Finance Research Letters 28 (2019) 355–362

Contents lists available at ScienceDirect

Finance Research Letters

journal homepage: www.elsevier.com/locate/frl

Investor behavior around monetary policy announcements: Evidence from the Korean stock market☆

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ARTICLE INFO

Keywords:
Central bank
Trading behavior
FOMC announcement
Institutional investors
Announcement returns

JEL Classifications:
E52
E58
G14
G23

ABSTRACT

Using the Korean stock market data between 2000 and 2017, this paper examines the order imbalances of different investors around monetary policy announcements. In line with the temporary reallocation of risk hypothesis, individual investors sell significantly on the day before the U.S. Federal Open Market Committee (FOMC) interest rate announcements, while the proprietary accounts of domestic institutions correspondingly take a long position. On the announcement day, foreign investors engage in substantial buying. Our main finding, particularly with regards to institutional investors' proprietary accounts, appears to be consistent with temporary reallocation of risk between investors rather than being informationally motivated.

1. Introduction

In recent years, there has been an increase in academic interest on equity return characteristics around monetary policy announcements. In an influential paper, Lucca and Moench (2015) document a pre-FOMC announcement drift, namely a significantly positive excess stock return earned during the 24-h window prior to the release of the FOMC interest rate decisions, both in the U.S. and other major markets.[1] Bernile et al. (2016) also uncover significant informed trading in the E-mini S&P 500 futures market during the 20-min FOMC embargo period.[2] Thus, there appears to exist a systematic difference in investor behavior around FOMC announcements.[3]

Nevertheless, there is little research on investor behavior around these policy announcements. This is surprising as it is difficult to come up with a rational explanation for the pre-FOMC announcement drift; the fact that a significantly positive return is earned

☆ Ji Yeol Jimmy Oh acknowledges financial support provided by Hanyang University's research grant (HY-201500000002088). We thank Brian Lucey (the editor) and the anonymous referee for their insightful suggestions. We are also grateful to Kyounghun Bae, Hyoung-Goo Kang, and Noolee Kim for their helpful comments.

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[1] Lucca and Moench (2015) report that this drift alone accounts for around 80% of the entire annual realized excess returns.

[2] Savor and Wilson (2014) further note that the Capital Asset Pricing Model (CAPM) performs much better at explaining the cross-section of returns on policy announcement days, and Cieslak et al. (2018) further report the existence of even-week FOMC cycle in stock returns.

[3] Savor and Wilson (2014) as well as Lucca and Moench (2015) further report that the observed patterns in stock returns are most prominent around monetary policy announcements compared to other macroeconomic announcements.

https://doi.org/10.1016/j.frl.2018.06.008
Received 9 February 2018; Received in revised form 7 June 2018; Accepted 9 June 2018
Available online 13 June 2018

during the pre-announcement blackout, when FOMC members are prohibited from speaking to the public, is puzzling. Whereas Bernile et al. (2016) focus on a short window where the interest rate decision is available to select members of the media under embargo, it is difficult to rationalize the existence of a pre-announcement drift over a longer window. Thus, it is worth exploring whether some groups of traders *particularly* engage in buying or selling ahead of and/or on the day of FOMC announcement. Yet, with the exception of Hendershott et al. (2015), who explore whether the institutional order flow predicts market reaction around various news announcements, how *different* investors trade on and around monetary policy announcements remains yet to be explored, mainly because it is difficult to classify buy and sell orders by investor type in most markets.

In this paper, we fill this gap using the data on the Korean stock market, which allows us to classify orders by investor type. This dataset has been used extensively in previous studies to explore the trading behavior of different investor groups (e.g., Choe et al., 1999, 2005; Chung et al., 2017; Kang and Park, 2008; Park et al., 2014), since it is one of the few markets that releases data on orders by investor type. As FOMC announcements have a sizeable impact across international markets (Ehrmann and Fratzscher, 2009), more so than most countries' own domestic monetary policy announcements, including in Korea (Brusa et al., 2017), our data presents a unique opportunity to explore further into how different groups of investors trade around FOMC announcement days.

Using the stock return data on the KOSPI index, the main stock index on the Korea Exchange, between 2000 and 2017, our findings are as follows. First, we find a statistically significant excess return of 28.1 bps on the day of FOMC announcement. We find limited evidence of pre-FOMC announcement drift; although the excess return is positive at around 18.0 bps, it lacks statistical significance. Second, and more importantly, we find some evidence of temporary reallocation of risk-bearing from individual to institutional investors ahead of FOMC announcements. Specifically, on the day before the announcement, individual investors engage in significant selling, while institutional investors take a corresponding buy position. Institutional investors then unwind their acquired position by engaging in significant selling two days subsequent to announcement. In particular, the pre-FOMC buying pressure of domestic institutions is driven primarily by the proprietary accounts of investment and securities firms.

On the whole, our results give more credibility to Duffie's (2010) model of inattentive investors as the potential driver of the pre-FOMC announcement drift; inattentive investors appear to "sell out of their positions ahead of the announcement for fear of trading with better-informed specialists (Lucca and Moench, 2015, p. 362)." If so, frequently-trading brokers may temporarily end up bearing more than usual amount of market risk, for which they would demand higher risk premium. Individual investors' selling being absorbed by institutions' proprietary accounts over the pre-announcement window is neatly in line with this point of view. We further show that the domestic institutions' trading patterns are unlikely to be informationally motivated, with their order imbalance having little extra explanatory power for next-day return around FOMC announcements.

Through an empirical analysis of order imbalances of different investor groups, our paper contributes to the literature by documenting a temporary risk reallocation from individual investors to the institutions' proprietary accounts ahead of FOMC announcements. Our paper suggests that the seemingly puzzling pre-FOMC announcement drift documented in Lucca and Moench (2015) ought to be better rationalized through a framework that incorporates risk reallocation between heterogeneous investors.

The rest of this paper is organized as follows. Section 2 outlines the basic methodology and briefly describes the Korean stock market data. Section 3 then presents our main results and discusses some potential explanations for the observed trading patterns. Section 4 concludes the paper.

2. Data and methodology

We collect the data on all stocks belonging to the KOSPI index between January 1, 2000 and December 31, 2017. The Korea Exchange (KRX hereafter) publishes for each stock listed in KOSPI daily aggregated buy and sell orders of different investor groups.

Investor classifications are as follows. Investors are first classified into three broad groups, namely institutions, individuals, and foreign investors. All foreign individual and institutional traders are grouped together under the "foreign" category. Then, domestic institutions are further classified into one of the following sub-categories: bank, financial investment, government, insurance, investment trusts, pensions, and private equity. Financial investment refers to proprietary accounts of all investment and securities companies.[4] Investment trusts refer to all mutual funds and other investment trusts that are publicly placed. Government accounts primarily refers to trading by public-owned corporations, and private equity includes all forms of private placement investment funds. The daily order information of each group is separately aggregated for buy and sell orders and is available for each listed stock.

As is standard in practice (e.g., Chordia and Subrahmanyam, 2004), our key measure of interest is the daily order imbalance of each trader group i on day t, $OIMSH_{i,t}$, defined as:

$$OIMSH_{i,t} = \frac{BUY_{i,t} - SELL_{i,t}}{BUY_{i,t} + SELL_{i,t}}, \tag{1}$$

where $BUY_{i,t}$ and $SELL_{i,t}$ are the total number of shares bought and sold by trader group i on day t, respectively. We first compute this measure for each stock, then the stock-level measure is value-weighted across the entire cross-section using the previous month-end's market capitalization to yield the aggregate market-level order imbalance.[5] As for the returns, we focus on the KOSPI index return in

[4] If an individual trader places an order through a securities firm, the order is classified under the individual investor category.

[5] Alternative value-weighting procedures using market capitalization at the previous day's close or the previous quarter-end does not lead to any qualitative change in results. Results are also consistent with equal-weighting.

Table 1
Summary statistics.
This table presents the summary statistics of our main variables of interest between 2000 and 2017. Risk free rate is defined as the daily return on the 364-day monetary stabilization bond issued by the Bank of Korea. Since the daily order data on the private equity category began to be released from June 2008 onward, there is some loss of observations. All returns are in per cent.

	Min.	Median	Mean	Max.	St. dev.	Obs.
Stock returns						
KOSPI excess return (%)	−12.839	0.048	0.000	11.271	1.529	4,446
KOSPI return (%)	−12.805	0.065	0.020	11.284	1.529	4,446
Risk free rate (%)	0.009	0.019	0.019	0.035	0.006	4,446
Order imbalance ratio by each investor group						
Institutions	−0.701	−0.016	−0.015	0.714	0.154	4,446
Individuals	−0.298	0.001	−0.000	0.263	0.070	4,446
Foreigners	−0.554	0.004	0.011	0.637	0.151	4,446
Order imbalance ratio by each domestic institution sub-category						
Banks	−0.969	−0.049	−0.064	0.986	0.295	4,446
Financial investment	−0.925	0.019	0.009	0.840	0.230	4,446
Government	−0.933	0.028	0.025	0.847	0.280	4,446
Insurance	−0.899	−0.009	−0.002	0.960	0.266	4,446
Investment trusts	−0.691	−0.035	−0.036	0.668	0.215	4,446
Pensions	−0.994	0.049	0.055	0.987	0.290	4,446
Private equity	−0.854	−0.030	−0.020	0.856	0.275	2,361

excess of the risk free rate, with the risk free rate defined as the daily return on 364-day monetary stabilization bond issued by the Bank of Korea, a standard practice in asset pricing studies on the Korean market (e.g., Jang et al., 2012; Kim et al., 2012).[6]

During our sample period, there are 144 scheduled FOMC meetings and 212 Bank of Korea MPC interest rate meetings.[7] Due to the 14-h time difference,[8] day 0 of FOMC announcement for Korea is classified as the earliest trading day following the day of FOMC announcement, given that there is no overlap in trading hours between the two countries. According to Lucca and Moench (2015), much of the pre-FOMC announcement drift is concentrated in the morning of the announcement day, between 09:30 and 14:00. Since the Korean market is not open at these hours, this pre-announcement drift would affect the KOSPI return, along with the post-announcement response between 14:00 and 16:00, on day 0, making it difficult to discern whether the return response on day 0 is from pre- or post-announcement reaction. However, they also document the existence of a small drift in the afternoon of the previous day. This would be reflected as a drift on day −1 in the Korean market. Thus, we expect a pre-announcement drift of a smaller magnitude than those documented in Lucca and Moench (2015) on day −1.

3. Results

Table 1 reports the summary statistics. Our sample period is characterized by a significant inflow of foreign capital into the Korean market, and it is thus unsurprising that the average order imbalance of foreign investors is positive while the corresponding figure for domestic institutions is negative.

Table 2 then reports the KOSPI excess returns during (−5, 5) trading days around monetary policy announcements, separately for FOMC and Bank of Korea MPC announcements. We find a strong positive excess return of 0.28% on the day of FOMC announcement, significant at the 5% level. There is limited evidence of pre-FOMC announcement drift on day −1, with the KOSPI excess return of 0.18% on the day before the FOMC announcement day but lacking statistical significance.[9] In contrast to FOMC announcements, we do not find a statistically significant return response around Bank of Korea MPC announcements.

Tables 3 then presents the daily order imbalance of institutional, individual, and foreign investors around FOMC announcements. There is a distinct pattern for each group of investors. Foreign investors' order imbalance on the day of announcement is significantly positive at the 1% level at around 0.033. Another interesting pattern occurs on the day before the announcement, when individual investors exert strong selling pressure of around 0.014, while domestic institutions' order imbalance is positive at 0.031, both

[6] Alternative definitions of the risk free rate such as 91-day certificate of deposit or one-year government bond return has no effect on the qualitative results.
[7] The large discrepancy in the number of meetings arises from the fact that regular FOMC meetings occur eight times a year, whereas Bank of Korea MPC meetings convene at monthly frequency for the vast majority of our sample period. Inclusion of eight unscheduled meetings (Kurov and Gu, 2016) has no qualitative effect on the results.
[8] The difference becomes 13 hours during the U.S. daylight saving hour period, but trading hours still do not overlap.
[9] This is not surprising, as the sizeable proportion of Lucca and Moench's (2015) pre-FOMC announcement drift that occurs on the morning of the announcement day would be reflected on day 0 in the Korean market due to the time difference.

Table 2
Excess returns around monetary policy announcements.
This table presents the excess returns of KOSPI index over risk free rate around monetary policy announcements between 2000 and 2017. All returns are in per cent. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level, respectively.

Days relative to announcement	FOMC			Bank of Korea MPC		
	Excess return	*t*-statistic	Obs.	Excess return	*t*-statistic	Obs.
−5	0.108	0.854	144	0.208*	1.864	212
−4	−0.103	−0.757	144	−0.013	−0.138	212
−3	−0.205*	−1.915	144	0.018	0.160	212
−2	−0.025	−0.209	144	0.028	0.322	212
−1	0.180	1.351	144	−0.013	−0.119	212
0	0.281**	2.110	144	−0.072	−0.760	212
1	0.074	0.642	144	0.068	0.660	212
2	−0.084	−0.713	144	−0.064	−0.549	212
3	0.066	0.554	144	−0.042	−0.427	212
4	0.034	0.369	144	−0.059	−0.464	212
5	−0.128	−0.905	144	−0.157	−1.440	212

Table 3
Order imbalance around FOMC announcements by investor group.
This table presents the value-weighted daily order imbalance of institutional, individual, and foreign traders during the (−2, 2) trading day window around monetary policy announcements between 2000 and 2017. Each stock's order imbalance is value weighted using the market capitalization at the previous month-end. All returns are in per cent. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level, respectively.

Investor	Days relative to announcement	FOMC		
		Order imbalance	*t*-statistic	Obs.
Institutions	−2	0.013	0.962	144
	−1	0.031**	2.521	144
	0	−0.021*	−1.849	144
	1	−0.013	−1.172	144
	2	−0.041***	−3.536	144
Individuals	−2	−0.007	−1.225	144
	−1	−0.014**	−2.554	144
	0	−0.009	−1.572	144
	1	−0.001	−0.084	144
	2	0.003	0.580	144
Foreigners	−2	−0.004	−0.319	144
	−1	−0.001	−0.102	144
	0	0.033***	2.815	144
	1	0.020*	1.808	144
	2	0.019	1.620	144

significant at the 5% level. Institutional investors' position is subsequently reversed, with significant selling two days after the announcement.[10] Fig. 1 further graphically illustrates the order imbalances of each respective investor group.[11]

In Table 4, we focus on FOMC announcements and explore the trading patterns of each of the institutional investor sub-category around them. Whereas banks exert consistent selling pressure over the window while the opposite is true of pensions, one group particularly stands out: financial investment, namely proprietary trading accounts of investment and securities firms. When

[10] Gilbert et al. (2018) document the disappearance of pre-FOMC announcement drift since the end of Lucca and Moench's (2015) sample period. Thus, we engage in an untabulated subsample analysis where we split our sample period into Jan. 2000 – Mar. 2011 (included in the Lucca and Moench sample period) and Apr. 2011 – Dec. 2017. We find that the positive returns on days -1 and 0 indeed disappear after Apr. 2011, although the pre-FOMC drift appears to have shifted to day -2 during the latter sub-period. Moreover, on days -2 and -1 during the latter sub-period, foreign investors exhibit greater willingness to take a buy position. Their "earlier-than-before" purchasing appears consistent with publication-informed trading behavior (McLean and Pontiff, 2016; Gilbert et al., 2018). Following Boguth et al. (2018), for the second sub-period, we further distinguish between FOMC meetings accompanied by Fed Chair press conferences, which attract heightened attention, and those without. We find that the shifting of pre-FOMC announcement drift to day -2 and foreign investors' buying on days -2 and -1 is more prominent for FOMC meetings with press conference, once again consistent with the desire to profit from an expected increase in prices following their awareness of Lucca and Moench's (2015) findings. We thank the anonymous referee for the suggestions.

[11] In an untabulated analysis, we do not find any similar pre-announcement pattern for the domestic central bank announcement, i.e., Bank of Korea MPC, announcements.

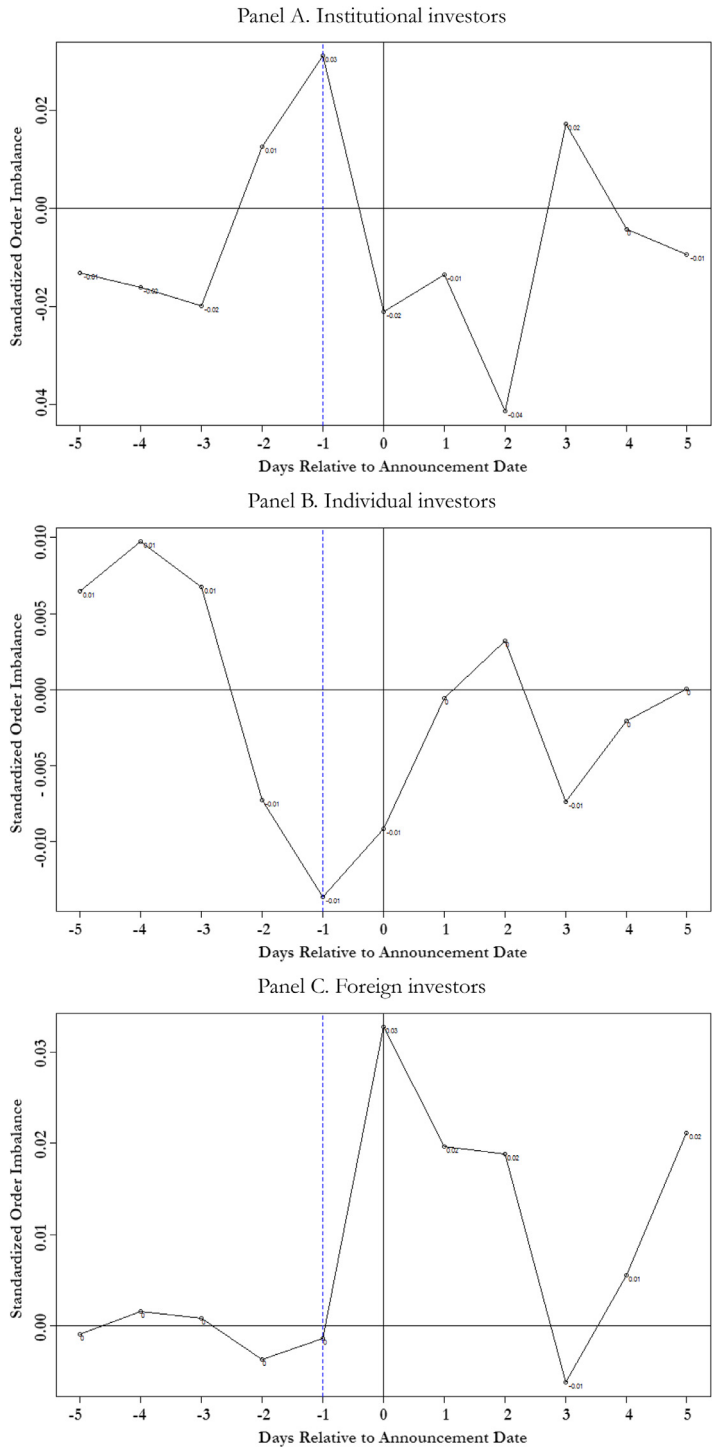

Fig. 1. Order imbalance of different investors around FOMC announcements.

Table 4
Order imbalance around FOMC announcements by institutional investor sub-category.

This table presents the value-weighted daily order imbalance of each institutional investor sub-category during the (−2, 2) trading day window around FOMC announcements. Each stock's order imbalance is value weighted using the market capitalization at the previous month-end. All returns are in per cent. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level, respectively.

Investor	Days relative to FOMC announcement	Order imbalance	*t*-statistic	Obs.
Bank	−2	−0.056**	−2.428	144
	−1	−0.073***	−3.033	144
	0	−0.089***	−3.460	144
	1	−0.083***	−3.307	144
	2	−0.085***	−3.203	144
Financial investment	**−2**	**0.021**	**1.090**	**144**
	−1	**0.072*** **	**4.148**	**144**
	0	**−0.013**	**−0.769**	**144**
	1	**0.023**	**1.143**	**144**
	2	**0.023**	**1.278**	**144**
Government	−2	0.054**	2.276	144
	−1	0.032	1.349	144
	0	−0.012	−0.492	144
	1	0.039*	1.682	144
	2	0.034	1.437	144
Insurance	−2	−0.022	−0.923	144
	−1	0.001	0.041	144
	0	−0.003	−0.143	144
	1	0.003	0.152	144
	2	−0.008	−0.330	144
Investment trust	−2	0.001	0.066	144
	−1	0.006	0.327	144
	0	−0.032*	−1.872	144
	1	−0.047**	−2.551	144
	2	−0.058***	−3.267	144
Pension	−2	0.061**	2.522	144
	−1	0.065***	2.660	144
	0	0.046*	1.915	144
	1	0.080***	3.311	144
	2	−0.004	−0.156	144
Private equity	−2	0.007	0.234	77
	−1	0.020	0.685	77
	0	−0.045	−1.484	77
	1	−0.058*	−1.703	77
	2	−0.094***	−2.925	77

individual investors sell on the day before the FOMC announcements, it appears their orders are primarily absorbed by these firms' proprietary accounts. Thus, the overall trading pattern is consistent with Duffie's (2010) model of slow-moving inattentive investors. Specifically, individual investors appear to sell before major monetary policy announcement out of their *perceived* fear of adverse selection—regardless of whether there actually exist better informed traders in the market—while frequently-trading specialists temporarily bear more market risk.[12] When viewed this way, our result yields more credibility to the temporary reallocation of risk as the possible driver behind the pre-FOMC announcement drift documented in Lucca and Moench (2015).[13]

However, the same pattern may also be consistent with possible information leakage, whereby institutional investors hold superior knowledge of the Federal Reserve's interest rate decision beforehand. After all, previous studies on the Korean stock market document some evidence of informed trading; Ülkü and Weber (2013) report that some domestic institutions have the ability to predict future returns up to two days, while the reverse is true of individual traders. Similarly, Hong and Lee (2011) engage in a stock-

[12] In a further untabulated analysis, we confirm that the selling behavior of individual investors and the corresponding buying by proprietary accounts of investment and securities firms ahead of FOMC announcements, as well as the subsequent buying behavior of foreign investors on the day of announcement, all coincide in two major industrial sectors, namely manufacturing and professional-, science-, and technology-related services. Following Jena et al. (2018) and Kiley (2016), we also check whether the investor behavior significantly changes during the Federal Reserve's prolonged zero bound policy after the global financial crisis, but we find no evidence of a structural break.

[13] In contrast, we do not observe a similar pattern for Bank of Korea MPC announcements among these proprietary accounts in untabulated analysis, yielding little evidence of temporary reallocation of risk in anticipation of domestic monetary policy announcements.

Table 5
OLS regressions: order imbalance and the subsequent KOSPI return.

This table presents the OLS regression results of the KOSPI excess return on the contemporaneous and lagged order imbalance for each investor group, as well as their interaction with the FOMC dummy. FOMC dummy is defined as the dummy that takes the value of 1 on the announcement day. The dependent variable is in per cent. Heteroscedasticity- and autocorrelation-consistent standard errors of Newey and West (1987) are in parentheses, although we confirm in untabulated analysis that results remain unchanged if time-clustered standard errors are used instead. In untabulated analysis, we further confirm that results are consistent when we add month or year fixed effect. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level, respectively.

Variable	Dependent variable: KOSPI excess return on day t			
	(1)	(2)	(3)	(4)
$OIMSH_{institutional,t}$	2.704***	2.771***	2.700***	2.767***
	(0.260)	(0.266)	(0.260)	(0.265)
$OIMSH_{individual,t}$	−3.445***	−3.291***	1.237***	1.227**
	(0.559)	(0.571)	(0.465)	(0.479)
$OIMSH_{foreign,\ t}$	4.102***	4.146***	4.098***	4.144***
	(0.322)	(0.327)	(0.322)	(0.327)
$OIMSH_{institutional,t-1}$	−0.664***	−0.668***	−0.660***	−0.663***
	(0.234)	(0.241)	(0.235)	(0.242)
$OIMSH_{individual,t-1}$	1.218***	1.211**	1.237***	1.227**
	(0.464)	(0.478)	(0.465)	(0.479)
$OIMSH_{foreign,\ t-1}$	−1.406***	−1.317***	−1.395***	−1.307***
	(0.284)	(0.295)	(0.285)	(0.296)
$FOMC_t$		0.216		0.188
		(0.131)		(0.133)
$OIMSH_{institutional,t} \times FOMC_t$		−1.934*		−1.943*
		(1.150)		(1.154)
$OIMSH_{individual,t} \times FOMC_t$		−5.248**		−5.303**
		(2.306)		(2.312)
$OIMSH_{foreign,\ t} \times FOMC_t$		−2.442*		−2.457*
		(1.476)		(1.479)
$\boldsymbol{OIMSH_{institutional,t-1} \times FOMC_t}$		**0.544**		**0.526**
		(0.848)		**(0.852)**
$\boldsymbol{OIMSH_{individual,t-1} \times FOMC_t}$		**2.000**		**1.922**
		(1.865)		**(1.873)**
$\boldsymbol{OIMSH_{foreign,\ t-1} \times FOMC_t}$		**−1.163**		**−1.182**
		(0.824)		**(0.825)**
Constant	0.000	−0.007	−0.067	−0.067
	(0.021)	(0.021)	(0.051)	(0.051)
Day of week fixed effect	No	No	Yes	Yes
No. of obs.	4,445	4,445	4,445	4,445
Adjusted R^2	0.238	0.238	0.238	0.238

level analysis to reveal that daily investment flows of foreign and domestic institutional traders positively predict future returns. Thus, we engage in a predictive regression approach similar to Chordia and Subrahmanyam (2004), regressing returns on contemporaneous and lagged order imbalance of investor groups. We also include the FOMC dummy, which takes a value of 1 on the announcement day, and its interaction terms with the order imbalances to check if the predictive power of a particular group's order imbalance increases around FOMC announcement days.[14] Table 5 reports that the predictive power of institutions or foreigners do not exhibit significant differences around FOMC announcements, with the interaction terms between the FOMC dummy and their lagged order imbalances lacking statistical significance, suggesting that the trading patterns are more consistent with temporary reallocation of risk than early informed trading.[15]

4. Conclusion

In this paper, we examine the trading patterns of institutional, individual, and foreign investors in the Korean stock market around domestic and U.S. interest rate announcements between 2000 and 2017. We document a temporary reallocation of market risk ahead of FOMC announcements, with individuals engaging in significant selling while proprietary accounts of institutional investors correspondingly taking a long position one day before FOMC announcement. On the announcement day, we document a significantly positive stock return of 28.1 bps as well as substantial buying from foreign investors. In contrast, we are unable to find a similar pre-announcement pattern for domestic policy announcements. Our primary finding, namely the temporary bearing of market

[14] In an untabulated analysis, we confirm that institutional order imbalance has little predictive power for the next-day returns for other trading days around the FOMC announcement window.

[15] Similar results are obtained when the order imbalance of financial investment proprietary accounts is used. In a further untabulated analysis, we also find that the predictive power of order imbalances of foreign and institutional traders exhibits little difference around Bank of Korea MPC announcements.

risk by frequently-trading brokers ahead of FOMC announcements, sheds an important insight on the potential driver of the pre-FOMC announcement drift documented in Lucca and Moench (2015). More specifically, any explanation for such pre-announcement drift ought to incorporate investor heterogeneity and investors' different degrees of willingness to bear market risk in the face of policy announcements.

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