V-Shaped Disposition Effect, Stock Prices, and Post-Earnings-Announcement Drift: Evidence from Korea

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May 12th, 2018

ABSTRACT

We attempt to explain post-earnings announcement drift using the newly documented refinement of the disposition effect, which is the V-shaped net selling propensity (VNSP). Using a novel data set containing stock-level information on the trading activities of different types of investors, we find that both large unrealized capital gains and losses positively predict subsequent stock returns in Korean stock markets. Furthermore, investors' net selling propensity affects investor underreaction to earnings news. Among good news stocks, post-announcement drift is more pronounced when they suffer from stockholders' higher net selling propensity. Specifically, these empirical results hold only when we construct a VNSP based on individual trading activity, which is more prone to behaivoral biases. Interestingly, the classic disposition effect does not induce underreaction to earnings news in our data set.

Keywords: V-shaped net selling propensity, post-earnings announcement drift, disposition effect, underreaction, individual investor

JEL classification: G12, G14, G40

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1. Introduction

An extensive body of literature documents that stock prices exhibit drift after corporate news announcements. Specifically, stock prices appreciate significantly after a positive earnings surprise. Similarly, negative earnings news is generally followed by a negative stock price drift. The so-called post-earnings announcement drift (PEAD), first proposed by Ball and Brown (1968), has been one of the most puzzling market anomalies to challenge the efficient market hypothesis (Fama, 1998). Bernard and Thomas (1989) argue that PEAD is the result of a delayed price response to an earnings report rather than risk mismeasurement. Furthermore, the recent study of Wang and Yu (2013) presents empirical evidence suggesting that the positive pricing impact of firms' return on equity (ROE) in the most recent quarters, used by the q-factor model of Hou et al. (2015), is not compensation for risk but, rather, related to investor underreaction to earnings news.

A variety of baseline mechanisms exist for these anomalous underreactions to earnings news.[1] Above all, we attempt to attribute investors' asymmetric selling propensity to this phenomenon. The V-shaped disposition effect, first examined by Ben-David and Hirshleifer (2012), shows that investors' selling propensity is actually a V-shaped function of unrealized profits; that is, investors tend to sell their stocks as their gains or losses increase, with the gain side having a larger slope than the loss side, as shown in Figure 1. This differs from the conventional disposition effect, documented by Shefrin and Statman (1985), which argues that investors are reluctant to sell their stocks only when the purchase price is relatively lower than the current price. Ben-David and Hirshleifer (2012) investigate retail investor trading data and find direct evidence for a V-shaped selling schedule. They argue that this V-shaped selling schedule could be driven by speculative retail investors with limited attention.[2] Moreover, An (2015) examines the pricing impacts on the cross section of subsequent stock returns of this newly documented disposition effect by constructing a net selling propensity measure that recognizes the V-shaped disposition effect. The author finds that this newly disposition effect subsumes the pricing impact of the original disposition effect.

In this paper, we argue that the market participation of a large set of investors who exhibit the V-shaped disposition effect can generate stock price underreaction to earnings news and,

[1] Starting with Bernard and Thomas (1989) arguing that PEAD is a delayed price response due to investors' consequent underreaction, many studies attempt to explain why this drift occurs. For examples, arbitrage risk (Mendenhall, 2004), transient institutional trading (Ke and Ramalingegowda, 2005), divergence of opinions (Garfinkel and Sokobin, 2006), disposition effects (Frazzini, 2006), trading costs (Ng et al., 2008), illiquidity (Chordia et al., 2009), investor inattention (Dellavigna and Pollet, 2009; Hirshleifer et al., 2009), ex ante earnings volatility (Cao and Narayanamoorthy, 2012), streaks in earnings news (Loh and Warachka, 2012), informational risk (Zhang et al., 2013), and anchoring bias (Birru, 2015; George et al., 2015) have determined a stock price drift after an earnings announcement.

[2] In normal times, when there is little change in stock prices after stock purchases, speculative investors have no reason to reexamine their stock positions, revise their beliefs, or trade. However, a substantial gain (or loss) will grab an investor's attention, causing the investor to reexamine his or her positions and trade (Ben-David and Hirshleifer, 2012).

in turn, return predictability of the recent earnings news announcement in Korean stock markets.[3] If investors with large unrealized gains (or extreme losses) on a stock comprise a sizeable proportion of stockholders, they would want to sell this stock to lock in the paper gain (or avoid larger losses). This net selling propensity of investors prevents a stock price from reflecting good news, so good news tends to lead to higher future returns in the presence of V-shaped disposition investors. On the contrary, investors' net selling pressure allows stock prices to incorporate bad news more efficiently. Therefore, bad news leads to a downward price drift only in the absence of investors displaying the V-shaped disposition effect.

To test the above hypothesis, we construct a better stock-level proxy for the degree of V-shaped net selling propensity (VNSP), based on the measure proposed by An (2015) with the capital gains overhang (CGO) variable of Grinblatt and Han (2005). We calculate the VNSP more intuitively with abundant stock-level data, including the daily average purchase price, sale price, buy volume, and sell volume. In addition, our data can categorize traders' types as either individual or institutional investors[4] to test which types cause the pricing implication of the V-shaped disposition effect and underreaction to news. Using a Korean stock market database containing these variables, we calculate the stock-level VNSP, CGO, and these variables based on individual (and institutional) trading and then examine their pricing impact and interaction with earnings news.

First, we check the V-shaped net selling schedules of investors, documented by Ben-David and Hirshleifer (2012) and An (2015), in Korean stock markets. Isolating unrealized gains and losses by conducting a conventional double-sort analysis, we find that investors sell more stocks when they have either larger gains or losses. Stocks with both larger unrealized gains and losses (in absolute value) could suffer from higher selling pressure and thus have higher consequent returns. This V-shaped net selling propensity temporarily push down current stock prices and leads to higher future returns. Specifically, the average of long–short spreads between the highest and lowest VNSP decile portfolios is 1.94% in a month, which is economically large and statistically significant. This cross-sectional pricing impact of the VNSP is consistent with the results of An (2015). However, the CGO variable of Grinblatt and Han (2005) does not have a significant impact on future stock returns, which differs from

[3] Based on trading amount data, we calculate the time-series average of individual investor trading weights in the Korean stock markets and find that individual investors account for 55% of the trading in the KOSPI market, 91% in the KOSDAQ market, and 66% in both markets. The higher weight in the Korea Securities Dealers Automated Quotations (KOSDAQ) market could be due to the larger proportion of listed stocks individuals are more likely to trade, that is, those that are smaller and with a lower price, greater volatility, and a skewed return distribution (e.g., Han and Kumar, 2013). Because of the large proportion of individual trading in Korean stock markets, we test our hypothesis by using a specific database on the trading activities of different types of investors that covers all of the Korean stock markets.

[4] In Korean stock markets, trading activities are typically divided among three types of investors: individual, institutional, and foreign. In this study, we categorize foreign investors as institutional investors because they are typically foreign institutions. Our main empirical results do not change qualitatively when we isolate domestic institutional investors from foreign investors.

the results for US markets. Similar long–short spreads underperform by about -0.67% per month, which is not statistically significant. These results are robust to characteristic or risk-adjusted returns, variable definitions, subsample analysis, and different testing periods. The overall empirical results emphasize the role of the newly documented V-shaped disposition effect on determining investors' behavioral biases.

Second, to test for an interactive effect between VNSP and price underreaction to news, we conduct a double-sort analysis based on VNSP and an earnings news proxy in the most recent quarters, using a Fama–MacBeth (1973) regression approach. In this paper, we use two kinds of variables to measure earnings news: standard unexpected earnings (SUE) and ROE. These two variables are widely used to measure the most recent earnings news. Throughout the portfolio analysis and regression approach, we first find that the degree of underreaction to earnings news interacts significantly with investor VNSP. For instance, based on a 5×5 quintile double-sorting analysis, among the highest-SUE (or highest-ROE) stocks experiencing positive news, those with stockholders in the highest VNSP quintile display a higher price drift than those with stockholders in the lowest quintile. To be specific, within the highest SUE (ROE) quintile, the top VNSP quintile of stocks earns 3.10% (3.05%) per month while the lowest earns 1.71% (1.55%) per month. The differences are both statistically significant. On the other hand, within the lowest SUE (or ROE) quintile experiencing negative news, stocks with stockholders with a lower VNSP experience a more negative price drift than those with stockholders with a higher VNSP. We construct a long–short portfolio that longs good news stocks whose stockholders have a higher net selling propensity and shorts bad news stocks whose stockholders have a lower net selling propensity that earns 3.39% per month. In contrast, a long–short portfolio that longs good news stocks whose stockholders have a lower net selling propensity and shorts bad news stocks whose stockholders have a higher net selling propensity earns -0.15% (based on SUE) and -1.16% (based on ROE) per month, which are negative returns, even though the portfolio longs good news stocks and shorts bad news stocks. This interactive effect is more pronounced among firms that are harder to value, that is, those that are smaller or with higher arbitrage risk. These results are robust to risk- and characteristic-adjusted returns. In addition, we conduct Fama–MacBeth (1973) cross-sectional analysis to control for other firm characteristics related to future stock returns and find similar results, supporting our hypothesis. Our overall empirical results emphasize the VNSP determining investor underreaction to earnings news.

We repeat the same analysis as above after classifying investors' types, individual or institutional, when we construct the VNSP measure. If the VNSP is driven by speculative retail investors (Ben-David and Hirshleifer, 2012), our main results should be more pronounced when based on the individual VNSP measure than on the institutional VNSP measure. Interestingly, the individual VNSP measure positively predicts subsequent stock returns but the institutional VNSP does not. In addition, the joint effect between the VNSP and earnings news only appears to exist based on individual trading. These results are verified by both the portfolio sorting and regression analysis. For instance, a long–short portfolio that longs good news stocks whose individual investors have a higher net selling

propensity and shorts bad news stocks whose individual stockholders have a lower net selling propensity earns 3.95% per month, which is economically large and statistically insignificant, but a similar long–short portfolio based on institutional trading earns -1.65%, which is even negative.

Our empirical analysis is similar to that of Frazzini (2006), arguing that the original disposition effect (Shefrin and Statman, 1985; Odean, 1998) induces underreaction to earnings news. In the study of Frazzini (2006), constructing a CGO measure based on mutual fund holdings data in US markets, the author find that PEAD is most severe when capital gains and the news event have the same sign. To check the robustness of our novel finding, suggesting that a V-shaped disposition effect induces underreaction to news, we replicate the Frazzini's analysis based on the newly improved CGO measure in Korean stock markets. Surprisingly, we find that the CGO measure does not predict subsequent stock returns and does not significantly interact with underreaction to earnings news. Specifically, through the 5×5 double-sorting analysis based on the CGO and ROE, a long–short portfolio that longs good news stocks with the highest CGO and shorts bad news stocks with the lowest CGO, called the overhang spread by Frazzini (2006), earns only 0.98% in a month. On the other hand, a long–short portfolio that longs good news stocks with the lowest CGO and shorts bad news stocks with the highest CGO, called the negative overhang spread' by Frazzini, earns 1.39% per month, which is larger than the overhang spread. These empirical returns are opposite those in US markets.

There are several possible reasons for this difference. First, the proportion of individual investors in the stock markets is much higher in Korea than in the United States.[5] Thus, speculative retail trading, which could be a main driver of the V-shaped net selling schedule, is more pronounced in Korean stock markets. Second, past research documents that individual investors fail to induce PEAD in US markets (e.g., Hirshleifer et al., 2008). In addition, trading turnover is higher in Korean markets than in US markets,[6] which reflects the different degrees of speculative trading and investment horizons. This paper does not analyze the exact reason for this empirical inconsistency between ours and Frazzini (2006), but we leave it to future studies for this part.

This paper makes several contributions to the literature. First, we find the magnitude of the price drift due to investor underreaction to news depends heavily on the VNSP. Focusing on Korean stock markets, in which individual trading comprises a larger part of trading activities, we document that the VNSP of individual investors positively predicts stock returns and induces stock price underreaction to earnings news. Since there is a paucity of previous studies examining the interactive effect of psychological bias and underreaction to

[5] Evans (2009) shows that retail investors only own 30% of US stock markets and recent New York Stock Exchange (NYSE) data reveal that trades by individual investors represent, on average, less than 2% of NYSE's trading volume for NYSE-listed firms.

[6] See http://data.worldbank.org/indicator/CM.MKT.TRNR.

earnings news in the Korean stock markets,[7] our study emphasizes the role of the V-shaped disposition effect, a newly emerging subject in behavioral finance, in identifying a potential factor behind underreaction to news and its return predictability. Second, we utilize additional Fama–MacBeth (1973) regression to analyze the interactive effect of VNSP and earnings news.[8] Frazzni (2006) does not use a regression approach to test their hypothesis, so our methodology provides more robust empirical results than those of Frazzini (2006). Furthermore, our empirical results do not support the hypothesis by Frazzini (2006). Rather, the newly documented disposition effect interacts significantly with investor underreaction to earnings news. Also, we construct a more intuitive measure of unrealized gains and losses to calculate the VNSP and CGO compared to the measures of Grinblatt and Han (2005), Frazzini (2006), and An (2015). Using a data set containing the average purchase (and sell) price and buy (and sell) volume for each type of investor, our improved measure results in different empirical patterns compared to those of past studies in US markets. Lastly, this paper conducts comprehensive studies regarding PEAD in Korean stock markets, employing two kinds of earnings news measures, calendar time portfolio approach, and various kinds of stock returns.

The remainder of this paper is structured as follows. Section 2 describes the data set and methodology to construct the main variables. Section 3 empirically examines the impact of VNSP on stock returns and Section 4 investigates the joint effect of VNSP and earnings news on stock returns. Section 5 summarizes the results and presents our concluding remarks.

2. Data and variable construction

In this section, we test the effects of unrealized gain and loss overhang on net order flow. We conduct an analysis on how unrealized gains and losses affect the demand for stocks as measured by the net order flow of Kyle's (1985) model. Since we cannot access the retail investor trading data set, we indirectly measure investors' demand to test the implications of Ben-David and Hirshleifer (2012).

2.1 Trading evidence of Ben-David and Hirshleifer (2012)

In Kyle's (1985) seminal study, the relation between investors' net order flow and asset prices can be summarized as $\Delta P = \lambda x$, where the price change ΔP is a result of the net order

[7] A few studies analyze PEAD in Korean stock markets with a psychological bias; however, only Goh and Jeon (2017) explain it using anchoring bias. Other studies attempt to identify the underlying factor of PEAD in the Korean stock markets focusing on audit quality (Nah and Lee, 2009), the trading volume around earnings announcements (Choi and Kim, 2009), individual investors' trading activities (Lee and Choe, 2012), and information uncertainty (Lee et al., 2015).

[8] The similar methodology is used by Goh and Jeon (2017). They provide this methodology to separate the pure and interactive effect of nearness to 52-week highs and earnings news. We utilized this methodology to test the interactive effect of VNSP and earnings news.

flow (x) and price sensitivity (λ), which is termed the market depth by Kyle (1985). Table 1 presents the regression results. We add stock characteristics that could affect the net order flow. In this analysis, we set λ as the turnover ratio, in that a higher turnover ratio indicates lower market depth. Then, we can indirectly calculate the net order flow, written as $x = \Delta P/\lambda$.[9]

Table 1 presents the results of cross-sectional regressions. We control for the following variables: the past one-month return ($Ret_{i,t}$,), separated by sign into $Ret_{i,t}^{+} = \max(Ret_{i,t}, 0)$ and $Ret_{i,t}^{-} = \min(Ret_{i,t}, 0)$; the volatility of the daily return ($Vol_{i,t}$) in the past year, also separated by sign into $Vol_{i,t}^{+} = \max(Vol_{i,t}, 0)$ and $Vol_{i,t}^{-} = \min(Vol_{i,t}, 0)$; and the firm size ($\log ME_{i,t}$), the logarithm of a firm's market capitalization.

The gain side has a steeper slope (-0.28) compared with the loss side (0.103). The selling pressure is higher for stocks with high unrealized gains. A 1% increase in unrealized gain leads to a -0.28% drop in investor demand, while a l% increase in unrealized loss induces investors to buy 0.103% more stocks. The overall net selling pressure is defined as the relation between the sensitivity of unrealized gains and losses to investor demand, which is $\frac{0.103}{-0.28} = -0.37$, which differs from the value of An (2015).[10]

2.2 Data

We obtain stock information and accounting data from FnGuide. The sample period is from January 2005 to June 2017. We examine all common stocks listed on the Korea Stock Exchange and the KOSDAQ with non-missing return, market value, and book value data. We exclude the stocks of financial and service firms and firms with a negative book value of equity. We also require that stocks be worth more than KRW 1,000 when we form portfolios and conduct regression analysis to control for the effects of micro-cap stocks.

2.3 Key variables

An (2015) measures aggregate unrealized gains (Gain) and losses (Loss) as the trading volume-weighted value of the deviation of the current stock price from the past purchase price. The author utilizes trading turnover for both the buy and sell turnover and the closing price for the past purchase price as daily stock data.

In this study, we calculate the variables Gain and Loss more intuitively with abundant stock-level data, including the daily average purchase price, sale price, buy volume, and sell volume. FnGuide provide these data for all listed stocks at a daily frequency.

The formula of aggregate unrealized gains (Gain) is as follows:

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[9] We get the similar empirical results based on Amihud (2002) illiquidity measure as a proxy for a market depth.

[10] We obtain qualitatively and quantitatively the same empirical results based on An's (2015) asymmetric sensitivity of -0.23 for unrealized gains and losses to net selling pressure.

$$
\begin{aligned}
Gain_t &= \sum_{n=1}^{\infty} w_{t-n} gain_{t-n} \\
gain_{t-n} &= \frac{P_t^{closing} - P_{t-n}^{buy}}{P_t^{closing}} \cdot I_{\left\{P_{t-n}^{buy} \le P_t^{closing}\right\}} \\
w_{t-n} &= \frac{1}{K} \cdot V_{t-n}^{buy} \prod_{i=1}^{n-1} \left[1 - V_{t-n+i}^{sell}\right] \\
K &= \sum_{n} V_{t-n}^{buy} \prod_{i=1}^{n-1} \left[1 - V_{t-n+i}^{sell}\right]
\end{aligned}
\tag{1}
$$

where $P_t^{closing}$ is the closing price at time *t*; P_{t-n}^{buy} is the average purchase price at time *t* – *n*; V_{t-n}^{buy} is the buying turnover ratio at time *t* – *n*, which is calculated as the buying volume divided by total shares outstanding; and V_{t-n+i}^{sell} is the selling turnover ratio at time *t* – *n* – *i*. The term *K* is a normalizing constant that makes the total weight (w_{t-n}) one and $I_{\left\{P_{t-n}^{buy} \le P_t^{closing}\right\}}$ is an indicator function set to one if the average buying price is less than or equal to the current closing price. The gain measure only counts when the past purchase price is less than or equal to the current price. At the end of each month, we calculate the value of Gain for each stock. Following Grinblatt and Han (2005) and An (2015), we also set a five-year estimation window.[11]

Compared to the measure proposed by An (2015) and Grinblatt and Han (2005), using only the closing price ($P_t^{closing}$, $P_{t-n}^{closing}$) and total turnover ratio (V_{t-n}, V_{t-n-i}), we utilize more intuitive data to construct unrealized gains. In our study, w_{t-n} is a proxy for the more realistic fraction of stocks purchased at time *t* – *n* and held until time *t*. Therefore, our aggregate unrealized gains (Gain) is a measure of the remaining buying volume-weighted average of the deviation of the current price from the past purchase price (not a closing price).Our data can categorize traders' types as well, as either individual or institutional investors. We calculate the Gain measure for the both individual and institutional traders.

Similarly, we compute the aggregate unrealized losses (Loss) according to the following equations, the only difference being that Loss accounts only for the case in which the past purchase price is higher than the current stock price, indicating paper losses:

$$
Loss_t = \sum_{n=1}^{\infty} w_{t-n} loss_{t-n}
$$

[11] This estimation window enables one to account for the different investment horizons of various investors (Grinblatt and Han, 2005).

$$loss_{t-n} = \frac{P_t^{closing} - P_{t-n}^{buy}}{P_t^{closing}} \cdot I_{\left\{P_{t-n}^{buy} > P_t^{closing}\right\}} \quad (2)$$

$$w_{t-n} = \frac{1}{K} \cdot V_{t-n}^{buy} \prod_{i=1}^{n-1} \left[1 - V_{t-n+i}^{sell}\right]$$

$$K = \sum_{n} V_{t-n}^{buy} \prod_{i=1}^{n-1} \left[1 - V_{t-n+i}^{sell}\right]$$

Using the new Gain and Loss above, we construct the VNSP measure (An, 2015) and the CGO measure (Grinblatt and Han, 2005). The VNSP measure represents the V-shaped disposition effect of Ben-David and Hirshleifer (2012) and the CGO measure presumes a conventional disposition effect (Shefrin and Statman, 1985; Odean, 1998). The formulas of the VNSP and CGO are, respectively,

$$VNSP_t = Gain_t - 0.37 \cdot Loss_t \quad (3)$$

where we set -0.37 as the asymmetric effect on net selling propensity, as we derive in Section 2.1, and

$$CGO_t = Gain_t + Loss_t \quad (4)$$

In addition, using only the individual and institutional trading data set, we calculate the VNSP and CGO measures for the separate investor categories. For instance, we use the daily individual buy volume, sell volume, average purchase price, and average sale price to calculate the individual trading versions of the VNSP and CGO, VNSP(ind) and CGO(ind), respectively, and the institutional investor versions VNSP(ins) and CGO(ins).

2.4. Earnings news variables

We employ two kinds of variables to measure earnings news: ROE and SUE. These two variables are widely used in the literature to measure recent earnings news. Quarterly earnings are used in the months after the most recent public earnings announcement days. We measure earnings news as ROE, which is earnings (net income) in the most recent quarter divided by one-quarter-lagged book equity. We define SUE as changes in earnings from four quarters ago, standardized by its standard deviation over the past eight quarters (Ball and Brown, 1968). In Section 4, we report the two sets of results based on ROE and SUE, respectively.

2.5 Control variables

We control for other known return predictors to elaborate the effects of unrealized gain and loss overhang. The Appendix shows the definitions of the variables. First, past prices are reflected in the gain and loss overhang. Thus we control for past returns at different horizons

($\text{Ret}_{i,t-1}$, $\text{Ret}_{i,t-12,t-1}$, and $\text{Ret}_{i,t-36,t-13}$). Since net selling propensity variables are computed using volume-weighted past prices, we include turnover in a set of control variables for computing residual gains and losses. Idiosyncratic volatility ($\text{Ivol}_{i,t-1}$) captures high price volatility, which is prevalent among stocks with high unrealized gains and losses. We also include Amihud's (2002) illiquidity measure ($\text{Amihud}_{i,t-1}$) to control for the effect of liquitidy. Finally, firm size ($\log ME_{i,t-1}$) and the book-to-market ratio ($\log \text{BM}_{i,t-1}$) are included because they are highly relevant to subsequent stock returns. Table 2 summarizes the net selling propensity, earnings news, and control variables.

3. VNSP and stock returns

In this section, we explore the relation between VNSP and subsequent returns. We begin by reporting the results of portfolio analysis based on unrealized gains and losses. We then conduct portfolio analysis based on VNSP that combines selling pressure from the gain and loss sides and perform Fama–MacBeth (1973) regressions to control for well-known stock return predictors.

3.1 Two-way sorting on residual gains and losses

To investigate how future average stock returns vary across unrealized gains and losses, we conduct a double-sort portfolio analysis. At the end of each month, we classify stocks into quintiles independently based on residual gain and losses. Instead of the raw values of Gain and Loss, the residual values of unrealized gains and losses are used because of the high correlation between them and common return predictors affecting both gains and losses (An, 2015). The residual Gain and Loss are obtained from the following cross-sectional regressions using the same control variables used by An (2015):

$$Gain_{i,t-1} = \alpha + \beta_1 Ret_{i,t-1} + \beta_2 Ret^{+}_{i,t-12,t-2} + \beta_3 Ret^{-}_{i,t-12,t-2} + \beta_4 Ret_{i,t-36,t-13} + \beta_5 logME_{i,t-1} + \beta_6 turnover_{i,t-1} + \beta_7 ivol_{i,t-1} + \epsilon_{i,t-1}$$

$$Loss_{i,t-1} = \alpha + \beta_1 Ret_{i,t-1} + \beta_2 Ret^{+}_{i,t-12,t-2} + \beta_3 Ret^{-}_{i,t-12,t-2} + \beta_4 Ret_{i,t-36,t-13} + \beta_5 logME_{i,t-1} + \beta_6 turnover_{i,t-1} + \beta_7 ivol_{i,t-1} + \epsilon_{i,t-1}$$

Table 3 reports the results of bivariate sorts based on residual gains and losses. Monthly rebalanced portfolio returns are computed by weighting stocks with gross returns in the previous month. Panel A displays raw portfolio returns and Panel B shows the characteristic-adjusted returns. To compute characteristic-adjusted returns, we follow the methodology proposed by Daniel and Titman (1997). At the end of the each month, all the stock in our sample are sorted into quintile portfolios based on their size and book-to-market ratio. The characteristic-adjusted return of a stock is calculated as its raw return subtracted by equal-weighted average return of corresponding size-BM sorted portfolio which it belongs to. For each given residual Loss quintiles, the average raw and characteristics-adjusted returns of

portfolios increase almost monotonically with their Gain quintile and vice versa. The selling pressure from paper gains or losses temporarily lowers current stocks prices and leads to higher subsequent returns. Moreover, the difference between the returns of the highest and lowest residual gain quintiles within each of the residual loss quintiles is statistically significant, ranging from 0.74% to 2.31% per month. In other words, large unrealized gains and losses induce stocks to undergo higher selling pressure and generate higher returns the next month.

3.2 VNSP, CGO, and the cross section of stock returns

After presenting the individual effects of unrealized gains and losses, we examine the price impact of unrealized gains and losses together, using the VNSP, a linear function of paper gains and losses. We also perform a formal analysis to compare the price impact of the CGO with the VNSP. Testing the return predictability of the CGO and VNSP classified by investor type provides more comprehensive evidence, because retail investors are more likely to suffer from psychological bias, such as the V-shaped disposition effect (e.g., Ben-David and Hirshleifer, 2012).

3.2.1 One-way sorting

We first analyze the relation between VNSP and subsequent returns using portfolio sorts. Stocks are sorted into decile portfolios based on their VNSP and we calculate the average decile portfolios' performance in the subsequent month. Panel A of Table 4 shows the results based on raw returns, while Panel B presents the results based on characteristic-adjusted returns by weighting the gross returns in the past month. For comparison, we reexamine the portfolio sorts based on the CGO of Grinblatt and Han (2005). Moreover, we present the same set of portfolio analysis results based on the VNSP of individual and institutional investors. By using the unique data set of trading data by investor type, we compute the VNSP and CGO the same way.

The evidence from Table 4 has the following implications. First, stocks with higher net selling pressure have higher subsequent returns than those with low net selling pressure. A trend of increasing returns across VNSP deciles appears in all panels in Table 4. Gross return-weighted characteristic-adjusted returns increase from -1.18% to 0.99% per month. The stocks in the highest VNSP decile portfolio have statistically significant positive returns. The spread between the highest and lowest VNSP deciles are highly significant, regardless of return expressions.

Second, the CGO does not seem to predict future returns in Korean stock markets, which differs from the US stock market. The long–short strategy of longing stocks with a high CGO and shorting stocks with a low CGO yields negative and insignificant returns. Carhart's (1997) four-factor alpha for the high-minus-low portfolio is -1.36% and significant, with a t-value of -3.62. Moreover, when we analyze the results based on different investor types, the return

differences between the highest and lowest CGO deciles become negative for all investor types. Even without controlling for other return predictors, we do not find the CGO has return predictability.

Third, the price impact of the VNSP differs according to investor type. While stocks with high individual investor selling pressure tend to experience relatively high realized returns compared to stocks with low individual investor selling pressure, stocks whose institutional investors face a high selling propensity seem to have low future returns. The four-factor alpha of a high-minus-low portfolio is 1.4%, significant at the 1% level, with a t-statistic of 3.56. The net selling pressure of individual investors has a positive impact on one-month future returns. Interestingly, different patterns are found in the results for institutional investors. Stocks whose institutional investors experience a high net selling pressure have lower returns than those whose institutional investors experience a low net selling pressure. Gross return-weighted characteristics-adjusted returns decrease from 0.05% to -0.41% across VNSP deciles and the return difference between the highest and lowest is -0.46%, with a t-statistic of -1.33. Thus, we conclude that the VNSP effect is mostly due to individual investors rather than institutional investors.

3.2.2 Fama–MacBeth regressions

Next, we regress subsequent monthly returns on the VNSP, with control variables. Table 5 presents the results from monthly cross-sectional Fama–MacBeth (1973) regression analysis. Columns (1) and (2) report the results of the regression of future returns on the VNSP and CGO plus a set of control variables. While the coefficients of VNSP are positive and significant, as expected, the coefficients of the CGO are not statistically significant. A 1% increase in the VNSP measure increases future returns by 4.393%. Putting together the VNSP and CGO, the CGO still does not have a significant impact in predicting future returns, while the VNSP remains highly significantly (column (3)). Consistent with Table 4, the CGO is not predictive with the proper controls. The other control variables have the expected signs.

The price impacts of the VNSP of individual and institutional investors are consistent with previous findings from portfolio analysis. In other words, the coefficients of VNSP(ind) are all highly significant and positive in all the columns. From columns (7) to (9), we note that the price impact of institutional investors has the opposite impact from that of individual investors. The coefficients of the CGO and VNSP measures are positive but insignificant. However, putting VNSP(ind) and VNSP(ins) together, we find the coefficients of VNSP(ind) and VNSP(ins) turn out to be significant. While the coefficient of VNSP(ind) is positive and significant, that of VNSP(ins) becomes negative and significant. Even after adding the original VNSP measure, the coefficients are unchanged and still significant (column (11)). The evidence in Table 5 indicates that the V-shaped disposition effect leads to strong stock predictability and is mostly due to individual investors.

3.2.3 Robustness

To check the robustness of our results, we conduct additional tests with alternative VNSP measures, subperiods, and subsample analysis. For simplicity, we only report return differentials between the highest and lowest VNSP decile portfolios in Table 6. First, we change the coefficient in equation (3) from -0.37 to -0.23, as in An's (2015) paper. We indirectly measure the investors' selling schedule by adapting Kyle's (1985) model instead of directly using retail investor trading data and we measure the effect of unrealized gains and losses on the net order flow, which is summarized in equation (3). However, An uses retail investor trading data and derives the coefficient -0.23 as the asymmetric sensitivity of the unrealized gain and loss sides to the net selling probability. We assume that this relation still holds in the Korean stock market and we obtain qualitatively and quantitatively similar results. The high-minus-low raw return spread of 1.71% is smaller than the original result but still highly significant. Even though we change the relation between the unrealized gain and loss sides, the price impacts of individual and institutional investors' VNSP are unchanged.

Next, we investigate the issue of the predictive power of the V-shaped disposition effect being potentially driven by firm characteristics such as firm size or liquidity. We first sort the stocks into quintile portfolios based on firm size or Amihud's illiquidity measure and then we sort these into VSNP quintiles. The return spreads are significant for large stocks and liquid stocks for all return specifications. Large stocks whose stockholders have a high net selling tendency deliver monthly returns 1.57% higher than those whose stockholders have a low net selling tendency. Moreover, the results based on different investor types remain the same. When we divide the sample period into halves and repeat the portfolio analysis for each period, we find the same results as in the formal findings. We conclude that the V-shaped disposition effect does not exist only for certain periods or stocks.

4. V-Shaped disposition effect and underreaction to earnings news

We show that a large number of investors exhibit the V-shaped disposition effect in the Korean stock market. In this section, we attempt to propose this behavior bias as one of the mechanisms of underreaction to earnings news. On the one hand, the higher net selling pressure of stocks trading at large unrealized gains or losses delays the incorporation of good news into stock prices. Thus, the underreaction to positive earnings news is stronger and more significant for stocks that investors are eager to sell. On the other hand, when bad news is released, the net selling schedule from paper losses or gains helps stock prices reflect bad information more efficiently. Thus, when facing negative earnings news, stocks price under a low V-shaped net selling tendency adjust more slowly than under high V-shaped selling pressure. In summary, we hypothesize that positive post-event returns are larger for stocks with a higher VNSP measure and the negative return drift becomes severe for stocks under low net selling pressure.

4.1 One-way sorting on earnings news

Before analyzing the interaction between the VNSP and underreaction to earnings news, we start our analysis by confirming the existence of PEAD using two proxies for earnings news: SUE and ROE. At the end of each month, we sort stocks into decile portfolios based on SUE or ROE in the most recent quarter and calculate the portfolio returns by weighting gross return in the previous month. Table 7 presents the performance of portfolios sorted by earning news measures in the form of portfolio raw returns, characteristic-adjusted returns, and Carhart's (1997) four-factor alphas. Gross return-weighted characteristic-adjusted returns increase almost monotonically with ROE, from -0.52% to 1.07% per month. The return differential between the top and bottom deciles is 1.58% (t-stat = 5.16). When we measure earnings news by SUE, the results deliver the same message. The average characteristic-adjusted return of the top (bottom) decile SUE portfolio is 0.96% (-0.83%), with a t-statistic of 5.43 (-5.60). This result indicates that investors tend to underreact to earnings information and thus face subsequent price drift. Overall, Table 7 confirms significant underreaction to earnings news in Korean stock markets, which leads to the strong stock return predictability of recent earnings news.

4.2 Two-way sorting on earnings news and the VNSP

We now analyze whether the V-shaped disposition effect, which affects the speed of price adjustment, accounts for price drift after the announcement of corporate earnings news. The net selling pressure from large unrealized gains or losses impedes good news from being reflected in stock prices and, conversely, helps bad news to be reflected in stocks prices. We predict good news stocks under large paper gains or losses to have a positive price drift and bad news stocks with small paper gains or losses to experience a large negative price drift.

To test our predictions, we perform bivariate sorts on the VNSP and earnings news measures ROE and SUE. At the end of each month, we sort stocks into quintiles based on earnings news measures and VNSP independently and calculate the gross return-weighted returns for each of the 25 (5×5) portfolios. Panels A and B of Table 8 report the results when earnings news is measured using ROE and SUE, respectively. Each panel shows three different returns; raw portfolio returns, characteristic-adjusted returns, and Carhart's (1997) four-factor alphas.

We first examine reactions to positive earnings news conditional on the net selling propensity. In the highest ROE quintile, characteristic-adjusted returns on VNSP portfolios increase from 0.17% to 1.73% per month, for an average return difference of 1.55%, with a t-statistic of 4.18, between high- and low-VNSP portfolios. The corresponding spreads for raw returns and Carhart's (1997) four-factor alphas portfolios are 1.5% and 1.06%, respectively. Additionally, in almost all ROE and SUE quintiles, the average returns of the ROE or SUE quintile portfolios increase almost monotonically with their VNSP quintile. These results indicate that the higher net selling pressure delays the incorporation of positive information

and leads to a larger positive price drift. In addition, there is lower level of underreaction among good news stocks trading at a low net selling pressure.

In contrasts, for stocks in the lowest SUE or ROE quintile, there is no negative post-event price drift for high-VNSP stocks. However, the characteristic-adjusted portfolio return for bad news stocks (ROE) with the lowest VNSP is -1.97% per month (t-stat = -7.09), while the portfolio return of bad news stocks trading at a high VNSP is 1.08% (t-stat = 2.40), even though this portfolio consists of bad news stocks. Among the lowest ROE quintile, the monthly characteristic-adjusted return difference between the highest and lowest VNSP portfolios is 3.05%, with a t-statistic of 5.38. Therefore, the immediate price adjustment due to the high VNSP makes the negative return drift disappear among bad news stocks.

To demonstrate our hypothesis more clearly, we construct VNSP spread portfolios that take a long position in stocks with good earnings news and a short position in stocks with negative earnings news under different degrees of VNSP. In detail, the *i*th VNSP spread portfolio is defined as a portfolio spread that longs the top 20% of good news stocks in the *i*th VNSP quintile and shorts the bottom 20% of bad news stocks in the (6 - *i*)th VNSP quintile. This methodology is similar to the overhang spread and the negative overhang spread constructed by Frazzini (2006).

As expected, the positive VNSP spread portfolio, exposed to the positive difference between VNSP measures, has the largest post-event return differentials, all significant under all return and earnings measure specifications, ranging from 2.83% to 3.69%. However, this pattern is reversed under the negative VNSP spread portfolios. Specifically, the characteristic-adjusted portfolio return in Panel B of Table 8 is -0.15% per month, which is not statistically significant. Interestingly in Panel A, the four-factor alpha of the negative VNSP spread portfolio is significantly negative, -1.59% with a t-statistic of -2.48, even if this spread longs good news stocks and shorts bad news stocks. The return differentials between positive and negative VNSP spread portfolios are statistically significant. To sum up the results of Table 8, the interactive effect of the VNSP and underreaction to earnings news is strong and robust, regardless of return specifications and earnings news measures.

4.3 Two-way sorting based on investor types

In this section, we repeat the bivariate portfolio sorts in the previous section after classifying investor types into individual and institutional investors. We construct the VNSP measures for each investor type by using a unique data set of individual and institutional investors. Since the Korean stock market is characterized by a high proportion of individual investors, it is natural to test which types of investors' net selling propensity contributes to underreaction to earnings news.

The previous results show that the individual VNSP measure positively predicts subsequent stock returns while the institutional VNSP does not. To conserve space, Table 9 reports only the VNSP spread portfolios, constructed in the same way as in Table 8. The joint effect between VNSP and earnings news only arises among individual investors. Focusing on

the individual VNSP measure, we find that the portfolio returns increase from the negative to the positive VNSP spread portfolios. The return differences between the positive and negative VNSP spread portfolios are statistically significant in all three return expressions. For instance, Carhart's (1997) four-factor alpha is 3.9% (2.6%) with a t-statistic of 4.59 (3.14) when ROE (SUE) is used as the earnings news measure. Interestingly, different patterns are found for the results based on the institutional VNSP measure. The raw returns of the VNSP spread portfolios do not show a monotonic pattern and the return difference between the positive and negative VNSP spread portfolios is even negative, for example, -1.65% with a t-statistic of -2.22 in Panel A.

Furthermore, we re-examine the double-sorted portfolio analysis in Table 8 using the CGO. We reconfirm Frazzini's (2006) findings that the CGO, based on the original disposition effect, induces underreaction to earnings news. The CGO spread portfolios are constructed in the same way as the VNSP spreads. Additionally, we estimate portfolio returns based on individual and institutional CGO, similar to the different investor types for VNSP.

In our data set, the CGO does not explain underreaction to earnings news, which is opposite the results in US markets. We summarize the results in Table 10 and report only the CGO spread portfolios, in the same manner as the VNSP spread portfolios. Specifically, in Panel A, based on Frazzini's (2006) original CGO, Portfolio 5, which is the overhang spread, earns only 0.98% in a month, which is even smaller than the monthly return of the negative overhang spread portfolio, at 1.39% per month. Compared to the positive and significant return spreads between the positive and negative VNSP spread portfolios, the return spreads on the CGO spread portfolio are insignificant and negative. In addition, the results based on the CGO of individual investors do not show a significant effect on price drift after earnings news. In the both Panels A and B, the return spread between the overhang and negative overhang portfolios is negative but insignificant for individual investors and significant for institutional investors. Taking the results of Tables 9 and 10 together, we find that only the V-shaped net selling pressure, and not the CGO, affects underreaction to earnings news.

4.4 Fama–MacBeth regression

In our multivariate tests, we check whether the interactive effect of the V-shaped disposition effect and underreaction to earnings news remains strong after controlling for well-known return predictors. We run monthly cross-sectional regressions of the form

$$Ret_{i,t} = \alpha + \beta_1 EN^{+}_{i,t-1} + \beta_2 EN^{-}_{i,t-1} + \beta_3 EN^{+}_{i,t-1} VNSP_{i,t-1} + \beta_4 EN^{-}_{i,t-1} VNSP_{i,t-1} + \beta_5 X_{i,t-1} + \epsilon_{i,t}$$

where $Ret_{i,t}$ is the monthly return and $EN^{+}_{i,t-1}$ and $EN^{-}_{i,t-1}$ represent one of two measures of the earnings news of stock i in the most recent quarter of month t - 1, ROE and SUE, respectively, separated by their signs. We include the interaction between positive or negative earnings news and the VNSP to prove that the higher degree of the V-shaped disposition effect is associated with higher post-event return drift.

Under Fama and MacBeth's (1973) methodology, columns (1) to (4) of Table 11 report the results using ROE as a proxy for earnings news and columns (5) to (8) show the results

using SUE as a proxy for earnings news. Columns (1) and (5) regress future returns only on positive and negative earnings news and the coefficients of $EN^{+}_{i,t-1}$ ($EN^{-}_{i,t-1}$) represent the effect of earnings news when the VNSP equals zero. The estimated coefficients are positive and significant for both positive and negative earnings news, confirming the existence of PEAD.

The average slope coefficients of the interaction term between VNSP and positive ROE are positive and highly significant, even after controlling for a large set of control variables. Our key results remain unchanged for the SUE measure as well. Specifically, a 1% increase in the VNSP results in a 3.12% higher post-event return drift. The positive and significant coefficients of the interaction term in all specifications suggest that the positive post-earnings announcement price drift after good news is stronger for stocks trading at larger unrealized gains and losses. Meanwhile, we find a statistically significant coefficient of -2.953 for $EN^{-}_{i,t-1}VNSP_{i,t-1}$, when SUE is used as a negative earning news proxy. The negative average slopes imply that bad news is incorporated more slowly into stocks with low-VNSP measures than those with high-VNSP stocks.

We also repeat the cross-sectional regression analysis with individual and institutional VNSP measures. In line with previous portfolio analysis results, the effect of the V-shaped disposition effect on PEAD differs across investor types. Focusing on individual investors, we find the coefficient of the interaction between positive ROE and VNSP to be 49.576, with a t-statistic of 5.66, and the coefficient of the interaction between negative ROE and VNSP to be -23.809, with a t-value of -1.63. However, the signs of the coefficients of the interaction between earnings news and VNSP become reversed and insignificant for institutional investors. Overall, the impact of VNSP(ind) on underreaction to earnings news is statistically significant and stronger than that of VNSP(ins).

Given these and our portfolio and regression analysis results, we conclude that the V-shaped disposition effect contributes to underreaction to earning news. The net selling pressure from behavior bias hinders the incorporation of fundamental news into stock prices. The underreaction to good news is stronger for stocks trading at a high VNSP, while negative return drift in response to bad news does not arise among stocks with a high net selling tendency. Furthermore, the joint effect of the V-shaped disposition and reaction to earnings news differs across investor types. The late incorporation of earnings news is mostly due to individual investors, while unrealized gain or loss of institutional investors are not related to return drift after earnings announcements.

4.5 Subsample analysis

Until now, we have tested and confirmed our hypothesis that VNSP induces underreaction to earnings news and the interactive effect is more pronounced among individual investors. In line with our hypothesis, we expect the impact of VNSP on price drift to be stronger for hard-to-value stocks, which are more likely to be mispriced. We categorize stocks based on firm size and idiosyncratic volatility into three groups. Generally, stocks of small size and high

idiosyncratic volatility are classified as hard to value. In each subsample, we reexamine the portfolio analysis in Section 4.2 and only report the VNSP spread portfolios. Table 12 presents the results.

Our findings are consistent with our expectations. The returns in the positive VNSP spread portfolio are statistically and economically significant across all firm size groups, ranging from 2.86% to 4.24% per month. The difference between the negative and positive VNSP spread portfolios using ROE as the earnings news measure is 6.38% for small stocks, which is 1.85 times greater than for large stocks. Subsample analysis based on idiosyncratic volatility yields more distinct results. The return differentials between positive and negative VNSP spread portfolios are more than four times greater for high idiosyncratic volatility stocks compared to low idiosyncratic volatility stocks. The results from Table 12 support our argument that the joint effect is particularly strong for stocks that are more likely to be mispriced.

5. Conclusion

In this paper, we utilize a novel data set containing detailed stock-level information on the trading activities of different types of investors and construct an improved measure of capital gains and losses for individual stocks compared to those of Grinblatt and Han (2005) and An (2015). Using these measures, we first show that the VNSP significantly predicts subsequent stock returns in Korean stock markets.

Second, we show that this V-shaped disposition effect contributes significantly to underreaction to earnings news and, in turn, PEAD. When investors who have large unrealized gains (or extreme losses) on a stock comprise a considerable proportion of stockholders, their net selling propensity prevents the stock price from reflecting good news and leads to higher future returns in the presence of V-shaped disposition investors. On the contrary, bad news leads to a downward price drift only in the absence of investors displaying the V-shaped disposition effect.

Consistent with the hypothesis, we find that, among positive news firms, the upward price drift is more pronounced when stockholders experience a more severe net selling propensity. In addition, this net selling propensity interacts in the opposite direction among bad news stocks. Stocks with a higher net selling propensity do not display a negative price drift after earnings announcements. In addition, these empirical results are pronounced only for the individual VNSP and this interactive effect is stronger among stocks that are harder to value. Furthermore, our improved measure of unrealized capital gains and losses, in turn, CGO, show different empirical patterns compared to those in US markets (e.g., Frazzini, 2006).

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Appendix. Variable definitions

Variable Name	Definition
V-Shaped disposition effect measure	
$Gain_t$	remaining buying volume-weighted average of the percentage deviation of the average purchase price from the current price if the purchase price is lower than the current price during the past five years
$Loss_t$	remaining buying volume-weighted average of the percentage deviation of the average purchase price from the current price if the purchase price is higher than the current price during the past five years
$VNSP_t$	$VNSP_t = Gain_t - 0.37 \cdot Loss_t$
$VNSP(ind)_t$	VNSP constructed based on individual investors' trading data
$VNSP(ins)_t$	VNSP constructed based on institutional investors' trading data
Disposition effect measure	
CGO_t	$CGO_t = Gain_t + Loss_t$
$CGO(ind)_t$	CGO constructed based on individual investors' trading data
$CGO(ins)_t$	CGO constructed based on individual investors' trading data
Earnings news measure	
ROE_t	earnings (net income) in the most recent quarter divided by one-quarter-lagged book equity
SUE_t	changes in earnings from four quarters ago, standardized by its standard deviation over the past eight quarters
Stocks return controls	
$\text{Ret}_{i,t-1}$	past one-month return
$\text{Ret}_{i,t-12,t-1}$	previous 12- to two-month cumulative return
$\text{Ret}_{i,t-36,t-13}$	past three- to one-year cumulative return
$\text{Ivol}_{i,t-1}$	standard deviation of the return residuals with respect to Carhart's (1997) four-factor model in the past month
$\text{Amihud}_{i,t-1}$	average ratio of the daily absolute return to the reading volume
$\text{logBM}_{i,t-1}$	logarithm of the book-to-market ratio in the previous fiscal year-end
$\log ME_{i,t-1}$	logarithm of a firm's market capitalization in the previous month
$turnover_{i,t-1}$	average daily turnover ratio in the past year

Figure 1. VNSP with respect to profits

Source: Ben-David and Hirshleifer (2012), Figure 2B. Reprinted by permission of Oxford University Press on behalf of the Society for Financial Studies.

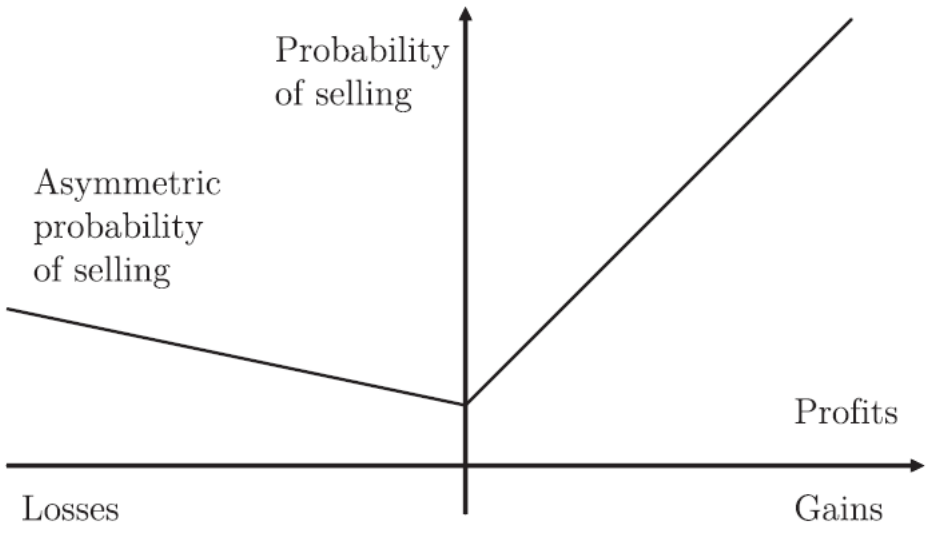

Table 1. Net order flows in response to unrealized gains (losses), Fama–MacBeth (1973) regression

This table reports the results of the Fama–MacBeth regression of net order flows on unrealized profits (gains and losses) and a set of control variables. The dependent variable, net order flow, is defined as the ratio of the return to turnover, where turnover is the average daily turnover over the past month. The variables Gain and Loss are the gain overhang and loss overhang, defined in Equations (1) and (2), respectively; $Ret_{i,t}^{+} = \max(Ret_{i,t}, 0)$ and $Ret_{i,t}^{-} = \min(Ret_{i,t}, 0)$, where $Ret_{i,t}$ is the past one-month return; $Vol_{i,t}^{+} = \max(Vol_{i,t}, 0)$ and $Vol_{i,t}^{-} = \min(Vol_{i,t}, 0)$, where $Vol_{i,t}$ is the volatility of the daily return in the past year; and $\log ME_{i,t}$ is the logarithm of a firm's market capitalization of stock *i* in month *t*. Newey–West (1987) *t*-statistics are reported in parentheses.

	Net Order Flow		
	(1)	(2)	(3)
Intercept	0.001	0.264	0.265
	(5.51)	(10.29)	(10.30)
Gain	-0.004	-0.291	-0.280
	(-5.88)	(-4.10)	(-3.92)
Loss	0.001	0.110	0.103
	(3.04)	(3.36)	(3.05)
Ret(-1)		-0.025	
		(-0.43)	
Ret(-1)+			-0.034
			(-0.48)
Ret(-1)-			0.147
			(1.64)
log(ME)		-0.035	-0.035
		(-9.32)	(-9.35)
Vol+		1.559	1.527
		(2.35)	(2.31)
Vol-		0.095	0.448
		(0.08)	(0.40)
R^2	0.006	0.045	0.048
Obs	198,186	197,933	197,933

Table 2. Summary statistics of net selling propensity, earnings news, and control variables

This table show summary statistics for the net selling propensity variables (Panel A), earnings news variables (Panel B), and control variables (Panel C). The numbers represent the time-series average of the cross-sectional distribution, that is, the mean; standard deviation (std); median; fifth, 25th, 75th, and 95th percentiles; and sample size (N). All variables are winsorized monthly at their first and 99th percentiles. Panel D presents the time-series averages of the cross-sectional correlations. The upper triangular matrix shows the Spearman rank correlations and the lower triangular matrix presents the Pearson correlations.

Panel A: Summary statistics for net selling propensity variables								
	N	mean	std	p5	p25	median	p75	p95
CGO	202,553	-0.101	0.346	-0.593	-0.210	-0.063	0.075	0.302
CGO(ind)	202,553	-0.097	0.363	-0.618	-0.217	-0.062	0.088	0.348
CGO(ins)	202,553	-0.592	4.781	-2.318	-0.454	-0.041	0.216	0.497
VNSP	198,774	0.144	0.119	0.041	0.072	0.111	0.179	0.352
VNSP(ind)	198,720	0.156	0.128	0.042	0.076	0.119	0.194	0.392
VNSP(ins)	197,723	0.432	1.687	0.094	0.165	0.253	0.394	0.864
Panel B: Summary statistics for earnings news variables								
	N	mean	std	p5	p25	median	p75	p95
SUE	173,242	0.044	1.110	-1.843	-0.620	0.035	0.716	1.929
ROE	186,466	0.007	0.755	-0.078	-0.002	0.015	0.035	0.082
Panel C: Summary statistics for control variables								
	N	mean	std	p5	p25	median	p75	p95
Ret(-1)	235,964	0.018	0.158	-0.196	-0.069	0.000	0.080	0.294
Ret(-12,-1)	225,777	0.224	0.700	-0.491	-0.180	0.059	0.415	1.506
Ret(-36,-13)	204,056	0.483	1.191	-0.636	-0.229	0.159	0.798	2.697
log(BM)	211,015	-0.039	0.788	-1.441	-0.537	0.017	0.512	1.166
log(ME)	235,964	4.661	1.484	2.710	3.637	4.395	5.366	7.770
Turn	228,911	0.016	0.023	0.001	0.003	0.008	0.019	0.061
Ivol	228,911	0.030	0.012	0.014	0.021	0.027	0.036	0.054
Amihud	228,911	0.247	2.445	0.000	0.002	0.006	0.020	0.478

Panel D: Correlation matrix

	CGO	CGO(ind)	CGO(inf)	VNSP	VNSP(ind)	VNSP(inf)	SUE	ROE	Ret(-1)	Ret(-12,-1)	Ret(-36,-13)	log(BM)	log(ME)	Turn	Ivol	Amihud
CGO		0.991	0.672	0.121	0.152	-0.003	0.208	0.305	0.420	0.491	0.170	0.065	0.317	-0.138	-0.140	-0.085
CGO(ind)	0.993		0.692	0.126	0.166	0.001	0.205	0.317	0.395	0.491	0.198	0.051	0.334	-0.151	-0.151	-0.098
CGO(ins)	0.378	0.383		0.072	0.113	-0.023	0.159	0.347	0.200	0.569	0.487	-0.012	0.386	-0.067	-0.102	-0.182
VNSP	-0.200	-0.181	-0.209		0.981	0.381	0.032	0.027	0.059	0.020	0.025	0.079	0.137	-0.484	-0.144	0.218
VNSP(ind)	-0.152	-0.122	-0.188	0.980		0.385	0.034	0.063	0.050	0.023	0.052	0.048	0.230	-0.503	-0.194	0.130
VNSP(ins)	-0.267	-0.266	-0.951	0.275	0.266		0.053	-0.012	0.010	0.019	-0.044	-0.191	0.056	0.151	0.300	-0.062
SUE	0.176	0.178	0.041	0.051	0.060	0.015		0.527	0.089	0.241	-0.042	-0.014	0.062	0.001	0.028	-0.005
ROE	0.081	0.085	0.030	0.012	0.025	-0.021	0.206		0.083	0.238	0.191	-0.147	0.242	-0.067	-0.163	-0.167
Ret(-1)	0.327	0.310	0.069	0.064	0.054	-0.012	0.077	0.025		-0.014	-0.019	0.060	0.061	-0.048	-0.038	0.043
Ret(-12,-1)	0.339	0.342	0.209	0.045	0.051	-0.072	0.209	0.073	-0.023		-0.076	0.158	0.150	0.077	0.141	0.012
Ret(-36,-13)	0.116	0.137	0.187	0.019	0.050	-0.096	-0.015	0.056	-0.041	-0.100		-0.198	0.224	-0.017	-0.100	-0.218
log(BM)	0.063	0.048	0.055	0.053	0.019	-0.095	-0.026	-0.013	0.044	0.094	-0.283		-0.282	-0.291	-0.210	0.445
log(ME)	0.248	0.274	0.122	0.101	0.209	-0.048	0.073	0.073	0.038	0.120	0.184	-0.271		-0.181	-0.310	-0.722
Turn	-0.049	-0.059	-0.061	-0.299	-0.316	0.088	-0.002	-0.045	-0.001	0.191	0.029	-0.178	-0.173		0.711	-0.346
Ivol	-0.132	-0.142	-0.199	-0.085	-0.129	0.242	0.011	-0.093	0.033	0.245	-0.042	-0.204	-0.309	0.667		0.043
Amihud	-0.062	-0.064	-0.010	0.133	0.104	-0.001	0.004	-0.017	0.009	-0.010	-0.076	0.156	-0.217	-0.118	-0.004	

Table 3. Bivariate portfolio sorts on residual gains and losses

This table reports the returns for double-sorted portfolios based on the residual values of gains and losses. The residuals are computed by regressing the Gain and Loss variables on past return, firm size, turnover, and idiosyncratic volatility. At the end of each month, the stocks are independently categorized into five groups by residual gains and losses, respectively. The stocks in a portfolio are weighted by the gross return in the previous month. Panel A show the raw portfolio returns and Panel B shows the characteristic-adjusted returns as a monthly percentage. Newey–West (1987) *t*-statistics are reported in parentheses.

Panel A: Double sorts on residual gains and losses, raw returns						
	Small loss	L2	L3	L4	Big loss	Big - small
Small gain	-1.15	0.45	0.96	0.74	0.45	1.60
	(-1.62)	(0.64)	(1.62)	(1.21)	(0.75)	(2.99)
G2	0.67	1.74	1.77	1.72	1.98	1.31
	(0.91)	(2.85)	(2.88)	(2.97)	(3.04)	(4.08)
G3	1.38	2.20	1.73	1.91	2.33	0.94
	(1.91)	(3.20)	(2.80)	(2.83)	(3.25)	(2.47)
G4	1.47	2.14	2.01	2.26	1.74	0.27
	(1.92)	(3.53)	(3.18)	(3.33)	(2.67)	(0.66)
Big gain	1.17	1.95	1.89	1.48	1.39	0.22
	(1.75)	(3.14)	(3.09)	(1.98)	(1.67)	(0.34)
Big - small	2.31	1.50	0.94	0.74	0.94	
	(4.68)	(4.08)	(2.99)	(1.93)	(1.72)	
Panel B: Double sorts on residual gains and losses, characteristic-adjusted returns						
	Small loss	L2	L3	L4	Big loss	Big - small
Small gain	-2.21	-0.87	-0.43	-0.61	-0.90	1.30
	(-5.33)	(-3.33)	(-1.85)	(-3.99)	(-3.52)	(2.53)
G2	-0.79	0.15	0.05	0.07	0.26	1.05
	(-2.74)	(0.74)	(0.30)	(0.49)	(1.13)	(3.26)
G3	-0.41	0.38	0.00	0.30	0.57	0.98
	(-1.98)	(1.91)	(0.01)	(1.47)	(2.09)	(2.68)
G4	-0.12	0.33	0.37	0.60	0.23	0.35
	(-0.47)	(1.89)	(1.70)	(2.65)	(0.66)	(0.88)
Big gain	-0.39	0.28	0.51	0.16	-0.25	0.15
	(-2.05)	(1.23)	(2.35)	(0.44)	(-0.42)	(0.23)
Big - small	1.82	1.15	0.94	0.77	0.66	
	(3.97)	(3.16)	(2.93)	(2.01)	(1.23)	

Table 4. Univariate portfolio sorts on the VNSP and CGO

This table reports the results for portfolios sorted based on the VNSP, the original CGO, and the VNSP and CGO based on different investor types. The variables VNSP(ind) and CGO(ind) refer to the VNSP and CGO calculated with the trading data of individual investors and VNSP(ins) and CGO(ins) refer to the VNSP and CGO calculated with the trading data of institutional investors. Each month, the stocks are categorized into 10 groups based on their VNSP, CGO, VNSP(ind), CGO(ind), VNSP(ins), and CGO(ins), with portfolio 10 holding those stocks with the highest measure. Stocks in a portfolio are weighted by their gross return in the previous month and held for the next month. Raw portfolio returns, characteristic-adjusted returns, and Carhart's (1997) four-factor alphas are reported in Panels A, B, and C, respectively. Newey–West (1987) t-statistics are reported in parentheses.

Panel A: Portfolio returns, sorted on VNSP and CGO, raw returns						
	CGO	VNSP	CGO(ind)	VNSP(ind)	CGO(ins)	VNSP(ins)
1	2.25	0.41	2.26	0.39	0.96	1.92
	(3.39)	(0.66)	(3.38)	(0.63)	(1.26)	(3.51)
2	1.74	1.07	1.70	1.18	1.68	2.11
	(2.60)	(1.76)	(2.57)	(1.87)	(2.31)	(3.54)
3	1.28	1.10	1.32	1.22	1.90	1.72
	(1.98)	(1.77)	(2.02)	(2.01)	(2.75)	(2.86)
4	1.40	1.60	1.39	1.48	1.83	1.81
	(2.20)	(2.63)	(2.15)	(2.32)	(2.85)	(3.01)
5	1.44	1.28	1.41	1.33	1.83	1.35
	(2.33)	(1.99)	(2.26)	(2.08)	(3.05)	(2.29)
6	1.37	1.45	1.44	1.49	1.64	1.35
	(2.11)	(2.24)	(2.28)	(2.40)	(2.80)	(2.17)
7	1.23	1.72	1.18	1.79	1.74	1.57
	(1.98)	(2.76)	(1.83)	(2.81)	(3.04)	(2.54)
8	1.17	1.94	1.29	1.85	1.60	1.18
	(1.91)	(3.17)	(2.06)	(3.03)	(2.67)	(1.86)
9	1.61	2.07	1.65	2.15	1.21	1.18
	(2.56)	(3.27)	(2.62)	(3.36)	(2.05)	(1.70)
10	1.58	2.35	1.43	2.10	0.65	0.81
	(2.52)	(3.54)	(2.38)	(3.30)	(1.01)	(1.05)
10 - 1	-0.67	1.94	-0.83	1.70	-0.32	-1.11
	(-1.33)	(5.85)	(-1.63)	(4.84)	(-0.56)	(-2.63)
Panel B: Portfolio returns, sorted on VNSP and CGO, characteristic-adjusted returns						
	CGO	VNSP	CGO(ind)	VNSP(ind)	CGO(ins)	VNSP(ins)
1	0.86	-1.18	0.87	-1.23	-0.32	0.05
	(3.52)	(-6.89)	(3.63)	(-6.90)	(-1.22)	(0.36)
2	0.22	-0.49	0.17	-0.42	-0.02	0.39
	(1.08)	(-3.60)	(0.90)	(-2.97)	(-0.07)	(2.47)
3	-0.23	-0.51	-0.19	-0.42	0.24	0.07
	(-1.89)	(-3.75)	(-1.52)	(-2.94)	(1.41)	(0.55)
4	-0.23	-0.04	-0.26	-0.15	0.16	0.14

	(-1.34)	(-0.28)	(-1.65)	(-1.18)	(1.07)	(1.15)
5	-0.19	-0.25	-0.25	-0.24	0.11	-0.26
	(-1.58)	(-2.06)	(-1.94)	(-2.03)	(1.03)	(-1.86)
6	-0.35	-0.12	-0.27	-0.12	-0.01	-0.21
	(-2.60)	(-0.92)	(-2.13)	(-1.06)	(-0.11)	(-1.61)
7	-0.33	0.13	-0.44	0.21	0.04	0.10
	(-2.41)	(0.82)	(-2.83)	(1.41)	(0.27)	(0.81)
8	-0.48	0.29	-0.39	0.25	0.03	-0.21
	(-3.11)	(1.91)	(-2.28)	(1.82)	(0.22)	(-1.36)
9	-0.03	0.53	0.01	0.64	-0.19	-0.29
	(-0.13)	(3.92)	(0.04)	(4.21)	(-0.92)	(-1.72)
10	0.15	0.99	0.13	0.84	-0.74	-0.41
	(0.59)	(5.00)	(0.54)	(4.48)	(-2.55)	(-1.67)
10 - 1	-0.70	2.18	-0.74	2.07	-0.42	-0.46
	(-1.60)	(8.10)	(-1.69)	(7.84)	(-0.87)	(-1.33)

Panel C: Portfolio returns, sorted on VNSP and CGO, Carhart's (1997) four-factor alphas

	CGO	VNSP	CGO(ind)	VNSP(ind)	CGO(ins)	VNSP(ins)
1	1.52	-0.32	1.51	-0.36	0.40	0.59
	(6.57)	(-1.46)	(6.75)	(-1.56)	(1.80)	(4.17)
2	1.04	0.13	1.01	0.26	1.01	1.00
	(5.41)	(0.69)	(5.22)	(1.32)	(4.66)	(4.82)
3	0.44	0.20	0.46	0.26	1.03	0.51
	(2.90)	(1.32)	(3.15)	(1.60)	(5.18)	(3.86)
4	0.56	0.65	0.53	0.55	0.94	0.76
	(2.56)	(4.04)	(2.41)	(3.05)	(4.52)	(4.83)
5	0.54	0.23	0.54	0.29	0.72	0.30
	(3.88)	(1.42)	(3.76)	(2.30)	(4.90)	(1.56)
6	0.33	0.34	0.38	0.36	0.53	0.34
	(1.64)	(2.14)	(2.04)	(2.42)	(3.41)	(2.04)
7	0.09	0.58	0.01	0.66	0.47	0.60
	(0.49)	(2.40)	(0.06)	(2.86)	(2.65)	(3.17)
8	-0.01	0.89	0.14	0.79	0.34	0.21
	(-0.06)	(4.30)	(0.68)	(4.13)	(2.08)	(0.81)
9	0.19	0.83	0.14	0.89	-0.15	0.18
	(0.83)	(3.94)	(0.58)	(3.84)	(-0.85)	(0.88)
10	0.16	1.26	0.09	1.04	-0.61	0.20
	(0.68)	(4.34)	(0.43)	(3.47)	(-2.38)	(0.86)
10 - 1	-1.36	1.58	-1.42	1.40	-1.01	-0.39
	(-3.62)	(4.30)	(-3.94)	(3.56)	(-2.86)	(-1.27)

Table 5. VNSP, CGO, and the cross section of stock returns, Fama–MacBeth (1973) regressions

This table reports the coefficients from Fama–MacBeth regressions of monthly returns on the VNSP, CGO, and other return predictors. The dependent variable is the return in month t and the explanatory variables are available at the end of month t - 1. Additionally, we conduct regression analysis for individual and institutional investors with the VNSP and CGO computed with the individual and institutional trading data sets, respectively. The variable $\text{Ret}_{i,t-1}$ is the past one-month return; $\text{Ret}_{i,t-12,t-1}$ is the previous 12- to two-month cumulative return; $\text{Ret}_{i,t-36,t-13}$ is the past three- to one-year cumulative return; $\text{logBM}_{i,t-1}$ is the logarithm of the book-to-market ratio; $\log ME_{i,t-1}$ is the logarithm of a firm's market capitalization; $\text{Ivol}_{i,t-1}$ is idiosyncratic volatility, defined as the standard deviation of the return residuals with respect to Carhart's (1997) four-factor model in the past month; and $\text{Amihud}_{i,t-1}$ is Amihud's (2002) illiquidity measure defined as the average ratio of the daily absolute return to the trading volume.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Intercept	5.667	6.079	5.653	5.813	6.086	5.777	6.132	6.181	6.144	5.711	5.806
	(7.10)	(7.53)	(7.03)	(7.27)	(7.54)	(7.19)	(7.41)	(7.46)	(7.41)	(6.95)	(7.21)
VNSP	4.393		3.766								-3.304
	(8.43)		(4.61)								(-1.19)
CGO		0.132	0.110								
		(0.38)	(0.25)								
VNSP(ind)				4.190		3.596				4.668	7.731
				(8.72)		(4.84)				(10.04)	(3.01)
CGO(ind)					0.233	0.065					
					(0.70)	(0.16)					
VNSP(ins)							0.010		0.202	-0.272	-0.266
							(0.12)		(0.37)	(-2.89)	(-2.81)
CGO(ins)								0.010	0.086		
								(0.32)	(0.42)		
log(ME)	-0.605	-0.560	-0.596	-0.646	-0.564	-0.629	-0.565	-0.570	-0.583	-0.644	-0.665
	(-6.68)	(-6.20)	(-6.77)	(-7.18)	(-6.25)	(-7.23)	(-6.17)	(-6.21)	(-6.59)	(-7.13)	(-7.54)
log(BM)	0.225	0.233	0.229	0.224	0.230	0.229	0.256	0.236	0.239	0.225	0.230
	(1.66)	(1.74)	(1.68)	(1.66)	(1.72)	(1.69)	(1.82)	(1.72)	(1.74)	(1.63)	(1.66)
Ret(-12,-1)	0.004	0.006	0.004	0.004	0.006	0.004	0.004	0.005	0.004	0.003	0.003
	(1.68)	(2.50)	(1.74)	(1.63)	(2.52)	(1.84)	(1.68)	(1.85)	(1.70)	(1.34)	(1.35)
Ret(-1)	-0.042	-0.036	-0.042	-0.042	-0.037	-0.042	-0.038	-0.038	-0.041	-0.042	-0.041
	(-5.89)	(-5.49)	(-6.75)	(-5.88)	(-5.62)	(-6.66)	(-5.08)	(-5.02)	(-6.02)	(-5.82)	(-5.74)
Ret(-36,-13)	-0.002	-0.002	-0.003	-0.003	-0.002	-0.003	-0.002	-0.002	-0.003	-0.003	-0.003
	(-2.90)	(-2.55)	(-3.10)	(-2.98)	(-2.59)	(-3.15)	(-2.73)	(-2.55)	(-3.06)	(-3.23)	(-3.25)
Ivol	-0.638	-0.692	-0.624	-0.631	-0.686	-0.621	-0.686	-0.696	-0.670	-0.592	-0.591
	(-5.68)	(-6.27)	(-5.62)	(-5.61)	(-6.23)	(-5.60)	(-6.08)	(-6.22)	(-5.99)	(-5.25)	(-5.27)
Amihud	-0.462	-0.080	-0.237	-0.500	-0.080	-0.299	-0.149	-0.160	-0.141	-0.496	-0.489
	(-1.56)	(-0.27)	(-0.76)	(-1.73)	(-0.27)	(-1.03)	(-0.50)	(-0.54)	(-0.48)	(-1.62)	(-1.57)
R^2	0.051	0.051	0.054	0.051	0.052	0.054	0.050	0.051	0.052	0.053	0.053
Obs	186,309	189,815	186,309	186,265	189,815	186,265	185,303	189,815	185,303	184,697	184,685

Table 6. Robustness checks

This table provides the results of additional tests. Stocks are sorted into deciles by the VNSP at the end of each month. Only the return differences between deciles 10 and 1 are reported in this table. Panel A presents the results using alternative VNSP measures, where the coefficients between the gain and loss sides change from -0.37 to -0.23 (the same as for An, 2015). Panel B shows the results of subsample analysis based on firm size and liquidity. Firm size refers to a firm's market capitalization and Amihud's (2002) illiquidity measure is defined as the average ratio of the daily absolute return to the reading volume. The "big only" group contains the top 20% of stocks by firm size and the "liquid only" group comprises the bottom 20% of stocks in terms of Amihud's illiquidity measure. Panel C reports the results of the subperiod analysis. The same portfolio analysis as in Table 4 is conducted between 2005 and 2010 and between 2011 and 2015. Newey–West (1987) *t*-statistics are reported in parentheses.

	VNSP		VNSP(ind)		VNSP(ins)	
	Raw return	Charateristic adjusted return	Raw return	Charateristic adjusted return	Raw return	Charateristic adjusted return
Panel A: Alternative VNSP measure						
An (2015)	1.71	1.93	1.48	1.85	-1.12	-0.48
	(4.86)	(7.08)	(3.83)	(6.58)	(-2.73)	(-1.37)
Panel B: Subsample						
Big only	1.57	1.48	1.71	1.54	-0.01	0.40
	(4.03)	(3.59)	(4.29)	(3.87)	(-0.02)	(0.79)
Liquid only	3.52	3.26	3.21	2.89	-0.02	0.10
	(7.47)	(7.56)	(6.39)	(6.95)	(-0.03)	(0.19)
Panel C: Subperiod						
2005–2010	2.53	2.34	2.35	2.26	-1.36	-0.43
	(5.78)	(5.87)	(5.20)	(5.80)	(-1.85)	(-0.72)
2011–2017	1.40	2.02	1.10	1.89	-0.88	-0.49
	(3.10)	(5.48)	(2.28)	(5.23)	(-2.03)	(-1.27)

Table 7. Univariate portfolio sorts on earnings news

This table reports the results for portfolios sorted based on earnings news measured by ROE and SUE in the most recent quarter. Here, ROE is measured by dividing income before extraordinary items by one-quarter-lagged book equity and SUE is defined as changes in earnings from four quarters ago, standardized by its standard deviation over the past eight quarters. Each month, stocks are categorized into 10 groups based on their ROE and SUE. Stocks in a portfolio are weighted by their gross return in the previous month. The right side of the table presents the results of the portfolio sort based on ROE and the left side reports the results of the portfolio sort based on SUE. Panel A shows raw portfolio returns while Panel B reports the characteristic-adjusted returns. Newey–West (1987) *t*-statistics are reported in parentheses.

	ROE			SUE		
	Raw return	Charateristic adjusted return	Carhart alpha	Raw return	Charateristic adjusted return	Carhart alpha
1 (bad)	0.97	-0.52	0.40	0.71	-0.83	-0.15
	(1.37)	(-2.72)	(1.57)	(1.13)	(-5.60)	(-0.79)
2	1.20	-0.51	0.25	1.04	-0.52	0.05
	(1.80)	(-3.11)	(1.19)	(1.79)	(-3.54)	(0.24)
3	1.21	-0.61	0.17	1.15	-0.46	0.14
	(2.11)	(-3.69)	(0.98)	(1.95)	(-3.26)	(0.76)
4	1.59	-0.15	0.48	1.59	-0.05	0.70
	(2.59)	(-0.98)	(2.70)	(2.89)	(-0.31)	(3.70)
5	1.52	-0.21	0.34	1.55	-0.03	0.46
	(2.66)	(-1.50)	(1.84)	(2.60)	(-0.18)	(2.15)
6	1.66	0.02	0.68	1.88	0.26	0.85
	(2.99)	(0.20)	(5.37)	(2.99)	(1.98)	(4.30)
7	1.85	0.37	0.73	2.08	0.39	1.01
	(3.20)	(3.22)	(4.39)	(3.44)	(2.48)	(5.96)
8	2.01	0.63	0.96	1.98	0.35	0.83
	(3.38)	(4.17)	(4.54)	(3.31)	(2.58)	(4.66)
9	2.14	0.85	1.15	2.32	0.69	1.19
	(3.78)	(5.31)	(5.00)	(3.77)	(3.87)	(4.62)
10 (good)	2.24	1.07	1.22	2.49	0.96	1.35
	(3.46)	(5.13)	(5.09)	(3.82)	(5.43)	(7.32)
10 - 1	1.27	1.58	0.82	1.78	1.79	1.49
	(3.56)	(5.16)	(1.99)	(7.39)	(7.87)	(6.40)

Table 8. Bivariate portfolio sorts on earnings news and VNSP

This table reports the returns from double-sorted portfolios based on the VNSP and an earnings news proxy, measured by ROE and SUE. Here, ROE is measured by dividing income before extraordinary items by one-quarter-lagged book equity and SUE is defined as changes in earnings from four quarters ago, standardized by its standard deviation over the past eight quarters. Each month stocks are independently sorted by VNSP and an earnings news variable into five groups, respectively, and stocks in a portfolio are weighted by their gross return in the previous month. The results of the portfolios constructed using ROE and SUE as a measure of earnings news are reported in Panels A and B, respectively. For each panel, the portfolio returns are estimated in three ways: as raw returns, characteristic-adjusted returns, and Carhart's (1997) four-factor alphas. The right side of the table presents the results of the VNSP spread portfolios, where VNSP spread portfolio *i* is defined as a portfolio spread that buys good news stocks in the *i*th VNSP quintile and sells bad news stocks in the (6 - *i*)th VNSP quintile. Newey–West (1987) *t*-statistics are reported in parentheses.

Panel A: Two-way sorts on ROE and VNSP

Panel A1: Raw returns

		ROE						VNSP spread portfolios	
		1 (bad)	2	3	4	5 (good)	5 - 1		
VNSP	1 (low)	-0.35	0.60	1.17	1.75	1.55	1.89	1 (negative)	-1.16
		(-0.49)	(1.00)	(1.98)	(2.84)	(2.58)	(4.79)		(-1.89)
	2	0.90	1.43	1.58	1.82	2.08	1.18	2	0.44
		(1.35)	(2.23)	(2.66)	(3.18)	(3.14)	(2.85)		(0.98)
	3	0.50	1.34	1.72	2.17	2.24	1.73	3	1.73
		(0.70)	(2.29)	(2.89)	(3.49)	(3.61)	(5.20)		(5.20)
	4	1.64	1.50	2.20	2.25	2.32	0.68	4	1.42
		(2.29)	(2.47)	(3.61)	(3.72)	(3.54)	(1.49)		(3.11)
	5 (high)	2.71	2.13	2.23	2.35	3.05	0.33	5 (positive)	3.39
		(3.18)	(3.29)	(3.50)	(3.38)	(4.74)	(0.51)		(6.69)
	5 - 1	3.06	1.53	1.06	0.60	1.50		5 - 1	4.56
		(5.05)	(3.91)	(2.66)	(1.45)	(3.50)			(5.91)

Panel A2: Characteristics-adjusted returns

		ROE						VNSP spread portfolios	
		1 (bad)	2	3	4	5 (good)	5 - 1		
VNSP	1 (low)	-1.97	-1.20	-0.54	0.18	0.17	2.14	1 (negative)	-0.91

		(-7.09)	(-4.53)	(-2.48)	(0.80)	(0.63)	(5.90)		(-1.62)
	2	-0.76	-0.47	-0.13	0.24	0.77	1.54	2	0.78
		(-3.17)	(-1.97)	(-0.76)	(0.91)	(3.04)	(4.14)		(1.77)
	3	-1.06	-0.45	-0.05	0.62	0.94	2.00	3	2.00
		(-4.58)	(-2.43)	(-0.24)	(2.89)	(4.57)	(6.76)		(6.76)
	4	0.00	-0.37	0.35	0.76	0.93	0.93	4	1.69
		(-0.01)	(-1.95)	(1.83)	(4.05)	(3.81)	(2.18)		(4.50)
	5 (high)	1.08	0.33	0.48	0.79	1.73	0.65	5 (positive)	3.69
		(2.40)	(1.33)	(1.96)	(2.64)	(5.76)	(1.08)		(8.86)
	5 - 1	3.05	1.53	1.03	0.61	1.55		5 - 1	4.60
		(5.38)	(4.14)	(3.19)	(1.68)	(4.18)			(6.77)

Panel A3: Carhart's (1997) four-factor alphas

		ROE						VNSP spread portfolios	
		1 (bad)	2	3	4	5 (good)	5 - 1		
	1 (low)	-1.08	-0.29	0.49	0.67	0.73	1.81	1 (negative)	-1.59
		(-3.30)	(-1.06)	(1.80)	(2.78)	(2.27)	(4.25)		(-2.48)
	2	0.12	0.24	0.52	0.93	0.91	0.79	2	0.16
		(0.36)	(0.77)	(2.51)	(3.46)	(3.02)	(1.59)		(0.33)
VNSP	3	-0.52	0.28	0.56	1.05	1.11	1.63	3	1.63
		(-1.91)	(1.27)	(2.03)	(3.81)	(4.26)	(4.10)		(4.10)
	4	0.76	0.33	0.83	1.20	1.34	0.58	4	1.21
		(2.02)	(1.52)	(3.82)	(4.17)	(3.54)	(1.20)		(2.30)
	5 (high)	2.33	0.78	0.88	1.11	1.79	-0.54	5 (positive)	2.87
		(4.31)	(2.09)	(2.21)	(2.34)	(4.94)	(-0.74)		(5.49)
	5 - 1	3.40	1.08	0.39	0.43	1.06		5 - 1	4.46
		(5.27)	(2.28)	(0.90)	(0.89)	(2.15)			(5.62)

Panel B: Two-way sorts on SUE and VNSP

Panel B1: Raw returns

		SUE						VNSP spread portfolios	
		1 (bad)	2	3	4	5 (good)	5 - 1		
VNSP	1 (low)	-0.08	0.61	1.05	1.56	1.71	1.79	1 (negative)	-0.15
		(-0.14)	(0.98)	(1.74)	(2.61)	(2.77)	(6.68)		(-0.36)
	2	0.36	1.28	1.93	1.87	2.45	2.09	2	0.75
		(0.59)	(2.09)	(3.04)	(2.82)	(3.81)	(6.49)		(2.45)
	3	0.47	1.56	1.65	1.91	2.40	1.93	3	1.93
		(0.69)	(2.65)	(2.95)	(3.33)	(3.34)	(6.38)		(6.38)
	4	1.70	1.81	1.88	2.33	2.29	0.59	4	1.94
		(2.76)	(3.03)	(2.87)	(3.64)	(3.46)	(1.74)		(4.97)
	5 (high)	1.86	2.02	2.35	2.70	3.10	1.24	5 (positive)	3.19
		(2.81)	(3.22)	(3.48)	(3.94)	(4.64)	(2.79)		(8.06)
	5 - 1	1.94	1.42	1.29	1.14	1.39		5 - 1	3.34
		(4.55)	(3.54)	(3.27)	(2.85)	(3.72)			(5.35)

Panel B2: Characteristics-adjusted returns

		SUE						VNSP spread portfolios	
		1 (bad)	2	3	4	5 (good)	5 - 1		
VNSP	1 (low)	-1.68	-1.03	-0.54	-0.12	0.08	1.76	1 (negative)	-0.16
		(-7.42)	(-4.67)	(-2.37)	(-0.71)	(0.36)	(6.57)		(-0.38)
	2	-1.27	-0.35	0.24	0.17	0.88	2.15	2	0.76
		(-7.47)	(-1.79)	(1.07)	(0.66)	(3.80)	(6.93)		(2.52)
	3	-1.06	-0.04	0.05	0.29	0.75	1.81	3	1.81
		(-5.75)	(-0.23)	(0.22)	(1.44)	(3.14)	(6.58)		(6.58)
	4	0.11	0.11	0.21	0.69	0.69	0.57	4	1.96
		(0.49)	(0.47)	(1.18)	(3.39)	(2.80)	(1.69)		(5.79)

	5(High)	0.25	0.40	0.85	1.05	1.55	1.30	5 (positive)	3.23
		(0.71)	(1.60)	(3.58)	(3.55)	(6.01)	(2.94)		(9.09)
	5 - 1	1.92	1.44	1.39	1.18	1.46		5 - 1	3.39
		(4.35)	(4.17)	(4.03)	(3.49)	(4.21)			(5.64)

Panel B3. Carhart's (1997) four-factor alpha

		SUE						VNSP spread portfolios	
		1 (bad)	2	3	4	5 (good)	5 - 1		
	1 (low)	-1.03	-0.13	0.16	0.86	0.85	1.87	1 (negative)	-0.15
		(-4.00)	(-0.45)	(0.58)	(4.43)	(3.37)	(6.26)		(-0.31)
	2	-0.64	0.45	0.77	0.75	1.44	2.08	2	0.69
		(-3.09)	(1.92)	(3.15)	(2.75)	(4.46)	(5.09)		(1.80)
VNSP	3	-0.65	0.61	0.78	0.77	1.16	1.81	3	1.81
		(-3.30)	(3.05)	(2.66)	(2.89)	(4.00)	(5.22)		(5.22)
	4	0.75	0.70	0.66	1.25	1.21	0.45	4	1.84
		(2.65)	(2.59)	(2.95)	(4.35)	(3.28)	(1.19)		(3.91)
	5 (high)	1.00	0.81	1.29	1.49	1.80	0.80	5 (positive)	2.83
		(2.46)	(2.70)	(3.68)	(3.82)	(4.80)	(1.81)		(6.10)
	5 - 1	2.03	0.94	1.13	0.63	0.95		5 - 1	2.98
		(4.22)	(2.34)	(2.44)	(1.60)	(1.97)			(3.72)

Table 9. Bivariate portfolio sorts on earnings news and VNSP based on different investor types

This table replicates Table 8 using VNSP based on different investor types, individual and institutional investors, and reports only the results of the VNSP spread portfolios. The VNSP spread portfolios are reported in the form of portfolio raw returns, characteristic-adjusted returns, and Carhart's (1997) four-factor alphas. The results of the portfolios constructed using ROE and SUE as a measure of earnings news are reported in Panels A and B, respectively. The right (left) side of the table shows the results based on the VNSP of individual (institutional) investors. Newey–West (1987) *t*-statistics are reported in parentheses.

Panel A: ROE

	VNSP (individual investors)			VNSP (institutional investors)		
	Raw return	Charateristic adjusted return	Carhart alpha	Raw return	Charateristic adjusted return	Carhart alpha
1 (negative)	-0.95	-0.79	-1.38	1.91	1.84	1.32
	(-1.55)	(-1.35)	(-2.04)	(3.97)	(4.17)	(3.33)
2	0.43	0.73	0.14	0.88	1.03	0.39
	(0.92)	(1.60)	(0.28)	(2.05)	(2.53)	(0.86)
3	1.69	1.93	1.69	1.82	1.89	1.52
	(4.84)	(5.82)	(3.66)	(4.45)	(4.80)	(3.12)
4	1.56	1.86	1.24	1.17	1.61	0.92
	(3.95)	(5.80)	(2.69)	(2.79)	(4.69)	(2.08)
5 (positive)	3.00	3.39	2.52	0.26	1.00	0.68
	(5.65)	(8.20)	(4.63)	(0.44)	(1.96)	(1.07)
5 - 1	3.95	4.18	3.90	-1.65	-0.84	-0.64
	(5.05)	(6.01)	(4.59)	(-2.22)	(-1.23)	(-0.92)

Panel B: SUE

	VNSP (individual investors)			VNSP (institutional investors)		
	Raw return	Charateristic adjusted return	Carhart alpha	Raw return	Charateristic adjusted return	Carhart alpha
1 (negative)	0.04	-0.19	0.14	2.43	2.15	2.02
	(0.10)	(-0.49)	(0.28)	(5.78)	(5.36)	(4.54)
2	0.97	0.93	0.89	1.75	1.43	1.47
	(3.11)	(3.07)	(2.35)	(5.58)	(4.43)	(4.33)
3	1.61	1.56	1.40	1.90	1.80	1.68
	(5.74)	(6.09)	(4.09)	(6.15)	(6.17)	(4.56)
4	1.99	2.02	1.93	1.20	1.29	1.21
	(5.51)	(6.17)	(4.88)	(3.10)	(3.77)	(3.04)
5 (positive)	3.05	3.22	2.73	0.62	1.07	0.77
	(7.77)	(9.33)	(5.54)	(1.32)	(2.40)	(1.64)
5 - 1	3.00	3.41	2.60	-1.81	-1.08	-1.25
	(4.91)	(6.13)	(3.14)	(-2.49)	(-1.58)	(-1.65)

Table 10. Bivariate portfolio sorts on earnings news and CGO based on different investor types

This table replicates Tables 8 and 9 using the CGO of total, individual, and institutional investors and reports only the CGO spread portfolio returns. The CGO of the different investor types is calculated using the trading data of each investor type. The CGO spread portfolios are reported in the form of portfolio raw returns, characteristic-adjusted returns, and Carhart's (1997) four-factor alphas. The results of the portfolios constructed using ROE and SUE as a measure of earnings news are reported in Panels A and B, respectively. Newey–West (1987) *t*-statistics are reported in parentheses.

Panel A. ROE

	CGO			CGO (individual investors)			CGO (institutional investors)		
	Raw return	Charateristic adjusted return	Carhart alpha	Raw return	Charateristic adjusted return	Carhart alpha	Raw return	Charateristic adjusted return	Carhart alpha
1 (negative overhang)	1.39	1.96	1.76	1.62	2.09	1.93	2.66	2.85	3.28
	(1.64)	(2.33)	(1.94)	(1.98)	(2.56)	(2.05)	(3.71)	(3.89)	(4.49)
2	1.33	1.64	1.17	0.70	1.07	0.65	1.55	1.58	2.01
	(2.60)	(3.25)	(2.00)	(1.19)	(1.89)	(1.00)	(2.33)	(2.42)	(2.94)
3	1.76	1.99	1.76	1.92	2.07	1.87	1.33	1.67	1.20
	(4.71)	(5.75)	(4.14)	(4.84)	(5.54)	(4.00)	(3.48)	(4.97)	(2.87)
4	0.89	1.19	0.62	1.13	1.40	0.81	1.01	1.31	0.59
	(2.42)	(3.54)	(1.54)	(3.25)	(4.36)	(2.10)	(2.58)	(3.80)	(1.48)
5 (overhang)	0.98	1.12	0.33	0.86	1.05	0.26	0.58	0.93	-0.12
	(1.84)	(2.62)	(0.91)	(1.57)	(2.38)	(0.76)	(1.02)	(1.97)	(-0.31)
5 - 1	-0.41	-0.84	-1.43	-0.77	-1.05	-1.67	-2.08	-1.92	-3.40
	(-0.37)	(-0.79)	(-1.48)	(-0.71)	(-1.00)	(-1.66)	(-2.06)	(-2.02)	(-4.42)

Panel B: SUE

	CGO			CGO (individual investors)			CGO (institutional investors)		
	Raw return	Charateristic adjusted return	Carhart alpha	Raw return	Charateristic adjusted return	Carhart alpha	Raw return	Charateristic adjusted return	Carhart alpha
1 (negative overhang)	2.07	2.14	2.65	2.30	2.32	2.82	3.06	2.77	3.59
	(3.32)	(3.57)	(4.31)	(3.86)	(4.27)	(5.53)	(5.73)	(5.11)	(7.01)
2	1.78	1.74	1.98	1.52	1.52	1.73	2.53	2.13	3.01

	(3.92)	(4.03)	(4.05)	(3.12)	(3.27)	(3.12)	(5.08)	(4.71)	(5.90)
3	2.04	2.10	2.34	2.15	2.18	2.42	1.58	1.69	1.44
	(6.05)	(6.20)	(5.99)	(6.33)	(6.36)	(5.70)	(6.01)	(7.00)	(5.28)
4	1.14	1.11	0.74	1.22	1.19	0.84	1.26	1.23	0.85
	(3.54)	(3.54)	(2.71)	(3.60)	(3.65)	(2.86)	(3.66)	(3.75)	(2.68)
5 (overhang)	1.08	1.01	0.21	1.03	0.97	0.16	0.31	0.57	-0.59
	(1.97)	(2.11)	(0.55)	(1.81)	(1.99)	(0.42)	(0.52)	(1.15)	(-1.55)
5 - 1	-0.99	-1.14	-2.44	-1.28	-1.34	-2.66	-2.76	-2.20	-4.18
	(-0.97)	(-1.23)	(-2.90)	(-1.25)	(-1.51)	(-3.54)	(-2.85)	(-2.52)	(-5.76)

Table 11. Interactive effect between VNSP and earnings news on the cross section of stock returns, Fama–MacBeth (1973) regression

This table reports the coefficients from Fama–MacBeth regressions of monthly returns on earnings news and the VNSP and other return predictors. The dependent variable is the return in month t and the explanatory variables are available at the end of month t - 1. The variables $EN^{+}_{i,t-1}$ and $EN^{-}_{i,t-1}$ are the positive and negative parts of the earnings news measure (ROE and SUE), respectively. Here, ROE is measured by dividing income before extraordinary items by one-quarter-lagged book equity and SUE is defined as changes in earnings from four quarters ago, standardized by its standard deviation over the past eight quarters. The variable $\text{Ret}_{i,t-1}$ is the past one-month return; $\text{Ret}_{i,t-12,t-1}$ is the previous 12- to two-month cumulative return; $\text{Ret}_{i,t-36,t-13}$ is the past three- to one-year cumulative return; $\text{logBM}_{i,t-1}$ is the logarithm of the book-to-market ratio; $\log ME_{i,t-1}$ is the logarithm of a firm's market capitalization; $\text{Ivol}_{i,t-1}$ is idiosyncratic volatility, defined as the standard deviation of the return residuals with respect to Carhart's (1997) four-factor model in the past month; and $\text{Amihud}_{i,t-1}$ is Amihud's (2002) illiquidity measure, defined as the average ratio of the daily absolute return to the trading volume. Newey–West (1987) t-statistics are reported in parentheses.

	Earnings news = ROE				Earnings news = SUE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	5.234	5.101	5.162	5.030	5.327	5.309	5.391	5.255
	(6.00)	(5.92)	(6.01)	(5.84)	(6.24)	(6.30)	(6.42)	(6.12)
EN+	6.655	0.410	0.599	9.235	0.621	0.119	0.157	0.572
	(5.00)	(0.23)	(0.33)	(5.48)	(7.62)	(1.11)	(1.45)	(5.28)
EN-	2.615	6.144	6.095	1.923	0.604	1.037	1.023	0.630
	(2.47)	(2.63)	(2.62)	(1.46)	(7.87)	(9.57)	(9.70)	(5.53)
EN+ * VNSP		53.959				3.117		
		(5.84)				(6.11)		
EN- * VNSP		-24.108				-2.953		
		(-1.61)				(-4.53)		
EN+ * VNSP(ind)			49.576				2.588	
			(5.66)				(6.04)	
EN- * VNSP(ind)			-23.809				-2.658	
			(-1.63)				(-4.56)	
EN+ * VNSP(ins)				-2.907				0.124
				(-1.36)				(0.57)
EN- * VNSP(ins)				2.181				-0.086
				(1.70)				(-0.36)
log(ME)	-0.510	-0.520	-0.539	-0.496	-0.504	-0.514	-0.534	-0.491
	(-5.34)	(-5.49)	(-5.74)	(-5.23)	(-5.29)	(-5.43)	(-5.69)	(-5.11)
log(BM)	0.244	0.270	0.276	0.274	0.259	0.269	0.273	0.274
	(1.49)	(1.65)	(1.68)	(1.64)	(1.65)	(1.71)	(1.74)	(1.73)
Ret(-12,-1)	0.002	0.000	0.000	0.001	0.000	-0.001	-0.001	0.000
	(0.63)	(0.04)	(0.01)	(0.20)	(-0.01)	(-0.40)	(-0.39)	(-0.06)
Ret(-1)	-0.044	-0.048	-0.048	-0.044	-0.047	-0.050	-0.050	-0.046
	(-5.45)	(-5.93)	(-5.94)	(-5.42)	(-5.81)	(-6.40)	(-6.37)	(-5.74)
Ret(-36,-13)	-0.003	-0.004	-0.004	-0.004	-0.003	-0.003	-0.003	-0.003
	(-3.67)	(-4.15)	(-4.21)	(-4.09)	(-3.17)	(-3.54)	(-3.56)	(-3.24)
Ivol	-0.448	-0.375	-0.369	-0.408	-0.448	-0.384	-0.382	-0.437

	(-3.85)	(-3.21)	(-3.16)	(-3.51)	(-4.06)	(-3.50)	(-3.48)	(-3.90)
Amihud	-0.251	-0.277	-0.302	-0.236	-0.304	-0.468	-0.491	-0.255
	(-0.85)	(-0.93)	(-1.04)	(-0.78)	(-1.04)	(-1.52)	(-1.63)	(-0.87)
R^2	0.055	0.057	0.057	0.057	0.054	0.056	0.056	0.057
Obs	163,104	158,699	158,664	157,878	162,718	158,377	158,343	157,557

Table 12. Subsample analysis

This table reports the results of subsample analysis. Three subsamples are constructed based on firm size and idiosyncratic volatility, where firm size refers to the firm's market capitalization and idiosyncratic volatility is the standard deviation of residual daily returns with respect to Carhart's (1997) four-factor model in the past year. This table shows only the negative and positive VNSP spread portfolio returns and the return differences between them. The left (right) side of the table presents the results of analysis based on ROE (SUE). Newey–West (1987) *t*-statistics are reported in parentheses.

Panel A: Firm size						
		ROE			SUE	
	Big	Medium	Small	Big	Medium	Small
1 (negative)	0.55	-0.24	-2.14	-0.34	0.11	-0.58
	(0.92)	(-0.31)	(-1.55)	(-0.83)	(0.18)	(-0.52)
5 (positive)	4.00	3.95	4.24	3.34	3.21	2.86
	(7.67)	(6.06)	(5.43)	(7.20)	(5.82)	(3.75)
5 - 1	3.45	4.18	6.38	3.69	3.10	3.44
	(4.76)	(4.36)	(4.28)	(5.89)	(3.28)	(2.35)
Panel B: Idiosyncratic volatility						
		ROE			SUE	
	High	Middle	Low	High	Middle	Low
1 (negative)	-3.57	-0.12	1.28	-3.14	0.90	0.79
	(-2.32)	(-0.22)	(2.27)	(-2.33)	(1.46)	(1.37)
5 (positive)	5.51	2.95	2.69	5.59	2.75	2.72
	(6.09)	(4.83)	(6.55)	(6.41)	(4.96)	(7.31)
5 - 1	9.08	3.07	1.38	8.73	1.84	1.93
	(4.98)	(3.67)	(2.24)	(5.20)	(2.12)	(3.28)