

Earnings Announcement Promotions: A Yahoo Finance Field Experiment

Alastair Lawrence*
lawrence@haas.berkeley.edu
Haas School of Business
University of California at Berkeley
2220 Piedmont Avenue
Berkeley, CA 94720

James Ryans
jryans@london.edu
London Business School
Regent's Park
London NW1 4SA
United Kingdom

Estelle Sun
yesun@bu.edu
Questrom School of Business
Boston University
595 Commonwealth Avenue
Boston, MA 02215

Nikolay Laptev
nlaptev@ucla.edu
Yahoo! Research
701 1st Ave
Sunnyvale, CA 94089

January 2017

ABSTRACT: This study presents a natural field experiment in which media articles for a random sample of firms with earnings announcements are promoted to a one percent subset of Yahoo Finance users. The promoted firms have similar fundamental and earnings-news characteristics as control firms, yet we find that promoted firms have higher abnormal returns on the day of the earnings announcement, and some evidence of lower bid-ask spreads. Moreover, these results are more pronounced for less visible firms. We do not find evidence of significant increases in trading volume, or of information acquisition by users subject to the promotion. These findings suggest that investor attention affects the pricing of earnings and that retail investors buy stocks that catch their attention, in a setting where attention is randomly assigned, a condition that is unlikely present in observational studies.

KEYWORDS: Investor attention; media articles; earnings responses; capital markets field experiment; abnormal returns; retail investors.

JEL CLASSIFICATION: M41, G12, and G14.

ACKNOWLEDGMENTS: We are grateful to *Yahoo! Inc.* for supporting this research and for providing the *Yahoo Finance* data. We have received helpful comments from Dirk Black, Robert Bushman, Bill Mayew, Katherine Schipper, Lorien Stice-Lawrence, Phillip Stocken, Mohan Venkatachalam, Rodrigo Verdi, and workshop participants at the 2016 Duke-UNC Fall Camp. Additionally, we thank the University of California at Berkeley's Office for Protection of Human Subjects and Boston University's Institutional Review Board for their reviews of our study. *Corresponding author.

I. INTRODUCTION

The literature on investor attention and the effects of media in financial markets generally rely on observational studies to investigate the links between media and investor activities. We conduct an analysis of a natural field experiment where randomly selected earnings announcements are promoted to users of Yahoo Finance, and observe the aggregate market response in order to provide causal evidence of the effects of investor attention at earnings announcements.¹ Our results can be considered causal, as the treatment is randomly assigned, and help both confirm prior studies that find effects of media attention on individual investors or individual stocks, and extend the literature on aggregate market effects of investor attention and the media. We build upon prior observational studies that generally use proxies such as media attention, extreme returns, trading volume, investor composition, and the salience of earnings announcements to study the effects of investor attention on financial markets (e.g., Chen, Hong, and Stein 2002; Barber and Odean 2008; Lehavy and Sloan 2008; DellaVigna and Pollet 2009; Hirshleifer, Lim, and Teoh 2009; Aboody, Lehavy, and Trueman 2010; Engleberg and Parsons 2011).

Media has been shown to be associated with financial markets and other economic activity (e.g., Tetlock 2007; Core, Guay, and Larcker 2008; Dyck, Volchkova, and Zingales 2008; Solomon, Soltes, Sosyura 2014). Firms can also manage the media to influence stock prices (e.g., Ahern and Sosyura 2014). The role of the media in price formation occurs through the dissemination of new information to market participants, and it may also occur by increasing investor attention; for example, by promoting stale information that should not otherwise have an

¹ Natural field experiments are experiments that occur in the environment where subjects are naturally undertaking their usual tasks, as opposed to in a laboratory, and the conditions in which they operate are subject to randomized treatment without the subjects' awareness of the treatment. See Floyd and List (2016) for a discussion of experimental techniques in the accounting and finance literature.

effect on prices. In observational studies, it is inherently difficult to disentangle the effects of investor attention from market-based and media-based measures, because these measures both reflect investor attention and generate investor attention.

It is clear that the media cannot promote all news with equal emphasis.² Instead, consumers of news prefer their media providers to help them filter news to focus on the most important items (e.g., Hamilton 2004; Gentzkow and Shapiro 2010). Thus, editorial choices determine which information is made more salient, either through a more prominent position such as on the front page of the Wall Street Journal, or through more channels, as in the decision by local media outlets to cover a story (Engelberg and Parsons 2011). Consequently, studies that use media measures as a proxy for investor attention need to diligently control for the information content of the news itself, because media coverage is by definition responding to events and the information content of those events, as well as to the demand of media consumers, which can endogenously determine the selection and prominence of disseminated information.

Prior literature examining the effects of media and investor attention at earnings announcements suggests that media does affect the market responses to earnings announcements. Engelberg and Parsons (2011) study retail brokerage accounts and show that local media coverage of earnings announcements appears to spur local retail trading volume, though their setting does not allow them to make inferences about the effects of media on market-wide returns or volumes. Drake, Guest, and Twedt (2014) find that media coverage appears to mitigate cash flow mispricing but not accrual mispricing. Related research examines the effects of investor attention on earnings announcement responses, without specifically considering the media. DellaVigna and Pollet

² Even if the New York Times could literally publish “All the News That’s Fit to Print”, it still makes editorial decisions about which are the most important articles to print on the front page, or towards the front of each section.

(2009) suggest that inattention to Friday earnings announcements versus those on other weekdays is related to a lower immediate response to earnings announcements coupled with a greater delayed response. Consistent with DellaVigna and Pollet (2009), Drake, Roulstone, and Thornock (2015) and Lawrence, Ryans, Sun and Laptev (2016) provide evidence that responses to earnings are associated with increased investor attention. However, in these observational settings, it is difficult to draw causal inferences between the investor attention measures and the observed market response, because the underlying properties of the news may affect both the market response and the investor attention measures.

Barber and Odean (2008) infer that individual investors reduce the complexity of their portfolio decisions by trading based on salience, proxied by firms that are in the news, that have unusual trading volume, and that recently experienced extreme returns. Since individual investors have small portfolios, they are unlikely to already own any particular stock, which they would then be able to sell, nor are they likely to take short positions. Observing greater buy-sell imbalances by individual investors on high-attention days leads them to conclude that retail investors are net buyers of firms that grab attention. Huberman and Regev (2001) is closely related to our study in that it attempts to show the effects of an exogenous shock to investor attention. Their case study on EntreMed, a firm promoted in a front-page article in the New York Times, shows a significant and sustained stock price increase following this coverage, even though the substantive information in the New York Times article was published in the scientific literature several months prior. Tetlock (2011) finds that individual investors trade on stale news, when new articles are published that are textually similar to prior articles. Yet even in these settings, it is difficult to control for information that may have entered into the editorial decision to report on stale news or to write a front-page article about potentially stale news page of the New York Times. Hence, there

remains the possibility that such publication decisions confer new legitimacy to the firm despite the stale nature of the news.

We extend this literature by examining whether the random promotion of firm-specific earnings announcement news on the front page of Yahoo Finance results in increases in abnormal returns and volumes, decreases in bid-ask spreads as well as increases in the information acquisition of financial data by users subject to the promotion. Yahoo Finance is the most popular financial web site in the U.S. with over 50 million unique monthly visits, an audience that is more than 2.5 times that of the Wall Street Journal and Bloomberg News, each with approximately 20 million unique monthly visits (comScore 2015). The field experiment was run on Yahoo Finance from May 12 to July 28, 2016, for a one percent sample of Yahoo Finance users, which based on comScore (2015)'s estimates would equate to roughly The Wall Street Journal's entire web-traffic for the State of Massachusetts including Boston. The one percent sample was calibrated to ensure that the selected users and their activities were representative of those of the entire Yahoo Finance user population. Thus, news articles on a random sample of earnings announcements were promoted to a significant audience in an attempt to separate the effects of the media promotion from the various factors that cause both media promotion and investor attention. In turn, any resulting effects should be due only to the additional investor attention generated from viewing an existing article.

Every day during the experiment period, up to five companies with earnings announcements on that day were selected for promotion and paired with a control firm, in order to support a balanced panel of treatment and control firms. Hence, if there were six firms reporting earnings on a given day, three would be randomly selected as treatment firms and the remaining three firms would be designated as control firms. Treatment stocks were promoted for 24 hours,

at which time any news articles relating to the treatment stocks were posted at the top of the Yahoo Finance home page for the selected experiment users. Section 2 provides more specific details concerning the experimental design.

We find that promoted firms have similar fundamental and earnings-news characteristics as the control firms, indicating that the covariates are balanced across the two groups. We document that promoted firms have a significant increase in abnormal returns on the day of the earnings announcement (i.e., the news promotion day) of approximately 160 basis points relative to the control firms. The positive price pressure for the promoted firms suggests that the media promotion resulted in some of the experiment users purchasing these stocks on the day the firm was promoted. Abnormal bid-ask spreads were lower for promoted firms, but with marginal statistical significance, indicating the potential for a reduction of information asymmetry when earnings news is more widely disseminated. Perhaps surprisingly, we did not find corresponding increases in volume or of information acquisition activities on Yahoo Finance by the users subject to the promotion. The lack of volume effects could reflect the fact that these experiment users displaced other trades in the promoted stocks. Moreover, we do find some evidence indicating that promoted firms have higher returns on the promotion day, especially for the firms with more negative earnings surprises. Taken together, the findings suggest that retail investors buy stocks that catch their attention and affect the pricing of earnings, in a setting where attention is randomly assigned.

Our study makes the following main contributions to the extant literature. First, it provides a clean experimental setting confirming observational studies documenting the effects of the business press and attention on stock prices. Moreover, it provides some insights into the effects that financial news providers can have on market prices. Second, it highlights that the market

response on the day of the earnings announcement appears to depend not only on the earnings news but on the extent of investor attention. Third, the lack of information acquisition activities by Yahoo Finance users subject to the promotion suggests that media promotion does not increase information acquisition practices, and therefore that attention-generated trading is less informed. Overall, we hope that this study encourages more capital market field experiments in accounting and finance.

II. EXPERIMENTAL DESIGN AND DATA

In this study, we are primarily concerned with the effects of investor attention to media articles reporting on firms' earnings announcements. From May 12 to July 28, 2016, Yahoo Finance promoted news articles for a randomly selected set of firms with earnings announcements occurring on each trading day, or which occurred after the market close on the previous trading day, to a one percent subsample of Yahoo Finance users. The one percent subsample was calibrated to be representative of the entire Yahoo Finance user population and was constant through the entire experiment period. The term "promoted" means that news items relating to the treatment stocks were presented in one of the first five news article slots on the sample users' home page news stream. Treated stocks were promoted for 24 hours, after which the next day's treatment stocks became active. The Yahoo Finance home page has five available positions for news article promotion. On days when five companies are selected for promotion and have available articles, only the most recent article for each firm is shown. For days with fewer than five firms available for promotion, more than one article may be shown for each firm, and if fewer than five articles are available, Yahoo Finance inserts other articles into the news feed based on default algorithms. Figure 1 illustrates a Yahoo Finance home page for a treatment sample user on May 18, 2016, and on this day, Hormel, Steris, and Booz Allen reported earnings and were randomly selected for

promotion. Articles relating to these firms are visible among the five positions in the user's news feed.

Yahoo Finance is the most popular source of financial information in the U.S. (Yahoo 2016; Lawrence, Ryans, and Sun 2017), providing financial news as well as firm-specific financial and market-related information. When a user arrives at the Yahoo Finance home page (*finance.yahoo.com*), depicted in Figure 1, the main body section of the page is dedicated to news articles. In addition, users may search for firm specific financial information by entering a name or ticker symbol in the search field at the top of the page, or they may select a stock from their portfolio list or a list of recently viewed stocks, which are positioned along the right column. As Yahoo generates revenue from display advertising (i.e., when impressions are delivered to users and when users click on an advertisement), news articles are strategically selected to maximize the number of times users click on the news articles during each visit to the web site.³

In order to have a balanced panel of treatment and control firms, up to five earnings announcements were randomly selected from among those scheduled to be released each trading day, or after the close on the previous trading day. To schedule the promotion in Yahoo Finance's systems, the random selection of stocks was generated each Tuesday based upon the firms expected to announce during the subsequent week, for stocks listed on the NYSE, NASDAQ, and AMEX exchanges and with confirmed earnings announcements on FactSet's earnings calendar. Each treatment firm's announcement date was manually validated by checking against the company's press releases or investor relations web site. Firms reporting earnings before and during market hours were scheduled for promotion on the report day, while firms reporting after hours were scheduled for promotion the following trading day. To illustrate how the random selection

³ Yahoo Inc. 10-K for the period ending December 31, 2015. Available at <https://www.sec.gov>

process operated in practice, consider as an example that fifteen companies were scheduled to report either on a given trading day or after the close on the previous trading day. Five firms would be randomly selected as treatment firms, and the remaining 10 firms would serve as the pool of control firms, to be size-matched one-to-one for our analysis. If only six firms were scheduled to report, three would be randomly selected as the treatment firms, and the remaining three would be designated as the control firms. Firms without scheduled earnings announcements do not appear in either our treatment or control samples. During the experiment period, 169 firms were sampled as treatment firms, and 1,134 firms were available control firms, with 169 being selected when size-matched to the closest treatment firm. Although we also document market effects using the complete unmatched pool of control firms, this method is less preferable as time-variant factors will not be equally balanced between the treatment and control firms, as in the one-to-one match approach.⁴

Total page views is our measure of information acquisition by our sample Yahoo Finance users, and it comprises the normalized number of page views for all the firm-specific pages on the Yahoo Finance web site. Yahoo Finance records page views for each firm when a user views any of the firm-specific information pages. Views generally come from three sources: (1) a user clicks on an active hyperlink to a firm's stock ticker symbol, (2) a user types a firm's name or ticker symbol into the Yahoo Finance search field, or (3) a user clicks through to a firm-specific information page from general search engine such as Google. Every firm-specific page that the sample population of users visit is logged, and we sum all such firm specific page views on a given day to measure the *total page views*. Because the level of Yahoo Finance page view traffic is

⁴ A greater number of firms report earnings towards the latter part of the sample period, and as a result there are a relatively even number of treatment firms throughout the experiment period, but a significantly larger number of control firms in the latter part. If the panel is not balanced, results relating to the control firms would be skewed towards the latter part of the experiment period.

provided on a confidential basis, we normalize every firm-day total search observation, dividing each firm-day count of *total page views* by the average firm-day value over our sample period, giving a mean value equal of one for all firms in our sample period. For our analysis, we then take the natural logarithm of one plus the normalized page views as *log total page views*, to be our measure of Yahoo Finance firm-specific information acquisition. We obtain our remaining financial and market data from FactSet, except for bid-ask spread, which is obtained from CRSP. Appendix A lists detailed definitions of all variables.

Table 1 shows the extent to which the treatment and control firms are balanced on observable characteristics, including *market capitalization*, the number of *analysts following*, the number of media articles (*media count*), *return on assets*, *market to book*, *earnings surprise*, *sales surprise*, and the incidence of a management guidance update (*guidance issuance*). None of the control variables are significantly different at conventional levels between the treatment and control firms. To verify that there are no differences between the matched control sample and all available control firms, we also consider the entire available pool of control firms instead of the matched sample, and again find in unreported analyses that there is no statistical difference ($p < 0.10$) in the control variables of any of the mean and median values between treatment and control firms, indicating that the random selection is effective at balancing covariates.

We perform regression analyses to control for the potential effects of residual differences between the two groups. *Treatment* is a dummy variable equal to 1 for firms that are randomly selected for promotion on Yahoo Finance, and 0 for control firms. First we perform a pooled regression analysis of our treatment and matched control firms on their earnings announcement day ($t = 0$).

$$y_{it} = \alpha + \beta_1 \text{treatment}_{it} + \beta_2 \text{treatment}_{it} \times \text{earnings surprise}_{it} + \beta \text{controls}_{it} + e_{it} \quad (1)$$

Equation 1 presents the general regression equation where y_{it} is one of the outcome variables of interest: *total page views*, *abnormal volume*, *abnormal returns*, and *abnormal bid-ask spread* for firm i on day t . These abnormal outcome measures follow Bushee, Core, Guay and Mamm (2010) and Blankespoor, Miller, and White (2014), using the firm as its own control, allowing us to observe the change in the outcome variables between the pre- and post-treatment periods. We use *total page views* and not abnormal page views for the experiment group because we are unable to obtain the search data for the experiment group prior to the start of the experiment. There is one observation per firm (day $t = 0$, the earnings announcement day), and the primary coefficient of interest is β_1 , which indicates the marginal effect of *treatment* on the outcome variable. We include a number of control variables which may account for differences in the outcome variables: *earnings surprise*, *log market capitalization*, *log media count*, *return on assets*, *market to book*, and *guidance issuance*. To understand whether the treatment effect varies based on the amount of the *earnings surprise*, we also include *treatment* \times *earnings surprise* as a predictor variable, and are interested in β_2 , which indicates the marginal effect of *treatment* and *earnings surprise* on the outcome variable. Standard errors are clustered by day.

$$y_{it} = \alpha + \beta_1 \text{treatment}_{it} + \beta_2 \text{post}_{it} + \beta_3 \text{treatment}_{it} \times \text{post}_{it} + \beta \text{controls}_{it} + e_{it} \quad (2)$$

We also perform a difference-in-differences regression, specified by Equation 2. Again, y_{it} is an outcome variable of interest: *total page views*, *abnormal volume*, *abnormal returns*, and *abnormal bid-ask spread* for firm i on day t . There are two observations per firm, one for the day prior to the earnings announcement ($t = -1$) where *post* is a dummy variable equal to 0, and one for the day of the earnings announcement ($t = 0$), where *post* equals 1. The coefficient of interest is

β_3 , which corresponds to the difference-in-differences effect of treatment on the outcome variable for the control group compared to the treatment group, from day $t = -1$ to day $t = 0$.

III. RESULTS

Figure 3 graphically illustrates the effects of the Yahoo Finance promotion on four key measures: *total page views*, *abnormal volume*, *abnormal returns*, and *abnormal bid-ask spread* from the fifth day prior to the earnings announcement ($t = -5$) to the fifth day after the earnings announcement ($t = 5$). We also illustrate how the effect of promotion varies according to the level of earnings surprise in Panel D. In Panel A, we find that the Yahoo Finance *total page views* are similar between the treatment and control groups, with only day $t = -3$'s difference being significant ($p < 0.10$). In Panel B, we compare abnormal trading volume for the treatment and control group and find that differences in abnormal volume are statistically insignificant, except for days $t = 2$ and $t = 3$, when the control group abnormal volume is slightly greater ($p < 0.10$) than that of the treatment group. Panel C illustrates the abnormal daily returns. The largest daily difference in abnormal returns is on day $t = 0$, where treatment firms have abnormal returns approximately 1.6 percent greater than control firms. This spread results from positive returns of 0.9 percent for the treatment firms and negative returns of -0.7 percent for the control firms. Returns for treatment firms are also lower on days $t = -1$ and $t = 3$, though these differences are smaller at -0.6 percent and -0.5 percent, respectively. Panel D illustrates the mean abnormal bid-ask spread is fairly similar between the treatment and control groups, though treatment firms have a negative abnormal bid-ask spread on day $t = 0$, whereas control firms have a positive abnormal bid-ask spread on day $t = 0$. Panel E illustrates the mean abnormal returns for treatment and control firms, by quintile of *earnings surprise*. We find that the returns for treatment firms are greater than for control firms across the range of earnings surprise, but the effect is strongest for the lowest

three quintiles of earnings surprise. Panel F illustrates the mean abnormal bid-ask spread for treatment and control firms, by quintile of *earnings surprise*. We find that the reduction in abnormal bid-ask spread is greatest for firms in the lowest two quintiles of earnings surprise. Together, these findings indicate that stocks subject to promotion have higher returns on the promotion day, especially for firms with more negative earnings surprises—suggesting that retail investors thought it was a good opportunity to buy the promoted firms after the earnings news caused stock price declines.

Table 2 reports the univariate differences between the treatment and control groups on the earnings announcement day. There are no significant differences for *log total page views* or *abnormal volume* ($p > 0.10$). This finding may be somewhat surprising given that the increased media promotion does not result in an increase in *log total page views*, which we might expect if users read the full articles. However, due to data and interface constraints, Yahoo Finance news articles are not linked to a particular company or ticker symbol. This means that users who click on news articles cannot easily click through to related Yahoo Finance company pages, and it also means that our traffic statistics cannot associate news article views with a particular firm, and as a result we do not directly observe news article clicks. Figure 2 illustrates an article that would have been seen by a user, showing that there are no active hyperlinks within the article to the stock of interest. Without such links, it is difficult for a user to quickly access Yahoo Finance’s firm-specific information pages to acquire additional information. There are technical reasons for this lack of ticker symbol linking, including the difficulty in extracting appropriate tickers from news feeds coming from many different sources, as well as Yahoo’s likely interest in encouraging users to view more news articles as opposed to engaging in further analysis of individual stocks. As a

result, we find no evidence of additional information acquisition by sample users on treatment firms.

We also find no abnormal trading volume differences between treatment and control firms ($p > 0.10$). While past empirical studies of attention and volume (e.g., Antweiler and Frank 2004 and Tetlock, Saar-Tsechansky, and Macskassy 2008) find that the frequency and tone of message board activity and news articles relate to increased trading volumes, and that media strikes are associated with a reduction in trading volume (Peress 2014), in our setting, we are not varying the content or amount of news, instead we are simply increasing the salience of such content to a sample of users.

While we do not find a detectible effect on volume or Yahoo Finance page views, we do find that treatment firms have higher abnormal returns on the earnings announcement day compared to control firms. Mean abnormal returns on the day of the promotion are 0.009 for treatment firms, compared to -0.007 for control firms (the difference is significant at the $p < 0.05$ level), indicating that treatment firms have significantly higher returns when their news articles are selected for promotion. We also find a reduction in the overall mean bid-ask spread for treatment firms, at -0.001, versus control firms, at 0.001, though the statistical significance is marginal for the entire sample ($p = 0.110$), giving initial indications that there may be a reduction in information asymmetry for firms subject to media promotion.

Table 3 reports Pearson correlation coefficients for all main variables for the pooled treatment and control firms. Abnormal returns are significantly correlated with *treatment* ($corr. = 0.11, p < 0.05$), *abnormal bid-ask spread* ($corr. = 0.18, p < 0.05$) and *earnings surprise* ($corr. = 0.33, p < 0.05$), while abnormal volume is only significantly correlated with *guidance issuance* ($corr. = 0.26, p < 0.05$). Abnormal bid-ask spread is also significantly negatively correlated with

earnings surprise ($corr. = -0.15, p < 0.05$). Yahoo Finance *total page views* is significantly correlated with *log media count*, the number of media articles published on the earnings announcement ($corr. = 0.41, p < 0.05$) and *log market capitalization* ($corr. = 0.63, p < 0.05$). *Log media count* is also significantly correlated with *return on assets* ($corr. = 0.15, p < 0.05$).

In Table 4, we perform a pooled regression of treatment and control firms on the earnings announcement day ($t = 0$), including a dummy variable, *treatment*, for firms with promoted news on day $t = 0$. Considering *total page views* in Column (1), we find no significant relationship to *treatment*, however we do find that page views are significantly associated with *log market capitalization* ($coeff. = 0.395, p < 0.01$), and *log media count* ($coeff. = 0.250, p < 0.05$), which is consistent with the prior literature, but also clarifies that using media articles as a measure of attention may be confounded with the fact that more media articles are associated with underlying phenomena relating to the firm, increasing both information acquisition by investors as well as the amount of media coverage. *Abnormal volume* is the dependent variable in Column (2), and it is most strongly related to *guidance issuance* ($coeff. = 1.442, p < 0.01$), *log market capitalization* ($coeff. = -0.296, p < 0.01$), and *return on assets* ($coeff. = 3.008, p < 0.01$).

Turning to abnormal returns in Column (3), after including controls for firm and earnings announcement characteristics, we find that *treatment* is associated with higher abnormal returns on day t , ($coeff. = 0.014, p < 0.10$). The most important determinant of abnormal returns on day t is *earnings surprise* ($coeff. = 2.545, p < 0.01$), while the other control variables are not significant. We also test whether the effect on the dependent variable of interest is affected by the level of earnings surprise by including *treatment* \times *earnings surprise* as a predictor variable. The coefficient on *treatment* \times *earnings surprise* is -1.264 ($p < 0.10$), providing some evidence that investor attention increases abnormal returns to a greater extent for firms with negative earnings

surprise, consistent with the results illustrated in Figure 3, Panel D. Column (4) provides results where *abnormal bid-ask spread* is the dependent variable, and the coefficient on *treatment* is -0.001 ($p < 0.10$), indicating that the bid-ask spread declines for treatment firms. The coefficient on *treatment* \times *earnings surprise* is positive but not significant at conventional levels.

To isolate the effect of news article promotion, Table 5 presents a difference-in-differences research design, which compares the difference in Yahoo Finance page views and market responses from the day before the promotion ($t = -1$, $post = 0$) with the earnings announcement and promotion day ($t = 0$, $post = 1$). Columns (1) and (2) report on the effect of *treatment* on *abnormal volume* and *total page views*, respectively, and the effect is not statically significant, similar to the inferences drawn from the earlier analyses. Column (3) reports the difference-in-differences effect of treatment on abnormal returns. Consistent with the earlier analyses, treatment has a positive effect on returns in the post period (*treatment* \times *post coeff.* = 0.022, $p < 0.01$), compared to the control firms. In the difference-in-difference analysis, the control variables have little effect on returns, with the exception of the earnings surprise, which again is positive as expected (*coeff.* = 0.991, $p < 0.01$). Column (4) provides results for the difference-in-differences effect on abnormal bid-ask spread, finding that treatment has a negative effect on bid-ask spread (*treatment* \times *post coeff.* = -0.002, $p < 0.10$).

Together, these results indicate some interesting ramifications for investor attention, in a setting where investor attention is varied, and other factors are held constant. We do not see an increase in information acquisition by the investors subject to promotion of randomly selected earnings announcement articles. We also do not observe increases in trading volume, indicating that the increased attention among a sample of users displaces trading by other market participants. We do, however, observe higher returns to stocks that receive the additional investor attention, and

that the higher returns are more pronounced for firms with negative earnings surprises. We also find that the level of information asymmetry decreases for promoted firms, with a reduction in bid-ask spread for promoted firms. These results differ somewhat from the existing investor attention literature, where these outcome variables are often used as proxies for investor attention, and with the media literature, where media can also be influenced by such factors as trading volume, market returns, and information demand by investors.

In Table 6, we investigate the effect of media promotion for less visible firms, predicting that the additional media promotion will have a greater effect on less visible firms. Panel A reports regression results similar to Table 5, but for firms with below-median market capitalization, and Panel B reports for above-median market capitalization. Inferences in Panel A are similar to the prior results, though they are somewhat stronger for less-visible firms. There are no significant results for *total page views* or abnormal volume in Columns (1) and (2). In Column (3) the difference-in-differences effect of treatment on abnormal returns is more pronounced for less-visible firms ($treatment \times post\ coeff. = 0.030, p < 0.05$). In Column (4), the difference-in-differences effect of treatment on abnormal bid-ask spread is also more pronounced for less-visible firms ($treatment \times post\ coeff. = -0.005, p < 0.10$). These results contrast with Panel B, which illustrates that for more visible firms, there is no difference-in-differences effect for any of the outcome variables.

IV. CONCLUSION

This study uses a natural field experiment to examine the effects of promoting earnings announcement articles on the equity markets. On the day of earnings announcements, media articles for a random sample of firms are given prominent positioning on the front page of Yahoo Finance to a one percent subsample of Yahoo Finance users. We confirm that promoted and control

firms are balanced across earnings news and fundamental characteristics, and we find that promoted firms experience an increase in abnormal returns on the day of the earnings announcement relative to control firms. Perhaps surprisingly, we do not find evidence of significant increases in trading volume or information acquisition by users subject to the promotion.

These findings suggest that retail investors buy stocks that catch their attention in a controlled setting, and highlight the potential capital market effects of the business media, independent of other market-related activity, such as trading volume or past returns. Moreover, they reinforce the notion of how the media and the internet can significantly shape individual behavior (e.g., Wu 2016). Furthermore, the study provides evidence that the market pricing of earnings not only depends on the earnings news but also on the extent of investor attention. Overall, we hope that this research encourages other capital markets field experiments.

REFERENCES

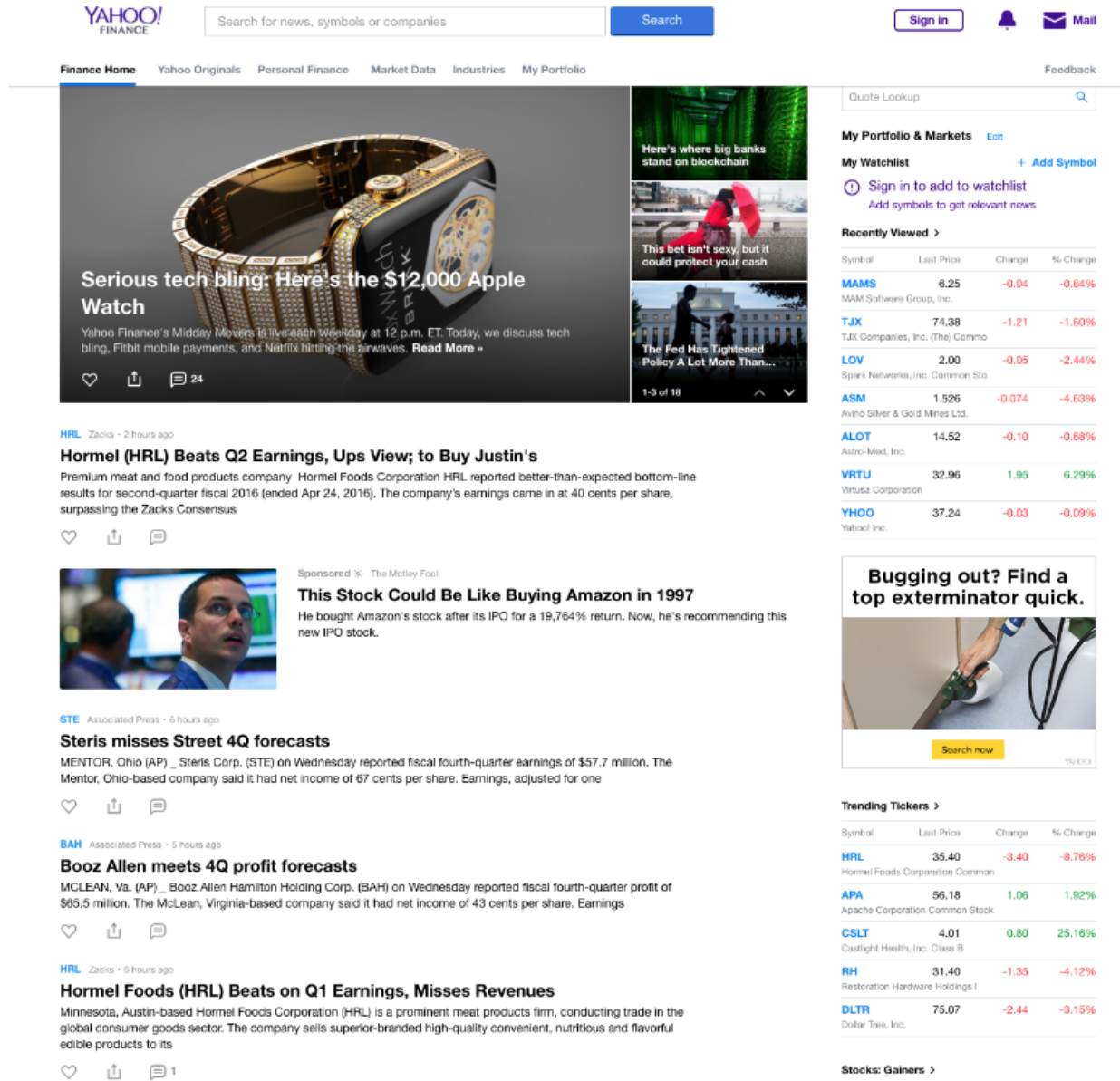
- Aboody, D., R. Lehavy, and B. Trueman. 2010. Limited attention and the earnings announcement returns of past stock market winners. *Review of Accounting Studies* 15 (2): 317-344.
- Ahern, K., and D. Sosyura. 2014. Who writes the news? Corporate press releases during merger negotiations. *The Journal of Finance* 69 (1): 241-291.
- Antweiler, W., and M. Frank. 2004. Is all that talk just noise? The information content of internet stock message boards. *The Journal of Finance* 59 (3): 1259-1294.
- Barber, B., and T. Odean. 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.
- Blankespoor, E., G. Miller, and H. White. 2014. The role of dissemination in market liquidity: Evidence from firms' user of Twitter. *The Accounting Review* 89 (1): 79-112.
- Bushee, B., J. Core, W. Guay, and S. Hamm. 2010. The role of the business press as an information intermediary. *Journal of Accounting Research* 48 (1): 1-19.
- Chen, J., H. Hong, and J. Stein. 2002. Breadth of ownership and stock returns. *Journal of Financial Economics* 66 (2): 171-205.
- comScore. 2015. comScore Top Financial News & Research Sites. New York, New York.
- Core, J., W. Guay, and D. Larcker. 2008. The power of the pen and executive compensation. *Journal of Financial Economics* 88 (1): 1-25.
- DellaVigna, S., and J. Pollet. 2009. Investor inattention and Friday earnings announcements. *The Journal of Finance*, 64 (2): 709-749.
- Drake, M., N. Guest, and B. Twedt. 2014. The media and mispricing: The role of the business press in the pricing of accounting information. *The Accounting Review* 89 (5): 1673-1701.
- , D. Roulstone, and J. Thornock. 2015. The determinants and consequences of information acquisition via EDGAR. *Contemporary Accounting Research* 32 (3): 1128-1161.
- Dyck, A., N. Volchkova, and L. Zingales. 2008. The corporate governance role of the media: Evidence from Russia. *The Journal of Finance* 63 (3): 1093-1135.
- Engelberg, J., and C. Parsons. 2011. The causal impact of media in financial markets. *The Journal of Finance* 66 (1): 67-97.
- Floyd, E., and J. List. 2016. Using field experiments in accounting and finance. *Journal of Accounting Research* 54 (2): 437-475.
- Gentzkow, M., and J. Shapiro. 2010. What drives media slant? Evidence from U.S. daily newspapers. *Econometrica* 78(1): 35-71.
- Hamilton, J. 2004. All the news that's fit to sell: How the market transforms information into news. *Princeton University Press*.

- Hirshleifer, D., S. Lim, and S. H. Teoh, 2009. Driven to distraction: Extraneous events and underreaction to earnings news. *The Journal of Finance* 64 (5): 2289-2325.
- Huberman, G., and T. Regev. 2001. Contagious speculation and a cure for cancer: A nonevent that made stock prices soar. *The Journal of Finance* 56 (1): 387-396.
- Lawrence, A., J. Ryans, E. Sun, and N. Laptev. 2016. Yahoo Finance search and earnings announcements. Working paper, University of California at Berkeley.
- , ———, and ———. 2017. Investor demand for sell-side research. Forthcoming *The Accounting Review*.
- Lehavy, R., and R. Sloan. 2008. Investor recognition and stock returns. *Review of Accounting Studies* 13 (2-3): 327-361.
- Peress, J. 2014. The media and the diffusion of information in financial markets: Evidence from newspaper strikes. *The Journal of Finance* 69 (5): 2007-2043.
- Solomon, D., E. Soltes, and D. Sosyura. 2014. Winners in the spotlight: Media coverage of fund holdings as a driver of flows. *Journal of Financial Economics* 113 (1): 53-72.
- Tetlock, P. 2007. Giving content to investor sentiment: The role of media in the stock market. *The Journal of Finance* 62 (3): 1139-1168.
- , M. Saar-Tsechansky, and S. Macskassy. 2008. More than words: Quantifying language to measure firms' fundamentals. *The Journal of Finance* 63 (3): 1437-1467.
- . 2011. All the news that's fit to reprint: Do investors react to stale information? *Review of Financial Studies* 24 (5): 1481-1512.
- Wu, T. 2016. *The attention merchants: The epic scramble to get inside our heads*. New York: Knopf.
- Yahoo Inc. (Yahoo). 2016. *Yahoo Advertising Statistics*. Sunnyvale, California.

APPENDIX A
Variable Definitions

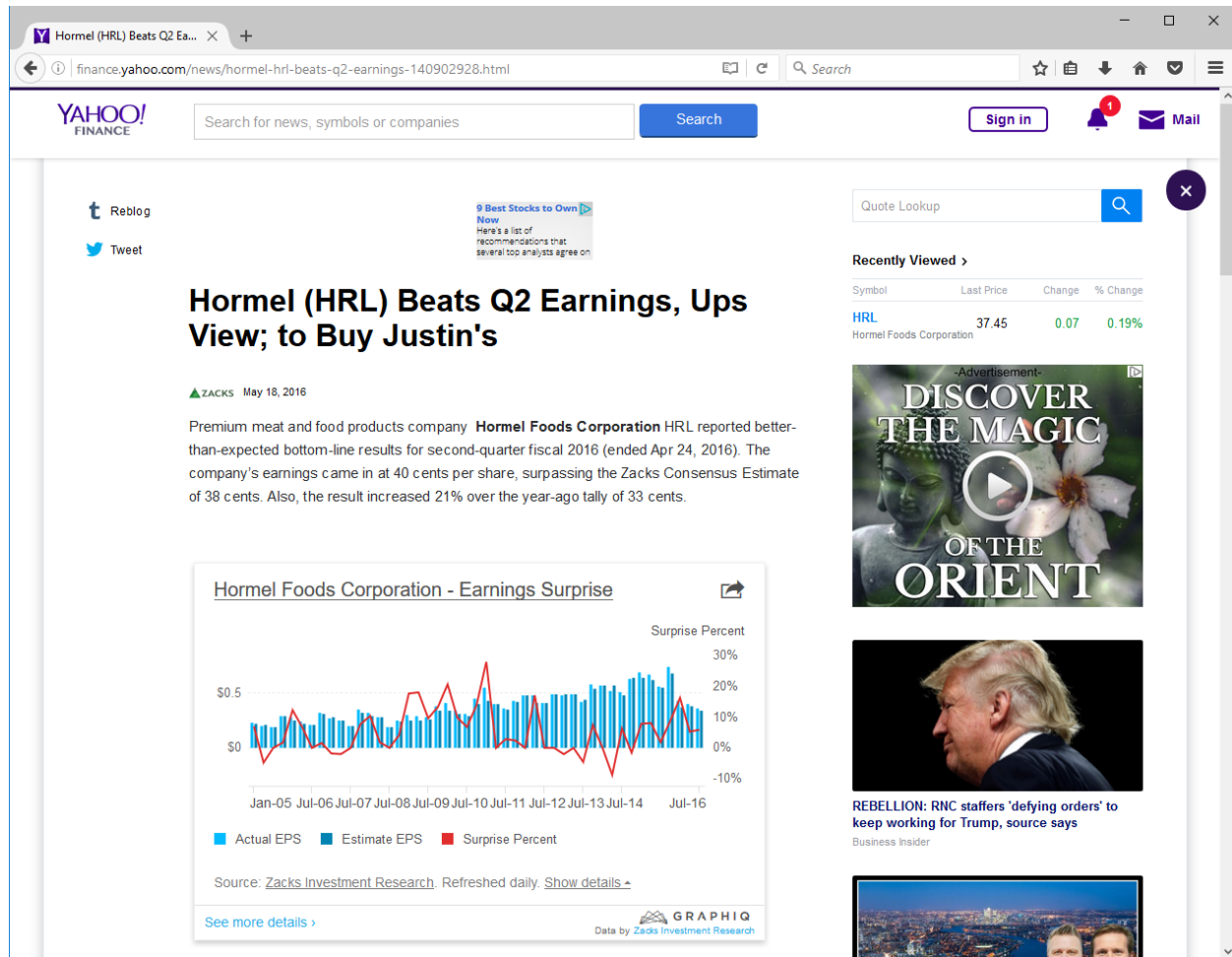
Variable	Definition
Abnormal Returns _{<i>i t</i>}	Firm <i>i</i> 's market-adjusted return on day <i>t</i> , where market-adjusted return is defined as the raw return minus the S&P 500 equal-weighted index return;
Abnormal Volumes _{<i>i t</i>}	Firm <i>i</i> 's trading volume on day <i>t</i> minus the average trading volume on the same day of the week over the prior 10 weeks, scaled by the average trading volume on the same day of the week over the prior 10 weeks; winsorized at the one-percent level;
Abnormal Bid – Ask Spread _{<i>i t</i>}	Firm <i>i</i> 's bid-ask spread on day <i>t</i> minus the average bid-ask spread on the same day of the week over the prior 10 weeks, scaled by the average bid-ask spread on the same day of the week over the prior 10 weeks. Bid-ask spread is calculated as ask price minus bid price, scaled the mid-point price of the spread;
Guidance Issuance _{<i>i t</i>}	"1" if management issues an EPS or sales guidance for firm <i>i</i> on day <i>t</i> , "0" otherwise;
Log Analyst Following _{<i>i t</i>}	The natural log of one plus the number of analyst following for firm <i>i</i> on day <i>t</i> ; winsorized at the one-percent level;
Log Media Count _{<i>i t</i>}	The natural log of one plus the number of media count for firm <i>i</i> on day <i>t</i> ; winsorized at the one-percent level;
Market Capitalization _{<i>i t</i>}	The natural log of market capitalization for firm <i>i</i> on day <i>t</i> ; winsorized at the one-percent level;
Log Total Page Views _{<i>i t</i>}	The natural log of one plus the total number of normalized Yahoo Finance page views for firm <i>i</i> on day <i>t</i> . Page views are normalized by the mean daily page view count for all treatment and control firms during our sample period. Total Yahoo Finance page views is the sum of page views from nine Yahoo Finance pages including Summary page, Conversations page, Statistics page, Profile page, Financials page, Options page, Holders page, Historical Data page, and Analysts page;
Market to Book _{<i>i t</i>}	The ratio of market capitalization to book value of equity for firm <i>i</i> on day <i>t</i> ; winsorized at the one-percent level;
Post _{<i>i t</i>}	"1" if firm <i>i</i> announces its earnings announcement on day <i>t</i> = 0, "0" for the trading day before the earnings announcement day (<i>t</i> = -1);
Return on Assets _{<i>i t</i>}	The ratio of net income to total assets for firm <i>i</i> on day <i>t</i> ; winsorized at the one-percent level;
Sales Surprise _{<i>i t</i>}	Firm <i>i</i> 's sales on day <i>t</i> minus its consensus analysts' sales forecast on day <i>t</i> = - <i>I</i> , scaled by its consensus analysts' sales forecast on day <i>t</i> = - <i>I</i> ; winsorized at the one-percent level;
Earnings Surprise _{<i>i t</i>}	Firm <i>i</i> 's actual earnings per share minus the most recent consensus analysts' earnings per share forecasts, scaled by the price per share two days before the earnings announcement day; winsorized at the one-percent level; and
Treatment _{<i>i t</i>}	"1" if firm <i>i</i> is a treatment firm, "0" for a matched control firm. A control firm is selected for each treatment firm per day based on the closest market capitalization.

FIGURE 1
Example of a Yahoo Finance Home Page for a Promotion Sample User

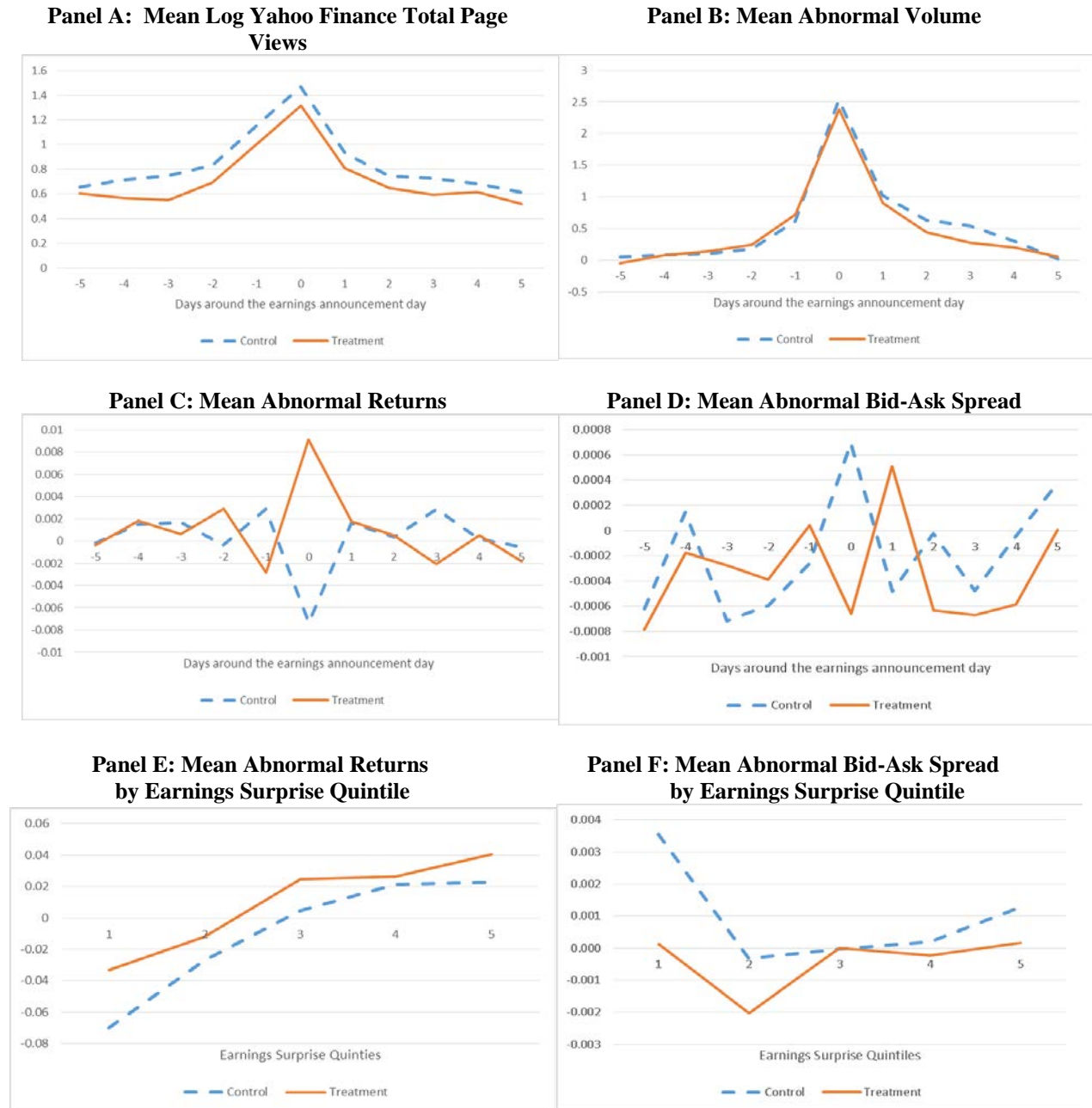


This figure illustrates an example of a Yahoo Finance (*finance.yahoo.com*) home page for a user in the promotion sample, from May 18, 2016. On this day, Hormel, Steris, and Booz Allen reported earnings and were randomly selected from promotion. The effect of their promotion was to present news articles related to their earnings announcements among the top five home page of a random 1% sample of Yahoo Finance users.

FIGURE 2
Example of a Yahoo Finance News Article Page



This figure illustrates an example of a Yahoo Finance (*finance.yahoo.com*) news page. This is the article presented to a user who clicked on the topmost article in the news stream presented in Figure 1. While the article clearly identifies Hormel's ticker symbol, there are no active hyperlinks in the article headline or the body text to allow the user to easily jump to the Yahoo Finance financial information pages for Hormel.

FIGURE 3*Yahoo Finance Search, Abnormal Volume, and Abnormal Returns around the Earnings Announcement Day*

This figure plots mean Yahoo Finance search, abnormal volume, abnormal returns, and abnormal bid-ask spread on and around the earnings announcement day. Panels A-D plot the log value of total Yahoo Finance search, abnormal volume, abnormal returns, and abnormal bid-ask spread from five trading days before the earnings announcement day to five trading days after the earnings announcement day, respectively. Panels E-F plot the mean value of abnormal returns and abnormal bid-ask spread by earnings surprise quintile, respectively, with quintile 1 being the lowest quintile and quintile 5 being the highest quintile.

TABLE 1
Firm Characteristics between Treatment and Matched Control Firms

	Panel A: Mean Comparisons						Panel B: Median Comparisons			
	Treatment		Control		Diff.	Sig.	Treatment	Control	Diff.	Sig.
	N	Mean	N	Mean			Median	Median		
Market Capitalization (in millions)	169	14,098	169	15,304	-1,206	0.747	1,946	2,224	-278	0.447
Log Market Capitalization	169	21.376	169	21.535	-0.159	0.505	21.389	21.523	-0.133	0.447
Analyst Following	168	11.833	169	12.657	-0.823	0.442	10.000	10.000	0.000	0.590
Log Analyst Following	168	2.238	169	2.287	-0.048	0.614	2.398	2.398	0.000	0.591
Media Count	169	7.118	169	7.231	-0.112	0.853	6.000	6.000	0.000	0.994
Log Media Count	169	1.885	169	1.849	0.037	0.646	1.946	1.946	0.000	0.995
Return on Assets	169	0.026	169	0.004	0.022	0.109	0.039	0.029	0.010	0.357
Market to Book	166	3.495	167	3.906	-0.412	0.400	2.323	2.395	-0.073	0.641
Earnings Surprise	164	0.000	164	-0.001	0.001	0.448	0.000	0.000	0.000	0.658
Sales Surprise	162	-0.146	159	-0.091	-0.055	0.941	0.158	0.142	0.016	0.723
Guidance Issuance	169	0.467	169	0.485	-0.018	0.899	0.000	0.000	0.000	0.900

This table presents the descriptive statistics for firm characteristics between treatment and matched control firms. Panel A presents the mean comparisons. Diff. refers to the mean difference between treatment and matched control firms. Sig. refers to the p-value obtained from two-sided tests of differences in means. Panel B presents the median comparisons. Diff. refers to the median difference between treatment and matched control firms. Sig. refers to the p-value obtained from the Mann-Whitney tests of differences in medians.

TABLE 2

Univariate Analysis of Yahoo Finance Search, Abnormal Volume, Abnormal Returns, and Abnormal Bid-Ask Spread between Treatment and Matched Control Firms

	Panel A: Mean Comparisons				Panel B: Median Comparisons			
	Treatment Mean	Control Mean	Diff.	Sig.	Treatment Median	Control Median	Diff.	Sig.
N	169	169			169	169		
Log Total Page Views	1.315	1.468	-0.153	0.308	0.917	0.945	-0.028	0.344
Abnormal Volume	2.389	2.539	-0.150	0.589	1.781	1.676	0.105	0.910
Abnormal Returns	0.009	-0.007	0.016	0.037	0.006	-0.011	0.017	0.037
Abnormal Bid-Ask Spread	-0.001	0.001	-0.002	0.110	0.000	0.000	0.000	0.140

This table presents the descriptive statistics for Yahoo Finance search, abnormal volume, abnormal returns, and abnormal bid-ask spread between treatment and matched control firms. Panel A presents the mean comparisons. Diff. refers to the mean difference between treatment and matched control firms. Sig. refers to the p-value obtained from two-sided tests of differences in means. Panel B presents the median comparisons. Diff. refers to the median difference between treatment and matched control firms. Sig. refers to the p-value obtained from the Mann-Whitney tests of differences in medians.

TABLE 3
Pearson Correlation

Variable	1	2	3	4	5	6	7	8	9	10	11
1 Log Total Page Views	1										
2 Abnormal Volume	0.17	1									
3 Abnormal Returns	0.00	-0.09	1								
4 Abnormal Bid-Ask Spread	-0.02	-0.07	0.18								
5 Treatment	-0.06	-0.03	0.11	-0.09	1						
6 Earnings Surprise	0.06	-0.09	0.33	-0.15	0.04	1					
7 Log Market Capitalization	0.63	-0.10	0.06	0.00	-0.04	0.07	1				
8 Log Media Count	0.41	-0.09	0.09	-0.02	0.03	0.03	0.49	1			
9 Return on Assets	0.14	0.09	-0.02	-0.00	0.09	-0.08	0.43	0.15	1		
10 Market to Book	0.22	0.02	0.02	-0.01	-0.05	0.03	0.34	0.05	0.28	1	
11 Guidance Issuance	0.15	0.26	0.08	-0.04	-0.02	0.05	0.22	0.01	0.22	0.18	1

This table presents the Pearson correlation coefficients for the regression variables in Table 4. The significant correlation coefficients at a 0.05 level are bolded. See Appendix A for variable definitions.

TABLE 4*Regressions of Yahoo Finance Search, Abnormal Volume, Abnormal Returns, and Abnormal Bid-Ask Spread for Treatment and Matched Control Firms*

Dep. Var.	(1)		(2)		(3)		(4)	
	Log Total Page Views		Abnormal Volumes		Abnormal Returns		Abnormal Bid-Ask Spread	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Intercept	-7.621***	-8.82	8.004***	4.64	-0.028	-0.73	0.003	0.39
Treatment	-0.049	-0.52	-0.205	-0.85	0.014*	1.86	-0.001*	-1.76
Earnings Surprise	-7.398	-1.48	-36.183	-1.50	2.545***	5.36	-0.176	-1.14
Treatment × Earnings Surprise	12.795	1.35	37.982	1.32	-1.264*	-1.79	0.183	1.16
Log Market Capitalization	0.395***	8.39	-0.296***	-3.34	0.000	0.04	-0.000	-0.21
Log Media Count	0.250**	2.31	0.106	0.49	0.008	1.26	-0.000	-0.11
Return on Assets	-1.699***	-3.65	3.008***	2.68	-0.011	-0.28	-0.004	-0.84
Market to Book	0.013	1.15	-0.001	-0.04	-0.000	-0.02	0.000	0.37
Guidance Issuance	0.120	1.03	1.442***	4.94	0.011	1.29	-0.001	-0.95
Day clustering	Yes		Yes		Yes		Yes	
N	323		323		323		323	
Adjusted R^2	0.420		0.113		0.131		0.021	

This table presents regression results for Yahoo Finance Search, abnormal volume, abnormal returns, and abnormal bid-ask spread for treatment and matched control firms. Column (1) presents the results for the log value of total Yahoo Finance Search. Column (2) presents the results for abnormal volumes. Column (3) presents the results for abnormal returns. Column (4) presents the results for abnormal bid-ask spread. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, using two-tailed tests. T-statistics are calculated using clustered standard errors by day. See Appendix A for variable definitions.

TABLE 5

Regressions of Yahoo Finance Search, Abnormal Volume, Abnormal Returns, and Abnormal Bid-Ask Spread for Earnings Announcement Day Relative to the Day before between Treatment and Matched Control Firms

Dep. Var.	(1)		(2)		(3)		(4)	
	Log Total Page Views		Abnormal Volume		Abnormal Returns		Abnormal Bid-Ask Spread	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Intercept	-6.788***	-11.41	4.888***	5.68	-0.019	-0.92	-0.003	-0.61
Treatment	-0.056	-0.55	0.030	0.31	-0.005*	-2.00	0.001	1.21
Post	0.067	0.46	1.217***	4.68	-0.019***	-3.08	0.002	1.82
Treatment × Post	-0.012	-0.08	-0.240	-0.82	0.022***	2.91	-0.002*	-1.86
Earnings Surprise	2.084	0.81	-3.277	-0.42	0.991***	4.78	0.033	0.70
Log Market Capitalization	0.344***	12.10	-0.209***	-5.12	0.001	0.79	0.000	0.66
Log Media Count	0.346***	6.64	0.153**	2.09	0.003	1.45	-0.000	-1.26
Return on Assets	-1.407***	-4.42	2.309***	3.23	0.000	0.02	-0.009	-1.72
Market to Book	0.014*	1.77	0.006	0.48	0.000	-0.37	0.000	0.11
Guidance Issuance	0.136	1.16	1.319***	4.92	0.013	1.54	-0.001	-1.25
Day clustering	Yes		Yes		Yes		Yes	
N	656		656		656		656	
Adjusted R^2	0.434		0.239		0.075		0.015	

This table presents regression results for Yahoo Finance Search, abnormal volume, abnormal returns, and abnormal bid-ask spread for earnings announcement day relative to the day before between treatment and matched control firms. Column (1) presents the results for the log value of total Yahoo Finance Search. Column (2) presents the results for abnormal volume. Column (3) presents the results for abnormal returns. Column (4) presents the results for abnormal bid-ask spread. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, using two-tailed tests. T-statistics are calculated using clustered standard errors by day. See Appendix A for variable definitions.

TABLE 6

Regressions of Yahoo Finance Search, Abnormal Volume, Abnormal Returns, and Abnormal Bid-Ask Spread for Earnings Announcement Day Relative to the Day before between Treatment and Matched Control Firms by Firm Size

Panel A: Small Firms								
Dep. Var.	(1)		(2)		(3)		(4)	
	Log Total Page Views		Abnormal Volume		Abnormal Returns		Abnormal Bid-Ask Spread	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Intercept	-2.862***	-4.58	3.317	1.65	-0.036	-0.59	-0.011	-0.70
Treatment	0.021	0.17	-0.009	-0.05	-0.008	-1.64	0.002	1.27
Post	0.078	0.65	1.481***	3.16	-0.032***	-3.18	0.005**	2.01
Treatment × Post	-0.062	-0.42	-0.284	-0.58	0.030**	2.31	-0.005*	-1.96
Controls	Yes		Yes		Yes		Yes	
Day clustering	Yes		Yes		Yes		Yes	
N	329		329		329		329	
Adjusted R^2	0.105		0.229		0.112		0.023	

Panel B: Large Firms								
Dep. Var.	(1)		(2)		(3)		(4)	
	Log Total Page Views		Abnormal Volume		Abnormal Returns		Abnormal Bid-Ask Spread	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Intercept	-13.240***	-11.52	6.854***	3.96	0.003	0.08	0.000	0.96
Treatment	-0.118	-0.91	0.127	1.20	-0.002	-0.89	0.000	1.05
Post	-0.006	-0.03	0.960***	3.32	-0.005	-0.71	-0.000***	3.03
Treatment × Post	0.042	0.21	-0.261	-0.80	0.014	1.20	-0.000	-0.82
Controls	Yes		Yes		Yes		Yes	
Day clustering	Yes		Yes		Yes		Yes	
N	327		327		327		327	
Adjusted R^2	0.423		0.261		0.001		0.049	

This table presents regression results for Yahoo Finance Search, abnormal volume, abnormal returns, and abnormal bid-ask spread for earnings announcement day relative to the day before between treatment and matched control firms partitioned by firm size. Panel A and Panel B present the results for small and large firms, respectively. Small (large) firms are defined as the observations with market capitalization lower (higher) than the sample median. Column (1) presents the results for the log value of total Yahoo Finance Search. Column (2) presents the results for abnormal volume. Column (3) presents the results for abnormal returns. Column (4) presents the results for abnormal bid-ask spread. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, using two-tailed tests. T-statistics are calculated using clustered standard errors by day. See Appendix A for variable definitions.