Overnight versus Intraday Momentum and Investor Heterogeneity: Evidence from the Korean Equity Market

Sampath Kongahawatte [1]

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ABSTRACT

I provide a heterogeneity-based explanation for robust overnight and intraday momentum, as well as offsetting cross-period reversals in the Korean equity market from 2014 to 2017, using investor-type trade flow data. I demonstrate that retail investors' attention-based trading on overnight returns and domestic institutions' arbitrage trading on intraday returns drive these relationships, employing Fama-Macbeth (1973) cross-sectional regressions. Finally, I show that the trading behavior of sentiment-prone retail investors weakens when overall market sentiment is pessimistic, particularly during down markets and financial crises. This study has significant implications for the literature on investor heterogeneity and stock prices.

1. Introduction

Lou et al. (2019) document strong overnight and intraday momentum and offsetting cross- period reversals in equity markets. They argue that this cross-period reversal, also known as the "tug of war" between overnight and intraday returns, results from the varying trading preference of investors who dominate the market at different times of the day. Accordingly, retail investors prefer to trade more at market open, whereas institutions become more active at market close. Lou et al. (2019) document that arbitrage portfolios sorted on past overnight (intraday) returns to generate significant monthly overnight (intraday) profits. Moreover, they report that arbitrage portfolio sorted on overnight (intraday) generates significant intraday (overnight) losses.[2] Despite retail investors and institutions trading is related to overnight and intraday momentum and cross period reversals, Lou et al. (2019) do not provide evidence from direct trading tests. In this context, a study that provides evidence on the behaviour of different investor groups on overnight and intraday returns using direct trading tests is of great importance. Taking advantage of the trading

[1]Corresponding Author, Department of Finance, Faculty of Management Studies and Commerce, University of Sri Jayewardenepura, Email: kongahawatte@sjp.ac.lk

[2]They show that the arbitrage portfolio that longs (shorts) overnight winners (losers) during the previous month generates a monthly overnight (intraday) return of 3.42% (-3.02%). Similarly, an arbitrage portfolio constructed based on intraday returns generates a monthly intraday (overnight) return of 2.41% (-1.77%) in the US market. Further, they document similar, but weaker results in a global sample consist of Canada, France, Germany, Italy, United Kingdom, Australia, Hong Kong, Japan, and South Africa.

[3]Due to the unavailability of the trade flow data in many markets, direct trading tests on this area are hardly found.

volume data by investor type in the Korean equity market, which is an order-driven market with high retail investor participation (Kang et al., 2014), I provide new evidence on the investors' role in the "tug of war" that drives overnight and intraday momentum and offsetting cross period reversals.[3]

Barber and Odean (2008) find that the individual investors' limited attention-prone choices make them trade more. Since the attention-based trading reflected through buy-sell imbalance (BSI) mainly occurs at the market open, increased buying (selling) inflates (deflates) the opening price of a stock, making it overpriced (under-priced). Then institutions in balancing their portfolios, sell (buy) overpriced (under-priced) stocks generating intraday return reversals. The above mechanism aligns with the argument of Lou et al. (2019) and Gao et al.

(2021) that some retail investors' (institutions') preference to trade intensively around the market open (close) generates persistent overnight and intraday momentum as well as cross period reversals. Therefore, the interesting question is whether the trading behaviour of retail investors at the market open and the institutional investors trading behaviour near the market close affect the overnight and intraday return patterns mentioned above in the Korean equity market. In this context, I conjecture that the stocks that grab more (less) attention from retail investors to be overnight winners (losers) and intraday losers (winners).[4] Accordingly, I expect a positive (negative) relationship between the net buying of retail investors and overnight (intraday) returns. Since a majority of the foreign investors are institutions, I expect a similar trading behaviour from domestic institutions and foreigners that contrasts with retail investors. The fact that the cross-period reversal is entwined with traditional price momentum opens an interesting question on how overall market sentiment would affect the investors' behaviour on overnight and intraday returns. Price momentum is generally high (low), following up (down) markets that resemble high (low) overall sentiment (Cooper et al., 2004).

Further, price momentum suffers crashes during financial crises (Daniel and Moskowitz, 2016, Baltzer et al., 2019). Therefore, it is intriguing to analyze the investors' trading behaviour on overnight and intraday momentum in differing market conditions. Interestingly, Gao et al. (2021), using overnight and intraday stock returns, document a persistent "tug of war" in the Chinese A-share market under different market states, suggesting a robust overnight and intraday investor behaviour in light of changes in the financial environment. I surmise a similar investor behaviour from the Korean market investors as there are considerable similarities between the two markets in many facets, including investor base, operations, size, and depth.[5]

Using Fama and MacBeth (1973) cross-sectional regressions, I show that the positive (negative) relationship between retail investors' demand and overnight (intraday) returns and counter trading behaviour of institutions drive the intraday and overnight momentum and cross period reversals in the Korean equity market.[6] Consistent with the previous studies on investors trading overnight and intraday, I show that on average retail investors buy (sell) overnight winners and sell (buy) intraday losers (winners). Domestic institutions perform the leading counter trading on intraday (overnight) winners and losers. This is consistent with the intensive attention-based trading by retail investors near market open and institutional trading motivated by arbitrage and the need to balance the portfolios during the day. Finally, I show that the investors' trading behavior, in general, remains stable in up and down markets and during the global financial crisis (GFC). However, in down market states and during the financial crisis, retail investors trading on overnight returns become weak, implying that the overall reduction of sentiment has a marginal impact on retail investors' trading. Overall, our study provides strong evidence on the presence of overnight and intraday clienteles that drives persistent overnight and

[4]Akbar et al. (2020) document that reversal of overnight returns intraday is equally likely irrespective of whether the overnight return is positive or negative

[5]See Gao et al. (2021), Raddant and Kenett (2021)

[6]Results of the Jegadeesh and Titman (1993) overlapping portfolio strategy in the Internet Appendix provides strong evidence for the intraday and overnight momentum and cross period reversals. These results are robust to different market states and the global financial crisis.

intraday momentum and cross-period reversals in the Korean equity market.

2. Data and Variables Construction

The study population contains all the listed companies on the Korean stock exchange (KRX). The sample consists of all the companies for which trading data is available from January 2004 to June 2015. Using Thompson Reuters Datastream, I identify firms which issued common equity and match with the investor-type trading flow data provided by KRX. Equity values and other market data are obtained from Bloomberg and Datastream. I exclude foreign companies, real estate investment trusts (REITs), exchange-traded funds (ETFs), and pooled investment funds from the analysis. Further, to counter survivorship bias, I include companies delisted during the analysis period. To ensure that non-trading stocks do not drive the results, I keep only the firms with a minimum of 200 trading days in a calendar year consistent with Ülkü and Onishchenko (2019). Further, I drop stocks with an average price below KRW5000 during the sample period from the analysis, consistent with Son and Nguyen (2019).The final sample consists of 648 stocks.

I follow Lou et al. (2019) and Gao et al. (2021) to calculate the daily (close-to-close) return and its' intraday and overnight components. Specifically, the daily return in day t is defined as the return from close prices from day t-1 to day t as in Equation (1).

$$Close\ to\ Close\ Return_{i,t} = ln(Close\ Price_{i,t} / Close\ Price_{i,t-1}) \quad (1)$$

Figure 1 presents how the market operates and trading times of the Korean equity market.

The intraday component of the return in day *t* is calculated based on the close price and open price at day *t* as in Equation (2).

$$Intraday\ Return_{i,t} = ln(Close\ Price_{i,t} / Open\ Price_{i,t}) \quad (2)$$

Furter, the overnight component of the return in day *t* is calculated based on the close-to-close (Equation (1)) and intraday return (Equation (2)) as in Equation (3).

$$Overnight\ Return_{i,t} = Close\ to\ Close\ Return_{i,t} - Intraday\ Return_{i,t} \quad (3)$$

Finally, I accumulate each daily return component in each month to calculate close-to-close, intraday, and overnight return values.

3. Empirical Results

3.1. Overnight and Intraday Momentum and Cross Period Reversals

I start off by testing the overnight and intraday momentum and cross-period reversals in the Korean equity market following Jegadeesh and Titman (1993), overlapping portfolio strategy, more specifically, all the stocks into deciles at the beginning of each month based on the cumulative intraday (overnight) returns in the previous three months. The bottom (top) decile contains the stocks with the lowest (highest) cumulative returns over the past three months. The arbitrage portfolio strategy involves buying (selling) the top (bottom) decile. Then for both overnight and intraday arbitrage portfolios, I calculate both overnight and intraday returns for the following three months. Each month's arbitrage portfolio return consists of portfolio return from the strategy implemented in the current month and the returns of portfolios from the strategy implemented in the previous two months. Portfolio results reveal that both overnight and intraday momentum persist, and similarly, overnight (intraday) momentum strategy yields significant negative returns intraday (overnight).[7]

Figure 2 presents overnight and intraday momentum and offsetting cross-period reversals in the Korean equity market. It is evident that the cumulative returns of 3, 3 overnight momentum strategy from January 2004 to June 2015 is a

[7] Please refer the internet appendix for the portfolio sorting results as well as the cross-sectional regressions that presents overnight and intraday momentum and cross period reversals

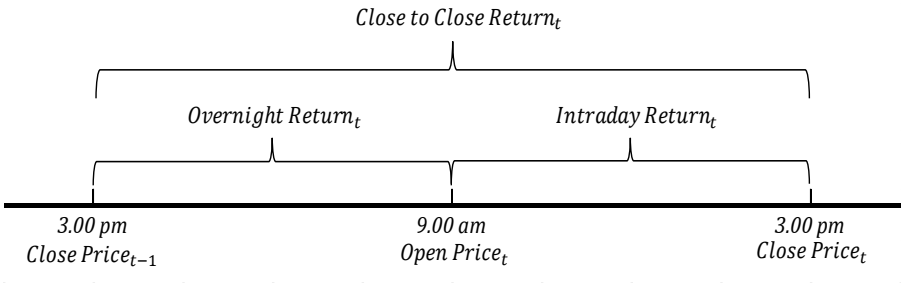

Figure 1: Trading time, trading mechanism and returns in Korea

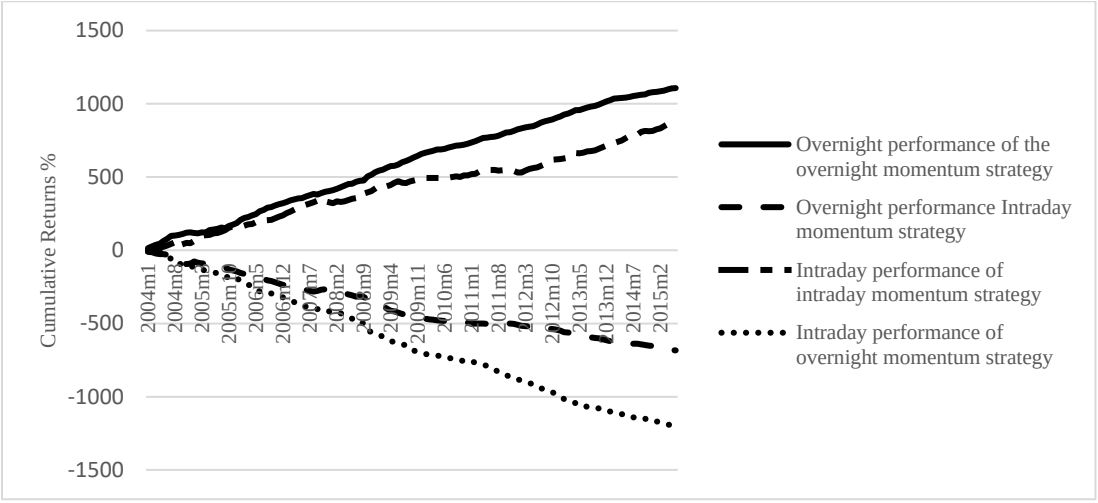

Figure 2: Performance of overnight and intraday momentum arbitrage portfolios: Tug of War.
This figure presents the performance of the overnight intraday momentum arbitrage portfolios in the Korean market. All stocks are sorted into deciles based on cumulative overnight (intraday) returns for the period t-1 to t-3 each month. Arbitrage portfolio longs (shorts) winner (loser) portfolios and held for subsequent three months skipping month t. All the portfolios are value weighted and the sample period runs from January 2004 to June 2015.

staggering into 1107%. However, the cumulative intraday returns of the overnight momentum strategy becomes -684%. Similarly, the cumulative intraday return of the intraday momentum strategy approaches to 884% while the cumulative overnight returns of the intraday momentum strategy is converging to -1196%. Overall, based on Figure 2, it is evident that a strong cross-period reversal virtually eliminates the same period return continuation effect with a similar magnitude.

3.2. Investor trading behaviour on overnight and intraday returns

To measure the investor-type specific demand on overnight and intraday returns, I regress the buy-sell imbalance (BSI) of different investor groups on cumulative past overnight and intraday returns with control variables adopted from Lau et al., (2019) and Gao et al., (2021) as in Equation (4).

$$BSI_{i,j,t} = \propto_i + \beta_1 RET_{t-1,t-3} + \sum_{k=1}^{n} \delta_k X_{i,k,t-1} + \varepsilon_{i,j,t} \quad (4)$$

Where, $BSI_{i,j,t}$ is the buy sell imbalance for stock *i*, for month *t* for investor group *j* (*j=retail, institutional, foreign*) measured as in Kumar and Lee (2006). $RET_{t-1,t-3}$ denotes either overnight returns (Overnight, MOM) or intraday returns (Intraday, MOM) accumulated over *t-1* to *t-3* months, based on whether the trading behavior on past overnight or intraday is analyzed . $X_{i,k,t-1}$ denotes following controls variables; SIZE measured as the natural log of the market

capitalization in million KRW, BM ratio which is the natural logarithm of the ratio of the book value of equity to the market value of equity at the end of year *t-1*, BETA which is the slope coefficient in the regression between the daily excess stock returns against the daily excess market returns over one year period, IVOL which is the idiosyncratic volatility measured as the standard deviation of the residuals from the monthly regression as in Ang et al. (2006) , ILLIQUIDITY measured as the one-month rolling average of the ratio of absolute return to KRW trading volume as in Amihud (2002) scaled by 10^8, the adjusted close price at the end of each month, TURNOVER measured as the ratio of monthly KRW trading volume to monthly market capitalization, IDIO_SKEW which is the idiosyncratic skewness calculated from daily residual terms obtained from Harvey and Siddique (2000) regression over one year period following Gao et al.(2021)[8].

Barber and Odean (2008) document that retail investors trade irrationally and that retail investors are attention-based traders. Most retail investors trades are executed at the beginning of the day because they review their portfolios at the end of the day and place orders to be executed for the following day (Lou et al., 2019; Bogousslavsky, 2021). Therefore, retail investors' trading impacts the opening stock prices that in turn affect the overnight returns (Lou et al., 2019). Institutions in contrast to retail investors are more informed traders and thus rarely trade based on an irrational basis (Barber and Odean, 2008; Kaniel et al., 2008). Further, they trade more near the close of the trading day affecting intraday returns (Lou et al., 2019). Therefore, when institutions trade, the mispricing generated with retail investors can be corrected during the day. The fact that stocks traded more by investor groups have common characteristics (Lou et al., 2019; Gao et al., 2021) could result in consistent overnight and intraday return patterns.

Findings of Lou et al. (2019) and Gao et al. (2021) that the overnight and intraday momentum and cross-period reversals persist for extended periods following the formation of portfolios imply that investors trading on past overnight and intraday returns contribute to overnight and intraday momentum and cross-period reversals. Especially, Gao et al. (2021) find that stocks with high (low) overnight returns and high (low) intraday returns significantly differ in firm characteristics. Therefore, I argue that there is a pattern for stocks to grab retail investors' attention and these trades are offset by institutional investors' trading. Therefore, retail investors' current trading on past overnight returns should reflect their attention-based trading, which makes past overnight winners (losers) to be overnight winners (losers) in the future. Accordingly, since retail investors' trading affects overnight returns, I conjecture that the stocks that grab more (less) retail investors' attention are overnight winners (losers). Similarly, since the intraday returns and overnight returns are negatively related,[9] I expect stocks that receive more (less) retail attention to be intraday losers (winners). Since institutions trade more during the day, I expect stocks that are traded more (less) by institutions to be intraday winners (losers) consistent with Lou et al. (2019). Since institutional investors perform trades in the opposite direction to retail investors, I expect institutions to buy (sell) overnight losers (winners). Kim and Yi (2015) point out that the contribution of foreign individual investors to the trading is negligible and most of the foreign traders are institutions in the Korean equity market. Therefore, I initially argue that foreign investors trade in a similar manner to institutional investors as far as overnight and intraday returns are concerned. The argument that investors' current trading behaviour on overnight and intraday returns drives overnight momentum, intraday momentum and cross-period reversals is consistent with Baltzer et al. (2019), who argue that the current shareholding changes in response to past stock returns drive the price momentum in the German stock market.

The results of the analysis are presented in Table 1. It is evident that the retail investors (institutions) display a momentum trading behaviour on overnight (intraday) returns and contrarian trading behaviour on intraday (overnight) returns. This is consistent with Akbas et al., (2020) that finds a higher positive overnight returns and negative daytime reversals which are entwined with greater

[8]Appendix 1 provides detailed explanation on control variable construction.

[9] See Akbas et al. (2021), and Gao et al. (2021).

retail buying. Foreign investors rather surprisingly display a similar trading behaviour to retail investors on overnight returns. However, their trading on intraday returns is as conjectured.[10] Retail investors tend to buy highly volatile stocks, which is consistent with the attention-based trading behaviour of retail investors. Foucault et al. (2011) find high idiosyncratic volatility is a nature of a stock that grabs the attention of investors who engage in attention-based trading. A positive relationship between BSI of retail investors and idiosyncratic volatility supports the notion that retail investors trading on overnight returns is related to attention at least partially.

3.3. Trading winners and losers

The momentum strategy consists of buying winners and selling losers, and a common question is whether investors' trading changes between winners and losers (Baltzer et al., 2019). To answer this question, I perform the following piecewise liner regression with the median of the cumulative lag overnight (intraday) returns as a base as in Baltzer et al. (2019)

$$BSI_{i,j,t} = \propto_i + \beta_1 Ret_{Loser,t-1,t-3} + \beta_2 Ret_{Winner,t-1,t-3} + \sum_{k=2}^{n} \beta_k X_{i,k,t-1} + \varepsilon_{i,j,t}\ , \quad (5)$$

where:
$Ret_{Loser,\ i,t-1,\ t-3} = \min\left(Ret_{i,\ t-1,\ t-3}; \widetilde{Ret}_{t-1,\ t-3}\right)$[11] and
$Ret_{Winner,\ i,t-1,\ t-3} = \max\left(Ret_{i,\ t-1,\ t-3} - \widetilde{Ret}_{t-1,\ t-3}; 0\right)$[12] such that $\widetilde{Ret}_{t-1,\ t-3}$ represents the either median intraday or overnight cumulative return from month *t-3* to month *t-1*, depending on whether the relationship is assessed between overnight returns and trading behaviour or intraday returns and trading behaviour. A positive coefficient associated with the above (below) median, i.e. $\beta_2 > 0$ ($\beta_1 > 0$) indicates that the corresponding investor group buys winners (sells losers) on average. Conversely, a negative coefficient associated with the above (below) median, i.e. $\beta_2 < 0$ ($\beta_1 < 0$) indicates that the corresponding investor group sells winners (buys losers) on average. Table 2 presents the results.[13] According to Table 2, the retail investors and foreigners' trading behaviour on overnight and intraday returns are statistically significant for both winners and losers. Results justify that the retail investors buy overnight winners and sell overnight losers. Consistent with the findings of the Table 1, they sell intraday winners and buy intraday losers. Foreign investors buy both overnight and intraday winners and sell both intraday winners and losers. As far as institutions are concerned, their trading is marginally significant for losers overnight, i.e., they buy overnight losers. However, their trading is significant for both winners and losers on intraday returns, i.e., institutional investors buy intraday winners and sell intraday losers.

3.4. Trading during up and down-market states

Investor sentiment is the investors' beliefs about the returns and risks that are not necessarily justified fundamentally. When the markets are up (down), investors' sentiment is believed to be optimistic (pessimistic). The investors' optimism and their overconfidence give rise to short- term momentum (Cooper et al., 2004). Generally, retail investors are sentiment-prone and their trading itself is considered a proxy for investor sentiment in the market (Baker and Wurgler, 2007). In this context, the way investors trade on overnight returns is mostly related to the attention and also a form of irrational trading, and it is an intriguing phenomenon. Table 3 reports the investors' trading behavior on overnight and intraday returns under different market states in the Korean equity market. If the cumulative market returns over the past 24months are less than (greater than or equal to) zero the market is categorized as down (up). Apart from the total sample being split in to two based on up and down-market months, the regression setting is similar to equation 4. According to Table 3, it is evident that the investors' trading behavior on intraday returns remains largely unchanged in both up and down markets. However, both retail investors and foreigners trading on overnight

[10] Regressions based on the contemporaneous BSI values and overnight and intraday returns produce qualitatively similar results. Further, regression results of overnight returns accumulated over past 6, 9 and 12 months on BSIt produces similar results.

[11] Denoted as *Loser, Overnight* or *Loser, Intraday* in regression results

[12] Denoted as *Winner, Overnight* or *Winner, Intraday* in regression results

[13] For Tables 2, 3 and 4, we do not report the coefficients associated with controls for brevity.

Table 01
Trading behavior of investors on past intraday and overnight returns

	BSI_FOR, t	BSI_RTL, t	BSI_INST, t	BSI_FOR, t	BSI_RTL, t	BSI_INST, t
	1	2	3	4	5	6
Overnight, MOM	0.0409***	0.0184***	-0.0483**			
	(2.7700)	(4.09)	(-2.39)			
Intraday, MOM				0.0722***	-0.0448***	0.1541***
				(4.4600)	(-7.8200)	(7.8600)
Size	0.0070*	-0.0033***	0.0239***	0.0055	-0.0020*	0.0196***
	(1.9700)	(-3.1500)	(6.6500)	(1.5500)	(-1.7700)	(4.8900)
Turnover	-0.0006	0.0029***	-0.0067	0.0038	0.0009	0.0002
	(-0.1500)	(4.2100)	(-1.2500)	(0.9600)	(1.2200)	(0.0400)
Illiquidity	-0.2223***	-0.0139	-0.2687***	-0.2568***	-0.0066	-0.3029***
	(-2.7600)	(-0.9300)	(-5.0400)	(-3.1200)	(-0.4400)	(-5.6300)
BM	0.0055	-0.0019	0.0156***	0.0029	-0.0003	0.0102**
	(0.8500)	(-1.0100)	(3.0500)	(0.4500)	(-0.1600)	(1.9900)
Idio_Skew	0.0140***	-0.0063***	0.0254***	0.0129***	-0.0041***	0.0185***
	(3.5000)	(-4.5200)	(6.1600)	(2.9000)	(-3.1400)	(4.2400)
Ivol	-0.0042	0.0474***	-0.4062***	0.0229	0.0570***	-0.4400***
	(-0.0800)	(2.6200)	(-6.2500)	(0.4300)	(3.3100)	(-7.3000)
Beta	-0.0129	0.0270***	-0.0442***	0.0013	0.0216***	-0.0256***
	(-1.1200)	(4.9300)	(-4.5800)	(0.1100)	(4.0200)	(-2.7600)
Price	-0.0006	-0.0043***	0.0003	-0.0017	-0.0038***	-0.0013
	(-0.2900)	(-4.6500)	(0.0700)	(-0.8000)	(-4.3500)	(-0.3600)
Constant	-0.0789	0.0408***	-0.2466***	-0.0583	0.0207	-0.1829***
	(-1.5400)	(3.1800)	(-6.8700)	(-1.1300)	(1.5600)	(-4.5200)

This table reports the results from Fama-Macbeth cross sectional regressions based on decomposed returns. The dependent variables used in this table are buy and sell Imbalance (BSI) of different investor groups in month ***t ;*** BSI of institutions (BSI_INST), BSI of retail investors (BSI_RTL), BSI of foreigners (BSI_FOR) . The main independent variables are cumulated intraday returns (Intraday, MOM) and overnight returns (Overnight, MOM) in month *t-3* to month *t-1*. The control variables include Natural logarithm of market capitalization in millions (Size), ratio of monthly stock trading volume in KRW to market capitalization (Turnover), natural logarithm of book to market ratio (BM), Ammihud illiquidity (Illiquidity), Idiosyncratic Skewness (Idio_Skew), Idiosyncratic volatility (Ivol), Monthly Beta (Beta) and natural logarithm of share price (Price). Newey West (1987) adjusted *t*-statistics are reported in parentheses and significance at the 1%, 5%, and 10% levels are denoted as ***, ** and * respectively. Sample period runs from January 2004 to June 2015.

Table 02
Trading behavior of investors on past overnight and intraday winners and losers

	BSI_FOR, t	BSI_RTL, t	BSI_INST, t	BSI_FOR, t	BSI_RTL, t	BSI_INST, t
	1	2	3	4	5	6
Loser, Overnight	0.0497*	0.0255**	-0.0626*			
	(1.7200)	(2.3500)	(-1.7100)			
Winner, Overnight	0.0320**	0.0133***	-0.0345			
	(2.0000)	(3.1300)	(-1.0500)			

Loser, Intraday	0.0971***	-0.0353***	0.1799***
	(4.3900)	(-5.7100)	(6.9900)
Winner, Intraday	0.0481*	-0.0573***	0.1259***
	(1.7800)	(-6.4200)	(4.6300)

This table reports the results from Fama-Macbeth cross sectional regressions based on decomposed returns. The dependent variables used in this table are Buy and Sell Imbalance of different investor groups in month *t ;* BSI of institutions (BSI_INST), BSI of retail investors (BSI_RTL), BSI of foreigners (BSI_FOR). The main independent variables are $Ret_{Loser,\ i,t-k,\ t-1} = \min\left(Ret_{i,\ t-m,\ t-1}; \widetilde{Ret}_{t-m,\ t-1}\right)$ and $Ret_{Winner,\ i,t-m,\ t-1} = \max\left(Ret_{i,\ t-m,\ t-1} - \widetilde{Ret}_{t-m,\ t-1}; 0\right)$ such that $\widetilde{Ret}_{t-m,\ t-1}$ represents the median intraday (overnight) cumulative return from month *t*-3 to month *t-1*. The control variables are the same used in Table 1. Newey West (1987) adjusted *t*-statistics are reported in parentheses and significance at the 1%, 5%, and 10% levels are denoted as ***, ** and * respectively. Sample period runs from January 2004 to June 2015.

Table 03

Trading behavior of investors on past intraday and overnight returns: Up markets Vs Down markets

	BSI_FOR, t	BSI_RTL, t	BSI_INST, t	BSI_FOR, t	BSI_RTL, t	BSI_INST, t
	1	2	3	4	5	6
			Panel A: Up markets			
Overnight, MOM	0.0494***	0.0195***	-0.0431*			
	(2.7000)	(4.2400)	(-1.8300)			
Intraday, MOM				0.0635***	-0.0456***	0.1586***
				(3.6700)	(-7.7100)	(6.6000)
			Panel B: Down markets			
Overnight, MOM	0.0162	0.0152	-0.0635**			
	(0.6200)	(1.5600)	(-2.1000)			
Intraday, MOM				0.0974***	-0.0427***	0.1409***
				(2.9000)	(-3.7500)	(4.6800)

This table reports the results from Fama-Macbeth cross sectional regressions based on decomposed returns for up and down markets. The dependent variables used in this table are Buy and Sell Imbalance of different investor groups in month ***t ;*** BSI of institutions (BSI_INST), BSI of retail investors (BSI_RTL), BSI of foreigners (BSI_FOR). Main independent variables are cumulated intraday returns and overnight returns in month *t-3* to month *t-1*. The control variables are the same used in Table 1. Panel A reports the results for Up markets and Panel B reports the results for own markets. Newey West (1987) adjusted *t*-statistics are reported in parentheses and significance at the 1%, 5%, and 10% levels are denoted as ***, ** and * respectively. Sample period runs from January 2004 to June 2015.

Table 4

Trading behaviour of investors on past intraday and overnight returns: Pre, during and post financial crisis

	BSI_FOR, t	BSI_RTL, t	BSI_INST, t	BSI_FOR, t	BSI_RTL, t	BSI_INST, t
	1	2	3	4	5	6
			Panel A: Pre-Crisis			
Overnight, MOM	0.0499	0.0159*	0.0111			
	(1.3800)	(1.96)	(0.3700)			
Intraday, MOM				0.0261	-0.0311***	0.0772***
				(1.0000)	(-3.8600)	(3.2200)
			Panel B: During the crisis			
Overnight, MOM	0.0735***	0.0048	-0.0567			
	(4.7700)	(0.4800)	(-1.5900)			
Intraday, MOM				0.0169	-0.0355***	0.1165***
				(0.9100)	(-3.0700)	(4.4600)

			Panel C: Post Crisis			
Overnight, MOM	0.0243*	0.0246***	-0.0797***			
	(1.7700)	(5.3200)	(-3.2200)			
Intraday, MOM				0.1183***	-0.0561***	0.2117***
				(9.0100)	(-11.9800)	(10.8400)

This table reports the results from Fama-Macbeth cross sectional regressions based on decomposed returns for pre, during and post financial crisis period. Pre-crisis period is from January 2004 to June 2007; crisis period span from July 2007 to July 2009 and post crisis period is from August 2009 to June 2015. The dependent variables used in this table are buy and sell Imbalance of different investor groups in month ***t ;*** BSI of institutions (BSI_INST), BSI of retail investors (BSI_RTL), BSI of foreigners (BSI_FOR) , BSI of all domestic investors (BSI_DOM). Main independent variables are cumulated intraday returns and overnight returns in month *t-3* to month *t-1*. The control variables are the same used in Table 1. Panel A reports the results for pre financial crisis period, Panel B reports during the financial crisis period and Panel C reports the results for post crisis period. Newey West (1987) adjusted *t*-statistics are reported in parentheses and significance at the 1%, 5%, and 10% levels are denoted as ***, ** and * respectively. Sample period runs from January 2004 to June 2015.

returns become insignificant in down-market states. Cooper et al. (2004) argue that the market state resembles the investors' general beliefs and expectations about the markets. When the overall beliefs are optimistic, markets become up, and if the overall beliefs are pessimistic, the markets become down. The reduction of the strength of the retail investors' trading behaviour on overnight returns suggests that the market sentiment, which is largely represented by the retail investors' sentiment, has a marginal impact on their trading behaviour. Institutional investors' trading is unchanged between market states, suggesting that the overall sentiment is of little importance to institutions trading on overnight and intraday returns.

3.5. Trading in pre, during, and post-financial crisis period

The global financial crisis (GFC) and its impact on financial markets and trading strategies are widely studied. In markets where price momentum persists, momentum crashes tend to occur following a financial crisis due to the changes in the investors' trading behavior (Daniel and Moskowitz, 2016, Baltzer et al., 2019). Baltzer et al. (2019) show that momentum traders oversell losers during a financial crisis, generating subsequent momentum crashes. In addition, the GFC was a major external shock to the Korean market participants that affect investor sentiment (Ryu et al., 2020). Given, none of the available studies provide evidence for the impact of the GFC on overnight and intraday momentum in the Korean equity market, it is intriguing to find how the investors contribute to this market.

Table 4 reports the investors' trading behavior on overnight and intraday returns for the sub-sample periods: pre, during, and post-financial crisis corresponding to equation (4). It is evident from Table 4 that the investors' trading behavior is largely unchanged on intraday returns. However, retail investors' trading on overnight returns becomes insignificant during the financial crisis period. Interestingly, investors trading becomes extremely strong post-financial crisis period. Retail investors' trading on overnight returns during the crisis period resembles their trading during down markets. Given that the down-market states and financial crisis are associated with lower investor sentiment, I argue that the lower investor sentiment has a marginally negative impact on the retail investors trading on overnight returns.

4. Conclusion

This study provides a heterogeneity-based explanation to the overnight and intraday momentum and offsetting cross-period reversals in the Korean equity market. I argue that the tug of war between retail investors and institutions that prefer to trade based on differing motives drive these stylized market phenomena. Consistent with the attention-based trading behaviour, retail investors tend to buy overnight winners and sell overnight losers. Institutional investors tend to buy intraday winners and sell intraday losers consistent with their arbitrage trading motive. Although

market states and financial crises do not seem to affect the investor trading behaviour considerably, retail investors trading, especially on overnight returns become weak in down market states and also during the financial crisis period. This indicates that the retail investors trading on overnight returns is affected when the overall investor sentiment is down.

References

Akbar, F., Boehmer, E., Jiang, C. & Koch, P. 2020. Overnight returns, daytime reversals, and future stock returns. *Available at SSRN:* http://dx.doi.org/10.2139/ssrn.3324880.

Amihud, Y. 2002. Illiquidity and stock returns: cross-section and time-series effects. *Journal of Financial Markets,* 5**,** 31-56.

Ang, A., Hodrick, R. J., Xing, Y. & Zhang, X. 2006. The Cross-Section of Volatility and Expected Returns. *The Journal of Finance,* 61**,** 259-299.

Baker, M. & Wurgler, J. 2007. Investor Sentiment in the Stock Market. *Journal of Economic Perspectives,* 21**,** 129-152.

Baltzer, M., Jank, S. & Smajlbegovic, E. 2019. Who trades on momentum? *Journal of Financial Markets,* 42**,** 56-74.

Barber, B. M. & Odean, T. 2008. All That Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors. *The Review of Financial Studies,* 21**,** 785-818.

Cooper, M. J., Gutierrez Jr., R. C. & Hameed, A. 2004. Market States and Momentum. *The Journal of Finance,* 59**,** 1345-1365.

Daniel, K. & Moskowitz, T. J. 2016. Momentum crashes. *Journal of Financial Economics,* 122**,** 221-247.

Fama, E. F. & Macbeth, J. D. 1973. Risk, Return, and Equilibrium: Empirical Tests. *Journal of Political Economy,* 81**,** 607-636.

Foucault, T., Sraer, D. & Thesmar, D. J. 2011. Individual Investors and Volatility. *The Journal of Finance,* 66**,** 1369-1406.

Gao, Y., Han, X., Li, Y. & Xiong, X. 2021. Investor heterogeneity and momentum-based trading strategies in China. *International Review of Financial Analysis,* 74**,** 101654.

Harvey, C. R. & Siddique, A. 2000. Conditional Skewness in Asset Pricing Tests. *The Journal of Finance,* 55**,** 1263-1295.

Jegadeesh, N. & Titman, S. 1993. Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *The Journal of Finance,* 48**,** 65-91.

Kang, J., Lee, E. & Sim, M. 2014. Retail Investors and the Idiosyncratic Volatility Puzzle: Evidence from the Korean Stock Market. *Asia-Pacific Journal of Financial Studies,* 43**,** 183-222.

Kumar, A. & Lee, C. M. C. 2006. Retail Investor Sentiment and Return Comovements. *The Journal of Finance,* 61**,** 2451-2486.

Lee, K.-H. & Wang, S.-F. 2016. Short-selling with a short wait: Trade- and account-level analyses in Korean stock market. *Pacific-Basin Finance Journal,* 38**,** 209-222.

Lou, D., Polk, C. & Skouras, S. 2019. A tug of war: Overnight versus intraday expected returns. *Journal of Financial Economics,* 134**,** 192-213.

Raddant, M. & Kenett, D. Y. 2021. Interconnectedness in the global financial market. *Journal of International Money and Finance,* 110**,** 102280.

Ryu, D., Ryu, D. & Yang, H. 2020. Investor Sentiment, Market Competition, and Financial Crisis: Evidence from the Korean Stock Market. *Emerging Markets Finance and Trade,* 56**,** 1804-1816.

Son, N. T. & Nguyen, N. M. 2019. Prospect theory value and idiosyncratic volatility: Evidence from the Korean stock market. *Journal of Behavioral and Experimental Finance,* 21**,** 113-122.

Ülkü, N. & Onishchenko, O. 2019. Trading volume and prediction of stock return reversals: Conditioning on investor types' trading. *Journal of Forecasting,* 38**,** 582-599.

Appendix 1: Variable Definitions

SIZE: SIZE is the natural log of market capitalization in millions of KRWs in each month t.

BM: BM is the natural log of book value of equity divided by market value of equity at the end of year $t-1$.

IVOL: IVOL is the idiosyncratic volatility estimated following Hou and Loh (2016). IVOL is estimated by calculating the standard error of residuals from a regression of daily stock returns

on the Fama-French (1993) three-factor model (FF). The steps involved with the estimation of the IVOL are as follows:

1. Calculate daily values for Fama-French (1993) three factors.
2. Select the stocks with at least 10 daily observations per month.
3. Regress the daily returns against the Fama-French (1993) three factors each month.
4. Estimate the standard deviation of residuals.

Following Bali et al. (2016), the residual standard deviation $\varepsilon_{i,t}$ is estimated from:

$$RET_{i,d} - R_{f,d} = \alpha_i + \beta_{i,m}(R_{m,d} - R_{f,d}) + \beta_{i,SMB}SMB_d + \beta_{i,HML}HML_d + \varepsilon_{i,d}, \quad (3.1.1)$$

where $RET_{i,d} - R_{f,d}$ is the excess return of the stock *i* at day d, and $R_{m,d} - R_{f,d}$, SMB_d and HML_d are market, size and book-to-market factors. Then the IVOL of stock i for month t is:

$$IVOL_{i,t} = \sqrt{\frac{\sum_{d=1}^{D} \varepsilon_{id}^2}{D-1}},$$

where D is the number of days in the month. RET_{id} is the share returns calculated using the prices adjusted for all the capital actions(stock splits, right issues, bonus issues, dividends, etc.):

$$RET_{i,d} = ln\left(\frac{P_{i,d}}{P_{i,d-1}}\right),$$

where $P_{i,d}$ is the price of stock i at day d and $P_{i,d-1}$ is the price of stock i at day $d-1$, and $R_{f,d}$ is the daily treasury bill yield. Further, $R_{m,d}$ is the market returns calculated using the KRX all share index:

$$R_{m,d} = ln\left(\frac{INDEX_d}{INDEX_{d-1}}\right),$$

where $INDEX_d$ is the KRX all share index value at day d and $INDEX_{d-1}$ is the KRX all share index value at day $d-1$.

BETA: BETA is calculated by regressing the daily excess stock returns against the daily excess market returns for each month, using daily data over a one-year period (250 trading days):

$$ERET_{i,d} = \alpha_i + \beta_i \ (R_{m,d} - R_{f,d}) + \varepsilon_{i,d},$$

where $ERET_{i,d}$ is the excess return of stock *i* at day d and $R_{m,d} - R_{f,d}$ is the excess market return at day d.

TURN: TURN is the total KRW denominated monthly trading volume divided by the market capitalization.

ILLIQ: ILLIQ is the one-month rolling average of the ratio of absolute return to KRW trading volume as in Amihud (2002) scaled by 10^8:

$$ILLIQ_{i,t} = \frac{1}{D}\sum_{d=1}^{D} \frac{|RET_{i,d}|}{VOL_{i,d}},$$

where $RET_{i,d}$ is the return of the stock *i* at day d, $VOL_{i,d}$ is the value of stock *i* traded at day d, and D is number of days in the estimation period.

PRICE: PRICE is the natural logarithm of the adjusted close price at the end of each month.

BSI: BSI is the buy-sell imbalance calculated using:

$$BSI_{it} = \frac{\sum_{d=1}^{D}(VB_{idt} - VS_{idt})}{\sum_{d=1}^{D}(VB_{idt} + VS_{idt})},$$

where D is the number of days in the month *t*, VB_{idt} (VS_{idt}) is the KRW denominated buy (sell) volume for stock *i* on the day d of month *t*. A given month's stock-level BSI indicates whether, the investors are net buyers (BSI >0) or net sellers (BSI < 0) of a given stock for a given month (Kumar and Lee, 2006).

IDIO_SKEW: IDIO_SKEW is the skewness of the daily residual terms obtained from Harvey and Siddique (2000) regression over a one-year period:

$$IDIO\_SKEW_{i,t} = \frac{\frac{1}{250}\sum_{d=-1}^{-250} \varepsilon_{i,d}^3}{\left(\frac{1}{250}\sum_{d=-1}^{-250} \varepsilon_{i,d}^2\right)^{3/2}},$$

where residual ε_{id} is obtained from:

$$ERET_{i,d} = \alpha_i + \beta_{i,m}(R_{md} - R_{f,d}) + COSKEW_{i,m}(R_{m,d} - R_{f,d})^2 + \varepsilon_{i,d},$$

where $ERET_{i,d}$ is excess return of the stock *i* at day d, and $R_{m,d} - R_{f,d}$ is the excess market return at day d.