North American Journal of Economics and Finance 37 (2016) 472–484

Contents lists available at ScienceDirect

North American Journal of Economics and Finance

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

The impact of individual investor trading on information asymmetry in the Korean stock market

Chune Young Chung [a,*], Kainan Wang [b]

[a] School of Business Administration, Chung-Ang University, Seoul 156-756, Republic of Korea
[b] Department of Finance, College of Business and Innovation, University of Toledo, OH 43606, USA

ARTICLE INFO

Article history:
Available online 25 May 2016

Keywords:
Individual investor trading
Information asymmetry
Bid-ask spread
Short-term trading data
Korean stock market
Emerging market

ABSTRACT

This paper examines the impact of individual investor trading on information asymmetry in the market. In particular, we examine the relationship between the trading volume by individual investors and the corresponding bid-ask spread in the Korean stock market, where the majority of the trading activity is driven by individual investors and therefore information asymmetry can be evident. We find that high trading activity by individual investors increases the bid-ask spread in a short investment horizon, suggesting that individual investors, as uninformed and unsophisticated traders, amplify the degree of information asymmetry in the market through trading.

1. Introduction

Individual investors do not always trade rationally in financial markets due to their informational disadvantages and/or behavioral biases in making their investment decisions compared to other groups of investors. Various studies document that trading behavior and performance by individual investors tend to be worse than those of institutional investors or foreign investors (e.g., Amihud & Li, 2006; Barber & Odean, 2000; Choi & Sias, 2012; Cohen, Gompers, & Vuolteenaho, 2002; Gibson, Safieddine, & Sonti, 2004; Grinblatt & Keloharju, 2000; Nofsinger & Sias, 1999). These studies suggest

* Corresponding author. Tel.: +82 2 820 5544.
E-mail address: bizfinance@cau.ac.kr (C.Y. Chung).

http://dx.doi.org/10.1016/j.najef.2016.05.005
1062-9408/

that the asymmetric information stemming from informational disadvantages and/or behavioral biases of individual investors largely explains their poor trading.[1] Hence, the information asymmetry among diverse market participants is a matter of importance in the market.

In this paper, we hypothesize that active trading by individual investors amplifies the degree of information asymmetry in the Korean stock market, which results in a wider bid-ask spread (BAS). The intuition behind our hypothesis is straightforward: if individual investors are collectively uninformed and unsophisticated, they tend to set high ask prices and low bid prices to recover potential losses from information asymmetry, which results in a larger discrepancy in the bid-ask spread. To test this hypothesis, we focus on the Korean stock market owing to its three unique features. First, unlike the U.S. stock market, the Korean stock market is an order-driven market, where all buyers and sellers display prices at which they wish to buy or sell a particular security, as well as the amounts of the security desired to be bought or sold.[2] Thus, the bid-ask spread in the Korean stock market reflects information asymmetry in valuation among investors.[3] Moreover, the trading volume by individual investors in the Korean stock market is one of the highest in the world. According to the Korea Exchange (KRX), during the period from January 2001 to December 2010, the trading volume by individual investors accounted for 88.19% of total market activities or 61.32% of the total trading value. Given that individual investors are the major participants in the Korean stock market, their trading should be the key determinant of price discovery in the market. Lastly, unlike the U.S. or other developed stock markets, where the financial system is relatively transparent and efficient, emerging markets typically do not have a sound financial system or strong legal protection for individual investors. Thus, the informational disadvantages of individual investors and their consequent noise trading are more pronounced in such an environment. Due to these reasons, we believe that the Korean stock market provides an ideal setting for studying the implication of individual investor trading on information asymmetry in the market.

The empirical evidence on the impact of individual investor trading on information asymmetry is sparse in the literature because of the limited availability of data on individual investor trading in a short investment horizon. Even though data on bid-ask spread, a commonly used measure for information asymmetry, are available on a daily basis, the literature typically utilizes the quarterly institutional ownership data in the U.S. (13F) to infer the ownership and trading by individual investors. This approach assumes that a firm's ownership that is not covered by institutional investors is held by individual investors and a positive net demand by institutional investors implies a negative net demand by individual investors.[4]

In this paper, we use a uniquely available short-term trading dataset in the Korean stock market to investigate if active trading by individual investors increases the degree of information asymmetry in the market. In particular, we study the relationship between the short-term trading volume by individual investors and the corresponding BAS. Our results show that high trading volume by individual investors increases BAS in a short investment horizon, consistent with the hypothesis that uninformed and unsophisticated individual investors amplify the degree of information asymmetry in the market through their trading activities. In addition, we test whether the impact of individual investor trading on information asymmetry can be attributed to their buy or sell trade. In particular, we study the relationship between the net buy trading volume by individual investors and the corresponding BAS. We find that the positive net buy trading volume by individual investors is associated with a high degree of information asymmetry, suggesting that the negative influence of individual

[1] The literature typically documents that information asymmetry among investors occurs due to two main reasons: (1) the lack of access to private information; and (2) the lack of information processing capability due to psychological biases.

[2] By contrast, the U.S. stock market is a quote-driven market, which only displays the bid and ask offers of designated market makers, dealers, or specialists, and these market makers will post the bid and ask prices that they are willing to accept at that time.

[3] Based on the theoretically and empirically strong association between the bid-ask spread and the level of information asymmetry among investors, a large body of literature has utilized the bid-ask spread as a proxy for information asymmetry (Bagehot, 1971; Brockman & Chung, 2000; Choi, Lam, Sami, & Zhou, 2013; Demsetz, 1968; Lev, 1988).

[4] Other studies use transaction data to infer trading by individual investors based on trade size (Hvidkjaer, 2008; Malmendier & Shanthikumar, 2007).

investor trading on information asymmetry stems from their buying activities. In summary, by studying the interplay between individual investor trading and information asymmetry, our paper provides unique and important implications for the trading behavior of individual investors in the emerging markets.

The remainder of the paper is organized as follows. The next section reviews the related literature. The third section discusses the data. The fourth section presents the empirical results. The final section concludes the study.

2. Related literature

A large body of literature has documented that individual investors suffer from behavioral biases compared to other groups of investors. Using the position data of 10,000 discount brokerage accounts maintained by a nationwide brokerage firm in the U.S., Odean (1999) shows that individual investors tend to sell more past winners than past losers. Similarly, Barber and Odean (2000, 2001) document that individual investors trade more than adequate and hold high-risk assets based on a sample of 78,000 U.S. households. These studies also reveal a tendency toward poor trading performance by individual investors.

A few studies extend the analysis of individual investor trading to markets outside the U.S. Grinblatt and Keloharju (2000, 2001) show that Finnish domestic individual investors are inclined to negative feedback trades and are more likely to engage in contrarian trading. Kim and Nofsinger (2003) document that individual investors tend to hold risky and high book-to-market ratio (BM) stocks, trade frequently, make poor trading decisions, and buy recent winners based on the annual holding data of individual investors in Japan. They show that such findings are more evident in the bull market than in the bear market, consistent with the overconfidence hypothesis of individual investors.

The aforementioned literature suggests that the behavioral trading pattern and subsequent poor performance of individual investors largely stem from their limited access to private information and inferior capability to process public information. Thus, these characteristics of individual investors lead to information asymmetry in the market. Asymmetric information and diverse information processing skills among different groups of investors have become increasingly important to both academics and practitioners, as informed and sophisticated investors could make abnormal profits and/or prevent losses at the expense of uninformed and unsophisticated investors in market clearing.

The literature studying the information asymmetry among market participants and their trading behaviors typically focuses on major corporate events. Kim and Verrecchia (1994) show that information asymmetry could exist among investors prior to corporate announcements and that it affects investors' trading decisions. They show that investors seek private information before, and at earnings announcements, and their ability to access the information differentiates the post-announcement trades. Nofsinger (2001) investigates the trading patterns of institutional and individual investors around firm-specific news releases and macroeconomic announcements. He finds that trading by institutional investors is generally superior to that by individual investors. Similarly, Welker and Sparks (2001) investigate trading activities of institutional and individual investors around good and bad corporate disclosures and find an imbalance in trading decisions between the two diverse groups. In addition, Campbell, Ramadorai, and Schwartz (2009) show that institutional investor trading makes abnormal profits before earnings announcements. These studies suggest that information asymmetry exists in the market and individual investors in particular suffer from informational disadvantages.

Our study differs considerably from the extant work on individual investor behavior and performance related to information asymmetry. We investigate the trading impact of individual investors on information asymmetry based on a uniquely available, short-term individual investor trading volume data in the Korean stock market. In other words, our focus is not on how information asymmetry affects the individual investor trading and performance but rather on how individual investor trading influences the degree of information asymmetry in the market.

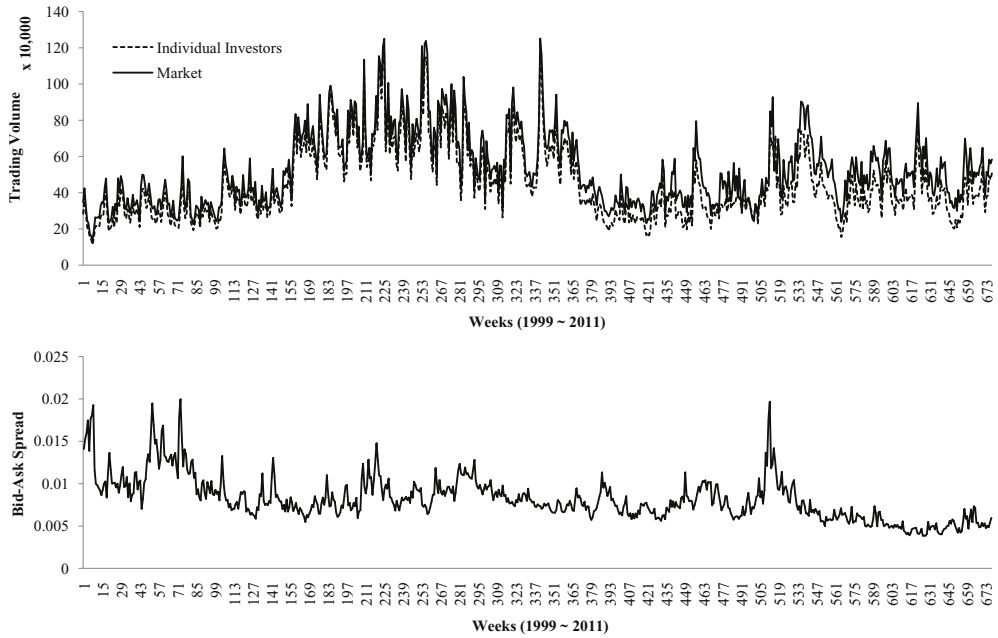

Fig. 1. Mean cross-sectional weekly trading volumes of individual investors and market, and bid-ask spread (BAS). *Notes:* The first figure shows the mean cross-sectional weekly market trading volumes and (average) trading volumes of individual investors for an average of 623 non-financial firms traded on the Korea Exchange (KRX) over the sample period of 1999–2011. The second figure shows the corresponding time-series values of cross-sectional weekly bid-ask spreads (BAS).

3. Data

We obtain the daily trading volume by individual investors and BAS for an average of 623 non-financial firms listed on the Korea Composite Stock Price Index of the KRX for the period 1999–2011.[5] Fig. 1 presents the weekly average trading volumes by individual investors (an average of buy and sell volumes), weekly average trading volumes in the market, and the corresponding BAS of our sample firms for 1999–2011.[6] It shows that both trading activities of individual investors and BAS (our measure for information asymmetry for a firm) are volatile over time. In addition, Fig. 1 suggests that trading volumes of individual investors account for the majority of market trading activities, which makes Korea an ideal market for studying the impact of individual investor trading on information asymmetry.

Table 1 describes the key variables in our study. The table reports the mean, standard deviation, median, and 25th and 75th percentiles of weekly average buy and sell trading volumes of individual investors, total trading volumes in the market, and BAS in each year for the sample period. Avg. # of firms is the average weekly number of non-financial firms traded on the KRX in each year. The table reveals substantial variations of average weekly sell and buy trading volumes by individual investors within each year and over our sample period. It also shows that BAS was the highest around 1999 and 2000, during which Korea's economy was suffering from the Asian financial crisis. Moreover, the table shows that the average number of firms traded in each week was the lowest in 2008 during the global financial crisis; however, more firms were added to the sample as the crisis faded.

[5] As a robustness test, we also consider the inclusion of financial firms in our sample and empirical analyses. We find that our results are not altered based on this extended sample.

[6] Given that the Korean stock market is an order driven market, we compute the daily BAS as the daily highest ask price minus the daily lowest bid price divided by the average of these two prices. The weekly BAS is then obtained as the average of daily BAS in a week.

Table 1
Descriptive statistics.

Year	Avg. # of firms	Variables	Mean	Std. dev.	25 Pctl.	Median	75 Pctl.
1999	654	Buy volume	281,654	77,399	218,510	275,273	330,190
		Sell volume	281,589	79,235	213,272	280,791	338,083
		Total volume	336,122	89,616	263,910	329,694	398,384
		BAS	0.0114	0.0030	0.0095	0.0102	0.0126
2000	612	Buy volume	276,581	61,538	233,890	266,152	297,326
		Sell volume	278,631	62,036	237,386	270,560	300,090
		Total volume	329,372	71,086	274,372	320,465	356,593
		BAS	0.0119	0.0028	0.0095	0.0119	0.0134
2001	620	Buy volume	372,005	74,440	307,866	362,474	427,732
		Sell volume	373,137	74,845	314,651	363,857	427,261
		Total volume	423,703	82,812	358,268	413,243	495,681
		BAS	0.0079	0.0014	0.0070	0.0078	0.0085
2002	602	Buy volume	675,595	121,740	598,358	657,704	782,797
		Sell volume	678,918	121,415	593,545	669,894	790,381
		Total volume	737,197	120,473	649,911	727,304	837,448
		BAS	0.0074	0.0012	0.0066	0.0073	0.0079
2003	588	Buy volume	755,416	190,045	613,411	712,322	841,508
		Sell volume	755,808	191,702	622,140	712,767	850,284
		Total volume	829,442	199,017	684,594	794,333	936,126
		BAS	0.0090	0.0018	0.0078	0.0087	0.0098
2004	613	Buy volume	598,497	171,649	471,019	569,591	763,714
		Sell volume	596,879	173,690	463,713	577,330	758,736
		Total volume	673,633	182,354	534,294	644,234	843,323
		BAS	0.0098	0.0012	0.0090	0.0096	0.0106
2005	610	Buy volume	646,584	198,005	497,259	633,903	718,348
		Sell volume	646,392	201,680	498,931	638,826	715,088
		Total volume	729,024	210,015	571,377	732,822	798,744
		BAS	0.0076	0.0007	0.0072	0.0076	0.0080
2006	621	Buy volume	314,362	95,613	242,171	291,758	350,124
		Sell volume	315,176	96,125	246,688	293,127	345,193
		Total volume	399,959	103,483	318,730	382,986	435,781
		BAS	0.0075	0.0012	0.0065	0.0073	0.0083
2007	643	Buy volume	308,437	99,115	237,655	291,199	348,916
		Sell volume	303,994	94,324	237,014	293,063	342,560
		Total volume	409,465	116,583	323,714	387,587	447,397
		BAS	0.0078	0.0014	0.0069	0.0076	0.0085
2008	554	Buy volume	422,168	144,802	333,442	397,510	479,331
		Sell volume	413,565	145,377	321,669	384,057	458,798
		Total volume	537,321	178,537	483,743	539,234	632,734
		BAS	0.0088	0.0029	0.0070	0.0079	0.0096
2009	661	Buy volume	422,011	140,794	337,571	419,410	471,059
		Sell volume	424,769	142,394	341,823	420,648	482,923
		Total volume	558,969	162,515	464,305	547,512	628,101
		BAS	0.0070	0.0014	0.0060	0.0066	0.0077
2010	674	Buy volume	408,978	97,300	342,121	379,318	449,063
		Sell volume	408,268	97,032	341,651	385,056	455,892
		Total volume	530,981	101,007	456,958	510,189	595,254
		BAS	0.0052	0.0008	0.0047	0.0050	0.0056
2011	654	Buy volume	371,208	94,379	289,891	380,142	438,599
		Sell volume	372,421	97,112	294,090	377,862	440,000
		Total volume	490,398	101,933	400,908	495,842	562,044
		BAS	0.0053	0.0016	bi0.0046	0.0050	0.0055

Notes: This table reports the mean, standard deviation, median, and 25th and 75th percentiles of the weekly average buy and sell trading volumes of individual investors, total trading volumes in the market, and BAS in each year over the sample period of 1999–2011. The BAS is measured in percentage terms by the daily highest ask price minus the daily lowest bid price divided by the average of these two prices. Avg. # of firms is the average weekly number of non-financial firms traded on the Korea Exchange (KRX) each year.

We construct two weekly measures, TV1 and TV2, to capture the trading intensity of individual investors. Specifically, we compute TV1 for firm i in week t as,

$$\text{TV1}_{i,t} = \frac{(\text{Buy volume}_{i,t} + \text{Sell volume}_{i,t})/2}{\text{Total trading volume}_{i,t}} \tag{1}$$

where buy volume and sell volume are the number of shares bought and sold by individual investors, respectively. Total trading volume is the total number of shares traded in the market for firm i. We normalize the average trading volume by individual investors by the total trading volume to control for the potential size effect. TV2 is similar in spirit to TV1, except that it takes into account the price impact of individual investor trading. Specifically, we compute TV2 for firm i in week t as,

$$\text{TV2}_{i,t} = \frac{(\text{Buy value}_{i,t} + \text{Sell value}_{i,t})/2}{\text{Total trading value}_{i,t}} \tag{2}$$

where buy value and sell value are the dollar valuation of individual investors' buy and sell trades, computed as buy volume and sell volume times stock price, respectively.

We collect firm characteristic data from Data Guide Pro provided by FnGuide, a South Korean financial data provider. The database compiles financial information for firms listed on the KRX and is equivalent to Compustat database in the U.S. In particular, for each firm in our sample, we obtain eight firm characteristic variables: turnover, return volatility, size, BM, return on assets (ROA), growth in sales (growth), leverage, and research and development (R&D) expense. These variables are used as controls in the multivariate regression analysis due to their potential correlation with BAS.

4. Empirical results

4.1. Univariate relationship between individual investor trading volume and bid-ask spread

We start by analyzing the relationship between the trading volume by individual investors and BAS based on a weekly portfolio sorting approach. In each week, stocks are sorted by their one-week (one-week lagged) TV1 or TV2. The stocks are then placed into five quintiles (quintile 1 has stocks with the lowest TV1 or TV2 and quintile 5 has stocks with the highest TV1 or TV2). Five equal-weighted quintile portfolios are formed and their one- and four-week BAS are obtained. The time-series means of one-week (one-week lagged) TV1 or TV2 and one- and four-week BAS for each of the five portfolios are calculated and displayed in Table 2.

Panel A of Table 2 shows a contemporaneously positive relationship between individual investor trading volume and BAS. For example, the largest quintile portfolio formed on TV1 has an average contemporaneous weekly BAS of 0.0156, which is about 71% larger than the BAS of 0.0091 for the smallest quintile portfolio. The t-test of the difference in weekly contemporaneous BAS between the largest and smallest quintile portfolios is statistically significant at the 1% level. We also find a strong and positive relationship between four-week BAS and individual investor trading volume. These results together suggest that high trading activities by individual investors increase the degree of information asymmetry in the firm and this impact is persistent in an investment horizon of at least four weeks.

However, a potential identification problem arises in the above analysis. Specifically, the positive contemporaneous relationship could also mean that a higher information asymmetry leads to a higher trading volume by individual investors. To address this issue, we consider the relationship between lagged trading volume by individual investors and post one- and four-week BAS. We report the results in Panel B of Table 2. In general, we find highly comparable results to those in Panel A. As seen in the last column, all differences in BAS are statistically significant at the 1% level.

To consider the value implications of individual investor trading, we replicate the tests in Panels A and B using TV2 and report the results in Panels C and D, respectively. We find that the positive relationship is strong in both contemporaneous and lagged models. In addition, the results in Panels C and D are quantitatively similar to those in Panels A and B, suggesting that the impact of investor trading activities on information asymmetry is not immensely affected by share prices. Overall, the

Table 2
Individual investor trading volume and bid-ask spread (BAS) based on portfolio sorting approach.

Mean	Individual investor trading volume quintiles					Diff.
	1	2	3	4	5	
Panel A: Portfolios formed on one-week individual TV1 ($TV1_t$)						
BAS_t	0.0091	0.0087	0.0091	0.0103	0.0156	0.0065***
						(46.96)
$BAS_{t,t+3}$	0.0088	0.0086	0.0090	0.0102	0.0152	0.0063***
						(45.71)
$TV1_t$ (%)	0.4415	0.7466	0.8963	0.9704	1.0002	0.5587***
						(128.19)
Panel B: Portfolios formed on one-week lagged individual TV1 ($TV1_{t-1}$)						
BAS_t	0.0088	0.0093	0.0098	0.0104	0.0149	0.0061***
						(44.59)
$BAS_{t,t+3}$	0.0087	0.0091	0.0096	0.0103	0.0145	0.0058***
						(41.31)
TV_{t-1} (%)	0.4655	0.7499	0.8871	0.9601	0.9958	0.5302***
						(123.17)
Panel C: Portfolios formed on one-week individual TV2 ($TV2_t$)						
BAS_t	0.0071	0.0077	0.0090	0.0108	0.0168	0.0097***
						(45.90)
$BAS_{t,t+3}$	0.0073	0.0079	0.0090	0.0107	0.0158	0.0085***
						(46.86)
$TV2_t$ (%)	0.0032	0.0107	0.0224	0.0458	0.2467	0.2434***
						(38.77)
Panel D: Portfolios formed on four-week lagged individual TV2 ($TV2_{t-1}$)						
BAS_t	0.0073	0.0078	0.0090	0.0110	0.0164	0.0090***
						(44.60)
$BAS_{t,t+3}$	0.0075	0.0079	0.0090	0.0109	0.0156	0.0080***
						(46.13)
$TV2_{t-1}$ (%)	0.0038	0.0119	0.0244	0.0491	0.2404	0.2366***
						(40.51)

Notes: This table presents the results for the contemporaneous (lagged) relationship between the trading volume by individual investors and one- and four-week BAS. In each week, stocks are sorted on their one-week (one-week lagged) TV1 or TV2. The stocks are then placed into five quintiles (quintile 1 has stocks with the lowest TV1 or TV2 and quintile 5 has stocks with the highest TV1 or TV2). Five equal-weighted quintile portfolios are formed and their one- and four-week BAS are obtained. The time-series means of one-week (one-week lagged) TV1 or TV2 and one- and four-week BAS for each of the 5 portfolios are calculated and displayed in the table. The last column reports the difference of the key variables between quintiles 1 and 5, with associated *t*-values given in parentheses. ***, **, and * Indicate the statistical significance at the 1%, 5%, and 10% levels, respectively.

results in Table 2 support the hypothesis that less informed and unsophisticated individual investors amplify the degree of information asymmetry in the market through their trading.

4.2. Multivariate analysis for individual investor trading volume and bid-ask spread

In this study, we use the trading volume by individual investors as the primary variable to explain the observed information asymmetry measured by BAS. However, other variables could potentially affect BAS. To examine this, we consider the aforementioned eight firm-specific variables: turnover, return volatility, size, BM, ROA, growth, leverage, and R&D expense.

Turnover is the number of shares traded daily divided by the total shares outstanding during the fiscal year *t*. Copeland and Galai (1983) document that a firm's turnover is likely to inversely affect BAS. We compute the weekly turnover by aggregating daily values in a week. Return volatility is measured as the average of 52-week standard deviations of daily returns during the fiscal year *t*. Aitken and Frino (1996) show that return volatility is positively correlated with BAS, as informed traders are more likely to exploit trading gains in the market. We measure firm size as the logarithm of the number of shares outstanding multiplied by the stock price and BM as the ratio of book value to market value of common

equity at the end of fiscal year t. Greenstein and Sami (1994) claim that the analyst and media coverage increases with firm size, implying that small firms are likely to have a higher information asymmetry than large firms. Baker and Wurgler (2002) argue that firms with a lower BM are associated with higher stock mispricing, which could be related to higher levels of information asymmetry.

ROA and growth denote the net income divided by total assets and the change of sales in percentage during the fiscal year t, respectively. ROA captures the indeterminate future use of sufficient internal funds from the high profits and growth captures the uncertainty of fast-growing firms. Leverage is the book value of debt divided by the sum of market value of equity and book value of debt at the end of fiscal year t. This variable is related to the agency cost of debt, as suggested in Jensen and Meckling (1976) and Myers (1977), and thus partially captures the degree of information asymmetry. R&D expense is the amount of R&D expenses divided by total assets during the fiscal year t. Higher R&D investments may be associated with a greater information asymmetry. For example, the pecking order theory of Myers and Majluf (1984) predicts a positive relationship between R&D expenses and leverage.

We use the multivariate regression model to examine the impact of individual investor trading on BAS. In particular, our model specification is:

$$\mathrm{BAS}_t = \beta_1 \cdot \mathrm{TV}_{t-1} + \beta_2 \cdot \text{Other variables}_{t-1} + \varepsilon_t \tag{3}$$

We use the approach of Fama and MacBeth (1973) to estimate the model and compute the coefficients as time-series averages from weekly cross-sectional regressions.[7] The coefficient of interest is β_1, which measures the impact of individual investor trading on information asymmetry.

Table 3 reports the coefficient estimates with related t-statistics. We find that the coefficients for TV1 and TV2 are both positive and statistically significant at the 1% level. Moreover, the partial R^2 associated with these variables are relatively significant compared to the overall R^2. This implies that higher trading volume and trading value by individual investors are related to a higher degree of information asymmetry. Specifically, the degree of information asymmetry in the market is more projected on BAS as individual investors trade more intensively in the market. Nevertheless, an alternative explanation for the increased spread could be volatility, because trades initiated via uninformed traders are noise trades and the theory posits that noise (uninformed) trades induce idiosyncratic volatility of stock returns (De Long, Shleifer, Summers, & Waldmann, 1990; Llorente, Michaely, Saar, & Wang, 2002). Furthermore, there is a large body of literature showing a positive relationship between trading volume and volatility (see Karpoff, 1987 for a survey). Also the literature finds a positive relationship between volatility and BAS (Bollerslev & Melvin, 1994; De Long et al., 1990; Hellwig, 1980; Wang, 1993; Wyart, Bouchaud, Kockelkoren, Potters, & Vettorazzo, 2008). Taken together, volatility could be the mechanism by which the trading volume by individual investors widens BAS. Consistent with this notion, our results show that the coefficient for volatility is positive and statistically significant at the 1% level. However, we also believe that the positive relationship between individual investor trading volume and BAS is not entirely due to volatility, and there are two reasons behind this. First, unlike the U.S. stock market, the Korean stock market is an order-driven market; therefore, individual investor trading is directly translated into bid and ask prices in the market, implying a direct link between individual investor trading and BAS. More importantly, we find that after controlling for volatility, the coefficients for TV1 and TV2 are significantly positive, which indicates that the predictability of individual investor trading volume on BAS is not subsumed by the volatility effect.

Regarding other control variables, we find that their coefficients are all statistically significant and the signs are mostly consistent with the aforementioned predictions, suggesting that our choice of control variables is appropriate. However, the negative relationship between R&D and spread is odd as we expect a higher spread in firms with more R&D spending. This could be due to the fact that not many firms in our sample spend on (or report) R&D, which weakens the power of this test. In sum, our

[7] Prior to estimating the multivariate regression based on the variables discussed above, we conduct the Pearson correlation test for the key variables. In support of our hypothesis, we find that BAS is positively and significantly related to both TV1 and TV2. These results are available upon request.

Table 3
Fama–Macbeth regression of bid-ask spread (BAS) on individual investor trading volume.

	BAS_t		BAS_t
Intercept	0.0811***	Intercept	0.0670***
	(32.07)		(30.45)
$TV1_{t-1}$	0.0072***	$TV2_{t-1}$	0.0230***
	(18.15)		(8.84)
$Turnover_{t-1}$	−0.1300***	$Turnover_{t-1}$	−0.0890***
	(−11.94)		(−12.50)
$Volatility_{t-1}$	0.0001***	$Volatility_{t-1}$	0.0001***
	(9.11)		(6.77)
$Size_{t-1}$	−0.0026***	$Size_{t-1}$	−0.0023***
	(−31.18)		(−29.26)
BM_{t-1}	0.0959***	BM_{t-1}	0.1016***
	(4.26)		(4.26)
ROA_{t-1}	0.0001***	ROA_{t-1}	0.0004***
	(2.95)		(3.62)
$Leverage_{t-1}$	0.0002***	$Leverage_{t-1}$	0.0003***
	(3.41)		(2.76)
$Growth_{t-1}$	0.0001***	$Growth_{t-1}$	0.0001***
	(5.39)		(4.15)
$R\&D_{t-1}$	−0.0323***	$R\&D_{t-1}$	−0.0265***
	(−13.44)		(−9.86)
Average partial R^2 for TV1	6.45%	Average partial R^2 for TV2	9.32%
Average R^2	27.96%	Average R^2	27.65%

Notes: This table presents the average coefficients from weekly cross-sectional regressions of BAS on lagged TV1 and TV2. Turnover is the number of shares traded daily divided by total shares outstanding during the fiscal year *t*, and weekly turnover is computed by aggregating the daily values to a week. Volatility is measured as the average of 52-week standard deviations of daily returns during the fiscal year *t*. Size is the logarithm of the number of shares outstanding multiplied by the stock price and BM is the ratio of the book value to market value of common equity at the end of fiscal year *t*. ROA and growth are the net income divided by total assets and change of sales in percentage during the fiscal year *t*, respectively. Leverage is the book value of debt divided by the sum of market value of equity and book value of debt at the end of fiscal year *t*. R&D is the amount of research and development expenses divided by total assets during the fiscal year *t*. The *t*-statistics are adjusted for Newey–West autocorrelations with 3 lags and are reported in parentheses. ***, **, and * Indicate the statistical significance at the 1%, 5%, and 10% levels, respectively.

findings in Table 3 shows that active trading by individual investors over a short investment horizon increases the information asymmetry in the market. This adds to our knowledge of the trading impact of individual investors on the information content of the firm.[8]

4.3. Individual investor net buy volumes and bid-ask spread

The trading impact of individual investors on BAS could be driven by their buy or sell trade. In this section, we examine the relationship between the net buy volume by individual investors and BAS using Eq. (3). We construct two additional measures, NB1 and NB2, to capture the weekly net buy intensity of individual investors. Specifically, we compute NB1 for firm *i* in week *t* as,

$$NB1_{i,t} = \frac{(\text{Buy volume}_{i,t} - \text{Sell volume}_{i,t})}{\text{Total trading volume}_{i,t}} \tag{4}$$

[8] Fig. 1 indicates a declining trend in BAS over time. To ensure the robustness of our results, we decompose the full sample into two subsamples (before and after 2004) and re-estimate the models in Table 3. We find that our main results remain unchanged, but the relationship between individual investor trading and BAS appears to be weaker after 2004. In addition, Table 1 shows that the average number of firms traded in each week was the lowest in 2008 during the global financial crisis. To consider the financial crisis effect on our results, we include a dummy variable equal to one if the firm years are 2008 and 2009 (subprime crisis period), and zero otherwise, in the regressions in Table 3. We find that after controlling for the financial crisis, the positive relationship between individual investor trading and BAS remains strong, and BAS tends to be higher during the crisis. This implies that individual investors as a group may become more pessimistic and conservative during economic downturns due to higher uncertainty, resulting in increased BAS. These results are available upon request.

Table 4
Fama–Macbeth regression of bid-ask spread (BAS) on individual investor net buy.

	BAS_t		BAS_t
Intercept	0.0804***	Intercept	0.0664***
	(32.35)		(30.99)
$NB1_{t-1}$	0.0035***	$NB2_{t-1}$	0.0028***
	(16.78)		(12.80)
$Turnover_{t-1}$	−0.1878***	$Turnover_{t-1}$	−0.1343***
	(−9.96)		(−11.86)
$Volatility_{t-1}$	0.0001***	$Volatility_{t-1}$	0.0001***
	(3.32)		(6.18)
$Size_{t-1}$	−0.0045***	$Size_{t-1}$	−0.0021***
	(−25.71)		(−30.83)
BM_{t-1}	0.0564***	BM_{t-1}	0.0887***
	(5.83)		(3.90)
ROA_{t-1}	0.0001***	ROA_{t-1}	0.0001***
	(5.31)		(3.26)
$Leverage_{t-1}$	0.0001***	$Leverage_{t-1}$	0.0001***
	(3.55)		(2.66)
$Growth_{t-1}$	0.0001***	$Growth_{t-1}$	0.0001***
	(3.99)		(4.47)
$R\&D_{t-1}$	−0.0513***	$R\&D_{t-1}$	−0.0304***
	(−9.25)		(−11.30)
Average partial R^2 for NB1	4.45%	Average partial R^2 for NB2	4.32%
Average R^2	26.94%	Average R^2	27.31%

Notes: This table presents the average coefficients from weekly cross-sectional regressions of BAS on lagged NB1 and NB2. The control variables are as defined in Table 3. The *t*-statistics are adjusted for Newey–West autocorrelations with 3 lags and are reported in parentheses. ***, **, and * Indicate the statistical significance at the 1%, 5%, and 10% levels, respectively.

NB2 considers the valuation of individual investor trading for firm i in week t as,

$$NB2_{i,t} = \frac{(\text{Buy value}_{i,t} - \text{Sell value}_{i,t})}{\text{Total trading value}_{i,t}} \tag{5}$$

Table 4 reports the results and shows that the time-series averages of coefficients for NB1 and NB2 are both positive and statistically significant at the 1% level. This implies that the net buy (sell) trading volume by individual investors is positively (negatively) associated with the degree of information asymmetry, and the negative influence of individual investor trading on information asymmetry mostly stems from their buying activities.[9] According to the overconfidence hypothesis of Daniel, Hirshleifer, and Subrahmanyam (2001), one explanation for this result is that individual investors are more confident or optimistic while buying shares than while selling them.

5. Robustness tests

In the above regression analyses, we focus on the lagged relationship between the trading volume by individual investors in the present week and the BAS in the next week. The trading volume by individual investors in the present week is a good proxy for their trading volume in the next week, especially in a short investment horizon. Therefore, considering the lagged relationship helps to mitigate the potential causality problem.

As a robustness test, we also consider the contemporaneous relationship between the trading volume by individual investors and BAS on a daily basis. This approach is clearly free of the endogeneity problem as seen in the weekly setup, because the daily BAS results directly from daily trading.[10] We first re-estimate Table 3 using a daily trading measure, TV3, and report the results in Table 5. Similar to

[9] As a robustness test, we also consider alternative measures for net buy and sell following Umutlu and Shackleton (2015) in our empirical analyses. Our results remain qualitatively unchanged.

[10] However, the relationship on a daily basis could be clouded by noise factors in daily trading.

Table 5
Fama–Macbeth regression on a daily basis.

	Model 1	Model 2	Model 3	Model 4
Intercept	0.0650***	0.0651***	0.0790***	0.0673***
	−68.41	−67.88	−67.99	−65.7
$TV1_t$	0.0072***			
	−18.15			
$TV3_t$		0.0230***		
		−8.84		
$NB1_t$			0.0035***	
			−16.78	
$NB3_t$				0.0028***
				−12.8
$Turnover_{t-1}$	−0.1300***	−0.1343***	−0.1878***	−0.1343***
	(−11.94)	(−11.86)	(−9.96)	(−11.86)
$Volatility_{t-1}$	0.0001***	0.0001***	0.0001***	0.0001***
	−9.11	−6.18	−3.32	−6.18
$Size_{t-1}$	−0.0026***	−0.0021***	−0.0045***	−0.0021***
	(−31.18)	(−30.83)	(−25.71)	(−30.83)
BM_{t-1}	0.0959***	0.0887***	0.0564***	0.0887***
	−4.26	−3.9	−5.83	−3.9
ROA_{t-1}	0.0001***	0.0001***	0.0001***	0.0001***
	−2.95	−3.26	−5.31	−3.26
$Leverage_{t-1}$	0.0002***	0.0001***	0.0001***	0.0001***
	−3.41	−2.66	−3.55	−2.66
$Growth_{t-1}$	0.0001***	0.0001***	0.0001***	0.0001***
	−5.39	−4.47	−3.99	−4.47
$R\&D_{t-1}$	−0.0323***	−0.0304***	−0.0513***	−0.0304***
	(−13.44)	(−11.30)	(−9.25)	(−11.30)
Average R^2	27.96%	27.65%	26.94%	27.31%

Notes: This table presents the average coefficients from daily cross-sectional regressions of BAS on daily TV1/TV3 and NB1/NB3. The control variables are as defined in Table 3. The *t*-statistics are adjusted for Newey–West autocorrelations with 3 lags and are reported in parentheses. ***, **, and * Indicate the statistical significance at the 1%, 5%, and 10% levels, respectively.

TV1, TV3 is defined as the average daily trading volume by individual investors divided by the number of shares outstanding.[11] We find that the results are not materially different from those reported in Table 3. In addition, we re-estimate Table 4 using a daily version of NB1 and report the results in the same table. We define NB3 as the daily net trading volume by individual investors divided by the number of shares outstanding. Again, we find that our main results do not change in a daily setup. Overall, the results in Table 5 support our salient implication of the trading impact of individual investors on the firm's information asymmetry.

6. Conclusions

Compared to the U.S. or other developed stock markets, emerging markets do not have a good financial system or strong legal protection for individual investors. In addition, the Korean stock market is predominantly run by individual investors, in terms of both trading volumes and values. These characteristics make the Korean stock market an ideal candidate for studying the influence of individual investor trading on the market.

This study examines the trading impact of individual investors on the firm's information asymmetry in the emerging Korean stock market. Using the trading volume of individual investors as their trading intensity/activity measure and BAS as a proxy for the degree of information asymmetry, we analyze the correlation between individual investor trading volume and BAS in a short investment horizon. After controlling for the potential endogeneity problem, we find that trading activities of individual investors widen BAS in the market. This result supports the hypothesis that uninformed

[11] We only consider the daily version of TV1 because the daily TV1 is mathematically equivalent to the daily TV2.

and unsophisticated individual investors amplify the degree of information asymmetry through their trading activities. In addition, we find that the positive net buy volume by individual investors is associated with a high degree of information asymmetry, implying that their buying activities aggravate the information dispersion in the market. Overall, our findings provide important implications for the interplay between individual investor trading and information asymmetry in the emerging financial markets.

Our study can be extended to investigating trading dynamics among heterogeneous investors and their impacts on BAS in the Korean stock market. Recently, Umutlu and Shackleton (2015) examine the short-run relationship between return volatility and trading activity by domestic individual, domestic institutional, and foreign investors on the KRX. In particular, they find that trades between informed institutional investors and uninformed individual investors have a decreasing effect on volatility. It would be interesting to examine the extent to which the trading activities between individual and institutional investors are related to the firm's information asymmetry.

Acknowledgement

We would like to thank two anonymous referees for their highly constructive comments.

References

Aitken, M., & Frino, A. (1996). The determinants of market bid ask spreads on the Australian stock exchange: Cross-sectional analysis. *Accounting and Finance*, *36*, 51–63.
Amihud, Y., & Li, K. (2006). The declining information content of dividend announcements and the effects of institutional holdings. *Journal of Financial and Quantitative Analysis*, *41*, 637–660.
Bagehot, W. (1971). The only game in town. *Financial Analysts Journal*, *27*, 12–14.
Baker, M., & Wurgler, J. (2002). Market timing and capital structure. *Journal of Finance*, *57*, 1–32.
Barber, B. M., & Odean, T. (2000). Trading is hazardous to your wealth: The common stock investment performance of individual investors. *Journal of Finance*, *55*, 773–806.
Barber, B. M., & Odean, T. (2001). Boys will be boys: Gender, overconfidence, and common stock investment. *Quarterly Journal of Economics*, *116*, 261–292.
Bollerslev, T., & Melvin, M. (1994). Bid-ask spreads and volatility in the foreign exchange market: An empirical analysis. *Journal of International Economics*, *36*, 355–372.
Brockman, P., & Chung, D. Y. (2000). Informed and uninformed trading in an electronic, order-driven environment. *Financial Review*, *35*, 125–146.
Campbell, J. Y., Ramadorai, T., & Schwartz, A. (2009). Caught on tape: Institutional trading, stock returns, and earnings announcements. *Journal of Financial Economics*, *92*, 66–91.
Choi, J. J., Lam, K. C., Sami, H., & Zhou, H. (2013). Foreign ownership and information asymmetry. *Asia-Pacific Journal of Financial Studies*, *42*, 141–166.
Choi, N. Y., & Sias, R. W. (2012). Why does financial strength forecast stock returns? Evidence from subsequent demand by institutional investors. *Review of Financial Studies*, *25*, 1550–1587.
Cohen, R. B., Gompers, P. A., & Vuolteenaho, T. (2002). Who underreacts to cash-flow news? Evidence from trading between individuals and institutions. *Journal of Financial Economics*, *66*, 409–462.
Copeland, T. E., & Galai, D. (1983). Information effects on the bid-ask spread. *Journal of Finance*, *38*, 1457–1469.
Daniel, K., Hirshleifer, D., & Subrahmanyam, A. (2001). Overconfidence, arbitrage, and equilibrium asset pricing. *Journal of Finance*, *56*, 921–965.
De Long, J. B., Shleifer, A., Summers, L. H., & Waldmann, R. J. (1990). Noise trader risk in financial markets. *Journal of Political Economy*, *98*, 703–738.
Demsetz, H. (1968). The cost of transacting. *The Quarterly Journal of Economics*, *82*, 33–53.
Fama, E. F., & MacBeth, J. (1973). Risk, return, and equilibrium: Empirical tests. *Journal of Political Economy*, *81*, 607–636.
Gibson, S., Safieddine, A., & Sonti, R. (2004). Smart investments by smart money: Evidence from seasoned equity offerings. *Journal of Financial Economics*, *72*, 581–604.
Greenstein, M. M., & Sami, H. (1994). The impact of the SEC's segment disclosure requirement on bid-ask spreads. *Accounting Review*, *69*, 179–199.
Grinblatt, M., & Keloharju, M. (2000). The investment behavior and performance of various investor types: A study of Finland's unique data set. *Journal of Financial Economics*, *55*, 43–67.
Grinblatt, M., & Keloharju, M. (2001). What makes investors trade? *Journal of Finance*, *56*, 589–616.
Hellwig, M. F. (1980). On the aggregation of information in competitive markets. *Journal of Economic Theory*, *22*, 477–498.
Hvidkjaer, S. (2008). Small trades and the cross-section of stock returns. *Review of Financial Studies*, *21*, 1123–1151.
Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency cost, and ownership structure. *Journal of Financial Economics*, *3*, 305–360.
Karpoff, J. M. (1987). The relation between price changes and trading volume: A survey. *Journal of Financial and Quantitative Analysis*, *22*, 109–126.
Kim, K., & Nofsinger, J. R. (2003). The behavior of Japanese individual investors during bull and bear markets. *Journal of Behavioral Finance*, *8*, 138–153.

Kim, O., & Verrecchia, R. E. (1994). Market liquidity and volume around earnings announcements. *Journal of Accounting and Economics*, *17*(1–2), 41–67.
Lev, B. (1988). Toward a theory of equitable and efficient accounting policy. *Accounting Review*, *63*, 1–22.
Llorente, G., Michaely, R., Saar, G., & Wang, J. (2002). Dynamic volume-return relation of individual stocks. *Review of Financial Studies*, *15*, 1005–1047.
Malmendier, U., & Shanthikumar, D. (2007). Are small investors naive about incentives? *Journal of Financial Economics*, *85*, 457–489.
Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, *5*, 147–175.
Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, *13*, 187–221.
Nofsinger, J. R. (2001). The impact of public information on investors. *Journal of Banking and Finance*, *25*, 1339–1366.
Nofsinger, J. R., & Sias, R. W. (1999). Herding and feedback trading by institutional and individual investors. *Journal of Finance*, *54*, 2263–2295.
Odean, T. (1999). Do investors trade too much? *American Economic Review*, *89*, 1279–1298.
Umutlu, M., & Shackleton, M. B. (2015). Stock-return volatility and daily equity trading by investor groups in Korea. *Pacific-Basin Finance Journal*, *34*, 43–70.
Wang, J. (1993). A model of intertemporal asset prices under asymmetric information. *The Review of Economic Studies*, *60*, 249–282.
Welker, M., & Sparks, H. C. (2001). Individual, institutional, and specialist trade patterns before and after disclosure. *Journal of Financial Research*, *24*, 261–287.
Wyart, M., Bouchaud, J. P., Kockelkoren, J., Potters, M., & Vettorazzo, M. (2008). Relation between bid-ask spread, impact and volatility in order-driven markets. *Quantitative Finance*, *8*, 41–57.