.75
HITE Brewery	1,032.19	162.27	5.05	1,461.05	0.03	0.19	42.92
LOTTE Chemical CORPORATION	6,920.41	636.50	4.57	2,548.38	0.08	0.53	37.21
Amore Pacific CORPORATION	775.10	543.48	4.57	4,352.48	0.01	0.29	35.17
Hyundai Motor	64,779.03	5,334.29	4.22	18,154.28	0.08	0.66	37.47
LG Electronics	49,598.72	4,973.13	4.00	12,767.29	0.06	0.80	32.44
Kia Motors	119,478.90	1,870.98	3.92	5,741.74	0.42	0.92	20.87
LG Display	91,688.86	3,615.58	3.90	13,476.89	0.15	0.71	41.52
LOTTE Shopping CO., LTD.	2,366.59	799.61	3.89	9,411.65	0.02	0.22	19.73
Hyundai Development CO.Engineering & Const	16,640.43	955.92	3.84	3,645.05	0.10	0.54	63.31
Nongshim	787.82	189.26	3.83	1,454.17	0.02	0.34	31.77
Hanjin Shipping Holdings	35,160.90	1,104.77	3.82	2,204.51	0.22	1.34	31.69
S-Oil Corporation	11,002.45	714.35	3.81	7,325.23	0.04	0.25	48.29
Hyundai Heavy Industries	15,527.99	4,245.99	3.72	18,273.55	0.04	0.49	19.33
Hanjin Heavy Industries & Construction	17,120.35	589.67	3.71	1,737.00	0.14	1.15	16.67
SAMSUNG SDI CO.,LTD.	17,305.71	1,477.57	3.71	3,895.45	0.07	1.08	21.43
Hankook Tire	32,266.46	575.60	3.53	2,434.79	0.03	0.59	41.19
S1	2,755.99	130.63	3.40	1,955.55	0.01	0.24	53.68
POSCO	10,724.57	4,768.13	3.35	35,973.61	0.02	0.37	54.50
CJ CheilJedang Corp	1,490.63	337.46	3.25	2,560.59	0.02	0.58	26.56
HITE Holdings	2,640.94	269.99	3.17	1,747.27	0.10	0.54	22.02
NCsoft Corporation	6,493.33	592.87	3.14	2,091.86	0.01	1.11	35.76
Doosan Heavy Industries & Construction	17,755.18	1,548.22	3.09	7,387.04	0.09	0.57	13.78
Hynix Semiconductor	191,247.15	5,036.92	3.06	12,910.17	0.26	1.42	22.63
LotteChilsung Beverage	73.30	80.07	2.95	1,292.77	0.00	0.23	32.95
Yuhan	1,059.67	193.64	2.90	1,650.63	0.03	0.45	26.04
Lotte Confectionery	56.74	72.33	2.83	1,700.12	0.00	0.17	39.68
GS Engineering & Construction Corp	11,759.76	1,330.71	2.81	4,511.41	0.07	0.69	45.08
Shinsegae CO., LTD	1,880.92	1,053.44	2.77	10,128.94	0.01	0.35	44.89
Daeduck Electronics	5,548.25	36.38	2.66	,314.50	0.08	0.53	31.94
Doosan Infracore	37,165.79	930.73	2.66	3,830.40	0.26	0.87	12.59
KT Corporation	25,861.78	1,162.15	2.65	11,445.72	0.13	0.37	46.05
Hyundai Merchant Marine	8,264.65	281.22	2.61	3,851.08	0.23	0.72	17.15
Daewoo Engineering & Construction	33,111.97	557.46	2.51	5,591.42	0.34	0.47	9.59
Samsung Electro Mechanics	23,544.34	1,423.85	2.49	4,225.89	0.11	1.31	10.63
Hyundai Departments Store CO., LTD	2,987.13	287.48	2.46	2,097.84	0.06	0.55	44.19
Hyundai Steel	23,250.73	1,495.24	2.43	4,900.01	0.14	1.07	22.49

Kumho Tire CO.,INC	8,748.73	89.39	2.39	706.18	0.59	0.71	23.15
STX Pan Ocean	406,172.95	1,219.04	2.38	3,580.17	0.05	1.84	7.42
Korea Electric Power	45,332.59	1,660.53	2.37	22,160.03	0.13	0.29	27.93
Cheil Worldwide	529.45	120.07	2.36	1,136.61	0.02	0.45	39.95
Daewoo Ship buliding & Marine Engineering	32,137.00	945.70	2.35	6,631.06	0.20	0.65	28.27
Samsung Heavy Industries	51,489.93	1,602.10	2.31	7,480.25	0.22	1.00	28.40
Korea Zinc	3,599.65	524.77	2.31	2,566.06	0.06	0.92	17.00
Samsung Engineering	6,293.57	543.12	2.27	3,154.11	0.11	0.66	37.23
Orion Corp.	763.52	188.33	2.25	1,553.67	0.02	0.62	29.74
NHN	5,713.72	1,019.88	2.22	8,630.36	0.00	0.57	51.11
Handsome Corporation	3,654.55	56.05	2.15	408.90	0.04	0.59	22.47
LG CHEM,LTD	10,967.80	1,223.38	2.09	7,135.23	0.08	0.76	26.99
Samsung Electronics	9,353.66	6,148.89	2.09	90,522.17	0.01	0.32	48.39

Table 3.3. Summary statistics of short-selling activity

Panel A reports the summary statistics of short-selling activity for sample stocks by different subperiods. Shorted share is the number of shorted shares for a stock and the short amount is the amount of shorted stocks in millions of Korean won. *relss*(%) is the number of shorted shares divided by the number of traded shares for a stock each day. Panel B shows the summary statistics of short-selling activity by investor type and subperiods. We classify investors into three types: domestic individual investors (individual), domestic institutional investors (institution), and foreign investors (foreigner). Panel C shows the average *relss* (%) for different groups of stocks. The small/large and low/high groupings are determined by the 33- and 67- percentile of all 761 stocks in the KOSPI market. Market capitalization (market cap) is measured at the end of June of each year for each stock. *B/M* is a book-to-market ratio at the end of previous year that is defined similarly as in Fama and French (1993). Price denotes a closing price at the end of each day. No institutional ownership denotes stocks with zero institutional ownership at the end of each year, while High institutional ownership refers to stocks whose institutional ownership is above the median in a given year, which is obtained after excluding stocks with zero institutional ownership. The sample period is from January 1, 2006, to May 31, 2010 (excluding October 1, 2008–May 31, 2009, when short-selling was prohibited by law). The sample covers fifty stocks and 42,981 stock–day observations.

		Mean			Median			Std.dev		
		Short shares	Short amount	*relss* (%)	Short shares	Short amount	*relss* (%)	Short shares	Short amount	*relss* (%)
Panel A: Short selling summary statistic										
2006:01-2010:05		29,564.50	1,305.39	3.16	11,424.10	524.52	1.14	47,631.04	2,131.42	4.99
2006:01-2008:09		33,160.38	1,266.57	3.24	12,882.24	434.28	1.03	50,048.87	2,142.12	5.24
2009:06-2010:05		26,259.13	1,500.07	2.98	14,629.15	826.40	1.56	37,104.73	2,027.62	3.96
Panel B: Short selling summary statistic by investors type										
individual	2006:01-2010:05	1,377.23	30.09	0.05	54.28	2.74	0.00	3,095.73	75.21	0.13
	2006:01-2008:09	1,495.09	14.64	0.03	575.01	2.40	0.00	2,529.14	35.21	0.08
	2009:06-2010:05	1,583.78	72.13	0.11	839.76	34.46	0.05	2,408.38	109.50	0.18
institution	2006:01-2010:05	2,203.76	130.11	0.24	280.30	13.75	0.02	5,996.72	327.90	0.90
	2006:01-2008:09	1,886.89	98.67	0.22	356.35	14.49	0.03	5,351.67	270.95	0.81
	2009:06-2010:05	3,212.66	218.85	0.28	1,117.88	90.22	0.06	5,957.60	368.98	0.81
foreigner	2006:01-2010:05	25,983.52	1,145.19	2.87	8,116.63	385.87	0.86	45,631.32	2,033.33	4.82

	2006:01-2008:09	29,778.40	1,153.26	2.99	9,802.81	341.99	0.83	48,296.56	2,060.83	5.06
	2009:06-2010:05	21,462.69	1,209.09	2.58	10,192.23	559.35	1.17	34,914.25	1,909.31	3.82

Panel C: Mean of relss(%) across stock characteristics

	Market Cap.		B/M	price		Institutional ownership
Small		Low	3.20	2.07	No	3.28
Large	3.14	High	2.52	3.23	High	2.72

Table 3.4. Regression of daily foreign investors' relative short-selling ($relss^F$) on past returns

The table shows the results of the regressions of daily foreign investors' relative short-selling, $relss^F$, which is defined as the number of shares shorted by foreign investors divided by the number of traded shares, on a stock's past cumulative returns and various other control variables. The regressions are performed with stock- and day-fixed effects. $r_{-5,-1}$ is the cumulative stock return from day t - 5 to t - 1. r_t is the stock return on day t. $spread_t$ (%) is the daily proportional spread at day t, which is defined as the quote number-weighted average of intra-daily bid–ask spreads, scaled by the bid–ask midpoint. oib_t^+ equals oib_t if $oib_t > 0$, and zero otherwise, where oib_t is a stock's daily buy–order imbalance, computed as the daily price-setting buy volume minus the daily price-setting sell volume, divided by the daily trading volume. Similarly, $oib^+_{-5,-1}$ is defined as $oib_{-5,-1}$ if $oib_{-5,-1} > 0$, and zero otherwise, where $oib_{-5,-1}$ is the average of oib_t from day t - 5 to t - 1. $relss^F_{-5,-1}$ is the average of $relss^F$ from days t - 5 to t - 1. σ_t is computed as the daily highest price minus the daily lowest price, scaled by the highest price on day t. $\sigma_{-5,-1}$ is the average of daily σ values from day t - 5 to t - 1. $tv_{-5,-1}$ is average trading volume, measured as average daily traded shares for days t - 5 to t - 1, divided by the number of shares outstanding at the end of the previous year. *Loser* (*winner*) is a dummy variable that equals one if a stock is in the lowest (highest) quartile in a sample of fifty stocks based on $r_{-5,-1}$, and zero otherwise. The sample period is from January 1, 2006, to May 31, 2010, excluding October 1, 2008–May 31, 2009, when short-selling was prohibited by law. The sample covers fifty stocks and 42,981 stock–day observations. An intercept is estimated in the regression but is not reported. The t-statistics are in parentheses and are based on standard errors adjusted for clustering by calendar date and by stock, as in Thompson (2011). The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	2006:01-2010:05		2006:01-2008:09		2009:06-2010-05	
	(1)	(2)	(1)	(2)	(1)	(2)
$r_{-5,-1}$	0.0155**		0.0116		0.0279**	
	(2.26)		(1.63)		(2.29)	
r_t	-0.1875***		-0.1856***		-0.1917***	
	(-10.76)		(-9.04)		(-7.05)	
$spread_t$	-0.4542**		-0.4975**		0.0116	
	(-2.15)		(-2.18)		(0.02)	
oib_t^+	1.2667***		1.3900***		0.9830***	
	(11.46)		(10.71)		(6.55)	
$oib^+_{-5,-1}$	-0.0591		-0.11022		0.1069	
	(-1.06)		(-1.60)		(1.10)	
$relss^F_{-5,-1}$	0.5257***		0.5312***		0.4103***	
	(27.95)		(23.51)		(16.49)	
σ_t	-0.0744***		-0.0684***		-0.0704***	
	(-4.01)		(-3.18)		(-2.73)	
$\sigma_{-5,-1}$	0.1308***		0.1160***		0.2460***	
	(3.56)		(2.88)		(4.47)	
$tv_{-5,-1}$	-0.2838***		-0.1256		-0.4631***	
	(-3.98)		(-1.48)		(-4.20)	
Winner		0.2065**		0.1206		0.6000***
		(2.20)		(1.15)		(3.48)
Loser		0.0045		0.0521		-0.0765
		(0.05)		(0.46)		(-0.56)
R^2	23.8%	12.3%	25.5%	13.9%	18.6%	11.7%
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Day fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 3.5. Regressions of daily future returns on foreign investors' short-selling activity

The table reports the results of regressions of the stock return on day $t + 2$ on past short-selling activity and various control variables together with stock- and day-fixed effects. $relss^F_t$ is the number of shares shorted by foreign investors divided by the number of traded shares on day t. $relss^F_t\_Low$ ($relss^F_t\_High$) is a dummy variable that equals one if a stock is in the lowest (highest) tercile based on $relss^F_t$. $r_{-5,-1}$ is a cumulative stock return from day $t - 5$ to $t - 1$. r_t is the stock return on day t. $spread_t$ (%) is the daily proportional spread at day t, which is the quote number-weighted average of intra-daily bid–ask spreads, scaled by the bid–ask midpoint. oib_t is a stock's daily buy–order imbalance, computed as the daily price-setting buy volume minus the daily price-setting sell volume, divided by the daily trading volume. oib_t^+ equals oib_t if $oib_t > 0$, and zero otherwise. $oib_{-5,-1}$ is the average of oib_t from day $t - 5$ to $t - 1$, and $oib^+_{-5,-1}$ equals $oib_{-5,-1}$ if $oib_{-5,-1} > 0$ and zero otherwise. σ_t is computed as the daily highest price minus the daily lowest price, scaled by the highest price on day t. $\sigma_{-5,-1}$ is the average daily σ from day $t - 5$ to $t - 1$. $tv_{-5,-1}$ is a trading volume measured as average daily traded shares for days $t - 5$ to $t - 1$, divided by the number of shares outstanding at the end of the previous year. *Loser* (*winner*) is a dummy variable that equals one if a stock is in the lowest (highest) quartile based on $r_{-5,-1}$. The sample period is from January 1, 2006, to May 31, 2010, excluding October 1, 2008–May 31, 2009, when short-selling was prohibited by law. The sample consists of fifty stocks and 42,981 stock–day observations. An intercept is estimated in the regression but not reported. The t-statistics are in parentheses and are based on standard errors adjusted for clustering by calendar date and by stock, as in Thompson (2011). The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	2006:01-2010:05			2006:01-2008:09			2009:06-2010:05		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
$relss^F_t$	-0.0050			-0.0042			-0.0067		
	(-1.27)			(-0.93)			(-1.12)		
$relss^F_t\_Low$		0.0457	0.0441		0.0078	0.0079		0.1302*	0.1242*
		(1.06)	(1.03)		(0.36)	(0.39)		(1.73)	(1.91)
$relss^F_t\_High$		-0.0710**	-0.0632*		-0.1079**	-0.1052**		0.0173	0.0250
		(-2.05)	(-1.84)		(-2.46)	(-2.42)		(0.29)	(0.42)
$r_{-5,-1}$	-0.0262***			-0.0313***			-0.0148*		
	(-4.44)			(-4.34)			(-1.65)		
$spread_t$			-0.0140			-0.0522			0.2792
			(-0.15)			(-0.54)			(1.36)
oib_t^+			-0.0725*			-0.0286			-0.1953***
			(-1.74)			(-0.52)			(-3.43)
σ_t			0.0097			0.0050			0.0078
			(0.50)			(0.21)			(0.32)
$tv_{-5,-1}$			0.0962**			0.0845*			0.0989*
			(2.45)			(1.68)			(1.66)
Loser		0.1600***	0.1459***		0.1867***	0.1758***		0.0981	0.0794

		(5.17)	(4.87)		(5.07)	(4.94)		(1.55)	(1.25)
Winner		-0.1302***	-0.1462***		-0.1787***	-0.1903***		-0.0677	-0.0793
		(-4.04)	(-4.34)		(-4.77)	(-4.67)		(-1.03)	(-1.27)
R^2	26.1%	26.0%	26.1%	28.1%	28.0%	28.0%	20.3%	20.3%	20.6%
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Day fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3.6. Daily abnormal returns of equally weighted portfolios based on foreign investors' short-selling activity

The table reports daily abnormal returns (in percentage) from foreign investors' short-selling activity. $relss^F_t$ denotes the number of shares shorted by foreign investors divided by the number of traded shares on day *t*. On day *t*, based on relative short-selling by foreign investors on a previous day, $relss^F_{t-1}$, I divide the sample stocks into terciles. The abnormal returns of equally weighted portfolios for days *t* + 2, *t* + 3, *t* + 4, and *t* + 5 are computed from characteristic-adjusted returns using 25 value-weighted size–B/M portfolios. The sample period is from January 1, 2006, to May 31, 2010 (excluding October 1, 2008–May 31, 2009, when short-selling was prohibited by law). The sample covers fifty stocks and 42,981 stock–day observations. The *t*-statistics are adjusted for autocorrelation using the Newey–West (1987) procedure with a lag of five days. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Small $relss^F$	Medium $relss^F$	Large $relss^F$	Small-Large
		2006:01-2010:05		
		Abnormal ret : Holding period = *t* + 2		
Mean	0.042	-0.042	-0.085*	0.127***
t-Stat	1.05	-0.89	-1.94	4.05
		Abnormal ret : Holding period = *t* + 3		
Mean	0.021	0.009	-0.055	0.076**
t-Stat	0.42	0.17	-1.12	2.47
		Abnormal ret : Holding period = *t* +4		
Mean	0.007	-0.023	-0.015	0.022
t-Stat	0.13	-0.39	-0.27	0.73
		Abnormal ret : Holding period = *t* + 5		
Mean	0.009	-0.063	-0.037	0.046
t-Stat	0.15	-0.93	-0.60	1.39
		2006:01-2008:09		
		Abnormal ret : Holding period = *t* + 2		
Mean	0.026	-0.049	-0.100*	0.126***
t-Stat	0.52	-0.81	-1.91	3.35
		Abnormal ret : Holding period = *t* + 3		
Mean	0.006	0.005	-0.067	0.073*
t-Stat	0.09	0.07	-1.13	1.94
		Abnormal ret : Holding period = *t* + 4		
Mean	-0.010	-0.035	-0.034	0.024
t-Stat	-0.15	-0.48	-0.53	0.67
		Abnormal ret : Holding period = *t* + 5		
Mean	-0.004	-0.089	-0.042	0.038
t-Stat	-0.06	-1.07	-0.54	0.93
		2009:06-2010:05		
		Abnormal ret : Holding period = *t* + 2		
Mean	0.086	-0.026	-0.043	0.130**
t-Stat	1.28	-0.37	-0.57	2.35
		Abnormal ret : Holding period = *t* + 3		
Mean	0.062	0.018	-0.023	0.086*
t-Stat	0.78	0.23	-0.28	1.65
		Abnormal ret : Holding period = *t* + 4		
Mean	0.055	0.009	0.039	0.016
t-Stat	0.58	0.09	0.43	0.29
		Abnormal ret : Holding period = *t* + 5		
Mean	0.043	0.005	-0.025	0.069
t-Stat	0.49	0.04	-0.25	1.26

Table 3.7. Regression of abnormal daily volatility on short-selling

The table reports the results of the regression of abnormal stock volatility on day t + 1 ($Ab(\sigma_{t+1})$) and day t + 2 ($Ab(\sigma_{t+2})$) on foreign investors' short-selling activity with various control variables together with stock- and day-fixed effects. The dependent variable is abnormal volatility which is defined as daily stock volatility minus daily market volatility. The variable σ_t is computed as the daily highest price minus the daily lowest price, scaled by the highest price on day t. Market volatility is computed as the daily highest Kospi200 index minus the daily lowest Kospi200 index, scaled by highest index on day t. The variable $relss^F_t$ is the number of shares shorted by foreign investors divided by the number of traded shares on day t. $r_{-5,-1}$ is a cumulative stock return from day t - 5 to t - 1. r_t is the stock return on day t. $spread_t$ (%) is the daily proportional spread at day t, which is the quote number-weighted average of intra-daily bid–ask spreads, scaled by the bid–ask midpoint. $tv_{-5,-1}$ is a trading volume measured as average daily traded shares from day t - 5 to t - 1, divided by the number of shares outstanding at the end of the previous year. The sample period is from January 1, 2006, to May 31, 2010, excluding October 1, 2008–May 31, 2009, when short-selling was prohibited by law. The sample consists of fifty stocks and 42,981 stock–day observations. An intercept is estimated in the regression but not reported. The t-statistics are in parentheses and are based on standard errors adjusted for clustering by calendar date and by stock, as in Thompson (2011). The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	2006:01-2010:05		2006:01-2008:09		2009:06-2010:05	
	$Ab(\sigma_{t+1})$	$Ab(\sigma_{t+2})$	$Ab(\sigma_{t+1})$	$Ab(\sigma_{t+2})$	$Ab(\sigma_{t+1})$	$Ab(\sigma_{t+2})$
$relss^F_t$	0.0004	-0.0010	0.0000	-0.0010	0.0047	0.0017
	(0.14)	(-0.30)	(0.01)	(-0.27)	(0.98)	(0.43)
r_t	0.0009	0.0096	-0.0012	0.0093	0.0074	0.0110
	(0.13)	(1.49)	(-0.15)	(1.17)	(0.72)	(1.27)
$r_{-5,-1}$	0.0100***	0.0110***	0.0081**	0.0075**	0.0121***	0.0181***
	(3.43)	(3.99)	(2.50)	(2.36)	(2.54)	(3.77)
$spread_t$	0.3175***	0.3859***	0.1877*	0.2556**	1.0698***	1.1530***
	(2.75)	(3.21)	(1.70)	(2.17)	(3.65)	(3.74)
$tv_{-5,-1}$	0.4585***	0.4500***	0.4291	0.4246	0.4455***	0.4049***
	(7.65)	(6.70)	(0.11)	(0.08)	(7.58)	(6.86)
σ_t	0.2601***	0.2041***	0.2530***	0.1878***	0.1833***	0.1479***
	(18.45)	(12.89)	(14.47)	(9.63)	(9.99)	(7.63)
R^2	29.8%	27.6%	30.9%	38.6%	32.0%	30.8%
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Day fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 3.8. Regression of daily spread on short-selling

The table reports the results of regressions of abnormal daily proportional spread on day $t + 1$ or $t + 2$ on foreign investors' short-selling activity with various other control variables together with stock- and day-fixed effects. The dependent variable is the abnormal log spread (*Ab(spread)*) which is defined as log spread minus log market spread. $spread_t$ (%) is the daily proportional spread at day t, which is the quote number-weighted average of intra-daily bid–ask spreads, scaled by the bid–ask midpoint. Market spread (%) is the daily average of proportional spread over all stock listed on KOSPI market. $relss^F_t$ is the number of shares shorted by foreign investors divided by the number of traded shares on day t. r_t is stock return on day t; $r_{-5,-1}$ is a cumulative stock return from day t - 5 to t - 1; σ_t is computed as the highest price minus the lowest price, scaled by the highest price on day t; $tv_{-5,-1}$ is a trading volume measured as average daily traded shares from day t - 5 to t - 1, divided by the number of shares outstanding at the end of the previous year. The sample period is from January 1, 2006, to May 31, 2010, excluding October 1, 2008–May 31, 2009, when short-selling was prohibited by law. The sample consists of fifty stocks and 42,981 stock–day observations. An intercept is estimated in the regression but not reported. The t-statistics are in parentheses and are based on standard errors adjusted for clustering by calendar date and by stock, as in Thompson (2011). The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	2006:01–2010:05		2006:01–2009:08		2009:06–2010:05	
	$Ab(spread_{t+1})$	$Ab(spread_{t+2})$	$Ab(spread_{t+1})$	$Ab(spread_{t+2})$	$Ab(spread_{t+1})$	$Ab(spread_{t+2})$
$relss^F_t$	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
	(0.25)	(0.27)	(0.13)	(0.14)	(0.23)	(0.24)
r_t	0.0019	0.0017	0.0025	0.0022	0.0002	0.0003
	(1.13)	(1.01)	(1.26)	(1.10)	(0.14)	(0.23)
$r_{-5,-1}$	0.0008	0.0008	0.0011	0.0011	0.0001	0.0001
	(1.27)	(1.29)	(1.46)	(1.49)	(0.17)	(0.20)
σ_t	0.0035	0.0044	0.0028	0.0036	0.0016	0.0023
	(1.33)	(1.66)	(0.93)	(1.17)	(0.79)	(1.13)
$tv_{-5,-1}$	-0.0081	-0.0088	-0.0182*	-0.0194*	-0.0023	-0.0029
	(-0.75)	(-0.78)	(-1.77)	(-1.71)	(-0.41)	(-0.52)
$spread_t$	0.4433***	0.3716***	0.3900***	0.3121***	0.5890***	0.5475***
	(13.96)	(12.03)	(12.28)	(10.58)	(12.55)	(11.44)
R^2	65.3%	63.5%	63.0%	61.2%	82.0%	81.0%
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Day fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Figure 2.1. Market index (KOSPI200 index) during sample period

The figure shows the daily KOSPI200 index from August 1, 2007 to May 31, 2010. The shaded area denotes the short selling ban period (from October 1, 2008 to May 31, 2009), during which the short selling was prohibited by law.

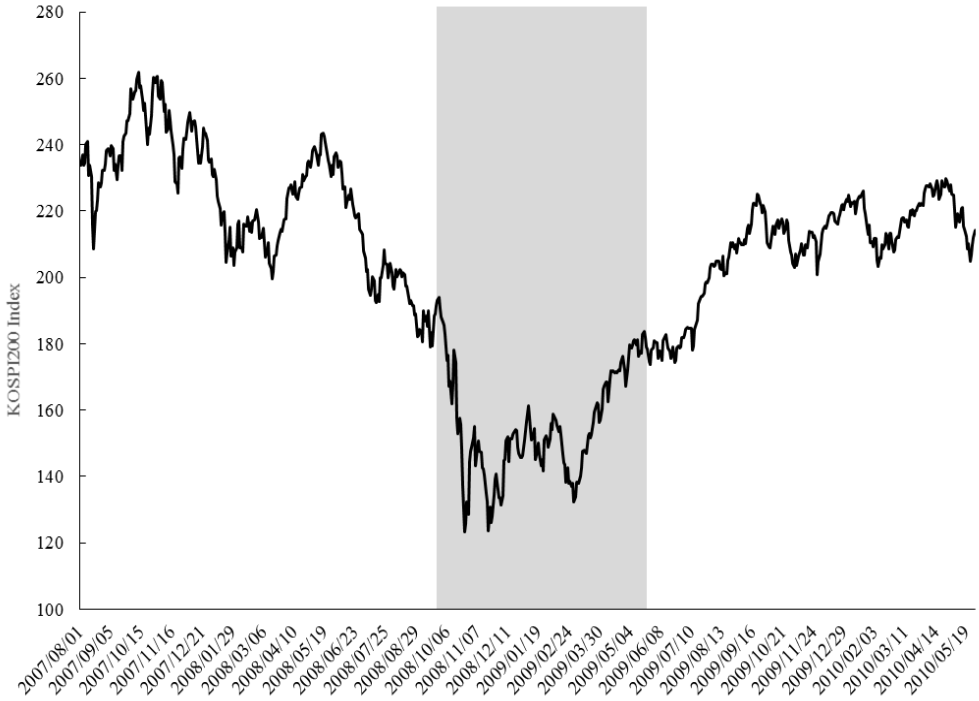
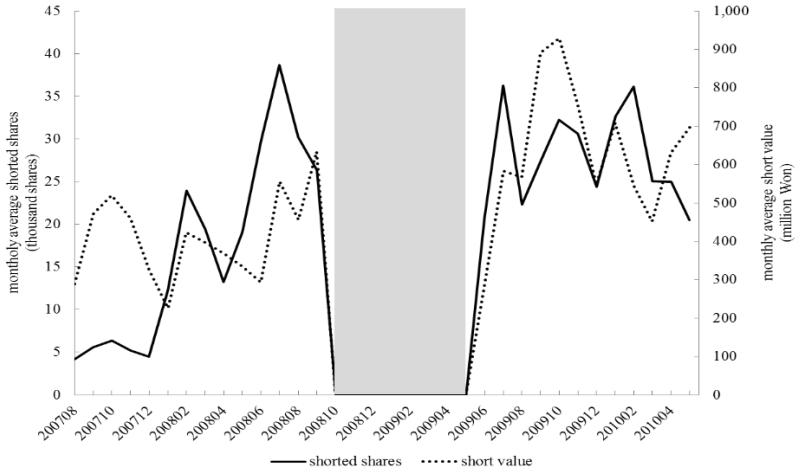


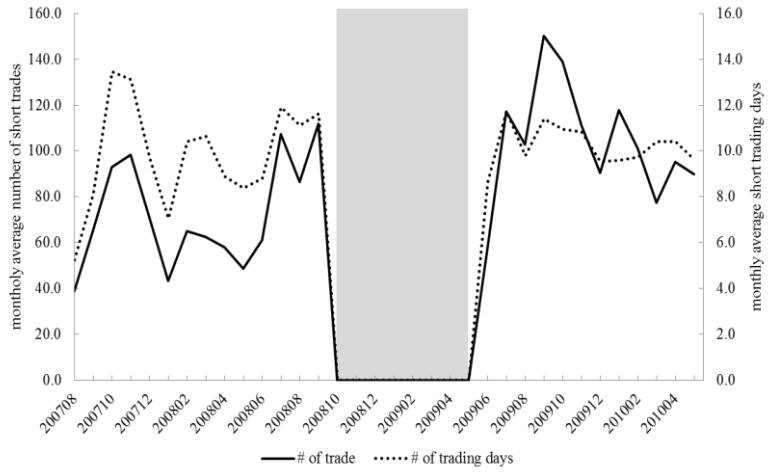
Figure 2.2. Monthly distribution of short selling activity

The figure shows the monthly short selling distribution of the sample firms. Panel A shows monthly shorted shares and short value. Monthly shorted shares (thousands of shares) are the average number of shorted shares in month *t* for each stock. Monthly short value (millions of won) is the average short value in month *t* for each stock. Panel B shows monthly shorted trades and number of trading days. Monthly shorted trades are the average number of shorted trades in month *t* for each stock. Monthly trading days are the average number of short selling trading days in month *t* for each stock. Panel C shows monthly shorted stocks and the number of short selling accounts. Monthly shorted stocks are number of shorted stocks in month *t*. Monthly number of short selling accounts are average traded accounts in month *t*. Panel D shows total number of accounts in month *t*. The sample period is from August 1, 2007 to May 31, 2010. The shaded area denotes the short selling ban period (from October 1, 2008 to May 31, 2009), during which the short-selling was prohibited by law.

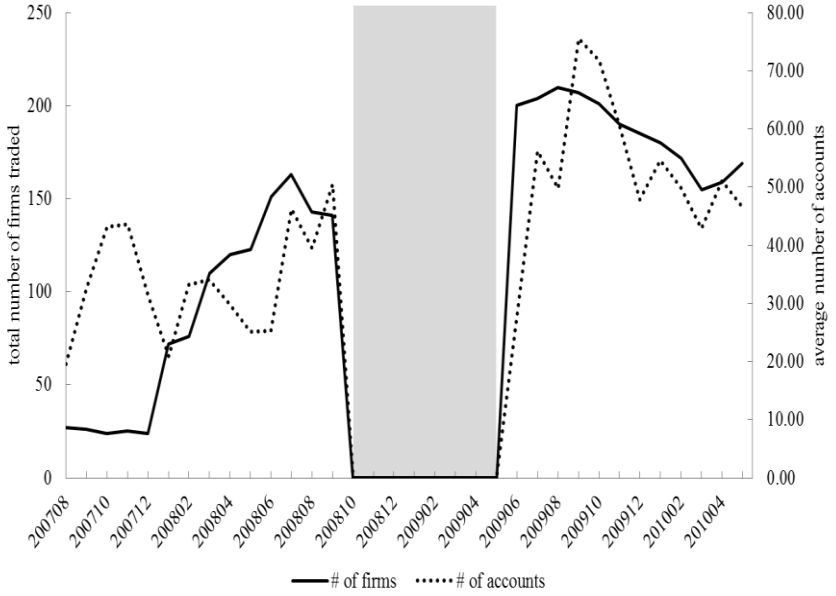
Panel A: Shorted shares and short value



Panel B. Shorted trades and the number of trading days



Panel C. Shorted stocks and the number of short selling accounts



Panel D. Total number of traded accounts

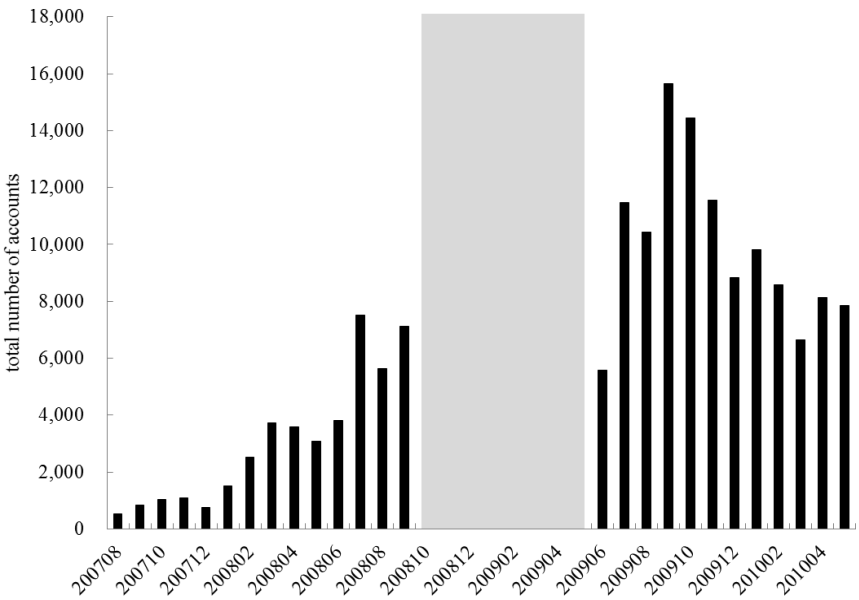
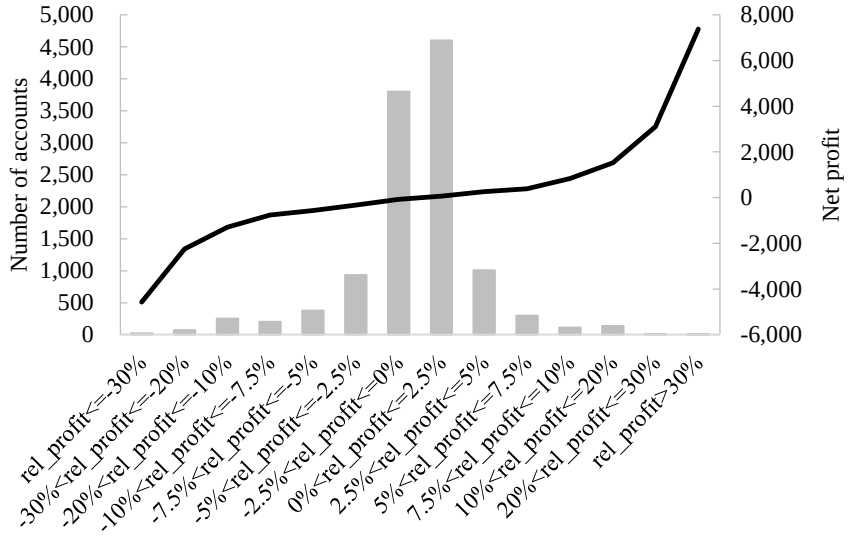


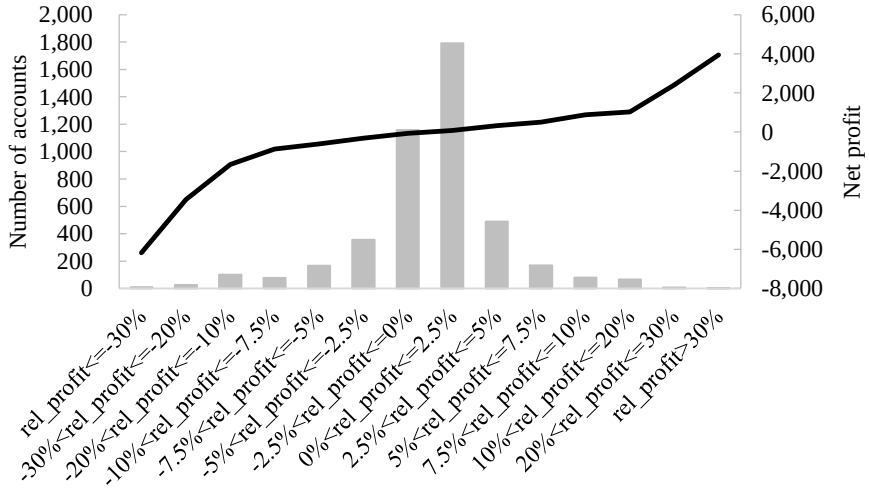
Figure 2.3. Distribution of the short selling profits by account

The figure shows the distribution of the short selling profits by account. *rel profit* (%) is relative profit, defined as net profit scaled by the short value. I first compute a pooled average of *rel profit* by account and then divided this value into 14 groups. Number of accounts are the total number of accounts for a given group. *net profit* (thousands of won) is the short selling profit after accounting for transaction costs. Panels A, B and C show the results for account profits by all sample period, before and after short selling ban, respectively.

Panel A: All sample period (2007:08-2010:05)



Panel B: Before short-selling ban (2007:08-2008:09)



Panel C: After short-selling ban (2009:06-2010:05)

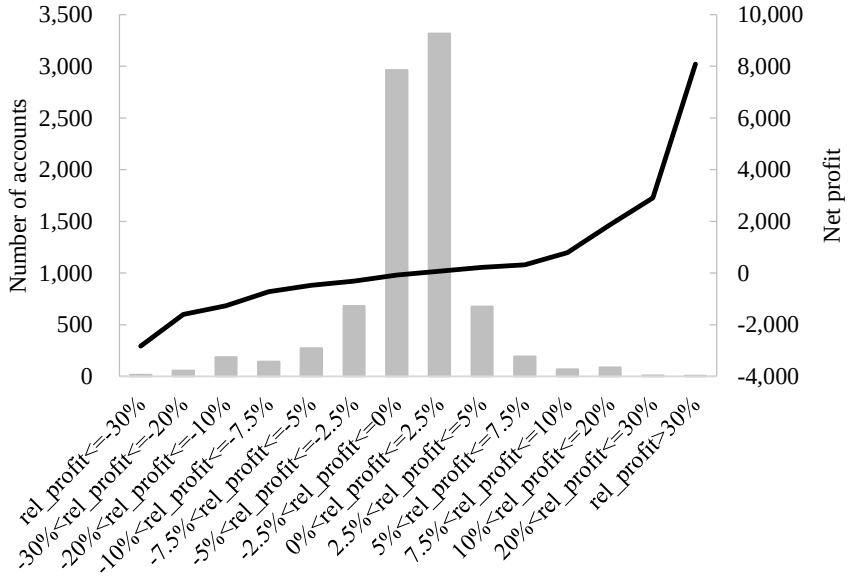
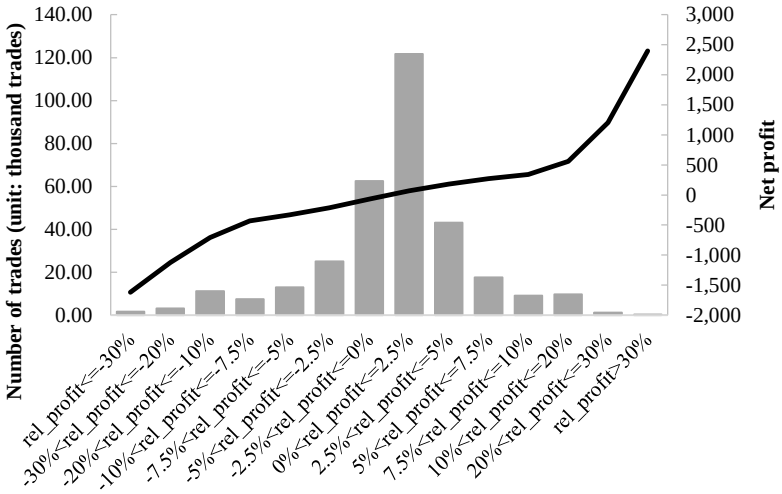


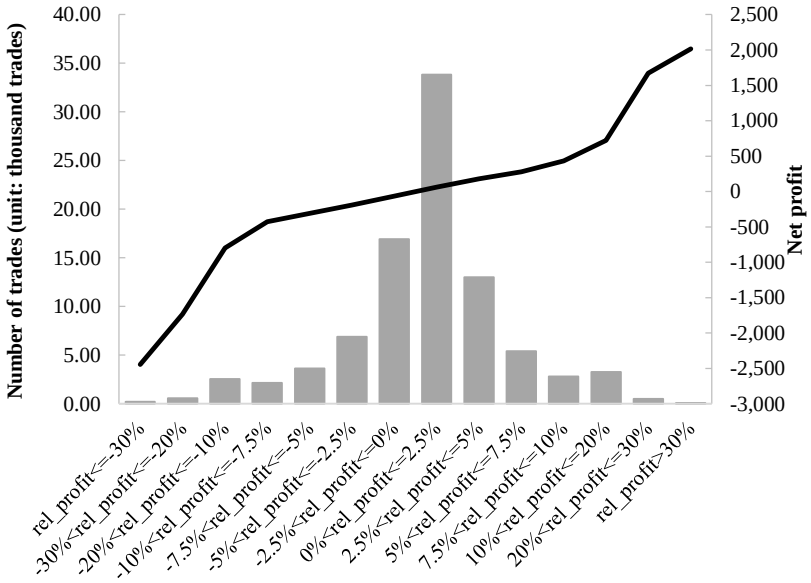
Figure 2.4. Distribution of the short selling profit by trade

The figure shows the distribution of the short trade profits. *rel profit* (%) is relative profit, defined as net profit scaled by the short value. I first compute an average of *rel profit* by trade and then divided this value into 14 groups. Number of trades are total number of trades for a given group. *net profit* (thousands of won) is the short selling profit after accounting for transaction costs. Panels A, B and C show the results for trade profits by all sample period, before and after short selling ban, respectively.

Panel A: All sample period (2007:08-2010:05)



Panel B: Before short-selling ban (2007:08-2008:09)



Panel C: After short-selling ban (2009:06-2010:05)

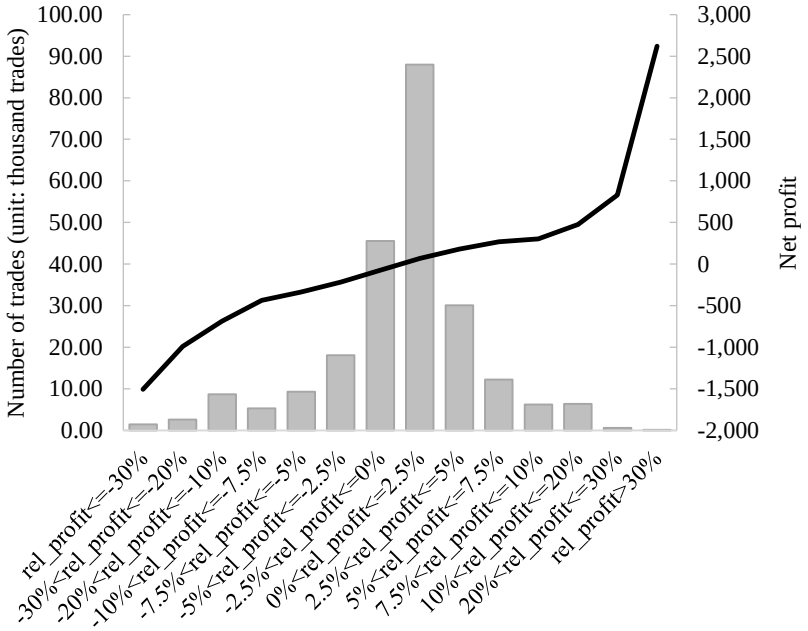


Figure 2.5. Distribution of the number of short trades by the number of days to cover (*DTC*)
The figure shows distribution of the number of short trades by the number of days to cover (*DTC*). *DTC* is days to cover, which is the average number of days to cover for short sales. I first compute to *DTC* for each short trade and count the number of short trade by *DTC* groups. The sample consists of 299 stocks with 326,625 trades and 11,841 accounts. The sample period is from August 1, 2007, to May 31, 2010. The short selling ban period (from October 1, 2008, to May 1, 2009) was excluded.

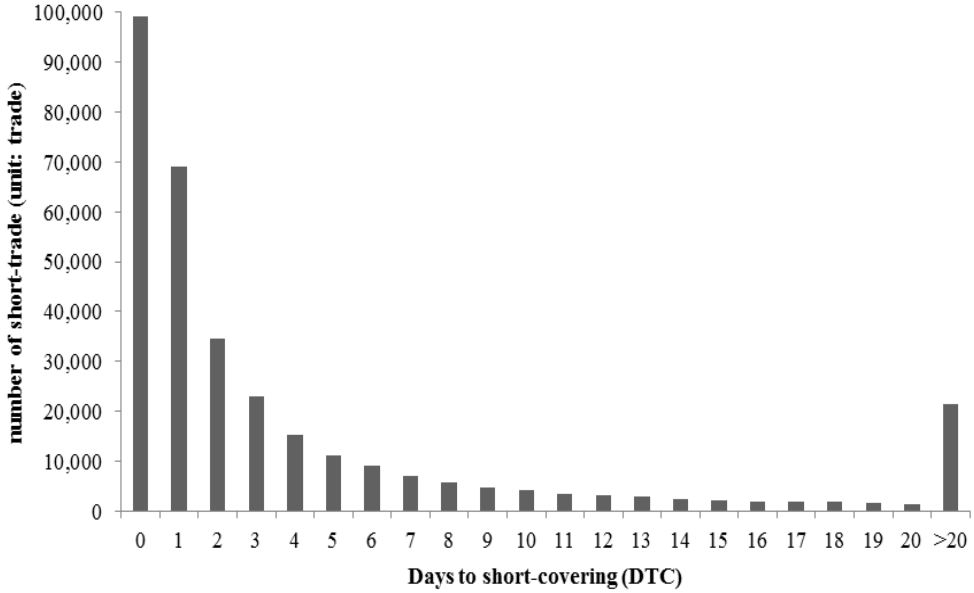
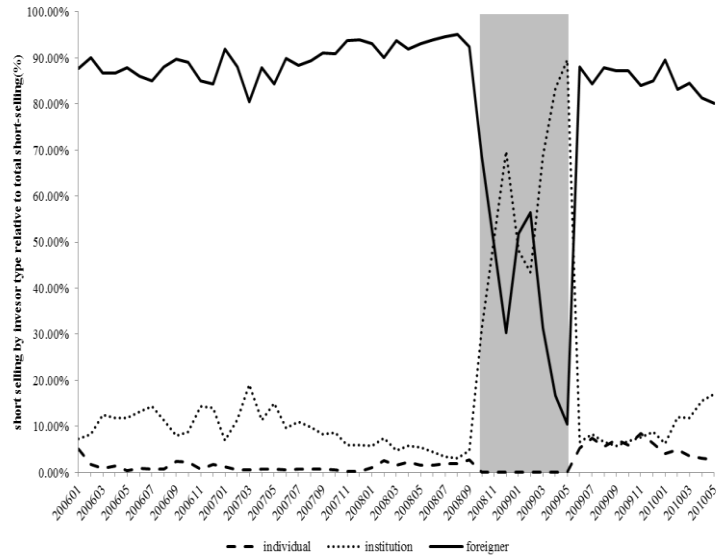


Figure 3.1. Short-selling activity in the KOSPI market over time.

Panel A shows the cross-sectional average across fifty sample stocks of monthly relative short-selling (*relss*) by different types of investors, which is obtained from the average of daily *relss* in month *t*. *Relss*(%) is the number of shorted shares divided by the number of traded shares for a stock in a given day. Panel B shows the sum of daily shares shorted by different types of investors in month *t* as a fraction of the sum of daily shorted shares in the same month. The sample covers fifty stocks in the KOSPI market and the sample period is from January 1, 2006 to May 31, 2010. The shaded area denotes the short-selling ban period (October 1, 2008 to May 31, 2009), during which the short-selling is prohibited by law.

Panel A. Short-selling activity relative to trading volume by investor type in the KOSPI market

Panel B. Proportion of short-selling activity by investor type in the KOSPI market



Appendix A. Calculation of short trade return (*STR*) and the number of days to cover (*DTC*)

For each short trade, I use volume-weighted price to calculate the short trade return (*STR*). The detailed example is below. Table A1 shows the one account-holder short selling and short covering transactions for SK Hynix stock. Suppose that the account-holder sold short total two hundred and fifty shares and sixty shares on December 10, Thursday, 2009 and December 17, Thursday, 2009, respectively. There are four trades executed at the price of 7,290, 7,310, 7,320 and 7,330 won at 13:07:40, 13:36:10, 13:36:10 and 13:37:10 (hour:minute:second) on the former date. The first short covering occurs on December 17, Thursday, 2009 and I apply first-in-first-out method. To close out this position, the investor bought one hundred shares in the subsequent three trades. The covering transaction of trade number 6, 8 and 9 is close out the trade number 1's one hundred shares at the price of 7,380, 7,340 and 7,270. Remaining two hundred and forty shares for unclosed position (i.e. shorted shares of trade number 2, 3, 4, 5 and 7) as shown in Table A1.

The detailed process of *STR* calculation is presented in Table A2. First, I calculate each trade elapsed hour from short selling time, because the trading hour is from 9:00 to 15:00, so I assume six hours as one day. Second, calculate the volume-weighted return and the volume-weighted index return for short covering trade. Third, I convert the volume-weighted return and the volume-weighted index return to hourly return using Eq.(2.5) and sum over the trade. Lastly, I multiply -1 by short trade return

(*STR*) and abnormal short trade return (*AbSTR*) to avoid misleading on short selling return.

Table A1. Short selling and short covering transactions
The table shows the one account-holder short selling and short covering transactions for SK Hynix stock.

Trade	Date	Time	Shares	Price	Buy or short	Net short position	KOSPI200 Index
1	2009-12-10 (Thursday)	13:07:40	-100	7,290	Short	-100	214.17
2	2009-12-10 (Thursday)	13:36:10	-50	7,310	Short	-150	213.24
3	2009-12-10 (Thursday)	13:36:10	-50	7,320	Short	-200	213.24
4	2009-12-10 (Thursday)	13:37:10	-50	7,330	Short	-250	213.04
5	2009-12-17 (Thursday)	9:13:10	-50	7,430	Short	-300	218.87
6	2009-12-17 (Thursday)	9:15:00	50	7,380	Covered buy	-250	218.90
7	2009-12-17 (Thursday)	13:18:30	-10	7,390	Short	-260	217.52
8	2009-12-17 (Thursday)	13:29:10	10	7,340	Covered buy	-250	217.43
9	2009-12-18 (Friday)	11:46:40	250	7,270	Covered buy	0	215.91

Table A2. Short trade return calculation

The table shows the detailed short trade return calculation process. Total elapsed hours denotes elapsed time in hours from the time of short trade executed. Weighted return (index weighted return) is a stock return (KOSPI200 return) weighted by each covering buy share volume. Hourly return (index hourly return) is weighted return (weighted KOSPI200 return) of short trade and calculated to hourly returns (see Eq. (2.5)). I assume six hours as one day. *STR* is sum of hourly return over trades. *AbSTR* is hourly abnormal short trade return which is defined as sum of hourly return over trades minus sum of index hourly return over trades.

Covered date	Total elapsed hours	Volume-Weighted return (%)	Volume-Weighted return of index (%)	Hourly return (%)	Index hourly return (%)
2009-12-17	26.122	0.617	1.104	0.024	0.042
2009-12-17	30.358	0.069	0.156	0.002	0.005
2009-12-18	34.650	-0.110	0.325	-0.003	0.009
			STR(%)	-0.023	
			AbSTR(%)	0.034	

Appendix B. Short-selling profit: exclude the dividend paid case

While stock dividend are also affect to short trade profit, so I exclude the short selling trade which paid the dividend to lender. Unlike U.S., Korea firms generally paid the dividend once a year and the ex-dividend date is the two trading days before the last trading day of the end of year. I exclude the short trade which shorts are not covered before ex-dividend day. In other words, short sellers who should paid dividend to lenders are excluded. The sample consists of 299 stocks and there are 32 stocks that does not paid any dividend during sample period. The total number of short trades in this study are 326,625 and 3,364 trades shorted before ex-dividend day and covered after ex-dividend day. Using these sample, I re-report the table 2.6 and the results are shown in table B.1. As is evident from the table, my results are not affected by dividend paid.

Table B.1 Summary statistics of short selling account data: Exclude the trades of dividend paid

This table shows summary statistics of short selling based on the short selling accounts of individual investors. Panel A shows summary statistics of short selling profits, where *profit* (thousands of won) is the pooled average of daily profit, defined as the short value minus the cover value; *net profit* (thousands of won) is the pooled average of daily profit after accounting for transaction costs; *net profit/DTC* is the pooled average of daily net profit per day, *DTC* is days to cover, which is the average number of days to cover for short sales; *rel profit*, as a percentage, is relative profit, defined as net profit scaled by the short value; *STR*, as a percentage, is the average of short trade returns, defined in Eq. (2.5); and *AbSTR*, as a percentage, is the short trade return in excess of the market return (see Eq. (2.6)). Panel B shows the price-weighted results using the previous month's end closing price as the weighting factor. Panel C reports the characteristics of short selling accounts. Shorted shares are the average number of shorted shares for short selling accounts. The short value is the number of shorted share times the short price for short selling accounts (millions of won). All the variables in this table are first computed as a pooled average of all the variables for each account and then the average of these variables is computed across short selling accounts. The sample consists of 299 stocks with 11,841 accounts and the sample period is from August 1, 2007 to May 31, 2010. The short selling ban period (from October 1, 2008, to May 31, 2009) was excluded. The numbers in parentheses are the *p*-value for mean test and the median rank sign test. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Profit		Net profit		Net profit/*DTC*		Rel profit(%)		STR (%)		AbSTR (%)	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Panel A: Simple average of profit : Exclude the observations of dividend paid												
2007:08–2010:05	-20.06**	2.78***	-36.86***	0.66	12.73***	2.28***	-0.290***	0.097***	0.338***	0.118***	0.377***	0.103***
	(0.028)	(0.000)	(0.000)	(0.343)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
2007:08–2008:09	-9.41	8.08***	-27.07	4.77***	16.54***	3.88***	0.003	0.375***	0.385***	0.134***	0.375***	0.105***
	(0.596)	(0.000)	(0.128)	(0.000)	(0.000)	(0.000)	(0.966)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
2009:06–2010:05	-22.21**	1.66***	-38.75***	-0.09***	12.51***	1.88***	-0.400***	0.032**	0.355***	0.117***	0.418***	0.106***
	(0.017)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Panel B: Price-weighted average of profits : Exclude the observations of dividend paid												
2007:08–2010:05	-16.21*	3.24***	-34.11***	0.86**	12.19***	2.18***	-0.298***	0.112*	0.331***	0.111***	0.382***	0.097***
	(0.086)	(0.000)	(0.000)	(0.037)	(0.000)	(0.000)	(0.000)	(0.082)	(0.000)	(0.000)	(0.000)	(0.000)
2007:08–2008:09	-6.71	9.00***	-25.45	5.42***	15.20***	4.01***	-0.032	0.392***	0.354***	0.124***	0.353***	0.097***
	(0.718)	(0.000)	(0.172)	(0.000)	(0.001)	(0.000)	(0.675)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
2009:06–2010:05	-18.36*	2.17***	-35.92***	0.14**	12.36***	1.78***	-0.393***	0.056**	0.361***	0.109***	0.439***	0.097***
	(0.056)	(0.000)	(0.000)	(0.025)	(0.000)	(0.000)	(0.000)	(0.015)	(0.000)	(0.000)	(0.000)	(0.000)

	Panel C: Summary statistic of accounts : Exclude the observations of divided paid										
	Shorted shares		Short value		*DTC*		Trade		Firms		# of accounts
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
2007:08–2010:05	340.22	90.36	8.39	3.18	4.82	2.00	27.35	6.00	6.36	3.00	11,818
2007:08–2008:09	378.34	81.43	8.83	3.55	4.68	2.00	20.41	5.00	4.67	2.00	4,493
2009:06–2010:05	325.37	94.22	8.26	3.02	4.91	2.00	26.76	6.00	6.26	3.00	8,655

국 문 초 록

공매도 거래전략 및 수익성에 관한 연구

본 연구는 국내 개인투자자 및 외국인 투자자의 공매도 거래전략 및 수익성에 관하여 분석한 연구이다. 각각의 투자주체가 하나의 연구로 구성되어 있다. 첫 번째 연구는 국내 개인투자자를 대상으로 공매도거래의 전략 및 수익성에 대해서 분석하였다. 한국주식시장을 대상으로 2007 년 8 월 1 일부터 2010 년 5 월 31 일까지 개인투자자의 공매도거래를 분석한 결과, 개인투자자는 공매도거래를 통해 거래당 평균적으로 약 12,660 원의 이익을 실현하고 있다. 이는 거래 수수료를 모두 고려하여 얻은 이익이다. 또한 전체 개인투자자의 거래 중에서 약 31%의 거래가 데이트레이딩(day trading) 으로 나타났고, 21%의 거래가 다음날에 공매도 포지션을 청산하였다. 공매도 거래수익은 공매거래의 기간과 음의 관계를 갖는 것을 발견하였다. 이는 짧은 거래기간을 갖는 투자자가 긴 거래기간을 갖는 투자자에 비해 더 높은 수익을 얻을 수 있다는 것을 발견하였다. 이외에 공매도 거래수익은 공매대상 기업의 주가 변동성이 높을 때, 호가스프레드(spread)가 작고, 주식회전율이 높고, 기업규모가 작고, 장부가치 대 시장가치가 낮을 때 더 크게 나타난다. 이중 가장 중요한 변수는 주가 변동성이다. 계좌별 분석을 실행한 결과, 거래종목수가 많은

계좌 즉 경험이 많은 계좌는 상대적으로 많은 수익을 낼 수 있고, 과거에 수익을 냈던 투자자는 미래에도 수익을 낸다는 것을 확인하였다. 이러한 결과를 종합하여 봤을 때, 개인투자자는 기업의 본질가치에 대해서 상대적으로 우월한 정보를 가지고 있고 이들은 이러한 정보를 가지고 이익을 실현한다. 또한 거래전략에 있어, 개인공매도 거래자는 장기투자전략보다는 이익을 빨리 실현하는 단기 투자전략을 사용하고 있다.

두 번째 연구는 외국인의 공매거래가 주가, 유동성 및 변동성에 미치는 영향에 관한 연구이다. 2006 년 1 월 1 일부터 2010 년 5 월 31 일까지의 분석기간을 대상으로 다음과 같은 결과를 발견하였다. 첫째, 한국주식시장에서 공매거래는 대부분 외국인 투자자로 이루어 지고 있다. 국내개인 및 국내기관투자자가 차지하는 비중은 매우 적다. 둘째, 외국인 투자자는 컨트래리안 공매거래 (contrarian) 를 (수익률이 높은 주식은 매도하고 수익률이 낮은 주식은 매수) 한다. 셋째, 외국인 공매거래자는 매수압력 (buying-pressure) 이 높을 때 공매거래를 하지만, 이는 주식 유동성을 개선 하지는 못한다. 마지막으로 외국인 공매거래의 증가는 주식 변동성의 증가를 초래하지 않으므로 외국인 공매도 거래자가 한국주식시장을 교란한다는 증거를 찾을 수 없었다.

주요어: 공매도, 공매도 상환, 외국인 투자자, 개인 투자자, 신흥시장, 한국주식시장

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