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散戶投資者會影響價值溢酬嗎？

Does retail investor affect the value premium?

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中文摘要

本文探討散戶的交易行為是否會影響價值溢酬。我們使用了著名網路券商羅賓漢所提供的資料，發現散戶的交易行為對股票報酬有正向且顯著的影響。此外，這正向的散戶效應在成長股當中表現更為明顯，這表示散戶更容易被成長股這類型的股票所吸引。更重要的是，我們發現散戶在買進成長股後的一週內便出現了報酬反轉的現象，這表示散戶激進的買入行為的確造成了價格壓力。而散戶在買進價值股後的一週內並沒有出現反轉的現象，並且對其報酬的正向影響仍可持續至一個月。因此，我們認為散戶的交易行為很有可能是導致成長股未來績效不好的原因之一。總的來說，本文的研究結果與價值溢酬的行為面解釋是一致的。

關鍵字：散戶、股票、成長股、價值股、報酬反轉、價值溢酬

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Does retail investor affect the value premium?

ABSTRACT

This paper examines whether retail investors' trading activities would affect the value premium. Using data from Robinhood, we find that retail investors' trading activities can have positive impacts on the stock returns and this positive retail effect is more pronounced in growth stocks. More importantly, we find that the retail effect on cumulative returns of growth stocks becomes diminished compared to value stocks. The findings suggest that excessive retail buying of growth stocks generates substantial price pressure and subsequently exhibits a negative return reversal pattern. Taken together, our evidence is consistent with the behavioral explanation of the value premium.

Keywords: retail investors, stocks, growth stocks, value stocks, return reversal, value premium

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I. Introduction

It is well documented that value stocks outperformed growth stocks over the past half century. Stocks with high ratio of book value to market value of equity (BE/ME) are known as value stocks, while growth stocks are referred to the stocks with low BE/ME. Fama and French (1992, 1993) document that high BE/ME value stocks earn higher average returns than low BE/ME growth stocks by using the US stock market data during 1963-1990 period. Several studies (Rosenberg, Reid, and Lanstein 1985; Chan, Hamao, and Lakonishok 1991) also provide evidence that support the existence of value premiums. Subsequently, researchers started to figure out why value stocks earn higher average returns than growth stocks. In general, they argue the risk-based and behavioral explanations for the existence of value effect. For instance, Fama and French (1992) consider that value stocks are fundamentally risker than growth stocks and the value premium is regarded as the compensation for bearing extra risk. On the other hand, some researches (Lakonishok, Shleifer, and Vishny 1994; Jaffe, Jindra, Pedersen, and Voetmann 2020) find that reward for bearing fundamental risk does not seem to explain higher average returns on value strategies but rather propose the explanation on behavioral finance. Specifically, Lakonishok, Shleifer, and Vishny (1994) suggest a few reasons about why individual and institutional investors are more

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attracted to glamour strategies rather than value strategies. However, more recent papers (Schwert 2003; Phalippou 2008; Linnainmma and Roberts 2018) study post-1990 value premiums find that the value premiums are low and thus conclude that the value effect seem to have disappeared.

Nowadays, retail investor could more easily access the stock market. For instance, investor can trade online via mobile app and are charged with significantly low commissions. The emergence of zero-commission has led investors trade more in the financial markets. TD Ameritrade reports that investors traded more than a million times a day on average in the quarter for the first time. Total trades in 2020 increased about 13% compared to last year and this growth is probably carried in small trades. Moreover, E*Trade also experienced a substantial growth in daily average revenue trades made by customers, which is 16% higher than the previous year.[1] The introduction of a new online brokerage, the *Robinhood*, induces even more innovative changes in the field of online trading. Robinhood was founded at April 18, 2013, was the first brokerage that offer commission-free trades in financial markets via mobile app. Robinhood's mission is to democratize finance for all, they dedicate to provide everyone with access to financial markets. In August 2017, Robinhood began to offer new stocks for new users. Appearance of commission-free trading and free stocks

[1] https://www.wsj.com/articles/online-brokers-go-from-zero-to-hero-11579867200?mod=article_inline

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offering reduce the barrier for investor accessing to stock market and thus increase the stock market participation. As of 2021, Robinhood's users has reached about 31 million.

During Covid-19 pandemic, more than three million funded accounts had registered in Robinhood. Half of new Robinhood customers are first-time investors.[2] RH Top 100 Fund is an equally-weighted index of top stocks most held by Robinhood's customers. It rose by 101.77% in 2020, about six times the S&P 500's performance. However, the most puzzled phenomenon is the popularity of the stock on Robinhood. For instance, stocks that actually perform worse are still rank in the RH Top-100 list such as Clover Health Investments, Coinbase and even Robinhood itself. Stocks that outperform the market such as Berkshire Hathaway dropped out of the top 100.[3] In other words, most of the Robinhood users typically hold the underperformed stocks and sell the outperformed stocks. This evidence suggest that Robinhood users are inexperienced and not sophisticated enough. Barber and Odean (2008) find that individual investors display attention-driven buying behavior. More broadly, they show that individual investors buy more stocks that experience high trading volume, with extremely positive and negative return and when stocks are in the news. Greenwood and Nagel (2009) show that young mutual fund managers increase their holdings of

[2] https://blog.robinhood.com/news/2020/5/4/robinhood-raises-280-million-in-series-f-funding-led-by-sequoia
[3] https://www.wsj.com/articles/how-robinhood-investors-robbed-themselves-11642777209

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technology stocks in the time that the technology stocks experience high returns. This finding provides evidence that inexperienced investors exhibit trend-chasing behavior. Human beings have bounded rationality with no exception to Robinhood users.

Barber, Huang, Odean, and Schwarz (2021) study the attention-driven trading behavior of Robinhood users. They find that Robinhood users are more likely to engage in attention-induced trading than other retail investors. They show that the retail trading drops more in 50 high attention stocks during the outage period. They also argue the simplified Robinhood's interface design indeed influences investors decisions, that is, investors are more concentrated in buying both top gainers and losers and eventually lead to predictable poor returns. As Robinhood users' trading are more heavily influenced by attention than other retail investors, we conjecture that Robinhood users can drive up stock price through excessive buying and subsequently exhibit return reversal pattern. Specifically, we find that retail investor can have positive and statistically significant effect on the stock return. For example, a one standard deviation increase in the retail ratio for a random stock leads to a 21.12 to 110.63 bps increase in the stock return on the same day. We then examine whether this price pressure exhibit reversal subsequently. The results show that the positive retail effect on cumulative stock return around one month become smaller, less significant and even negative in magnitude. This finding supports the evidence that Robinhood users largely engage in

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attention-driven trading, their extensive buying activity create price pressure and subsequently exhibit return reversal.

On the other hand, we further test whether the retail investors would cause the value premium to be diminished. The results indicate that the positive retail effect is more pronounced in growth stocks. For example, a one standard deviation increase in *retail_ratio* leads to a 156.83 basis points increase in growth stock returns, whereas leads to only 127.96 basis points increase in value stock returns on the same day. We again check for the return reversal pattern for price pressure created by retail investors. We find that higher price pressure in growth stocks is followed by more return reversal. For example, a one standard deviation increase in *retail_ratio* lowers growth stocks cumulative returns by 9.27 basis points and increases 3.50 basis points for the value stock cumulative returns.

We find no evidence that the value premium seems to be diminished. Our results indicate the return reversal pattern is more pronounced in growth stocks in the following week. This finding suggests that value stocks outperformed growth stocks. Moreover, our result is consistent with behavioral views on the book-to-market effect. Individual investors may extrapolate the past growth rates of growth stocks and equate a well-run company with a good investment regardless of price(Lakonishok, Shleifer, and Vishny 1994). Our evidence indicates that retail investors largely buy growth

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stocks, drive up the stock price and ultimately reverse. Barberis, Shleifer, and Vishny (1998) propose that investors overreact to the future news announcements after a series of announcements of good news, drive up the stock price, and eventually lead to lower returns. While their model is motivated by the representativeness heuristic, that is, people tend to put more weight on the information with high strength but low weight, our paper focus on the stories of attention, retail investors tend to pay more attention to growth stocks that had good performance in the past, their excessive buying activity create price pressure and subsequently exhibit return reversal.

There are some limitations of methodology in our paper. First, we use the 50th BE/ME percentile to separate growth stocks and value stocks. The breakpoint percentile may not precise enough for this identification since there would have some stocks fall into the range of the 50th BE/ME percentile that making us indistinguishable. Second, the definition of value premium in our paper is inconsistent with the previous studies. Specifically, they construct glamour and value strategies based on the past accounting data from 3 to 5 years while we compute the BE/ME based on the accounting data from last year.

There are emerging literatures study the impact of trading activity of Robinhood investors on financial markets. Welch (2020) indicates most of the stock holdings of

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Robinhood investors are larger and more liquidity firms. In particular, he shows two variables-past share trading volume and dollar trading volume can largely explain Robinhood investors' preferences for stocks. He also shows that Robinhood investment portfolio earns positive abnormal return of 1.3% per month. Ozik, Sadka, and Shen (2020) study the retail trading and its impact on market liquidity during pandemic lockdown period. They document the retail trading exhibits a sharp increase among the stock with high COVID-19 related media coverage, which support the evidence of retail investors are more likely to trade attention-grabbing stocks(Barber and Odean 2008; Barber, Huang, Odean, and Schwarz 2021). They also find that the increase in retail trading contributes to lowering the bid-ask spreads and the price impact of trades. Eaton, Roseman, and Wu(2021) use Robinhood ownership data to study the financial market implications of zero-commission individual traders. Their findings suggest that zero-commission investors behave like noise traders as they find that the changes in Robinhood ownership cannot predict future returns. They also document Robinhood investors' trading behavior may have negative effect on market quality during Robinhood platform outages. Both of these researches provide an remarkable evidence, that is, the retail trading activity can have distinct impacts on financial markets.

This article contributes to the literature that document the Robinhood user trading behavior. The existing literature shows that Robinhood investors' trading behavior are

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attention-motivated and supports the return predictions of attention-based trading models by using Robinhood trading as a proxy for herding episodes (Barber, Huang, Odean, and Schwarz 2021). Our findings support the emerging literatures related to Robinhood user attention-driven trading behavior. Specifically, we use a more direct regression method to present a strong and positive relation between the stock returns and the number of Robinhood user holding that particular stock. Our results are consistent with attention model, that is, Robinhood users tend to create price pressure through excessive buying, and immediately experienced return reversal.

This article also contributes to the literatures that document the value stocks outperformed growth stocks. This paper provides evidence that retail investors hold more growth stocks rather than value stocks. Specifically, we find that the retail effect is more pronounced in growth stocks, and followed by significantly return reversal pattern. On the other hand, we provide evidence that retail investors might be one of the causes why growth stocks earn lower expected returns than value stocks. Moreover, the results provide no evidence that the value premium seems to be diminished.

The rest of this paper is organized as follows. We describe our data in Section II. We present the empirical methods and results in Section III. We make a conclusion in Section IV.

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II. Data

II.A. Robintrack Data

The primary dataset is collected from the Robintrack website[4], which keeps track of how many Robinhood users hold a particular stock over time. Robinhood provides the stock popularity data from May 2, 2018 to August 13, 2020 and stop updated the data on August 13, 2020. The Robintrack dataset is presented as follows: 107,537 Robinhood users held Amazon stock at 3:52 pm ET on March 6, 2020. The Robintrack data are generally reported for every hour, we compute the daily user data as mean user data for each day. We use the daily stock return, market capitalization, and share volume data from CRSP and quarterly accounting data from Compustat. We merge the Robintrack data to CRSP and Compustat data by using the stock ticker.

We define the important independent variable *retail_ratio* as the mean user data scaled by the sum of user data in the past one month for individual securities.[5] We detrend the user data to allow us focus only on the differences in values and to identify the actual trend of changes in the users holding a particular stock.

[4] https://robintrack.net

[5] We use Dickey-Fuller Test to determine the stationarity of the independent variable-*retail_ratio*. The p-value is smaller than 0.01, hence we reject the null hypothesis. It implies that the time series is stationary, meaning that the statistical properties of the time series doesn't change over time.

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We compute the BE/ME as the ratio of book value of equity for the last fiscal year end in t-1 divided by the market value of equity at the end of December of t-1 (computed as in Fama and French, 1992). BE is the book value of stockholders' equity, plus balance sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock. ME is price times shares outstanding. In our sample, we ignore the companies with negative book values.

We present the graphical evidence on the relation between *retail_ratio* and daily stock returns of two growth stocks and two value stocks in Figure 1. We use BE/ME breakpoints from Kenneth and French's website to identify the value and growth stocks. In our sample, Apple and Google are considered as growth stocks whereas Applied Optoelectronics, Inc. and Atlantic American Corporation are considered as value stocks. As the figure shows, the red fitted line is slightly upward sloping for growth stocks and downward sloping for value stocks.

The summary statistics are presented in Table 1, Panel A. The independent variable-*retail_ratio* has a mean of 0.034, a median of 0.033, and a standard deviation of 0.015. The interquartile range of *retail_ratio* is 0.003. The mean of daily returns, cumulative returns 1 to 5 days and cumulative returns 6 to 21 days are 0.032%, 0.124%, and 0.346% respectively. Table 1, Panel B presents the correlation matrix of the variables. The correlation between *retail_ratio*, daily returns, and cumulative returns is

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positive. In addition, the correlation between *retail_ratio* and control variables, ROA, LEV, and Turnover is reasonably low, meaning that multicollinearity is not a problem.

III. Methodology and Results

III.A. Retail Investors and Stock Returns

In this section, we examine the effect of retail investors on stock returns. In our framework, the retail investors can drive the stock price to a higher level by holding the stock. Therefore, we expect the *retail_ratio* to be significantly and positively associated with the stock returns.

To test our predictions, we estimate the following regression:

$$R_{it} = \alpha + \beta retail\_ratio_{it} + \gamma_1 ROA_{it} + \gamma_2 LEV_{it} + \gamma_3 TURNOVER_{it} + \sum_{k=1}^{5} \emptyset_k retail_{ratio_{i,t-k}} + \sum_{k=1}^{5} \delta_k R_{i,t-k} + \varepsilon_{it}$$

where R_{it} is the stock returns for stock *i* on day *t*. We include the control variables related to the firm characteristics that may affect the retail investors' stock preferences. Return on Assets (ROA) is a financial ratio that indicates a firm profitability in relation to its total assets. Investors can use ROA to determine how efficiency the firm can create profit by managing its assets. Leverage ratio (LEV) can be used to measure the firm's ability to meet its debt obligations. A higher leverage ratio may represent that

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firm takes a higher level of debt financing, thus having more probability of bankruptcy. Turnover rate (TURNOVER) reflects the stock liquidity in the financial market. We calculate ROA as net income divided by total assets, LEV as total liabilities divided by total stockholders equity, and TURNOVER as trading volume divided by outstanding shares. We also include the lagged return $R_{i,t-k}$ to control the effect of past returns on the dependent variable R_{it} for robust and more accurate parameter estimates in regression analysis.

In addition, we present pooled and fixed-effect regression model to estimate these equations. Table 2 presents the results for regression of daily stock returns on Robinhood users on day *t* relative to the past one month. We report the robust standard error clustered by stock level to allow for serial correlations in individual securities. As shown in all columns of table 2, the coefficient of *retail_ratio* is positive and statistically significant at 1% level, which ranges from 0.139 to 0.728 over two different regression methods. In terms of economic magnitude, a one standard deviation (0.015) increase in the *retail_ratio* for a random stock leads to a 21.12 to 110.63 basis points increase in the stock return on the same day. Columns (2)-(5) are reported by using the fixed-effect technique, the effect of retail investors becomes smaller but remarkable when the day fixed effect is included. The coefficient of *retail_ratio* remains significant and its magnitude becomes even larger after including lagged *retail_ratio* up to 5 days

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as control variables. The coefficient of turnover rate is 0.007 but not statistically significant, which consistent with the studies that find no evidence on relation between turnover rate and stock returns in developed markets (Dey 2005).

In summary, the positive relation between *retail_ratio* and stock returns is economically and statistically significant, which is consistent with our prediction, that retail investors can drive the stock price to a higher level by holding the particular stock.

III.B. Retail Investors and Cumulative Stock Returns

To verify whether the retail investor could create price pressure by extreme buying, we examine the cumulative returns patterns after the event time *t*. In particular, we estimate panel regressions of cumulative stock returns 1 to 5 days (up to 1 month) after the event day on the *retail_ratio* and a set of controls:

$$R_{i,[t+1:t+5]} = \alpha + \beta retail\_ratio_{it} + \gamma_1 ROA_{it} + \gamma_2 LEV_{it} + \gamma_3 TURNOVER_{it} + \sum_{k=1}^{5} \emptyset_k retail_{ratio_{i,t-k}} + \sum_{k=1}^{5} \delta_k R_{i,t-k} + \varepsilon_{it}$$

$$R_{i,[t+6:t+21]} = \alpha + \beta retail\_ratio_{it} + \gamma_1 ROA_{it} + \gamma_2 LEV_{it} + \gamma_3 TURNOVER_{it} + \sum_{k=1}^{5} \emptyset_k retail_{ratio_{i,t-k}} + \sum_{k=1}^{5} \delta_k R_{i,t-k} + \varepsilon_{it}$$

where the cumulative return $R_{i,[t+h:t+H]}$ over time period (t+h, t+H) for stock *i* calculated as $\prod_{j=t+h}^{t+H}(1 + R_{i,j})$-1.

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Table 3 presents the regression results of cumulative stock returns in the following week. Columns (1) and (2) show that the *retail_ratio* is significantly related to cumulative return, with a coefficient of 0.054. In the sense of economic magnitude, a one standard deviation increase in *retail_ratio* for a random stock leads to an increase of 8.21 basis points in the cumulative stock returns. It is noteworthy that the economic magnitude of *retail_ratio* becomes significantly smaller compared to the result presented in Table 2. Moreover, the coefficient of *retail_ratio* turns insignificant, in which the day fixed effect has been included in Specifications (3) and (4). More importantly, the effect of retail investors becomes negative and statistically significant at 5% level, as we add the lagged *retail_ratio* in Specification (5). In other words, the impact of concentrated buying from the retail investor is diminishing after we controlled the retail effect in the previous five days. This finding suggests that return probably reverses after the price pressure created by extreme buying activities from retail investors.

Table 4 presents the regression results of cumulative stock returns from 6 to 21 days. As the table shows, we observe a positive retail effect on cumulative return after six days across all the specifications, ranging from 0.106 to 1.164. In terms of economic magnitude, a one standard deviation increase in *retail_ratio* for a random stock leads to a 16.11 to 176.90 basis points increase in the following month's cumulative stock

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returns. These results are economically and statistically significant. The associated *t*-statistics range from 2.23 to 14.75. The coefficient of *retail_ratio* becomes positive and smaller after we include the lagged *retail_ratio* as control variables. On the other hand, it is worth to mention that the coefficient of TURNOVER rate becomes statistically significant at 5% level, although that is not the key point in this paper.

Overall, the results in this section are consistent with evidence that retail investors create price pressure through excessive buying activities. Price pressure subsequently exhibit reversal when investors realized they have intensely bought the stocks.

III.C. Retail Investors and Value Premium

We show that retail investors' trading activities can have important impacts on stock returns in the prior sections. In this section, we would like to test whether this retail effect is more pronounced in growth stocks. Robinhood investors are inexperienced and more likely to trade speculatively. We conjecture that growth stocks such as Google, Tesla, Amazon, and Facebook are more likely to grab the attention of retail investors. To some extent that retail investors are more likely to buy growth stocks, it will probably generate a positive effect on growth stock returns.

To test our prediction, we estimate the following regression:

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$$R_{it} = \alpha + \beta_1 retail\_ratio_{it} + \beta_2 I_{it} + \beta_3 retail\_ratio_{it} * I_{it} + \gamma_1 ROA_{it} + \gamma_2 LEV_{it}$$
$$+ \gamma_3 TURNOVER_{it} + \sum_{k=1}^{5} \emptyset_k retail_{ratio_{i,t-k}} + \sum_{k=1}^{5} \delta_k R_{i,t-k} + \varepsilon_{it}$$

where I_{it} is the indicator variable equal to one for growth stocks and zero for value stocks. We use BE/ME breakpoints from Kenneth and French's website[6] to identify the value and growth stocks. They use all NYSE stocks which have ME for December of t-1 and positive BE for the last fiscal year end in t-1 to compute the BE/ME breakpoints for year t. The coefficient of interest in this regression is β_3, the coefficient on the interaction of *retail_ratio* and dummy variable for growth stocks. In our framework, growth stocks are more likely to grab the attention of retail investors, it will definitely lead to intense retail buying activities and subsequently contribute to growth stock returns. Thus, we expect the coefficient of interaction effect to be positive and significant.

Table 5 presents the result. As column (1) shows, the coefficient of *retail_ratio* is 0.035(t=4.26), which means that a one standard deviation increase in *retail_ratio* leads to a 5.32 basis points increase in value stocks returns on the same day. In addition, the coefficient of *retail_ratio* interacted with the growth dummy is 0.15(t=4.64), which means that the retail effect contributes 0.185 to growth stock returns. Economically, a

[6] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#Research

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one standard deviation increase in *retail_ratio* leads to a 28.11 basis points increase in growth stock returns on the same day. The coefficients of *retail_ratio* and its interaction with the growth dummy are similar over Specifications (1) to (4). More interestingly, the economic magnitude of the interest variables has magnified in Specifications (5), especially the coefficient of *retail_ratio* raises to 0.842(t=5.65). More specifically, a one standard deviation increase in *retail_ratio* leads to a 156.83 basis points increase in growth stocks returns whereas leads to only 127.96 basis points increase in value stock returns.

The regression results in this section indicate that retail investors' trading activities contribute more positive effects on growth stock returns. More importantly, these results are economically and statistically significant. The findings are also consistent with the prediction that retail investors are more attracted by growth stocks and their excessive buying activities generate more pronounced retail effects in growth stock returns. As mentioned earlier, recent studies show that Robinhood investors are more likely influenced by attention and they are more concentrated in buying stocks. These researchers also document that attention-induced trading may also cause return reversals. We examine whether this price pressure will exhibit reversals in the next section.

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III.D. Retail Investors and Value Premium

In this section, we examine whether the price pressure created by retail investor exhibit reversals afterwards, especially for growth stocks. We estimate the following regressions:

$$R_{i,[t+1:t+5]} = \alpha + \beta_1 retail\_ratio_{it} + \beta_2 I_{it} + \beta_3 retail\_ratio_{it} * I_{it} + \gamma_1 ROA_{it} + \gamma_2 LEV_{it} + \gamma_3 TURNOVER_{it} + \sum_{k=1}^{5} \emptyset_k retail_{ratio_{i,t-k}} + \sum_{k=1}^{5} \delta_k R_{i,t-k} + \varepsilon_{it}$$

$$R_{i,[t+6:t+21]} = \alpha + \beta_1 retail\_ratio_{it} + \beta_2 I_{it} + \beta_3 retail\_ratio_{it} * I_{it} + \gamma_1 ROA_{it} + \gamma_2 LEV_{it} + \gamma_3 TURNOVER_{it} + \sum_{k=1}^{5} \emptyset_k retail_{ratio_{i,t-k}} + \sum_{k=1}^{5} \delta_k R_{i,t-k} + \varepsilon_{it}$$

where the dependent variable is cumulative stock returns 1 to 5 days (up to 1 month).

Table 6 indicates that the *retail_ratio* is positively associated with the cumulative return. However, the positive relation between *retail_ratio* and cumulative return turns to negative after we control the lagged *retail_ratio*, although the associated t-statistic is only -1.51. On the other hand, the coefficient of *retail_ratio* interacted with the growth dummy is negative across all the specifications. For instance, the coefficients of *retail_ratio* and its interaction effect are 0.023 and -0.084 respectively. In terms of

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economic magnitude, a one standard deviation increase in *retail_ratio* leads to a decrease of 9.27 basis points in growth stock cumulative returns, whereas leads to an increase of 3.50 basis points in value stock cumulative returns. More notably, the negative effect of retail investors on growth stock returns becomes more obvious in specifications (5). In particular, a one standard deviation increase in *retail_ratio* leads to a 39.82 basis points decrease in the following week's growth stock returns. On the other hand, the coefficient of *retail_ratio* is negative but not significant, meaning that there is no any reversal pattern in value stocks. Table 7 reports the regression results of cumulative stock returns from 6 to 21 days. The result is quite similar to Table 6, however, the coefficients of *retail_ratio* interacted with the growth dummy become insignificant.

Consistent with prior literature, Robinhood investors are inexperienced, more likely influenced by attention, and thus buy the stocks aggressively. Their excessive buying activities drive up the stock price far away from its fundamental value and ultimately lead to poor return performance. In addition, our results show that the return reversal pattern is more pronounced in growth stocks. As mentioned earlier, individual investors tend to extrapolate past earnings growth too far into the future and assume a long trend in stock prices. They overreact to growth stocks that had good performance in the past, put more weight on buying growth stocks, and lead these stocks to become

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overpriced. Taken together, our evidence is consistent with the behavioral explanation of the value premium.

IV. Conclusion

Robinhood has made everyone access to financial markets. It provides zero-commission trading and offers new stocks for first-time users. All of its effort in marketing strategy indeed reduces the market entry barrier and increases the stock market participation. However, every coin has two sides. Half of Robinhood users are first-time investors. They are inexperienced and more likely to trade speculatively. Attention-driven buying by Robinhood users generally leads to negative returns(Barber, Huang, Odean, and Schwarz 2021). Therefore, we conjecture that Robinhood users can drive up the stock prices through excessive buying and subsequently exhibit a return reversal pattern.

We find that the *retail_ratio* is positively correlated with stock returns, implying retail investors can drive up stock prices by holding particular stock over time. Furthermore, we show that this positive retail effect is more pronounced in growth stocks, suggesting Robinhood investors are more attracted by growth stocks. Their intense buying of growth stocks leads to substantial price pressure followed by a negative return reversal pattern.

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On one hand, our findings support evidence that individual investors have bounded rationality. On the other hand, the negative return reverse in growth stocks suggests that retail investors' trading activity may be one of the causes why growth stocks earn lower expected returns than value stocks. More broadly, our results provide no evidence that the value premium seems to be diminished.

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References

Barberis, N., Shleifer, A., and Vishny, R. 1998. A Model of Investor Sentiment. *Journal of Financial Economics* 49(3): 307-343.

Barber, B. M., and Odean, T. 2008. All that glitters: The effect of attention and news on the buying behavior of individual and institutional investors. *Review of Financial Studies* 21(2): 785-818.

Barber, B. M., Huang, X., Odean, T., and Schwarz, C. 2021. Attention induced trading and returns: Evidence from Robinhood users. *Journal of Finance* forthcoming.

Chan, L.K.C., Hamao, Y., and Lakonishok, J. 1991. Fundamentals and stock returns in Japan. *Journal of Finance* 46(5): 1739-1764.

Dey, M. K. 2005. Turnover and return in global stock markets. *Emerging Markets Review* 6(1): 45-67.

Eaton, G., Green, C., Roseman, B., and Wu, Y. 2021. Zero-Commission individual investors, high frequency traders, and stock market quality. *Working paper*.

Fama, E. F., and French, K. R. 1992. The cross-section of expected stock returns. *Journal of Finance* 47(2): 427-465.

Fama, E. F., and French, K. R. 1993. Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33(1): 3-56.

Greenwood, R., and Nagel, S. 2009. Inexperienced investors and bubbles. *Journal of Financial Economics* 93(2): 239-258.

Jaffe, J. F., Jindra, J., Pedersen, D. J., and Voetmann, T. 2020. Can mispricing explain the value premium? *Financial Management* 49(3): 615-633.

Lakonishok, J., Shleifer, A., and Vishny, R.W. 1994. Contrarian investment, extrapolation, and risk. *Journal of Finance* 49(5): 1541-1578.

Linnainmma, J., and Roberts, M. R. 2018. The history of the cross-section of stock returns. *The Review of Financial Studies* 31(7): 2606-2649.

doi:10.6342/NTU202201335

Ozik, G., Sadka, R., and Shen, S. 2020. Flattening the illiquidity curve: Retail trading during the COVID-19 lockdown. *Journal of Financial and Quantitative Analysis* 56(7): 2356-2388.

Phalippou, L. 2008. Where is the value premium? *Financial Analysts Journal* 64(2): 41-48.

Rosenberg, B., Reid, K., and Lanstein, R. 1985. Persuasive evidence of market inefficiency. *Journal of Portfolio Management* 11(3): 9-16.

Schwert, G. W. 2003. Anomalies and market efficiency. *Handbook of the Economics of Finance* 15(1): 939-974.

Welch, I. 2020. Retail Raw: Wisdom of the Robinhood crowd and the COVID crisis. *Journal of Finance* forthcoming.

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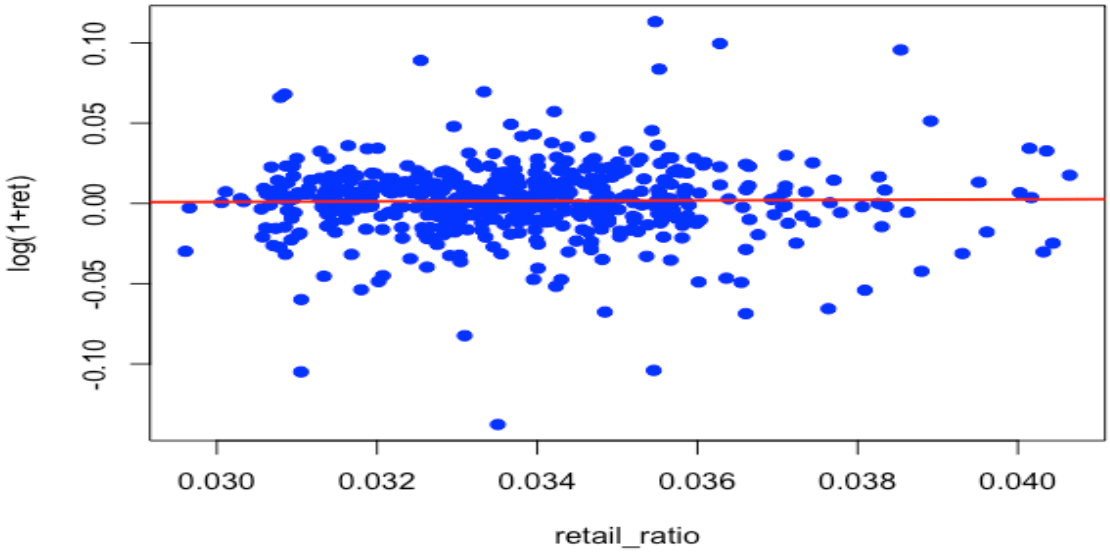
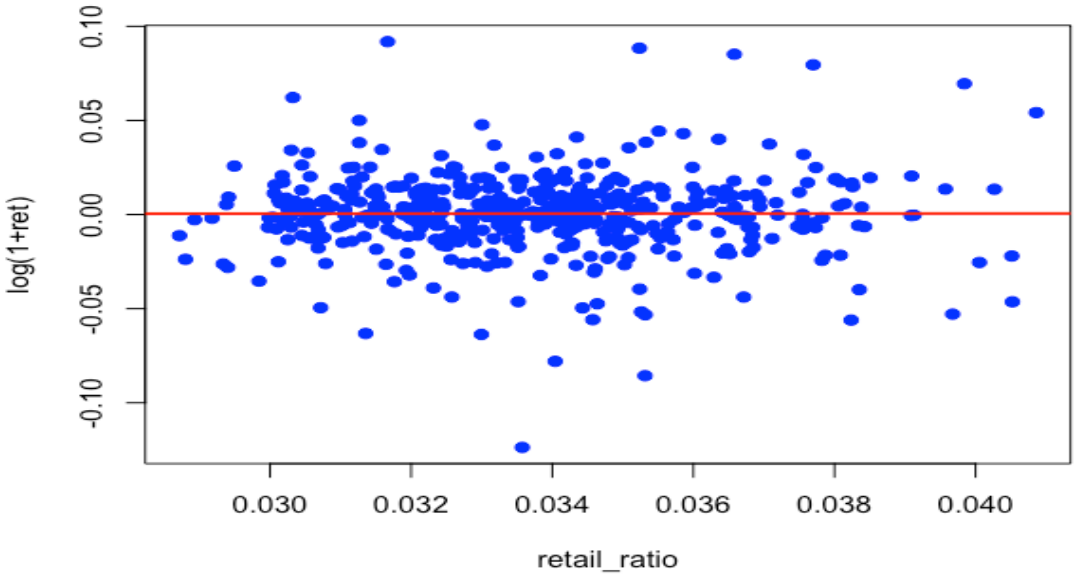
1(a) APPLE



1(b) GOOGLE



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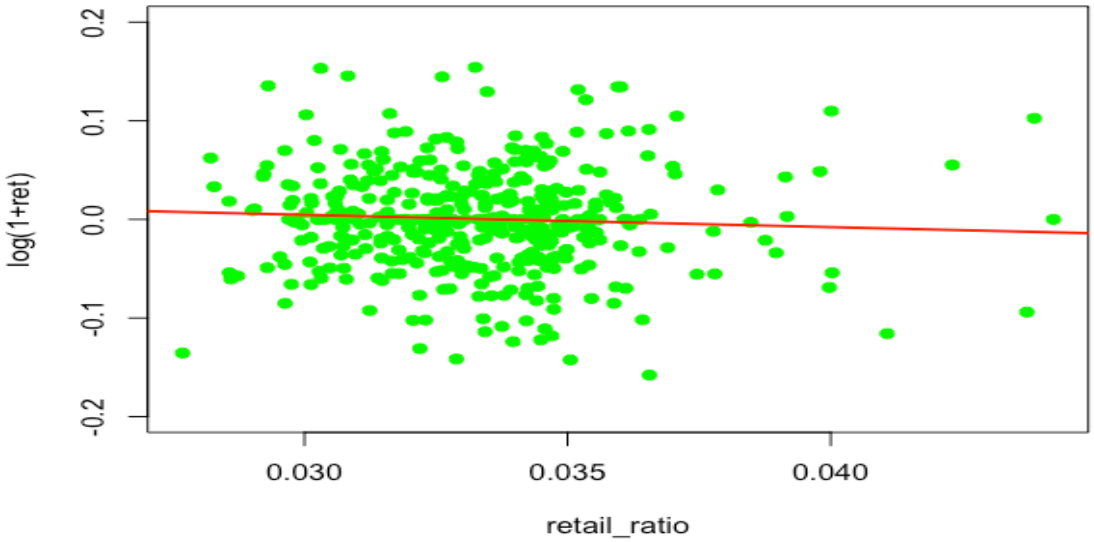
1(c) Applied Optoelectronics, Inc.



1(d) Atlantic American Corporation

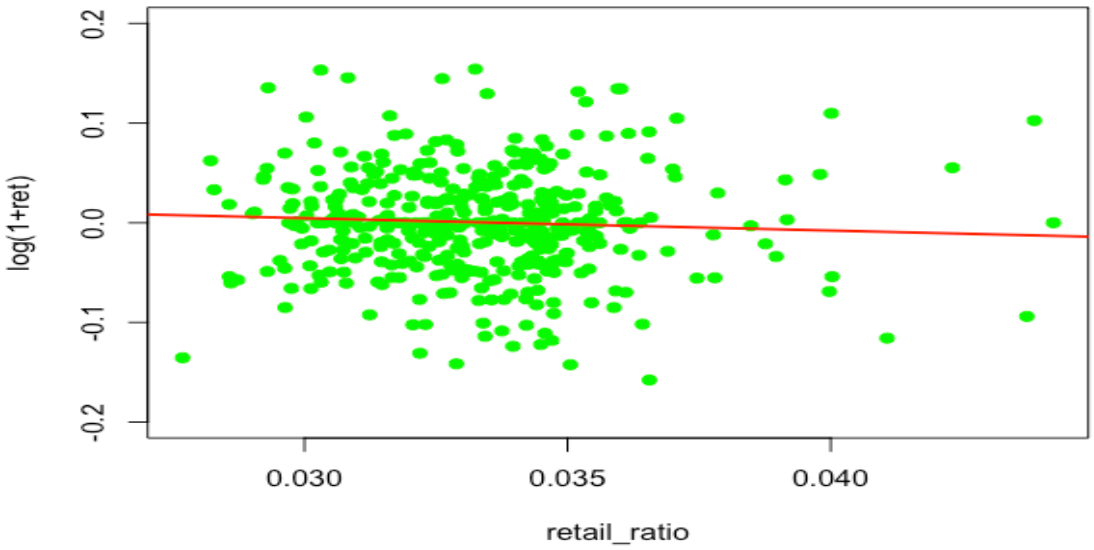


Figure 1

The figure presents the relation between daily returns and *retail_ratio* of four stocks in the sample. We present the scatter plot of two growth stocks(APPLE, GOOGLE) and two value stocks(Applied Optoelectronics, Inc., Atlantic American Corporation). The red lines are the fitted lines.

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Table 1. Descriptive statistics

Panel A presents the summary statistics of the variables used in the test. Panel B presents the correlation between the variables. The variables are Ret_t(daily return on day t), $Ret_{[t+1:t+5]}$(cumulative return from 1 to 5 days), $Ret_{[t+6:t+21]}$(cumulative return from 5 to 21 days), *retail_ratio*(mean user scaled by the sum of user in the past one month), *ROA*(return on assets), *LEV*(leverage ratio) and *Turnover*(turnover rate). *ROA* is the ratio of net income to total assets, *LEV* is the ratio of total liabilities to total stockholders equity and *Turnover* is the trading volume scaled by total outstanding shares.

Panel A. Summary statistics

	N	Mean	Std	Min	P25	Median	P75	Max
Ret_t(%)	3,766,229	0.032	4.215	-91.794	-1.031	0.009	1.013	1025.181
$Ret_{[t+1:t+5]}$(%)	3,529,559	0.124	9.213	-92.436	-2.399	0.079	2.314	1872.825
$Ret_{[t+6:t+21]}$(%)	3,361,800	0.346	16.33	-97.473	-4.790	0.298	4.674	1999.615
retail_ratio	3,685,894	0.034	0.015	0.000	0.032	0.033	0.035	1.000
ROA	3,766,204	-0.024	0.337	-31.615	-0.020	0.003	0.014	29.295
LEV	3,766,204	3.718	136.158	-2817.682	0.438	1.143	2.841	29585.000
Turnover	3,766,204	0.017	0.456	0.000	0.002	0.005	0.011	770.288

Panel B. Correlation

	Ret_t	$Ret_{[t+1:t+5]}$	$Ret_{[t+6:t+21]}$	*retail_ratio*	ROA	LEV	Turnover
$Ret_{[t+1:t+5]}$	-0.01	1.00					
$Ret_{[t+6:t+21]}$	-0.00	-0.02	1.00				
retail_ratio	0.02	0.02	0.05	1.00			
ROA	-0.00	-0.00	-0.00	-0.01	1.00		
LEV	-0.00	-0.00	-0.00	-0.00	-0.01	1.00	
Turnover	0.23	-0.02	0.01	0.07	-0.01	-0.00	1.00

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Table 2. Regression of daily returns on retail ratio

This table reports the regression result of daily returns on Robinhood users changes on day *t* relative to the past one month. The dependent variable is the daily stock return(*ret*) on day *t* and the independent variable is the mean user scaled by the total user in the past one month (*retail_ratio*) for individual securities. Control variables include return on assets(*ROA*), leverage ratio(*LEV*), turnover rate(*TURNOVER*), lagged returns(*ret*), and lagged *retail_ratio*. We present Pooled OLS regression result in columns (1) and Fixed Effect regression result in columns (2) to (5). We use the robust standard errors clustered by ticker level and t-statistics are reported in parentheses. *$p < 0.1$; **$p < .05$; ***$p < .01$.

	(1)	(2)	(3)	(4)	(5)
Dep var:			*ret(t)*		
Intercept	-0.005***	-0.005***	-0.005***	–0.005***	-0.003***
	(-8.14)	(-8.21)	(-7.00)	(-7.24)	(-5.91)
retail_ratio(t)	0.150***	0.156***	0.139***	0.150***	0.728***
	(7.65)	(7.79)	(6.69)	(6.97)	(7.03)
ROA	-0.000**	0.000	-0.000***	0.000	0.000
	(-2.17)	(0.20)	(-2.32)	(0.60)	(0.39)
LEV	0.000	-0.000	0.000	0.000	0.000
	(0.28)	(-0.27)	(0.67)	(0.05)	(0.02)
TURNOVER	0.007	0.007	0.007	0.007	0.007
	(1.04)	(1.03)	(1.04)	(1.03)	(1.02)
ret(t-1)	-0.053***	-0.055***	-0.042***	-0.044***	-0.047***
	(-15.84)	(-16.36)	(-10.52)	(-11.05)	(-11.65)
ret(t-2)	0.028***	0.027***	-0.010	-0.012***	-0.010***
	(10.88)	(10.17)	(-4.52)	(-5.47)	(-4.30)
ret(t-3)	-0.014***	-0.016***	-0.019***	-0.021***	-0.020***
	(-8.70)	(-9.76)	(-9.64)	(-10.76)	(-10.24)
ret(t-4)	-0.015***	-0.017***	-0.014***	-0.016***	-0.015***
	(-9.40)	(-10.52)	(-8.08)	(-9.31)	(-8.63)
ret(t-5)	0.009***	0.008***	-0.006***	-0.008***	-0.007***
	(6.00)	(4.92)	(-4.17)	(-5.50)	(-4.84)
retail_ratio(t-1)					-0.807***
					(-6.30)
retail_ratio(t-2)					0.268***
					(4.31)
retail_ratio(t-3)					-0.088***
					(-2.94)
retail_ratio(t-4)					0.008

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retail_ratio(t-5)					(0.49) -0.006 (-0.56)
Stock FE		X		X	X
Day FE			X	X	X
N	3,528,479	3,528,479	3,528,479	3,528,479	3,486,912
adj. R^2	0.0107	0.0109	0.0096	0.0101	0.0130

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Table 3. Regression of cumulative stock returns from 1 to 5 days on retail ratio

This table reports the regression result of cumulative returns from 1 to 5 days on Robinhood users changes on day *t* relative to the past one month. The dependent variable is the cumulative stock return(*cumulative ret[t+1:t+5]*) and the independent variable is the mean user scaled by the total user in the past one month (*retail_ratio*) for individual securities. Control variables include return on assets(ROA), leverage ratio(LEV), turnover rate(TURNOVER), lagged returns(ret), and lagged *retail_ratio*. We present Pooled OLS regression result in columns (1) and Fixed Effect regression result in columns (2) to (5). We use the robust standard errors clustered by ticker level and t-statistics are reported in parentheses. *$p < 0.1$; **$p < .05$; ***$p < .01$.

	(1)	(2)	(3)	(4)	(5)
Dep var:	*cumulative ret[t+1:t+5]*				
Intercept	-0.000***	-0.000**	0.001***	0.001***	-0.000
	(-3.10)	(-2.48)	(6.58)	(5.80)	(-0.05)
retail_ratio(t)	0.056***	0.054***	0.002	0.007	-0.069**
	(9.38)	(8.47)	(0.46)	(1.37)	(-2.33)
ROA	-0.001**	-0.000	-0.001**	0.000	0.000
	(-2.24)	(-0.10)	(-2.39)	(0.23)	(0.21)
LEV	0.000	-0.000	0.000	-0.000	-0.000
	(0.18)	(-0.52)	(0.45)	(-0.33)	(-0.34)
TURNOVER	-0.001*	-0.001	-0.001*	-0.001	-0.001
	(-1.66)	(-1.53)	(-1.67)	(-1.52)	(-1.51)
ret(t-1)	-0.039***	-0.047***	-0.067***	-0.076***	-0.076***
	(-14.68)	(-17.39)	(-20.15)	(-22.21)	(-22.08)
ret(t-2)	-0.034***	-0.042***	-0.052***	-0.062***	-0.063***
	(-12.36)	(-15.46)	(-17.02)	(-20.04)	(-20.36)
ret(t-3)	-0.035***	-0.043***	-0.041***	-0.050***	-0.051***
	(-12.11)	(-14.97)	(-12.97)	(-15.97)	(-16.04)
ret(t-4)	-0.000	-0.008***	-0.021***	-0.031***	-0.032***
	(-0.24)	(-3.23)	(-7.43)	(-10.52)	(-10.79)
ret(t-5)	-0.011***	-0.054***	-0.016***	-0.025***	-0.026***
	(-3.77)	(-6.42)	(-4.94)	(-7.76)	(-7.95)
retail_ratio(t-1)					0.110***
					(5.06)
retail_ratio(t-2)					-0.028**
					(-2.01)
retail_ratio(t-3)					0.026**
					(2.21)

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retail_ratio(t-4)					0.022***
					(3.07)
retail_ratio(t-5)					-0.011*
					(-1.80)
Stock FE		X		X	X
Day FE			X	X	X
N	3,529,559	3,529,559	3,529,559	3,529,559	3,488,527
adj. R^2	0.0009	0.0013	0.0019	0.0027	0.0028

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Table 4. Regression of cumulative stock returns from 6 to 21 days on retail ratio

This table reports the regression result of cumulative returns from 6 to 21 days on Robinhood users changes on day *t* relative to the past one month. The dependent variable is the cumulative stock return(*cumulative ret[t+6:t+21]*) and the independent variable is the mean user scaled by the total user in the past one month (*retail_ratio*) for individual securities. Control variables include return on assets(ROA), leverage ratio(LEV), turnover rate(TURNOVER), lagged returns(ret), and lagged *retail_ratio*. We present Pooled OLS regression result in columns (1) and Fixed Effect regression result in columns (2) to (5). We use the robust standard errors clustered by ticker level and t-statistics are reported in parentheses. *$p < 0.1$; **$p < .05$; ***$p < .01$.

	(1)	(2)	(3)	(4)	(5)
Dep var:	*cumulative ret[t+6:t+21]*				
Intercept	-0.036***	-0.037***	-0.006***	-0.007***	-0.013***
	(-13.59)	(-12.97)	(-2.78)	(-3.01)	(-3.90)
retail_ratio(t)	1.149***	1.164***	0.261***	0.289***	0.106**
	(14.75)	(14.08)	(4.22)	(4.43)	(2.23)
ROA	-0.004***	-0.000	-0.004***	0.000	0.000
	(-2.65)	(-0.14)	(-2.78)	(0.20)	(0.10)
LEV	0.000	-0.000	0.000	-0.000	-0.000
	(0.29)	(-0.99)	(0.34)	(-1.04)	(-1.10)
TURNOVER	-0.000**	-0.001*	-0.001**	-0.001*	-0.001
	(-2.25)	(-1.81)	(-2.22)	(-1.65)	(-1.63)
ret(t-1)	0.003	-0.020***	-0.017***	-0.044***	-0.043***
	(0.65)	(-4.52)	(-3.59)	(-9.36)	(-9.27)
ret(t-2)	-0.053***	-0.077***	-0.033***	-0.060***	-0.061***
	(-11.55)	(-16.19)	(-6.30)	(-11.29)	(-11.23)
ret(t-3)	-0.016***	-0.039***	-0.017***	-0.044***	-0.045***
	(-3.29)	(-7.80)	(-2.97)	(-7.62)	(-7.67)
ret(t-4)	-0.048***	-0.071***	-0.028***	-0.055***	-0.056***
	(-9.51)	(-13.76)	(-4.95)	(-9.59)	(-9.69)
ret(t-5)	-0.039***	-0.062***	-0.018***	-0.044***	-0.045***
	(-8.48)	(-12.89)	(-3.35)	(-8.19)	(-8.35)
retail_ratio(t-1)					0.091***
					(4.01)
retail_ratio(t-2)					0.070***
					(3.67)
retail_ratio(t-3)					0.074***
					(4.13)

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retail_ratio(t-4)					-0.014
					(-0.63)
retail_ratio(t-5)					0.142***
					(3.09)
Stock FE		X		X	X
Day FE			X	X	X
N	3,361,800	3,361,800	3,361,800	3,361,800	3,320,866
adj. R^2	0.0030	0.0034	0.0004	0.0009	0.0011

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Table 5. Regression of daily returns on retail ratio and growth stocks indicator

This table reports the regression result of daily returns on Robinhood users changes on day *t* relative to the past one month and its interaction with growth stocks indicator. The dependent variable is the daily stock return(*ret*) on day *t*. We use BE/ME breakpoints from Kenneth and French's website to identify the value and growth stocks. The indicator variable equal to one(zero) if the computed BE/ME_i smaller(larger) than the 50th BE/ME percentile, which is regarded as growth(value) stocks. Control variables include return on assets(ROA), leverage ratio(LEV), turnover rate(TURNOVER), lagged returns(ret), and lagged *retail_ratio*. We present Pooled OLS regression result in columns (1) and Fixed Effect regression result in columns (2) to (5). We use the robust standard errors clustered by ticker level and t-statistics are reported in parentheses. *$p < 0.1$; **$p < .05$; ***$p < .01$.

	(1)	(2)	(3)	(4)	(5)
Dep var:			*ret(t)*		
Intercept	-0.001***	-0.003***	-0.001***	-0.002***	-0.003***
	(-6.95)	(-11.05)	(-5.42)	(-8.68)	(-3.67)
retail_ratio(t)	0.035***	0.037***	0.027***	0.031***	0.842***
	(4.26)	(4.48)	(3.33)	(3.71)	(5.65)
dummy(growth)	-0.004***	-0.001	-0.004***	-0.002*	-0.003**
	(-3.39)	(-1.06)	(-3.58)	(-1.85)	(-2.11)
retail_ratio dummy(growth)*	0.150***	0.150***	0.154***	0.156***	0.190***
	(4.64)	(4.45)	(4.69)	(4.54)	(5.65)
ROA	-0.000**	-0.000	-0.000**	0.000	0.000
	(-2.34)	(-0.02)	(-2.51)	(0.33)	(0.23)
LEV	0.000	-0.000	0.000	0.000	0.000
	(0.03)	(-0.28)	(0.51)	(0.05)	(0.00)
TURNOVER	0.007	0.007	0.007	0.007	0.005
	(1.03)	(1.02)	(1.03)	(1.02)	(0.98)
ret(t-1)	-0.050***	-0.052***	-0.038***	-0.040***	-0.042***
	(-15.64)	(-16.26)	(-9.75)	(-10.32)	(-11.12)
ret(t-2)	0.030***	0.028***	-0.009***	-0.011***	-0.008***
	(11.57)	(10.81)	(-4.03)	(-4.97)	(-3.72)
ret(t-3)	-0.014***	-0.016***	-0.018***	-0.020***	-0.019***
	(-8.41)	(-9.60)	(-9.06)	(-10.24)	(-10.15)
ret(t-4)	-0.015***	-0.017***	-0.014***	-0.016***	-0.016***
	(-9.75)	(-11.07)	(-8.23)	(-9.56)	(-8.79)
ret(t-5)	0.009***	0.007***	-0.006***	-0.008***	-0.008***
	(6.01)	(4.76)	(-4.11)	(-5.48)	(-5.40)***

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retail_ratio(t-1)					-1.036***
					(-5.11)
retail_ratio(t-2)					0.371***
					(3.14)
retail_ratio(t-3)					-0.130**
					(-2.41)
retail_ratio(t-4)					0.008
					(0.40)
retail_ratio(t-5)					0.009
					(1.43)
Stock FE		X		X	X
Day FE			X	X	X
N	3,390,957	3,390,957	3,390,957	3,390,957	3,287,451
adj. R^2	0.0105	0.0109	0.0094	0.0099	0.0105

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Table 6. Regression of cumulative returns from 1 to 5 days on retail ratio and growth stocks indicator

This table reports the regression result of cumulative returns from 1 to 5 days returns on Robinhood users changes on day *t* relative to the past one month and its interaction with growth stocks indicator. The dependent variable is the cumulative stock return(*cumulative ret[t+1:t+5]*). We use BE/ME breakpoints from Kenneth and French's website to identify the value and growth stocks. The indicator variable equal to one(zero) if the computed BE/ME_i smaller(larger) than the 50^{th} BE/ME percentile, which is regarded as growth(value) stocks. Control variables include return on assets(ROA), leverage ratio(LEV), turnover rate(TURNOVER), lagged returns(ret), and lagged *retail_ratio*. We present Pooled OLS regression result in columns (1) and Fixed Effect regression result in columns (2) to (5). We use the robust standard errors clustered by ticker level and t-statistics are reported in parentheses. *$p < 0.1$; **$p < .05$; ***$p < .01$.

	(1)	(2)	(3)	(4)	(5)
Dep var:	*cumulative ret[t+1:t+5]*				
Intercept	-0.003***	0.001***	0.000	0.004***	0.001
	(-5.88)	(2.81)	(1.35)	(10.03)	(0.79)
retail_ratio(t)	0.118***	0.118***	0.015	0.023**	-0.075
	(8.31)	(8.09)	(1.50)	(2.20)	(-1.51)
dummy(growth)	0.001	-0.008***	0.003***	-0.006***	-0.002
	(1.07)	(-7.03)	(3.37)	(-5.93)	(-1.36)
retail_ratio dummy(growth)*	-0.018	-0.051	-0.055**	-0.084***	-0.187***
	(-0.61)	(-1.61)	(-2.24)	(-3.22)	(-3.54)
ROA	-0.001**	0.000	-0.001**	0.000	0.000
	(-2.22)	(0.04)	(-2.41)	(0.37)	(0.26)
LEV	0.000	-0.000	0.000	-0.000	-0.000
	(0.15)	(-0.51)	(0.42)	(-0.31)	(-0.32)
TURNOVER	-0.001	-0.001	-0.001*	-0.001	-0.001
	(-1.63)	(-1.49)	(-1.65)	(-1.48)	(-1.46)
ret(t-1)	-0.039***	-0.046***	-0.067***	-0.076***	-0.076***
	(-14.70)	(-17.11)	(-19.71)	(-21.88)	(-21.20)
ret(t-2)	-0.036***	-0.043***	-0.053***	-0.062***	-0.063***
	(-12.75)	(-15.57)	(-16.89)	(-19.91)	(-20.33)
ret(t-3)	-0.036***	-0.043***	-0.041***	-0.050***	-0.051***
	(-12.34)	(-15.06)	(-12.73)	(-15.73)	(-16.09)
ret(t-4)	-0.001	-0.008***	-0.022***	-0.030***	-0.031***
	(-0.35)	(-3.04)	(-7.38)	(-10.31)	(-10.43)
ret(t-5)	-0.011***	-0.018***	-0.016***	-0.024***	-0.025***

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	(-3.88)	(-6.45)	(-4.79)	(-7.64)	(-7.94)
retail_ratio(t-1)					0.173***
					(4.32)
retail_ratio(t-2)					-0.067**
					(-2.37)
retail_ratio(t-3)					0.050**
					(2.46)
retail_ratio(t-4)					0.049***
					(3.60)
retail_ratio(t-5)					-0.011
					(-0.88)
Stock FE		X		X	X
Day FE			X	X	X
N	3,317,031	3,317,031	3,317,031	3,317,031	3,233,129
adj. R^2	0.0010	0.0021	0.0020	0.0034	0.0035

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Table 7. Regression of cumulative returns from 6 to 21 days on retail ratio and growth stocks indicator

This table reports the regression result of cumulative returns from 6 to 21 days returns on Robinhood users changes on day *t* relative to the past one month and its interaction with growth stocks indicator. The dependent variable is the cumulative stock return(*cumulative ret[t+6:t+21]*). We use BE/ME breakpoints from Kenneth and French's website to identify the value and growth stocks. The indicator variable equal to one(zero) if the computed BE/ME_i smaller(larger) than the 50^{th} BE/ME percentile, which is regarded as growth(value) stocks. Control variables include return on assets(ROA), leverage ratio(LEV), turnover rate(TURNOVER), lagged returns(ret), and lagged *retail_ratio*. We present Pooled OLS regression result in columns (1) and Fixed Effect regression result in columns (2) to (6). We use the robust standard errors clustered by ticker level and t-statistics are reported in parentheses. $*p < 0.1$; $**p < .05$; $***p < .01$.

	(1)	(2)	(3)	(4)	(5)
Dep var:	*cumulative ret[t+6:t+21]*				
Intercept	-0.057***	-0.041***	-0.013***	-0.002	-0.011**
	(-12.30)	(-8.39)	(-3.35)	(-0.49)	(-1.97)
retail_ratio(t)	1.751***	1.793***	0.436***	0.502***	0.187*
	(13.03)	(12.56)	(3.88)	(4.19)	(1.88)
dummy(growth)	0.007	-0.028***	0.002	-0.023***	-0.022***
	(0.99)	(-3.65)	(0.46)	(-3.82)	(-3.39)
retail_ratio dummy(growth)*	-0.172	-0.331	0.027	-0.137	-0.178
	(-0.83)	(-1.51)	(0.16)	(-0.79)	(-0.97)
ROA	-0.004***	0.000	-0.003***	0.000	0.000
	(-2.59)	(0.06)	(-2.76)	(0.27)	(0.15)
LEV	0.000	-0.000	0.000	-0.000	-0.000*
	(0.28)	(-0.99)	(0.29)	(-1.03)	(-1.77)
TURNOVER	-0.000**	-0.001	-0.001**	-0.001	-0.001
	(-2.36)	(-1.56)	(-2.16)	(-1.49)	(-1.53)
ret(t-1)	0.000	-0.019***	-0.019***	-0.044***	-0.041***
	(0.11)	(-3.94)	(-3.93)	(-8.62)	(-8.25)
ret(t-2)	-0.057***	-0.077***	-0.033***	-0.059***	-0.057***
	(-11.67)	(-14.73)	(-6.10)	(-10.18)	(-10.09)
ret(t-3)	-0.017***	-0.037***	-0.017***	-0.043***	-0.042***
	(-3.49)	(-7.15)	(-2.87)	(-7.06)	(-6.94)
ret(t-4)	-0.048***	-0.068***	-0.027***	-0.053***	-0.053***
	(-9.32)	(-12.78)	(-4.71)	(-8.88)	(-8.88)

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ret(t-5)	-0.039***	-0.059***	-0.017***	-0.042***	-0.043***
	(-8.26)	(-11.78)	(-3.16)	(-7.41)	(-7.50)
retail_ratio(t-1)					0.165***
					(4.24)
retail_ratio(t-2)					0.080***
					(2.73)
retail_ratio(t-3)					0.134***
					(4.06)
retail_ratio(t-4)					0.000
					(0.00)
retail_ratio(t-5)					0.198***
					(3.09)
Stock FE		X		X	X
Day FE			X	X	X
N	3,090,761	3,090,761	3,090,761	3,090,761	3,035,647
adj. R^2	0.0044	0.0076	0.0006	0.0029	0.0031

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