Physica A 562 (2021) 125357

Contents lists available at ScienceDirect

Physica A

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

Stock market reactions to social media: Evidence from WeChat recommendations

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ARTICLE INFO

Article history:
Received 6 November 2018
Received in revised form 23 September 2020
Available online 30 September 2020

Keywords:
WeChat recommendations
Price pressure hypothesis
Market reactions
Information diffusion
Social media

ABSTRACT

This paper examines the market behavior of stocks that are favorably mentioned on official WeChat account (OWA). To the best of our knowledge, we are the first to investigate market reactions to recommendations on WeChat. The empirical results show that there is a significantly positive abnormal return and excess trading volume on the publication day. Moreover, the cumulative average abnormal return for OWA completely reverses in a short time, which supports the price pressure hypothesis. Additional analyses reveal that market reactions in the smaller firms are significantly greater than those in the largest firms on the publication day. Finally, we preclude possibilities that market reactions on the event day are induced by the secondary dissemination of analyst recommendations, firm-specific news releases, media coverage, and previous positive significant abnormal returns.

1. Introduction

In recent years, due to the popularity of intelligent terminals as well as the low cost and convenience of information acquisition, social media has gradually played a greater role in our lives. Micro-blogging, WeChat and mobile clients have become the primary sources of information about current events for many Chinese. Among them, WeChat is one of the most popular social media platforms in China and can provide free services for intelligent terminals. According to the "2016 WeChat Data Report", the daily number of login users reached 768 million in September 2016, the viscosity and frequency of users are much better than those of micro-blogging, 80% of users read content in the Moments sections, and 20% of users actively obtain information from official WeChat accounts (OWA). Specifically, OWA are application accounts applied for by developers or sellers on the WeChat public platform. The applicants can publish daily information in text, picture, voice and video format. To enhance their reputations, so that they can obtain some economic benefits, the groups of the OWA usually issue useful or interesting content to attract people's attention. WeChat users can obtain information that they are interested in as long as they pay close attention to the accounts. Therefore, OWA can reach a large number of potential investors whose trading behavior may be influenced by the pushed information. It is known that information is an important basis on which investors make investment decisions. Individual investors usually obtain relevant stock information by independently searching behaviors through the internet [1–4], examining investors' expectations as reflected by sentiment, which are extracted from social networks [5–9], and acquainting relevant stocks through the online interactive platforms [10–13]. In this paper, we study how the market reacts to OWA recommendations.

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https://doi.org/10.1016/j.physa.2020.125357
0378-4371/

To examine the question of whether security recommendations have an impact on the stock market, we investigate the reactions of stock prices and trading volume after OWA recommendations, which are mainly browsed on mobile smartphones. Investors can obtain the issued information anywhere and anytime as long as they have a smart mobile phone. Based on Efficient Market Theory [14], the available information can be fully and instantaneously reflected by the security price. Therefore, the recommendations of such information by financial media outlets would have no value for a long time. Although analysts' recommendations often depend on historical information, many studies have shown that high-ranked recommended stocks can obtain a significantly positive abnormal return [15,16]. Furthermore, a large number of studies have studied the underlying mechanisms of market reactions to mass media. The price pressure hypothesis (PPH) and the information diffusion hypothesis (IDH) are two main points of views. The PPH states that price reactions are driven by the naïve buying-pressure or selling-pressure from individual investors and will reverse in a relatively short period. The IDH states that price changes are driven by information diffusion and have no obvious reversal in a short time. In this paper, we find that the stock market reacts to OWA recommendations via the PPH.

Our paper contributes to the literature in the following two aspects. First, we investigate market reactions to recommendations on WeChat, which is a new information carrier and information dissemination channel through which investors can obtain the information more conveniently and faster than by traditional media, i.e., newspaper, magazines, newsletters [17–21]. This study supplements existing literature about analysts' recommendations. Second, we further show that the market reactions induced by the recommendations on OWA are not secondary disseminations of analyst information and not induced by firm-specific news releases, media coverage, and previous positive significant abnormal returns. This analysis provides implications for the study of investors' behavior, for example, why some investors follow recommendations on OWA. This analysis is especially relevant as the transaction volume of individual investors accounted for more than 80% of the total transactions in the Chinese stock market in 2017.

The paper proceeds as follows. Section 2 discusses the related literature. Section 3 describes the dataset of OWA and the capital market data. Section 4 presents the models and empirical results. Section 5 gives the empirical results of the potential explanations. Section 6 concludes the paper.

2. Literature review

A large body of studies is related to our research. One strand of literature focuses on the market reactions to recommendations issued by financial experts. Barber and Loeffler [22] use analysts' recommendations published in the monthly "Dartboard" column of the *Wall Street Journal* to analyze market reactions, and they find an average abnormal return of 4% for the two days following the publication of a recommendation. Palmon et al. [18] show that analysts' recommendations published in *BusinessWeek* induce abnormal returns on both the publication day and the following day. Desai and Jain [23] report that purchase recommendations can obtain a significant abnormal return of 1.91% from the recommendation day to the publication day but the abnormal returns disappear for one to three year post-publication day holding periods. Womack [24] finds that the post-recommendation drift is modest and short-lived for purchase recommendations but that the drift is larger (−9.1%) over a longer six-month post-event period for sell recommendations. Ferreira and Smith [25] show that the "Small Stock Focus" column in the *Wall Street Journal* tends to focus on stocks that have large market reactions on the day before the event day. Jegadeesh et al. [26], Liu et al. [17], and Desai and Jain [23] observe positive and significant excess returns on the day before the publication date, the publication day, and the day after the publication day. Barber et al. [27] use the recommendations from 269 brokerage houses and 4340 analysts to find that the portfolios following the analysts' recommendations provide an average annual abnormal gross return of more than 4%.

Another strand of literature further studies the underlying mechanisms of market reactions to different corporate news, either by affecting information or by affecting the temporary price pressure. Kraus and Stoll [28] were the first to study this topic. Blouin et al. [29] and Trueman et al. [11] reveal that market reactions to the disclosure of earnings announcements is a temporary price-pressure effect. Barber and Loeffler [22] and Albert and Smaby [30] find that a positive excess return is a result of buying pressure as well as information content within the recommendations. Kerl and Walter [21] conclusively observe that price increases for value stocks are effects of information value, whereas these of small stocks are the result of price pressure. Furthermore, Barber and Loeffler [22] show that the positive abnormal return on publication day is partially reversed within 25 trading days. Similarly, Liang [31] documents that the initial price effect is reversed within 15 trading days. Zhang et al. [32] study the underlying mechanisms of market reactions to internet news and find that excess return reactions to news related to announcement interpretations completely reverse within 50 trading days but that reactions to news related to investment focus only partially reverse within 50 trading days. The price pressure hypothesis (PPH) suggests that market reactions are the effects of temporary buying pressure and will reverse in a relatively short period. However, the information diffusion hypothesis (IDH) suggests that market reactions are the effects of relevant information about fundamentals and will not reverse in a relatively short period.

3. Data description

3.1. Official WeChat accounts

By December 2016, almost 6.4 million OWA were included in the QingBo index, which is the main authority on the big-data platforms of new media; all the related accounts are ranked daily by the QingBo index according to their level

Table 1
Descriptive statistics.

Variable	Mean	Median	Max	Min	Sd
Market *capitalization*	2.28e+06	9.66e+06	1.17e+09	8.09e+05	6.84e+07
Analysts' recommendations	0.09	0.00	5.0	0.00	0.39
Media coverage	6.94	3.00	252.00	0.00	13.00
Firm-specific news	0.59	0.00	4.00	0.00	0.77

The table provides the sample's summary statistics of market *capitalization*, the number of analysts' recommendations on five trading days before to event day, the number of reports on traditional news media on five trading days before to event day, and the number of firm-specific news releases on five trading days before to event day, respectively.

of influence.[1] In this study, we only focus on the OWA that are labeled as being under the sub-classification of the stock market. A total of 355 of these OWA were collected in December 2016. As is well known, the higher the ranking, the greater the level of influence. Therefore, we choose OWA that were continuously ranked in the top ten of the monthly lists from June 2016 to December 2016. As a result, we obtain five OWA. We eliminate one OWA because it mainly pushes messages about the macro-economy rather than stock recommendations.

We manually collect the suggested stocks by paying attention to the four OWA. We preclude recommendations that were cited by analysts as belonging to the financial sector according to Wind Database. because such recommendations may have been pre-published via other channels and would thus interfere with our results on event day. We record both the publication date and the corresponding mentioned stock in a spreadsheet. The sample period ranges from June 1, 2016 to November 30, 2016. If multiple recommendations exist for the same company on the same day, the company is counted only once. Recommendations issued between 3 p.m. the previous day and 9:30 a.m. the next day are taken as issued at the next day. The next trading day following the publication date is the event date in the event study methodology.

In total, there are 964 observations from the four OWA; specifically, there are 283 observations, 148 observations and 533 observations from the ChiNext board, the SME board and the Main board, respectively. Therefore, it seems that the OWA prefer to recommend stocks from the Main board. As these OWA recommendations only show the stock codes or the reasons why they suggest you should buy such stocks, which is not related to the matter of negative tone, the research in this paper does not consider the tone of the recommendations.

3.2. Capital market data

The capital market data come from the China Stock Market and Accounting Research Database (CSMAR Database) and include individual *stock return*, trading volume, *market capitalization* and the corresponding *daily return* of the Chinese stock index CSI300. The data of analysts' recommendations, *media coverage*, as well as firm-specific news releases, are from the RESSET financial database. More details are shown in Table 1.

The series period ranges from November 1, 2015 to June 30, 2017. As our sample covers the stocks listed by the ChiNext board, the SME board and the Main board from the two stock exchanges, we use the ChiNext board index, the SME board index and the CSI300 index return as the market returns.

4. Model setup and results

4.1. Abnormal return and excess volume

To investigate the impact of the OWA recommendations on stock price, we employ an event study model with market return adjustment [33]. Thus, the abnormal return for security i on date t is calculated as follows:

$$AR_{it} = R_{it} - R_{mt}, t = -10, \cdots, 10 \tag{1}$$

$$\mathrm{AR}_t = \frac{\sum_{i=1}^{N} \mathrm{AR}_{it}}{N}, t = -10, \cdots, 10 \tag{2}$$

where R_{it} is the return on stock i for date t, and R_{mt} is the return on the relevant index of the board to which the samples belong for date t. Therefore, we choose the CSI 300 index, the ChiNext board index and the SME board index. The AR_t is average abnormal return and is calculated for the trading days $[-10, 10]$.[2]

[1] The QingBo index for the big-data platform of new media is currently the largest new media data search engine for third parties and the largest big-data platform for new media for micro-blogging, WeChat and mobile clients. The index also has the largest WeChat database for third parties. The web site is http://www.gsdata.cn/.

[2] We also used the Fama–French three-factor model to calculate the abnormal returns and obtained similar results.

Table 2
Abnormal returns and Excess Volumes.

Event day	AR_t	t-stat	ETV	t-stat
−10	0.37%***	4.29	1.02	0.68
−9	0.22%***	2.69	1.06**	2.02
−8	0.47%***	5.40	1.07***	2.43
−7	0.40%***	4.55	1.08***	2.54
−6	0.13%	1.52	1.11***	3.53
−5	0.44%***	5.06	1.15***	4.46
−4	0.52%***	5.70	1.21***	5.91
−3	0.28%***	3.40	1.24***	6.85
−2	0.55%***	9.39	1.32***	8.37
−1	1.37%***	13.49	1.54***	12.47
0	0.38%***	3.87	1.71***	9.95
1	0.06%	0.73	1.54***	8.55
2	0.11%	1.30	1.64***	7.05
3	−0.28%***	−3.52	1.43***	6.51
4	−0.11%	−1.32	1.36***	5.73
5	−0.01%	−1.15	1.29***	5.81
6	0.03%	0.39	1.28***	6.55
7	0.07%	0.86	1.24***	5.14
8	0.15%**	2.02	1.26***	4.90
9	0.07%	1.01	1.27***	4.52
10	−0.13%	−1.63	1.28***	4.49

This table shows abnormal returns (AR_t) and excess volumes (ETV) for the event period [−10, 10]. ***, **, * indicate statistical significance at the 1%-, 5%, 10%-level(two-tailed test) according to the parametric t-test.

We also test the impact of the recommendations made on the OWA on trading volume. We define excess trading volume in a manner similar to the definition of excess trading volume (see, for example, Barber and Odean [34]). Thus, the excess trading volume for firm i on day t is defined as follows:

$$\tilde{V}_{it} = \sum_{t=-100}^{t=-1} \frac{V_{it}}{100} \tag{3}$$

$$\mathrm{ETV}_{it} = \frac{V_{it}}{\tilde{V}_{it}} \tag{4}$$

where $\tilde{V}_{it}$ is the average trading volume over the previous 100 trading days, and V_{it} is the trading volume of stock i on day t. We want to examine whether the trading volume around the event day reacts to the recommendations made on the OWA. This activity can be viewed as excess trading volume on that day as long as the value of ETV_{it} is larger than 1.

Many previous studies have shown that financial experts seem to convey valuable information to the market [18,26,35,36]. We wonder how the prices react to the recommendations made on the OWA. Table 2 depicts the abnormal returns and the excess trading volume for days [−10, 10]. We observe positive and statistically significantly abnormal returns prior to the event day. The abnormal return is also positive and significant (0.38% and t-value = 3.87) on the event day. These results are similar to those found in Liu et al. [17], Palmon et al. [18] and Kerl and Walter [21]. The outcomes suggest that market experiences reactions on publication days. However, the ARs on the two days after the event day are positive but not significant (0.06% and t-value = 0.73; 0.11% and t-value = 1.30), and in the subsequent trading days, the abnormal returns are positive or negative, most of them are not significant. These outcomes likely suggest that the high frequency recommendations on OWA attract investors' attention in a short period of time. The maximum value of a daily AR is observed on the day prior to the event day [−1], with a value of 1.37% (t-value = 13.49).

Table 2 also displays significant excess volumes for the 21 trading days [−10, 10], which means that prices react to the market around the publication day. On the event day, the excess trading volume peaks at approximately 171% of the average trading level, which is consistent with the results found by Liu et al. [17], Palman et al. [18] and Zhang et al. [32]. This outcome further suggests that the recommendations published on OWA attract investors' attention on the event day, so that the market has a strong reaction. Moreover, we can observe excess trading volume after the event day.

4.2. The cumulative abnormal return

New information is usually absorbed by the market gradually; therefore, we not only measure the price reactions of one single day but also examine the market reactions to OWA recommendations using the cumulative abnormal return. Prior research has revealed that the price reactions caused by the price pressure cannot persist for the subsequent 50 trading days [30]. Therefore, the period of CAR we choose ranges from the event day [0] to the subsequent 50 trading

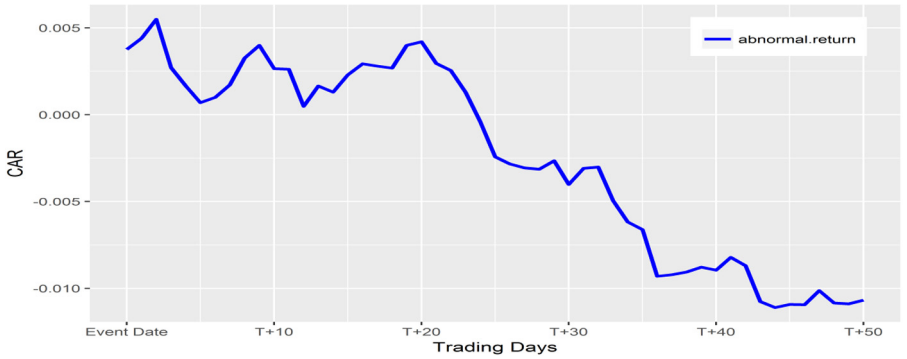

Fig. 1. Cumulative abnormal return.

day [50]. For the recommendations made by OWA, the cumulative abnormal return from date t_1 to date t_2 ($\mathrm{CAR}_{(t_1,t_2)}$) is denoted as follows:

$$\mathrm{CAR}(t_1, t_2) = \sum_{t=t_1}^{t_2} \mathrm{AR}_t, t_1 = 0, t_2 = 50 \tag{5}$$

Fig. 1 shows the cumulative abnormal return starting from trading day [0] to trading day [50]. The maximum positive value of 0.55% is shown in the period [0, 2], and we find fluctuation in the CAR for the subsequent 18 trading days. The CAR reverses quickly after 20 trading days and is at 0.30% on trading day [21], which is lower than the CAR on the trading day [0]; also, the CAR is at -1.1% on trading day [50]. In general, it seems that individual investors can make a statistically significant but economically small profit in a short period of time rather than during the long time period following the OWA recommendations. The result suggests that market reactions to the recommendations made on the OWA is due to the PPH.

4.3. Analysis of partitioned sample

We also detect the impact of the OWA recommendations on samples of different firm sizes. Many studies have examined that market participants process less information about smaller companies. Therefore, smaller firms are given less attention due to the less frequent reporting. Using the Value Line ranking system, Stickel [37] shows that the stock prices of smaller companies react more than those of large companies. Womack [24] examines the investment values of both buy and sell recommendations of stocks from security analysts at major U.S. brokerage firms, and he finds that the smaller-capitalization firms experience significantly larger market reactions than those of larger-capitalization firms on both the pre- and post-event days. Kerl and Walter [21] find that smaller stocks display greater price reactions than those of larger stocks when analyzing the market responses to purchase recommendations issued by German personal finance magazines from 1995 to 2003. Therefore, in this paper, the overall samples are divided into three subsamples based on the market values.

Table 3 depicts the association between firm size and abnormal returns. We find that the abnormal return in the smallest size group is significant and positive (0.69% and t-value = 3.39) on the event day. This means that investors can obtain a high yield if they purchase such stocks. However, the abnormal return in the largest size group is positive but insignificant (0.22% and t-value = 1.56) on the publication day. The result is consistent with prior research showing that the reactions to stock prices in smaller companies are greater than those of large companies.

5. The potential explanations

In the age of social media, the channels through which investors can obtain relevant information are greatly broadened. Investors can gather information from newspapers, TVs, online news sources, online forums, etc. Therefore, we want to further prove that market reactions are induced by OWA buy recommendations and not by others.

5.1. First or secondary dissemination?

We examine whether such recommendations were initially issued by analysts and subsequently reported on the OWA. For each sample observation in OWA, we first examine whether the relevant stocks were recommended by analysts prior to their publication day on the OWA. The search period ranges from the date of the publication back to the 5 trading days preceding the publication date on the OWA. The search yields a sample of 101 observations, accounting for 10.48% of the OWA observations. The small size of the matched sample suggests that the sample observations in the OWA are not the

Table 3
Abnormal returns of the samples from different market values.

Event day	The largest group		The smallest group	
	AR_t	t-stat	AR_t	t-stat
0	0.22%	1.56	0.69%***	3.39
1	−0.10%	−0.83	0.38%*	1.92
2	−0.02%	−0.14	0.32%*	1.72
3	−0.43%***	−4.23	−0.04%	−0.25
4	−0.13%	−1.18	−0.02%	−0.14
5	−0.21%*	−1.88	0.02%	0.08
6	−0.09%	−0.82	0.19%	1.20
7	−0.02%	−0.20	0.10%	0.53
8	0.01%	0.10	0.32%*	1.89
9	−0.17%*	−1.80	0.41%**	2.53
10	−0.17%	−1.60	−0.15%	−0.85

This table reports abnormal returns (AR_t) of two groups based on the market value. ***, **, * indicate statistical significance at the 1%-, 5%, 10%-level(two-tailed test) according to the parametric t-test.

Table 4
Abnormal returns on the basis of whether there are analysts' recommendations.

Event day	Have analysts' recommendations (101)		Have no analysts' recommendations (863)	
	AR_t	t-stat	AR_t	t-stat
−10	0.40%*	1.65	0.36%***	3.98
−9	0.39%	1.46	0.21%**	2.33
−8	0.33%	1.47	0.48%***	5.19
−7	0.64%***	2.61	0.37%***	3.96
−6	0.01%	0.37	0.13%	1.48
−5	0.74%***	2.88	0.40%***	4.38
−4	1.08%***	3.85	0.45%***	4.71
−3	0.80%***	2.67	0.22%***	2.59
−2	1.07%***	3.43	0.49%***	5.51
−1	1.00%***	3.20	1.41%***	13.16
0	0.47%*	1.65	0.36%***	3.53
1	0.12%	0.48	0.06%	0.61
2	0.17%	0.65	0.11%	1.15
3	−0.30%	−1.33	−0.28%***	−3.27
4	−0.15%	−0.62	−0.01%	−1.18
5	0.02%	0.08	−0.11%	−1.22
6	−0.54%**	−2.47	0.10%	1.21
7	0.10%	0.47	0.07%	0.76
8	0.05%	0.26	0.16%**	2.02
9	−0.17%	−0.92	0.10%	1.30
10	0.01%	0.06	−0.15%**	−1.72

This table reports abnormal returns (AR_t) of two groups, based on whether there are analysts' recommendations on five trading days before to the event day, for the event period [−10, 10]. The left group is the sample which has been recommended by analysts during the period from five trading days before to event day [−5, 0]. The right group is the sample which haven't been recommended by analysts during the period from five trading days before to event day [−5, 0]. ***, **, * indicate statistical significance at the 1%-, 5%, 10%-level(two-tailed test) according to the parametric t-test.

secondary dissemination of analysts' recommendations. We further partition the sample into two parts based on whether the stocks were recommended by analysts during the period from five trading days before to event day [−5, 0].

Table 4 shows the abnormal returns for the two groups. For the group on the left, we find that the AR is positive and statistically significant($AR_t = 0.47\%$; t-value = 1.65) at the 10% level on the event day, but it is almost not statistically significant for the subsequent 10 trading days [1, 10]; The result probably means that the recommendation information is incorporated into the security price both fully and instantaneously. However, after precluding these stocks, which were recommended by analysts on trading days [−5, 0] relative to the date of publication on OWA, we still obtain a similar result with the total samples; specifically, the AR is still positive and significant on the event day (0.36% and t-value = 3.53), which is shown in the right group of Table 4. Therefore, we show that the market reactions on the event day is not the result of secondary dissemination, and have no connection with analysts' recommendations.

5.2. Induced by other news media?

We also examine the possibility that the market reactions on event day could be caused by other news coverage around the time of the recommendations on the OWA. We mainly focus on traditional news media, which includes newspapers, magazines, various TV stations and radio stations. We collect relevant data of traditional news media from the RESSET

Table 5
Abnormal returns on the basis of whether there are news coverage by traditional news media.

Event day	Have media coverage (472)		Have no media coverage (492)	
	AR_t	t-stat	AR_t	t-stat
−10	0.41%***	3.29	0.31%***	2.76
−9	0.31%**	2.44	0.15%	1.31
−8	0.51%***	3.89	0.42%***	3.74
−7	0.49%***	3.65	0.32%***	2.75
−6	0.37%***	2.77	−0.10%	−0.97
−5	0.53%***	4.09	0.35%***	3.04
−4	0.73%***	5.04	0.32%***	2.85
−3	0.55%***	4.02	0.03%***	0.35
−2	0.77%***	5.66	0.35%***	3.20
−1	1.75%***	10.54	1.00%***	8.60
0	0.33%**	2.26	0.42%***	3.25
1	0.05%	0.35	0.08%	0.69
2	0.20%	1.46	0.03%	0.29
3	−0.48%***	−4.29	−0.09%***	−0.82
4	−0.20%*	−1.71	−0.02%	−0.15
5	−0.24%**	−2.05	0.05%	0.37
6	−0.00%	−0.08	0.07%	0.64
7	−0.06%	−0.52	0.19%*	1.71
8	0.19%	1.63	0.12%	1.21
9	−0.07%	−0.65	0.21%**	2.14
10	−0.22%*	1.76	−0.05%	−0.47

This table reports abnormal returns (AR_t) of two groups, based on whether there are reports on traditional news media on five trading days before to the event day, for the event period [−10, 10]. The left group is the samples have been reported by traditional news media during the period from five trading days before to event day [−5, 0]. The right group is the sample which hasn't been reported by traditional news during the period from five trading days before to event day [−5, 0]. ***, **, * indicate statistical significance at the 1%-, 5%, 10%-level(two-tailed test) according to the parametric t-test.

financial database in China. Then, we take a similar approach as that previously described and we divide the samples into two groups based on whether the stocks have traditional news media coverage on the day of or the 5-day trading period preceding the date of publication on the OWA.

Table 5 shows the results for the two groups based on whether there are news coverage via traditional news media formats during the period from five trading days before to event day [−5, 0]. We find that 472 observations were reported by traditional news media during the five-day trading period before the event day, accounting for 48.96% of the OWA samples. From the right side of Table 5, we find that there is a positive and significant abnormal return (0.42% and t-value = 3.25) on the event day. Therefore, we show that the market reaction on event day is not caused by news coverage via traditional news media formats prior to publication on OWA.

5.3. Induced by the firm-specific news releases?

Next, we examine the possibility that the market reactions on event day could be caused by firm-specific news releases around the time of recommendations made on OWA. The data of firm-level news release are collected from the "firm's big event" column in the RESSET financial database. This column gathers all kinds of disclosures about firm announcements, which includes cost decisions, dividends, board resolutions, and the allocation of profits. Such releases would interfere with the study results. Thus, we take an approach similar to those described above and divide the sample into two groups based on whether there are firm-specific news releases on the day of or the five-day trading period before the date of publication on OWA.

Table 6 shows the results for the two groups based on whether there are firm-specific news releases during the period from five trading days before to event day [−5, 0]. We find that 421 observations have firm-specific news releases during the five-day trading period before the event day, accounting for 39.11% of the OWA samples. It seems that the OWA do not prefer to recommend stocks that have firm-specific news releases previously. Furthermore, from the right side of Table 6, we can observe that the abnormal return is positive and significant (0.39% and t-value = 3.09) on the event day. This result suggests that market reaction on event day is not caused by firm-specific news releases prior to the publication of OWA.

5.4. Induced by the pre-event market reactions?

In addition, Table 1 show that there are positive and significant abnormal returns before the event day. We examine the possibility that weather the market reactions on event day are caused by previous returns. If this is true, then the OWA recommendations may be pseudo causes. To address this issue, we use propensity score matching (PSM) to form

Table 6
Abnormal returns on the basis of whether there are firm-specific news releases.

Event day	Have firm-level news (421)		Have no firm-specific news (543)	
	AR_t	t-stat	AR_t	t-stat
−10	0.26%**	2.40	0.50%***	3.68
−9	0.15%	1.45	0.32%**	2.34
−8	0.43%***	4.00	0.51%***	3.63
−7	0.40%***	3.54	0.40%***	2.88
−6	0.00%	0.15	0.21%*	1.90
−5	0.60%***	4.28	0.31%***	2.88
−4	0.47%***	3.51	0.55%***	4.50
−3	0.16%	1.39	0.38%***	3.22
−2	0.45%***	3.43	0.63%***	5.50
−1	1.45%***	9.57	1.31%***	9.55
0	0.35%**	2.36	0.39%***	3.09
1	0.03%	0.27	0.01%	0.74
2	0.06%	0.49	0.15%	1.29
3	−0.32%***	−2.72	−0.25%**	−2.31
4	−0.27%**	−2.31	0.00%	0.24
5	−0.00%	−0.03	−0.17%	−1.51
6	0.00%	0.65	−0.00%	−0.05
7	0.03%	0.21	0.10%	0.96
8	0.11%	0.88	0.19%**	1.98
9	0.16%	1.24	0.00%	0.11
10	−0.20%*	−1.67	−0.01%	−0.72

This table reports abnormal returns (AR_t) of two groups, based on whether there are firm-specific news releases during the period from five trading days before to the event day, for the event period [−10, 10]. The left group is the samples which have firm-specific news release during the period from five trading days before to event day [−5, 0]. The right group is the sample which hasn't firm-specific news release during the period from five trading days before to event day [−5, 0]. ***, **, *indicate statistical significance at the 1%-, 5%, 10%-level(two-tailed test) according to the parametric t-test.

Table 7
The difference in abnormal returns between the test group and the control group.

Event day	Experimental group (946)		Control group (910)	
	AR_t	AR_t	Difference	t-value
−10	0.37%***	0.33%***	0.03%	0.28
−9	0.22%***	0.21%**	0.00%	0.17
−8	0.47%***	0.35%***	0.12%	1.01
−7	0.40%***	0.27%***	0.13%	1.21
−6	0.13%	0.33%***	−0.20%	−1.57
−5	0.44%***	0.45%***	−0.00%	−0.06
−4	0.52%***	0.50%***	0.02%	0.13
−3	0.28%***	0.32%***	−0.04%	−0.31
−2	0.55%***	0.34%***	0.22%*	1.75
−1	1.37%***	0.45%***	0.92%***	6.71
0	0.38%***	0.15%	0.23%*	1.67
1	0.06%	0.02%	0.04%	0.40
2	0.11%	0.13%	−0.02%	−0.15
3	−0.28%***	0.05%	−0.33%***	−2.92
4	−0.11%	0.19%**	−0.30%***	−2.63
5	−0.01%	0.03%	−0.01%	−1.08
6	0.03%	0.33%***	−0.30%***	−2.75
7	0.07%	0.35%***	−0.29%***	−2.56
8	0.15%**	0.14%**	0.01%	0.12
9	0.07%	0.03%	0.04%	0.43
10	−0.13%	0.03%	−0.16%	−1.41

This table shows abnormal returns (AR_t) for the event period [−10, 10]. We perform the two-sample t-test to detect the significant differences. ***, **, * indicate statistical significance at the 1%, 5%, 10%-lever.

matched pairs that are most similar to the target stocks but are not mentioned by OWA on the same day. The details are as follows: Firstly, we choose industry, market capitalization and price runup within 5 trading days [−5, −1] as the matched covariates.[3] Secondly, we used 1:1 nearest neighbor matching to select samples in control group. The PSM is performed with the MatchIt package for R software. As a result, we get 910 recommendations in control group.

[3] The result from Table 2 shows that there is a positive and significant abnormal return during the five trading days before the event day [−5, −1], so we choose control stocks which have similar price runup during the five trading days before the event day [−5, −1].

Table 7 shows the abnormal returns in the experimental group and control group and their differences within the event period [−10, 10]. In the control group, we observe positive and significant abnormal returns on trading days[−10] through [−1]. However, the abnormal returns is positive but not significant (0.15% and t-value = 1.54) on the event day. Moreover, the abnormal returns in the test group are significantly larger than that in the control group on the event day (0.23% and t-value = 1.67). The result suggests that market reactions on event day is not driven by previous returns.

Moreover, it is interesting to find that market reactions to recommendations take place before the publication day. Beneish [38] (1991) documents that information leakage may exist if the market have reactions prior to the publication of relevant news. Therefore, the study results may suggest that information has been obtained by relevant beneficiaries before the recommendations are published on the OWA. Beneficiaries purchase such stocks in advance and sell them after the event-day.

6. Conclusions

In this paper, we examine market reactions to the recommendations made on OWA. The conclusion is similar to those found in previous studies by Liu et al. [17], Palmon et al. [39] and Kerl and Walter [21]. The empirical results show a significantly positive abnormal return and abnormal trading volume on the event day. The CAR of recommendations made on OWA completely reverse within 21 trading days, which supports the PPH. We also show that the market reactions in smaller-capitalization firms are significantly greater than those in larger-capitalization firms on the publication day. We further show that market reactions on the event day are not induced by the secondary dissemination of analysts' recommendations, firm-specific news releases, media coverage on traditional news media formats, and previous positive significant abnormal returns. Therefore, we believe that market reactions are driven by the recommendations made on OWA.

With the popularity of intelligent mobile terminals, great changes have taken place in information transmission modes. Social media can serve as an important channel for investors to obtain relevant information quickly and conveniently. Thus, it would be interesting to study the evolution of market reactions induced by information dissemination following the path of mass media to social media. We leave this possibility for future research.

CRediT authorship contribution statement

Yuzhao Zhang: Conceptualization, Data curation, Investigation, Writing - original draft, Software. **Haifei Liu:** Formal analysis, Funding acquisition, Methodology, Project administration, Validation, Writing - review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

This work is supported by the National Natural Science Foundation of China (71771170, 71771116 and 71701150), the Tianjin Education Commission Key Project on Social Sciences, PR China (No. 2016JWZD08). The Jiangsu Provincial Natural Science Foundation, PR China (No. BK20161398).

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