

Article

# Intraday Return Reversals: Empirical Evidence from the Korean ETF Market

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**Abstract:** We find that the overnight returns of Korean exchange-traded index funds (ETFs) are significantly positive, whereas the subsequent intraday returns are negative. These intraday return reversals are caused by relatively higher opening prices than the closing prices. In the Korean ETF market, where institutional investors are dominant participants, the return reversals are not explained by the attention hypothesis as in Berkman et al. [1]. Hence, we investigate whether the disagreement hypothesis can explain return reversals. Under the disagreement situations between positive and negative traders at the open, positive traders can have a positive influence on the ETF prices by increasing their investments. However, negative traders, who give up investments due to limited short selling opportunities in the ETF market, have no effects on the prices. Comparing ETF markets with KOSPI 200 Futures where there are no restrictions on short selling, we find that short selling constraints are significant factors for the return reversals. This implies that disagreement among the investors can cause return reversals even in the markets without noise traders. Using unique Korean market data, we conclude that return reversals cannot be completely explained by the attention hypothesis, and that disagreement among investors is also a significant factor for the return reversals. This study contributes to the existing literature by showing that the attention hypothesis does not explain return reversals in the ETF market completely, and suggesting the disagreement hypothesis as an alternative.

**Keywords:** return reversals; exchange-traded funds (ETFs); attention hypothesis; disagreement hypothesis; short selling

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## 1. Introduction

According to the risk-return tradeoff, the returns of high-risk assets should be higher than those of low-risk assets. If the return of an asset with relatively low risk is higher than that with a high risk, investors' buying pressure will lead to an increase in the price and a decrease in the return, and finally, it will converge to the proper return on risk. From this point of view, it is very unusual that overnight returns are consistently higher than intraday returns even though the variance of overnight returns is lower than that of intraday returns [2-3]. In recent studies on mature markets, such as the US, and emerging markets, it is widely reported that the overnight returns are significantly positive, and the intraday returns are close to zero or negative [4-6]. Cliff et al. [6] point out that the positive overnight returns and the systematic reversals during the trading day are major challenges to the traditional asset pricing model.

Recent studies on intraday return reversals support the attention hypothesis that return reversal is caused by a relatively higher opening price than the closing price and that the high opening price is mainly caused by the limited attention of individual investors who are considered noise traders [7]. Barber and Odean [5] have reported that the limited attention of individual investors causes the high opening price and the return reversal. Individual investors face the search problem of selecting from thousands of stocks when they want to buy, and they mainly choose stocks that attract their attention. Therefore, stocks with a high trade volume or high return attract individual investors'

attention, and they become net buyers of these attention-grabbing stocks. By contrast, when individual investors want to sell stocks, they do not have a search problem because they typically sell stocks they own rather than short selling.

Berkman et al. [1] extended the theory of Barber and Odean [5] to examine how the limited attention of individual investors affects return reversals. Using the square of yesterday's close-to-close return and the net shares bought by individual investors yesterday as variables to measure the level of attention of individual investors, they find that the higher the previous day's return volatility and the greater the intensity of individual investors' net buying, the higher the opening price the following day. They prove empirically that the increase in these opening prices is caused by the increase in net buying of individual investors.

We consider the disagreement hypothesis as an alternative for explaining higher overnight returns. The disagreement hypothesis explains that the overnight and intraday return reversals are caused by a disagreement between positive investors, who expect an increase in stock prices, and negative investors, who predict a bearish market. After the closing of the stock market, new information is not reflected until the open of the following day, and this information accumulates so that disagreements between positive and negative investors become worse at the open of the following day. Positive investors have no constraints on buying stocks, but negative investors are forced to abandon their investments if it is difficult to make a short sale, so positive investors' buying leads to a relatively higher opening price than the closing price. Thus, the increase in opening price leads to return reversals.

In this study, we investigate whether there are overnight and intraday return reversals in Korean index ETFs and analyze what factors affect these return reversals. First, we examine the attention effect of individual investors. Because individual investors' market share is less than 10 percent in the Korean ETF market, the individual investors' attention effect may be limited.

Second, we introduce and test the disagreement hypothesis. The disagreement hypothesis argues that the return reversals take place because of a disagreement between positive and negative investors. Positive investors can increase their investments in ETFs without any restriction, but negative investors give up their investment because of short selling constraints in Korea ETF market, which will lead to the relatively high opening prices, resulting in return reversals. With short selling constraints in ETF market, negative investors may seek alternative instruments such as short positions in KOSPI200 futures. KOSPI200 futures and index ETFs share the same underlying variable, KOSPI200 index.

In the futures market, positive and negative investors are free to invest in any direction they want, so the futures' opening prices will not be relatively higher at the open. We examine the disagreement hypothesis by comparing the KOSPI 200 ETF with KOSPI 200 futures. If we find return reversals in ETF market, which is not explained by the attention hypothesis, and none in futures market at the same time, we can say that the return reversals in ETF market are caused by the disagreement among investors.

Negative investors may consider inverse ETFs as an alternative for taking a short position because inverse ETFs track the reverse of index returns. However, since the values of inverse ETFs are designed to be reset every morning, it is well known that returns on inverse ETFs do not replicate the returns from taking short positions [8]. In addition, index ETFs track the KOSPI 200, while Inverse ETFs track the KOSPI 200 futures index.

We explore the intraday return reversals for four different KOSPI 200 ETFs and the KOSPI 200 futures in the Korea Exchange (KRX) from January 2012 to December 2016. The main results are as follows. First, we confirm that the overnight returns of the KOSPI 200 ETFs are significantly positive and the intraday returns are negative. Second, we test the attention hypothesis using the previous day's return volatility and the individual investors' previous day net buying ratio as proxies that measure the level of individual investor attention. We find that the increase in the level of individual investor attention does not raise overnight returns and the individual investors' net buying intensity at the following day's open in the Korean ETF market. Finally, we compare the KOSPI 200 ETF with the KOSPI 200 futures to test the disagreement hypothesis. In the futures market, unlike in the ETF

market, return reversals are not observed, indicating that the short selling constraints affect the return reversals.

This study examines whether return reversals occur in the Korean ETF market, unlike the existing literature that studies the return reversals on the individual stocks. There are several reasons why the study of return reversals in the Korean ETF market is meaningful: (1) Because in the Korean ETF market, institutional investors are major traders and individual investors have a very low share, we can identify the implications of the return reversals by comparing with the results of the stock market, where the share of individual investors is relatively high; (2) As ETFs track the underlying assets, it is possible to compare them with other derivatives that track the same underlying assets; (3) Because the Korean ETF market is an order-driven market, we can exclude the effects of the strategic trading of market makers or specialists; and (4) As the opening prices in the Korean ETF market are determined through the opening call auction system, we can measure the individual investor's net buying ratio more effectively.

The remainder of this paper is organized as follows. Section 2 reviews the literature on return reversals. Section 3 describes our data and research methodology. Section 4 presents the descriptive statistics and the main results, and Section 5 concludes.

## 2. Literature Review

We study the intraday return reversals and the factors that affect them. Some research supports the attention hypothesis that return reversals are caused by the limited attention of individual investors. Odean [9] and Barber and Odean [5] suggest that individual investors are limited in choosing stocks and that this limited attention is the cause of the return reversals. Barber and Odean [5] observe that individual investors are more influenced by their limited attention when they want to buy rather than sell. They indirectly measure whether investors are paying attention to a particular firm using abnormal trading volume and extreme one-day returns as proxies of individual investor attention. They find that individual investor is a net buyer of stocks with a high level of attention and that this attention-driven buying behavior affects the intraday return reversals.

Berkman et al. [1] contribute to this literature by extending Barber and Odean's study [5]. Using yesterday's squared return and individual investors' net buying of the previous day as proxies of the level of individual investor attention, they empirically prove that the higher the level of individual investor attention, the higher the intensity of their net buying at the open of the following trading day and that this behavior leads to relatively higher opening prices. As a result, relatively high opening prices lead to positive overnight returns and negative intraday returns. They find that these patterns are more prominent for stocks that are costly to arbitrage and difficult to value. These results have an interesting implication in the Korean ETF market. The share of individual investors in the Korean stock market is 40 to 60 percent, but the proportion of individual investors in the ETF market only about 10 percent. Therefore, it is interesting to investigate whether return reversals in the ETF market are attributable to a small number of individual investors, and this work will contribute to filling the gap of the existing literature on the explanation of the return reversals.

By contrast, Branch and Ma [4] find that a negative correlation exists between overnight and intraday returns and that these patterns are related to the microstructure of how market makers and specialists behave at the open. They explain that return reversals in the US stock market occur due to the strategic trading of specialists and market makers. This is not the case in the Korean stock market. As an order-driven market, there are no specialists or market makers in the Korean market, and we can rule out the effects of the strategic behavior of market makers in explaining the return reversals.

Some studies theoretically analyze the investor's limited attention in terms of asset allocation decisions and equilibrium price decisions. Peng and Xiong [10] explain that the limited investor attention leads to category-learning behavior that focuses more on market and sector-wide information than on firm-specific information, and Huang and Liu [11] show that rational inattention caused by information acquisition cost makes investors over- or underinvest. Conversely, the empirical research analyzing the effect of investor attention on the stock market uses various

attention variables such as news reports [12, 13], upper price limits [14], Google search frequency [15], and trading volume [16] as proxies for investor attention.

There is some research that has studied return reversals for ETF or futures markets similar to our study. Liu and Tse [17] investigate US ETFs and international index futures and find that the overnight returns of US ETFs and most index futures are significantly positive, whereas intraday returns are negative. They also find that the risk of trading hours is higher than that of non-trading hours estimating the value at risk and expected shortfall. Fung et al. [18] investigate intraday price reversals for the US and Hong Kong index futures and find intraday price reversals following large price changes at the open of the futures market. They find that the magnitude of intraday price reversals is positively related to the initial price changes and that the price reversals can be exploited after transaction costs.

Some existing research on the Korean stock market reports that the return reversal phenomenon exists [19, 20]. Choi and Hahn [19] confirm the overnight and intraday return reversals for the Korean Securities Dealers Automated Quotation (KOSDAQ) market and explain the return reversals using a proxy for individual investor attention. They support the attention hypothesis by empirically proving that the higher the previous day's net buying ratio of individual investors, the greater the individual investors' net buying intensity at the open of the following day and the larger the return reversal magnitude. These results are robust even considering the stock price changes of the US stock market the day before. Kwon et al. [20] confirm the overnight and intraday return reversals for the KOSPI 200, reporting that this reversal is caused by the overreaction of the opening price and the under reaction of the closing price. They also find that foreign investors' trading contributes to the overreaction of the opening price and individual investors' trading contributes to the return reversal during the trading day.

With these previous results, we try to explain the return reversals in a new viewpoint, the disagreements among investors. To do this, we use the Korean ETF market, where the effects of the market makers are completely ruled out and the influences of individual investors might be limited. In particular, unlike in other studies, we use the entire market data which include all the daily trading data for all market participants. This enables us to perform a more accurate analysis.

### **3. Data and Methodology**

#### *3.1. A Unique Data Set*

The Korean ETF market began by launching four products in October 2002. Since then, a number of ETFs including index, bond, derivative, and overseas ETFs have listed and traded on the Korean market. The Korean Exchange (KRX) reports detailed data on investor types. In KRX data, investor types are divided into eight members, which can be broadly grouped into the following three groups: institutional, foreign, and individual investors. This unique data set makes it possible to more accurately analyze how the investment behavior of each investor group affects the ETF market. We collected additional data which consist of trading volumes and prices, classified by the investor groups on the opening and closing call auctions. To verify the attention hypothesis, we need to confirm whether individual investors' buying behavior raises the opening price to an abnormally high level. This unique transaction data set allows for more accurate analysis of the individual investors' effects on the opening prices.

#### *3.2. Sample*

This study examines the daily data of four different ETFs tracking the KOSPI 200 traded on KRX. There are 8 ETFs tracking the KOSPI 200 in the Korean market, however, these four ETFs are listed first in the exchange and are bigger in trading volume and in net asset value. The sample period is for 60 months from 2 January 2012 to 29 December 2016, and the average annual trading day is 247 days.

The ETFs selected as samples are the KODEX 200, KOSEF 200, TIGER 200, and KINDEX 200. The KODEX 200 and KOSEF 200 were listed on the Korea Exchange on October 14, 2002, TIGER 200 on April 3, 2008, and KINDEX 200 on September 10, 2008. Table 1 provides the summary data for four

ETFs selected as the sample as of December 29, 2016. They track the KOSPI 200; however, there are some price differences between ETFs, and the total market value of the KODEX 200 is 9.5 times bigger than that of the KOSEF 200. The TIGER 200 includes all 200 individual stocks that comprise the KOSPI 200, while KOSEF 200 tracks the KOSPI 200 with 166 individual stocks. The ETF data are downloaded from the website of the KRX Market data (<http://marketdata.krx.co.kr>) and investors' transaction data were obtained from the KRX.

**Table 1.** The Summary data of the four index ETF samples

Item	Date of Listing	Manager	Number of Components	Closing Price(won)	Number of Shares Outstanding	Total Market Value (million won)
KODEX 200	20021014	Samsung Asset Management	198	26,325	185,200,000	4,875,390
KOSEF 200	20021014	Kiwoom Asset Management	166	26,430	19,500,000	515,385
TIGER 200	20080403	Mirae Asset Management	200	26,340	73,200,000	1,928,088
KINDEX 200	20080910	Korea Invest Management	196	26,390	33,200,000	876,148

### 3.3. Daily Return Measures

We calculate the overnight returns ( $CTO_t$ ) using the closing price on day  $t - 1$  ( $CLOSE_{t-1}$ ), the opening price on day  $t$  ( $OPEN_t$ ), and the intraday returns ( $OTC_t$ ) using the opening and closing prices on day  $t$ . Because the opening and closing prices in the Korean ETF market are determined through the call auction system, we do not need to calculate the midpoint of the bid and ask quotes as the previous studies on the US stock market did [1]. Returns are measured by taking the log of the price, and returns over each time frame are as follows:

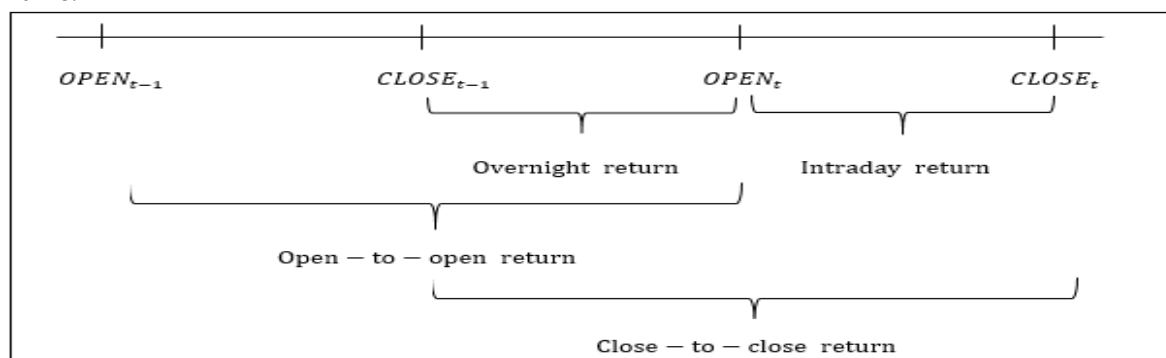
$$\text{Overnight, Close-to-Open Return} = CTO_t = \log(OPEN_t/CLOSE_{t-1}), \quad (1)$$

$$\text{Intraday, Open-to-Close Return} = OTC_t = \log(CLOSE_t/OPEN_t), \quad (2)$$

$$\text{24-Hour, Open-to-Open Return} = OTO_t = \log(OPEN_t/OPEN_{t-1}), \quad (3)$$

$$\text{24-Hour, Close-to-Close Return} = CTC_t = \log(CLOSE_t/CLOSE_{t-1}). \quad (4)$$

where the Close-to-close return ( $CTC_t$ ) is the sum of the  $CTO_t$  and  $OTC_t$ . We screen our data for extreme observations or errors. Figure 1 shows a visual representation of returns over each time frame.



**Figure 1.** Return measures over each time frame

### 3.4. Variables

We estimate two proxies that Berkman et al. [1] used to measure the level of individual investor attention. The first is the previous day's return volatility ( $VOL_{t-1}$ ), which is calculated as the square of the previous day's close-to-close return. This measure is motivated by the main result of Barber and Odean [5]. Using the absolute return of the previous day as a proxy for news that attract the individual investor attention, they find that as this measure increases, the net buying by individual investors increases on the next day. The second proxy is the net buying trading volume bought by individual investors on the previous day ( $Nbuy_{t-1}$ ), which is calculated by dividing the net buying by the total daily trading volume. This measure is also motivated by Barber and Odean's [5] proposal that individual investor is a net buyer of attention-grabbing stocks. The two proxies to measure the level of individual investor attention follow:

$$VOL_{t-1} = (CTC_{t-1})^2, \quad (5)$$

$$Nbuy_{t-1} = \frac{\text{Net Individual Buying Volume of the previous day}}{\text{Total Daily Trading Volume of the previous day}}. \quad (6)$$

Next, we compute the net individual buying volume at the opening, as a percentage of total individual opening volume to measure the intensity of net buying by individual investors at the open.

$$Nbuy_{open} = \frac{\text{Net Individual Buying Volume at the open}}{\text{Total Individual Volume at the open}} \quad (7)$$

where net individual buying volume at the open ( $Nbuy_{open}$ ) is the net number of ETF shares  $i$  bought by individual investors at the open on day  $t$ , total individual volume at the open is the total number of ETF shares  $i$  bought by individual investors at the open on day  $t$ .

## 4. Empirical Results

### 4.1. Descriptive Statistics

We investigate whether the overnight and intraday return reversals occur in the Korea ETF market. Table 2 reports the mean and median of the overnight returns (CTO), intraday returns (OTC), close-to-close returns (CTC), and open-to-open returns (OTO) of four index ETFs for 1,234 trading days from 2 January 2012 to 29 December 2016. After we compute the mean and median of the cross-sectional CTO and OTC for the four ETFs and calculate the time-series mean and median.

Table 2 shows that the mean OTCs of each ETF are all positive, and CTOs of three of the ETFs, except the KOSEF 200, are statistically significant at the 1% level. On the other hand, the mean CTOs are all negative; however, only the KINDEX 200 is significant. The mean DIFFs are statistically significant at the 1% level, except for the KOSEF 200. When averaged across all ETFs and days, the mean OTC is 4.0bp per day, the mean CTO is -3.5bp per day. The mean DIFF is 7.6bp, which is statistically significant. This result means that the significant intraday return reversals are observed in the Korean ETF market as in the existing literature. The return of 7.6bp per day is equivalent to 18.77% per year. This implies that an 18.77% return per year can be achieved before deducting transaction costs by repeating the strategy that buys an ETF at the closing price and sells that ETF at the opening price at the subsequent day's open, or shorts the ETF at the opening price and buys back the corresponding ETF at the closing price at the close of day.

Comparing the standard deviations (SD) of the overnight and intraday returns, the SD of OTCs is higher than that of CTOs in all sample ETFs. If the ETF market is efficient, OTCs with higher risk should be higher. However, as shown above, CTOs are higher than OTCs, which is against the risk-return tradeoff. The two columns on the right side of table 2 are the mean (or median) of the daily CTC and OTO, which are not significantly different from 0 for the sample periods. The 24-hour CTC is 0.5bp per day, and the 24-hour OTO is 0.7bp per day. In terms of annual rates, the CTC and OTO are 1.24% and 1.73%, respectively, which are very small compared with OTCs. Even though the daily mean return is not statistically different from 0, it is an anomaly that the CTO of all sample ETFs is positive, and the OTC is negative.

Table 2. Descriptive Statistics of ETFs (2012 ~ 2016)

		Overnight and Intraday Returns			24-Hour Returns	
		CTO	OTC	DIFF	CTC	OTO
KODEX 200	Mean	<b>0.036</b>	-0.030	0.066	0.007	0.006
	Median	0.019	-0.018	0.058	0.019	0.041
	T	2.617**	-1.608	2.953**	0.278	0.280
	SD	0.480	0.650	0.780	0.830	0.820
KOSEF 200	Mean	0.025	-0.018	0.044	0.007	0.007
	Median	0.019	0.000	0.019	0.019	0.041
	T	1.679	-0.943	1.723	0.298	0.293
	SD	0.530	0.690	0.900	0.840	0.850
TIGER 200	Mean	0.041	-0.036	0.075	0.007	0.007
	Median	0.000	-0.019	0.076	0.020	0.039
	T	2.985**	-1.881	3.265**	0.195	0.276
	SD	0.480	0.670	0.830	0.830	0.830
KINDEX 200	Mean	0.059	-0.052	0.111	0.007	0.007
	Median	0.039	-0.037	0.119	0.022	0.007
	T	3.837**	-2.658**	4.292**	0.312	0.293
	SD	0.540	0.690	0.910	0.840	0.850
4 ETF	Mean	0.040	-0.035	0.076	0.005	0.007
	Median	0.034	-0.017	0.066	0.010	0.039
	T	2.974**	-1.936	3.446**	0.197	0.286
	SD	0.470	0.640	0.770	0.830	0.800

Note: CTO, OTC, and DIFF refer to close-to-open (overnight) return, open-to-close (intraday) return, and the difference between the overnight and intraday returns, respectively. CTC and OTO refer to the 24-hour close-to-close and 24-hour open-to-close returns. SD refers to standard deviations. \*\* denotes statistical significance at the 1% level.

Table 3 reports the mean overnight, intraday, and 24-hour returns of the KOSPI 200, which is the underlying asset of the sample ETFs. The mean CTO of the KOSPI 200 is a statistically significantly positive, 5.8bp per day, and the mean OTC is a statistically significant negative, -5.1bp per day. The DIFF is 11bp per day, which equals to 26.69% per annum. The daily average DIFF in KOSPI 200 is bigger than the mean DIFF in ETFs by 3.5bp, which is statistically significant. The mean 24-hour CTC and OTO for five years from 2012 to 2016 are not significantly different from 0. The absolute values of the KOSPI 200 CTO, OTC, and DIFF are all higher than those of the ETFs. This implies that the return reversals are more evident in the KOSPI200 market.

Table 3. Descriptive Statistics of KOSPI 200 (2012 ~ 2016)

		Overnight and Intraday Returns			24-Hour Returns	
		CTO	OTC	DIFF	CTC	OTO
KOSPI 200	Mean	0.05750	-0.05057	0.10807	0.00694	0.00651
	Median	0.01893	-0.04505	0.09831	0.00404	0.01898
	T	3.54**	-2.71**	4.32**	0.28370	0.26640
	SD	0.57	0.66	0.88	0.86	0.86

Note: CTO, OTC, and DIFF refer to close-to-open (overnight), open-to-close (intraday), and the difference between the overnight and intraday returns, respectively. CTC and OTO refer to the 24-hour close-to-close and open-to-close returns. SD refers to standard deviations. \* and \*\* denote statistical significance at the 5% and 1% levels, respectively.

#### 4.2. Individual Investor Attention

In this section, we investigate factors that affect the return reversals. First, we examine whether the attention hypothesis can explain the return reversals in the Korean ETF market as in Berkman et al. [1]. The attention hypothesis explains the overnight and intraday return reversals persuasively with the limited search problem of individual investors. We compare the results of the ETF market which is dominated by institutional investors with those of previous studies on individual stocks where the influence of the individual investor is significant.

The first proxy to test the attention hypothesis is the return volatility of the previous day ( $VOL_{t-1}$ ). Individual investors who want to buy are constrained by stock selection because they are selecting from thousands of stocks. High-return volatility stocks tend to attract their attention. Therefore, individual investors will intensively buy these stocks on the first buying chance of the next day. This individual investors' buying behavior will raise the opening price to an abnormally high level. Because of the relatively high opening price against the closing price, the CTOs will be positive and the OTCs will be 0 or negative.

Panel A of Table 4 reports the result of analyzing whether the higher the  $VOL_{t-1}$  of ETFs, the higher the CTO and the greater the intensity of individual investor net buying at the open ( $NBuy_{open}$ ) will be. Based on the level of  $VOL_{t-1}$ , we form 3 groups: each with low, medium, and high attention level. High-Low is the mean difference between the high and low groups, and the t-statistic is the test statistic of the null hypothesis where the mean difference is 0.

In Panel A of Table 4, the mean difference between the high and low attention groups (High-Low) of the CTO is only 1.9bp, which is not statistically different from 0, even though the CTO of the ETFs tends to be higher as the  $VOL_{t-1}$  is high. The  $NBuy_{open}$  of the following day is not higher as the  $VOL_{t-1}$  is high; the mean High-Low of the  $NBuy_{open}$  is rather negative and statistically not different from 0. Using the  $VOL_{t-1}$  as an attention proxy, we cannot find any evidence supporting the attention hypothesis that the higher the attention level, the greater the intensity of  $NBuy_{open}$  of the following day, resulting in a relatively higher opening than intraday price.

Our second proxy is the individual investors' net buying of the previous day ( $NBuy_{t-1}$ ) as a percentage of total volume. If the  $NBuy_{t-1}$  increases, it attracts the individual investors' attention and raises  $NBuy_{open}$  at the following day, thereby raising the opening price abnormally. We form three subgroups based on individual investors' net buying ratio of the previous day, and we test whether the CTO and the  $NBuy_{open}$  become higher as the  $NBuy_{t-1}$  increases. The results appear in Panel B of Table 4.

Panel B shows that the CTO tends to be higher as the  $NBuy_{t-1}$  increases, but the mean High-Low of the CTO is 6.5bp, which is not statistically significant. The mean High-Low of the OTC is 1.2bp, which is not significant. In addition, contrary to the predictions of the attention hypothesis, the  $NBuy_{open}$  tends to be low as the  $NBuy_{t-1}$  increases, and the mean High-Low of the  $NBuy_{open}$  is statistically significantly negative. This implies that the attention hypothesis does not explain the



return reversals in the Korean ETF market. This seems to be because ETFs are mainly traded by institutional and foreign investors and are less influenced by individual investors.

**Table 4.** Returns across Groups Sorted by 2 Proxies for Individual Investor Attention.

<b>(A) Proxy for individual investor attention = <math>VOL_{t-1}</math></b>				
<b>Attention</b>	<b>CTO</b>	<b>OTC</b>	<b>CTC</b>	<b>NBuy<sub>Open</sub></b>
Low	0.03327	-0.03917	-0.00590	6.84000
Medium	0.03455	-0.05582	-0.02127	5.57000
High	0.05218	-0.00826	0.04392	4.96000
High-Low	0.01891	0.03090	0.04982	-1.88000
t-statistic	0.54	0.71	0.89	-0.69
<b>(B) Proxy for individual investor attention = <math>NBuy_{t-1}</math></b>				
<b>Attention</b>	<b>CTO</b>	<b>OTC</b>	<b>CTC</b>	<b>NBuy<sub>Open</sub></b>
Low	0.01717	-0.05524	-0.03808	9.25000
Medium	0.02070	-0.00750	0.01320	4.84000
High	0.08229	-0.04368	0.03861	3.28000
High-Low	0.06512	0.01157	0.07669	-5.98000
t-statistic	1.97	0.26	1.34	-2.31*

Note: CTO, OTC, and CTC refer to close-to-open (overnight), open-to-close (intraday), and 24-hour close-to-close (daily) returns, respectively. NBuy<sub>Open</sub> is the ratio of individual investors' net buying at the open. \* denote statistical significance at the 5% level.

#### 4.3. Disagreements and Short-sale restrictions

We confirm that the overnight and intraday return reversals exist in the ETF market, but the return reversals are not explained by the individual investor's attention effect. In this section, we examine the disagreement hypothesis as an alternative for explaining the return reversals. The disagreement hypothesis argues that the return reversals occur because disagreement among investors is intensified at the open. After the stock market closes, new information is not reflected in the stock prices. So information accumulates until the open of the following day and the accumulation of this information deepens disagreement among investors. At the opening, positive investors increase their investments, while negative investors try to take short positions. However, with short selling restrictions in the market, it is difficult for negative investors to take the positions they want. Therefore, the short selling constraints of negative investors make the opening price relatively higher than the closing and intraday prices.

In order to test the disagreement hypothesis, this study compares the ETF market with the futures market where there are no constraints on taking a long and short position. Under the disagreement hypothesis, since there are no restrictions on short selling in the futures market, the opening prices should not be higher than the closing prices even with disagreement among investors. KOSPI 200 ETF and KOSPI 200 futures markets are very active markets with institutional, foreign and individual investors. They are both highly efficient markets with low transaction costs. Considering that the underlying assets are the same, KOSPI 200 index, for both ETFs and KOSPI 200 futures, and there are almost no institutional differences except short selling constraints between two markets, it is possible to examine the disagreement hypothesis by comparing the return reversals in the two markets.

In the case of ETFs, positive investors will buy ETFs without any constraints, but negative investors who expect a decrease in ETF prices will only abandon investment opportunity because of short selling constraints. Or, instead, the negative investors may invest in inverse ETFs or take a short position in index futures, which do not directly affect ETF prices. Under the disagreement hypothesis, therefore, the ETF opening price will be relatively higher than the closing and intraday prices. In KOSPI 200 futures market, because both positive and negative investors can take a long or short

position without any restrictions, the opening price will not be relatively higher and the return reversals will not be observed.

Table 5 shows the CTO, OTC, and CTC returns of the KOSPI 200 futures. The CTO of the KOSPI 200 futures is 1.34bp, and OTC is -0.92bp, which are not significantly different from 0. The difference between CTO and OTC is 2.25bp, which is significantly not different from 0 either. While we observe the overnight and intraday return reversals in the ETF market which has constraints on short selling, we don't find any evidence of return reversals in the futures market which has no constraint on short selling. These findings support the disagreement hypothesis that the overnight and intraday return reversals occur because negative investors in the ETF market have no choice other than abandoning investment opportunity under the short selling constraints.

**Table 5.** Overnight Returns, Intraday Returns, 24-Hour Returns of KOSPI 200 Futures

		Overnight and Intraday Returns			24-Hour Returns	
		CTO	OTC	DIFF	CTC	OTO
Futures	Mean	0.01336	-0.00918	0.02254	0.00418	0.00571
	Median	0.01896	0.00000	0.02011	0.02943	0.05910
	T	0.86	-0.47	0.91	0.17	0.23
	SD	0.54	0.69	0.87	0.88	0.86

Note: CTO, OTC, and DIFF refer to close-to-open (overnight), open-to-close (intraday), and the difference between the overnight and intraday returns, respectively. CTC and OTO refer to 24-hour close-to-close and 24-hour open-to-close returns. SD refers to standard deviations.

#### 4.4. Summary for Empirical Results

It is found that there are return reversals in KOSPI 200 and index ETFs, but not in KOSPI 200 futures. The average magnitude of return reversals for KOSPI 200 index, the daily mean difference between CTO and OTC of KOSPI 200, is 11bp, and that for index ETFs is only 7.6bp, which is significantly smaller than KOSPI 200. Choi and Hahn [19] find return reversals at individual stock level occur due to individual investors' attention in the Korean market. Thus we can interpret that individual investors' attention is at least partly responsible for return reversals in KOSPI 200, since KOSPI 200 is composed of 200 individual stocks with return reversals. We show that there is no return reversal in KOSPI 200 futures and argue that return reversals in ETFs are caused not by attention effects, but by short selling constraints. This implies that return reversals can be decomposed into two parts: a part from investors' attention, and another part by disagreement among investors and short selling constraints.

## 5. Conclusions

This study examines whether the overnight and intraday return reversals observed in major mature and emerging markets also exist in the Korean ETF market, and can be explained by individual investors' attention. We find that the observed Korean ETFs' return reversals are not influenced by individual investor behavior. This implies that there may be other factors which cause higher opening prices, and then return reversals.

We identify another factor causing return reversals using a unique Korean ETF data set. We obtained complete daily trading data by investor types (institutional, foreign and individual investors) for entire listed ETFs from Korea Exchange. In addition, the data set includes trading and price data at the opening call auction, which enables us to calculate net buying or selling amount by investor groups at the open. With this unique Korean data set, we can more accurately analyze the effects of individual investors' transaction behavior on return reversals.

We first confirm that ETF CTOs are significantly positive, whereas the subsequent OTCs are negative, and that there are return reversals in the Korean ETF market. However, the return reversals in ETFs are not explained by the attention hypothesis. The Korean ETF market is dominated by

institutional investors, and individual investor behavior is not affected either by attention proxies as in Berkman et al. [1]. This indicates that the ETF market's return reversals are hardly caused by individual investors' noise trading. Hence, we examine whether the disagreement among the investors and short selling constraints can explain return reversals in ETFs. By comparing the results from Korean ETFs and KOSPI 200 futures markets, we conclude that the return reversals in Korean ETFs occur due to disagreement among investors, not to individual investors' attention.

We show that return reversals can be observed without attention effects of the noise traders. It seems clear that both the individual investors' attention and the disagreement among the investors are major reasons for the return reversals, and return reversals can be decomposed into a part by attention and another part by disagreement. On an individual stock level, where the participation of individual investor is significant, both disagreement among investors and attention of individual investors cause return reversals. In the markets dominated by informed traders like institutional investors, such as the Korean ETF market, the existence of return reversals can be explained only by disagreement among investors. This implies that the return reversals in individual stocks might be stronger than in ETFs. As shown in the empirical analysis, the magnitude of the return reversals is estimated larger in KOSPI 200 index, which is the collection of individual stocks, than in ETFs, since KOSPI 200 is affected simultaneously by the attention effects and the short selling restrictions. This study contributes to the literature by showing that the return reversals which are not explained by the attention hypothesis can be caused by disagreement among investors and that thus the return reversals are decomposed into two parts.

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