COVID-19, public attention and the stock market

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Abstract

This paper investigates the impact of coronavirus disease 2019 (COVID-19) on the Chinese stock market. We show that the COVID-19 outbreak not only hurts the stock returns but also affects the stock price sensitivity to firm-specific information. We document heterogeneous effects of the epidemic infection scale and the public attention about the pandemic. The stock market response to firm-specific information is decelerated (accelerated) by the public attention (infection scale). Moreover, the decreasing (increasing) effect of the public attention (infection scale) on such response is more intensive to positively toned (negatively toned) firm-specific news articles. Finally, we observe price reversal (momentum) following the public attention (infection scale).

Key words: COVID-19; Efficient price; Investor sentiment; Public information

JEL classification: G12, G14

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1. Introduction

The coronavirus disease 2019 (COVID-19), caused by a novel strain of severe acute respiratory syndrome (SARS), started in Wuhan city in China at the end of 2019. It now has become a fierce global storm attacking public health. As of August 2020, almost 25 million people have been infected, and 850,000 deaths
have been recorded. To decelerate the further spread of the pandemic, various precautionary measures have been strictly implemented, which has led to more than a third of the world population living under strict mobility restrictions. This public health crisis has also brought the world economy to its knees, leaving millions of people jobless and inflicting devastating damage on the financial markets. For example, the global stock market wiped out approximately US$10 trillion within just one week between 9 and 13 March 2020. Given such a collapse in the economy, it is therefore imperative to thoroughly investigate the effects of the current pandemic on the stock market in China where the outbreak was first reported.

Focusing on the epidemic situation in China, this paper examines the effect of the pandemic on the Chinese stock market response to firm-specific information, measured based on firm-specific news articles. We study the pandemic in terms of the scale of infection and the public attention to it. First, large-scale infection deals a lethal blow to a wide range of industries, leading to an observed crash in the stock market. Second, fear and uncertainty about the current pandemic is an important force that affects the stock market (McKibbin and Fernando, 2020; Ozili and Arun, 2020), although parts are non-fundamental. Stock market response to firm-specific news on its own is also an important topic in finance research because it is related to stock market efficiency and corporate’s information environment.

To answer the question of how the stock market response to information is affected by the current pandemic, we first compare the stock returns and their reaction to firm-specific news articles in the pre-outbreak and post-outbreak periods. Next, we thoroughly examine the impacts of epidemic infection scale and public attention about the pandemic on stock returns as well as on the stock price sensitivity to firm-specific information over the post-outbreak period. We also distinguish between expected and unexpected public attention and positive and negative firm-specific information, respectively. Finally, we conduct analysis of future stock returns to seek price momentum or reversal following the epidemic infection scale or public attention.

The main findings of this paper can be summarised as follows. First, comparing between the pre- and post-outbreak periods, we show that the epidemic outbreak not only reduces the stock returns but also weakens investors’ processing ability of firm-specific news as reflected by the reduced stock price sensitivity to firm-specific information. Second, focusing on the post-outbreak period, we confirm that both epidemic infection scale and public concern about the pandemic hurt the stock returns. However, the effects of infection scale and public attention on the stock price sensitivity to firm-specific information are heterogeneous. We provide evidence that the (unexpected) public attention considerably dulls the stock market reaction to firm-specific news articles, whereas the infection scale itself makes stock prices even more sensitive to firm-specific information. Moreover, the increasing effect of
infection scale on stock price sensitivity to firm-specific information is more intensive to negatively toned news articles. In contrast, the decreasing effect of the (unexpected) public attention is stronger for positively toned news articles. It demonstrates that the COVID-19 outbreak significantly distorts the price discovery process in the stock market and complicates the corporate’s information environment. Finally, we observe return momentum and reversal following the epidemic infection scale and (unexpected) public attention, respectively. This indicates that the pandemic itself leads to fundamental shocks to the stock market, while the shocks caused by the (unexpected) public attention to the pandemic are non-fundamental.

The contribution of this study to the literature is twofold. On the one hand, the impact of critical public health issues on the economy has attracted long-lasting attention among researchers. For example, when SARS swept across Asian countries in 2003, China suffered the most with a significant downturn in economic growth that year. A large strand of studies investigated the economic effects of SARS (see, e.g., Hai et al., 2004; Lee and McKibbin, 2004). Relating COVID-19 to the stock market, Yilmazkuday (2020) observes the sizeable reduction in the S&P 500 Index caused by the number of COVID-19 cases in the US. Onali (2020) relates the change in COVID-19 cases and deaths to the volatility of the stock market. Gormsen and Koijen (2020) associate COVID-19 with stock prices and growth expectations. Yan et al. (2020) propose a profitable investment strategy for the stocks in the affected industries. Cookson et al. (2020) examine the relationship between partisanship and investor beliefs in the US market in the context of the COVID-19 outbreak. However, few studies investigate the stock market response to information in the context of such an exogenous crisis. Our paper focuses on the Chinese stock market and demonstrates that the COVID-19 outbreak distorts stock price incorporation of firm-specific information and affects price discovery efficiency in a heterogeneous manner.

On the other hand, public fear of the pandemic hits market sentiment, which distracts investor attention from speculative investment. Thus, this paper also contributes to the literature about the market sentiment around the release of firm-specific news. Hirshleifer et al. (2009) demonstrate the importance of investor attention as well as information demand for market responses to earnings announcements. Using Baker and Wurgler’s (2006) sentiment measure, Mian and Sankaraguruswamy (2012) relate market sentiment to stock price sensitivity to earnings news. Using changes in market volatility index to measure macro-uncertainty shocks, Williams (2015) examines the effect of such shocks on investment decisions. Chi and Shanthikumar (2017) associate local bias on the internet with market reaction to earnings news. Different from prior studies, our paper simultaneously considers COVID-19 as a critical macro-uncertainty shock together with the public attention as the market sentiment during the shock period in the analysis of stock market response to the release of all kinds of firm-specific information rather than earnings news alone.
The rest of the paper is organised as follows. Section 2 presents the details of the sample, data and regression variables. We conduct the empirical analysis throughout Sections 3–5, in which the comparison between the pre-outbreak and post-outbreak periods is documented in Section 3, the analysis of epidemic infection scale and public attention in Section 4, and Section 5 further examines stock return momentum and reversal. Section 6 summarises the robustness tests, and the final section concludes the paper.

2. Sample, data and regression variables

We focus on all Chinese firms publicly listed on Shanghai and Shenzhen stock exchanges between 1 January 2019 and 30 August 2020. This sample period enables us to compare the stock market before and after the epidemic outbreak which occurred at the end of 2019. The dependent variable of our analysis is daily close-to-close stock returns, defined as:

$$\text{Ret}_{i,t} = \frac{\text{Close}_{i,t} - \text{Close}_{i,t-1}}{\text{Close}_{i,t-1}} ,$$

where \( \text{Close}_{i,t} \) is the closing price of stock \( i \) on day \( t \). The closing price data are taken from the Wind database.

Our explanatory variable has three streams: firm-specific news articles, epidemic infection scale and public attention. First, following You et al. (2015), who demonstrate that market-oriented media provide investors with more accurate and critical news than state-controlled media, we manually collect firm-specific news articles from the market-oriented newspapers and construct the news variable. More specifically, we first define the tone of each news article as positive (negative) if the positive (negative) words outnumber negative (positive) words. Then, we define the variable of firm-specific news articles for stock \( i \) on day \( t \) as:

$$\text{News}_{i,t} = \sum_{j} I_{j,\text{Article} \text{ about} \text{stock} \text{ on} \text{day} \ t}$$

where \( I_{j,\text{Article} \text{ about} \text{stock} \text{ on} \text{day} \ t} \) equals 1 if the tone of the news article \( j \) is positive and \(-1\) if the tone is negative. This firm-specific news variable measures the daily net number of positive articles and allows negative news to offset positive news.

We use the daily change in confirmed cases officially released by the Chinese government to indicate the infection scale of COVID-19 in China. Then, we use Baidu Index sentiment to gauge public attention to the pandemic. A similar approach is also applied by Fang et al. (2020) in studying the volatility of the Chinese stock market. Baidu is the leading Chinese search engine, and its

\(^1\)See You et al. (2015) for the newspaper details.
sentiment data capture search volumes and public concerns. The summary statistics of all regression variables are given in Table 1.

3. The stock market before and after the pandemic

In this section, we want to compare the stock returns and their response to firm-specific news articles before and after the outbreak of COVID-19 in China. To this end, we introduce a dummy variable which indicates whether the outbreak has occurred or not. While the exact date of the outbreak is still an open research question, it is unambiguous that the pandemic did not gain public attention until the end of 2019. Therefore, we set the cut-off date as the last trading day in 2019. That is, the dummy variable $Outb_t$ equals zero for the period January–December 2019 and equals unity during January–August 2020. Then, we conduct the following regression to examine the individual stocks’ response to firm-specific news:

$$
Ret_{i,t}^{std} = \alpha + \beta_1 \text{News}_{i,t}^{std} + \beta_2 Outb_t + \beta_3 \text{News}_{i,t}^{std} \times Outb_t + \beta_4 \text{Ret}_{i,t-1}^{std} + e_{i,t},
$$

(1)

where $Ret_{i,t}$ and $\text{News}_{i,t}$ are, respectively, the close-to-close return and firm-specific news variable of stock $i$ on day $t$. To capture the economic significance of the regression, we use their standardised versions, indicated by the superscript $std$. The estimate of $\beta_1$ indicates the stock market reaction to firm-specific news, and the estimates of $\beta_2$ and $\beta_3$ capture the effects of epidemic outbreak on stock returns and on the stock price sensitivity to firm-specific

| Table 1: Descriptive statistics |
|---------------------------------|
|                                |
| $Ret_{i,t}$ | $\text{News}_{i,t}$ | $\text{NIC}_t$ | $PA_t$   |
| Mean       | 0.002               | 0.271           | 490.624  | 7.127    |
| Median     | 0.001               | 0.220           | 37.000   | 6.025    |
| Max        | 0.081               | 9.840           | 15142.000 | 36.528   |
| Min        | −0.092              | −10.020         | 0.000   | 1.339    |
| SD         | 0.017               | 1.806           | 1424.478 | 5.001    |

This table reports the descriptive statistics of the key variables used in our analysis. $Ret_{i,t}$ is the stock’s close-to-close return. $\text{News}_{i,t}$ indicates the firm-specific news variable, measured by the difference between the numbers of positive and negative firm-specific news articles. $\text{NIC}_t$ represents the number of increased confirmed cases of COVID-19 infection. $PA_t$ measures the public attention to the pandemic, gauged by the natural logarithm of the Baidu index search volume. The sample period for $Ret_{i,t}$ and $\text{News}_{i,t}$ starts in January 2019 and ends in August 2020. The sample period for $\text{NIC}_t$ and $PA_t$ is from January 2020 to August 2020. For $Ret_{i,t}$ and $\text{News}_{i,t}$, we first calculate the time-series average for each sample stock and then report the descriptive statistics across the sample stocks.

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news, respectively. The results of estimating regression (1) are tabulated in Table 2.

As we can see from the table, the estimated coefficients of $\text{News}^{\text{std}}_{i,t}$ are positive and significant at the 1 percent level. It suggests that more positively toned (negatively toned) news articles timely increase (reduce) stock returns, consistent with Mian and Sankaraguruswamy (2012) and Williams (2015) who, however, only focus on firm earnings news. Moreover, we show that the COVID-19 outbreak directly reduces the stock returns in a significant fashion in the sense that the estimated coefficients of $\text{Out}_{t}$ are negative and significant at the 1 percent level. Its effect is also economically substantial. Let us take column (3) as an example. The estimated coefficient of $\text{Out}_{t}$ is $-0.061$, indicating that the average stock return is reduced by 6.1 percent of its standard deviation after the epidemic outbreak. This observation is not surprising as it is well known that the COVID-19 outbreak has led to a global economic recession.

On the other hand, the coefficients of the interaction variable $\text{News}^{\text{std}}_{i,t} \times \text{Out}_{t}$ are negative and significant at the 5 percent level. It indicates that the stock market response to firm-specific news articles significantly dulls after the epidemic outbreak. Its economic significance is also substantial. As can be seen in column (3), the news response coefficient is 0.071 before the outbreak, and is

| $\text{Ret}^{\text{std}}_{i,t}$ | (1) | (2) | (3) | (4) |
|--------------------------------|-----|-----|-----|-----|
| $\text{News}^{\text{std}}_{i,t}$ | 0.087*** | 0.080*** | 0.071*** | 0.073*** |
|                                 | (3.82) | (3.52) | (3.12) | (3.20) |
| $\text{Out}_{t}$              | $-0.069^{**}$ | $-0.061^{***}$ | $-0.065^{***}$ | $-0.065^{***}$ |
|                                 | ($-3.01$) | ($-2.66$) | ($-2.84$) | ($-2.84$) |
| $\text{News}^{\text{std}}_{i,t} \times \text{Out}_{t}$ | $-0.051^{**}$ | $-0.058^{**}$ | $-0.051^{**}$ | $-0.058^{**}$ |
|                                 | ($-2.23$) | ($-2.52$) | ($-2.23$) | ($-2.52$) |
| $\text{Ret}^{\text{std}}_{i,t-1}$ | $-0.050^{**}$ | $-0.046^{**}$ | $-0.043^{*}$ | $-0.041^{*}$ |
|                                 | ($-2.18$) | ($-2.00$) | ($-1.86$) | ($-1.78$) |
| Constant                       | Yes  | Yes  | Yes  | Yes  |
| Stock fixed effect             | Yes  | Yes  | Yes  | Yes  |
| Adjusted $R^2$                 | 0.05 | 0.07 | 0.08 | 0.08 |

This table reports the results of estimating regression (1). $\text{Ret}^{\text{std}}_{i,t}$ is the standardised stock’s close-to-close return. $\text{News}^{\text{std}}_{i,t}$ indicates the standardised firm-specific news variable. $\text{Out}_{t}$ is a dummy indicator, which equals unity from 1 January 2020 onwards and zero before that date. Stock fixed effects are included except for column (4). The standard errors are clustered at the stock level. The sample period starts in January 2019 and ends in August 2020. The $t$-statistics are reported in parentheses, and ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

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reduced by $-0.061$ to become $0.010$ afterwards. It suggests a reduction of 85.9 percent in the timely incorporation of stock market information. The main findings here indicate that the epidemic outbreak hits the Chinese stock markets in two ways: firstly, it directly lowers the individual stock returns on average; and secondly, it weakens the stock price sensitivity to firm-specific news and thereby decelerates the price discovery process.

4. Epidemic infection scale, public attention and the stock market

We have confirmed that the stock returns and stock market response to firm-specific news are significantly lower after the epidemic outbreak than before. It is interesting to know whether the severity of the pandemic and the public attention to the pandemic could also affect stock returns as well as the stock market reaction to the release of firm-specific news. Thus, we focus on the post-outbreak period in this section.

To capture the severity of COVID-19, we focus on its infection scale which is gauged by the number of new confirmed cases. We use Baidu Index sentiment to indicate the public attention to the pandemic. Then, we conduct the following regression:

$$
Ret_{i,t}^{std} = \alpha + \beta_1 News_{i,t}^{std} + \beta_2 NIC_t^{std} + \beta_3 PA_{i,t}^{std} + \beta_4 News_{i,t}^{std} \times NIC_t^{std} \\
+ \beta_5 News_{i,t}^{std} \times PA_{i,t}^{std} + \beta_6 Ret_{i,t-1}^{std} + e_{i,t}
$$

(2)

where $NIC_t$ and $PA_t$ are, respectively, the number of new (i.e., increased) confirmed cases of COVID-19 infection and the public attention to the COVID-19 on day $t$. Both $NIC_t$ and $PA_t$ are market-wide variables. As previously, we use their standardised versions indicated by the superscript $std$ to capture the economic significance of their effects. We report the regression outcome in Table 3.

The main observations are summarised as follows. First, we confirm a positive relationship between the firm-specific news and stock returns over the post-break period, evidenced by the positive and significant coefficient of $News_{i,t}^{std}$, consistent with what we find in Section 3. Second, the negative and significant coefficients of $NIC_t^{std}$ and $PA_{i,t}^{std}$ indicate that both epidemic infection scale and public attention lead to significant stock return decrease over the post-outbreak period. A closer comparison between their magnitude and $t$-statistics suggests that the impact of public attention appears to be greater than that of the pandemic itself. This observation demonstrates the destructive power of public concern over the pandemic to the stock market. Third, the evidence shows that the public attention makes stock prices stale in reflecting firm-specific news, in the sense that the estimated coefficient of the interaction term $News_{i,t}^{std} \times PA_{i,t}^{std}$ is significantly negative. However, while the severity of the pandemic harms stock returns, it could expedite stocks’ price discovery,
indicated by the significantly positive coefficient of $\text{News}_{it} \times \text{NIC}_{it}$. This observation is interesting as it reveals that the effect of the pandemic itself and that of public attention on stock market reaction to firm-specific news are heterogeneous. COVID-19 hits a super-wide range of industries such as recreation, catering, aviation, etc., which then exerts an immediate and fundamental effect on the stock market and promotes timely incorporation of news. However, the public attention to this pandemic largely represents the public's sentiment about the virus, and these sentiments could be non-fundamental for stock prices, delay information impounding, and reduce price discovery efficiency.

To confirm the effect of public fear, we next focus on the unexpected public attention beyond the pandemic. To this end, we regress $PA_t$ against the $\text{NIC}_t$ and obtain the residuals as the unexpected attention. That is:

$$PA_t = \alpha + \beta_1 \text{NIC}_t + u_t$$ (3)

Table 3
The effects of epidemic infection scale and public attention

| $\text{Ret}_{it}$ | (1) | (2) | (3) | (4) |
|-------------------|-----|-----|-----|-----|
| $\text{News}_{it}$ | 0.072*** | 0.068*** | 0.063*** | 0.064*** |
|                   | (3.15) | (2.96) | (2.71) | (2.82) |
| $\text{NIC}_{it}$ | $-0.049^*$ | $-0.045^*$ | $-0.045^*$ | $-0.052^*$ |
|                   | ($-2.13$) | ($-1.90$) | ($-1.97$) | ($-2.32$) |
| $\text{PA}_{it}$ | $-0.056^*$ | $-0.048^*$ | $-0.045^*$ | $-0.052^*$ |
|                   | ($-2.50$) | ($-1.12$) | ($-1.97$) | ($-2.32$) |
| $\text{News}_{it} \times \text{NIC}_{it}$ | 0.046** | 0.047** | (1.96) | (2.02) |
| $\text{News}_{it} \times \text{PA}_{it}$ | $-0.064^*$ | $-0.067^*$ |
|                   | ($-2.80$) | ($-2.91$) |
| $\text{Ret}_{it-1}$ | $-0.047^*$ | $-0.042^*$ | $-0.039^*$ | $-0.038^*$ |
|                   | ($-2.03$) | ($-1.84$) | ($-1.69$) | ($-1.65$) |
| Constant | Yes | Yes | Yes | Yes |
| Stock fixed effect | Yes | Yes | Yes |
| Adjusted $R^2$ | 0.04 | 0.06 | 0.08 | 0.08 |

This table reports the results of estimating regression (2). $\text{Ret}_{it}$ is the standardised stock’s close-to-close return. $\text{News}_{it}$ indicates the standardised firm-specific news variable. $\text{NIC}_{it}$ and $\text{PA}_{it}$ are, respectively, the number of increased confirmed cases and public attention to the pandemic, in the standardised version. Stock fixed effects are included except for column (4). The standard errors are clustered at the stock level. The sample period starts in January 2020 and ends in August 2020. The $t$-statistics are reported in parentheses, and ****, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.
and \( \hat{\beta}_1 \equiv EPA_t \), unexpected public attention; \( \hat{\beta}_1 \) \( NIC_t \) \( \equiv EPA_t \), expected public attention. Then, we conduct the following regression:

\[
Ret_{i,t}^{std} = \alpha + \beta_1 News_{i,t}^{std} + \beta_2 EPA_{t}^{std} + \beta_3 EPA_{t}^{std} + \beta_4 News_{i,t}^{std} \times EPA_{t}^{std} \\
+ \beta_5 News_{i,t}^{std} \times UPA_{t}^{std} + \beta_6 Ret_{i,t-1}^{std} + \epsilon_{i,t}.
\] (4)

The regression output is reported in Table 4. In general, the results are highly consistent with those in Table 3. We confirm the harmful effect of the unexpected public attention on stock returns as well as on the stock market reaction to firm-specific news. Moreover, comparing the estimates of \( PA_{t}^{std} \) in Table 3 and \( UPA_{t}^{std} \) in Table 4, we can observe that the explanatory powers of \( UPA_{t}^{std} \) and \( News_{i,t}^{std} \times EPA_{t}^{std} \) are greater than those of \( PA_{t}^{std} \) and \( News_{i,t}^{std} \times PA_{t}^{std} \). It points to the fact that the impact of unexpected public attention beyond the pandemic on the stock market is even more harmful than the aggregate public attention, and the unexpected attention is non-fundamental.

Table 4
The effects of expected and unexpected public attention to the pandemic

|                | (1)   | (2)   | (3)   | (4)   |
|----------------|-------|-------|-------|-------|
| \( News_{i,t}^{std} \) | 0.072*** | 0.065*** | 0.060*** | 0.063*** |
| \( EPA_{t}^{std} \) | -0.046** | -0.041* | -0.043* | -0.043* |
| \( UPA_{t}^{std} \) | -0.065*** | -0.058** | -0.060*** | -0.060*** |
| \( News_{i,t}^{std} \times EPA_{t}^{std} \) | 0.044* | 0.046** | (1.92) | (2.00) |
| \( News_{i,t}^{std} \times UPA_{t}^{std} \) | -0.074** | -0.077*** | (3.23) | (3.35) |
| \( Ret_{i,t-1}^{std} \) | -0.047** | -0.041* | -0.038* | -0.037 |
| Stock fixed effect | Yes | Yes | Yes | Yes |
| Adjusted \( R^2 \) | 0.04 | 0.06 | 0.08 | 0.08 |

This table reports the results of estimating regression (4). \( Ret_{i,t}^{std} \) is the standardised stock’s close-to-close return. \( News_{i,t}^{std} \) indicates the standardised firm-specific news variable. \( EPA_{t}^{std} \) and \( UPA_{t}^{std} \) are, respectively, the expected and unexpected public attention to and beyond the pandemic, in the standardised version. Stock fixed effects are included except for column (4). The standard errors are clustered at the stock level. The sample period starts in January 2020 and ends in August 2020. The \( t \)-statistics are reported in parentheses, and ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

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Finally, we want to dig into the effects of infection scale and public attention by classifying the firm-specific news articles into two categories: positively toned and negatively toned. For each stock on each trading day, we construct two news variables $G_{Newsi,t}$ and $B_{Newsi,t}$ indicating the number of positively toned and negatively toned news articles, respectively, for capturing good and bad firm-specific news. Then, we use their standardised variants to replace $News_{std,i,t}$ in Equations (2) and (4):

$$\begin{align*}
Ret_{std,i,t} &= \alpha + \beta_1 G_{Newsi,t} + \beta_2 B_{Newsi,t} + \beta_3 NIC_{std,i} + \beta_4 PA_{std,i} \\
&\quad + \beta_5 G_{Newsi,t} \times NIC_{std,i} + \beta_6 B_{Newsi,t} \times NIC_{std,i} + \beta_7 G_{Newsi,t} \\
&\quad \times PA_{std,i} + \beta_8 B_{Newsi,t} \times PA_{std,i} + \beta_9 Ret_{std,i,t-1} + \epsilon_{i,t}, \\
Ret_{std,i,t} &= \alpha + \beta_1 G_{Newsi,t} + \beta_2 B_{Newsi,t} + \beta_3 EPA_{std,i} + \beta_4 UPA_{std,i} + \beta_5 G_{Newsi,t} \\
&\quad \times EPA_{std,i} + \beta_6 B_{Newsi,t} \times EPA_{std,i} + \beta_7 G_{Newsi,t} \times UPA_{std,i} \\
&\quad + \beta_8 B_{Newsi,t} \times UPA_{std,i} + \beta_9 Ret_{std,i,t-1} + \epsilon_{i,t}.
\end{align*}$$

(5)

(6)

Other settings are the same as previously, and the regression results are tabulated in Table 5. We can see from the table that $G_{Newsi,t}$ ($B_{Newsi,t}$) is significantly associated with the increase (decrease) in stock returns. It therefore suggests that the release of positively toned (negatively toned) news articles benefits (harms) the stock returns, which is consistent with the estimates of $News_{std,i,t}$ in our previous tables. Moreover, the estimates of $NIC_{std,i}$, $PA_{std,i}$, $EPA_{std,i}$ and $UPA_{std,i}$ are also closely in line with those reported in Tables 3 and 4, and all of them are significantly negative. Turning to the interaction terms, we show that the stock price sensitivity to negatively toned news articles is higher than that to positively toned news articles following the increase in epidemic infection scale (i.e., the expected public attention according to our definition), evidenced by the greater magnitude and $t$-statistics of $B_{Newsi,t} \times NIC_{std,i}$ and $B_{Newsi,t} \times EPA_{std,i}$ than those of $G_{Newsi,t} \times NIC_{std,i}$ and $G_{Newsi,t} \times EPA_{std,i}$, respectively. This observation suggests that investors pay more attention to bad firm-specific news but less to good news when the epidemic worsens, leading to much timelier incorporation of adverse firm-specific information in stock returns. However, opposite situations exist following the increasing public attention and its unexpected component. In particular, the coefficients of $G_{Newsi,t} \times PA_{std,i}$ and $G_{Newsi,t} \times UPA_{std,i}$ have a much larger magnitude than those of $B_{Newsi,t} \times PA_{std,i}$ and $B_{Newsi,t} \times UPA_{std,i}$, respectively. It indicates that investors delay processing good firm-specific news more, and, in other words, underreact to favourable firm-specific information to a larger extent, compared to their responses to bad firm-specific news, when the (unexpected) public attention about the pandemic is higher.

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Table 5
Positively toned and negatively toned news articles

Panel A: Epidemic infection scale and public attention

|                      | $Re_{it}$   |
|----------------------|-------------|
|                      | (1)         | (2)         | (3)         | (4)         |
| $G\text{New}_{it}$  | 0.065***    | 0.062***    | 0.058**     | 0.059***    |
|                      | (2.86)      | (2.75)      | (2.50)      | (2.60)      |
| $B\text{New}_{it}$  | $-0.051^*$  | $-0.048^{**}$| $-0.044^*$  | $-0.046^{**}$|
|                      | $(-2.17)$   | $(-2.06)$   | $(-1.88)$   | $(-1.98)$   |
| $NIC_{it}$           | $-0.046^{**}$| $-0.042^*$  | $-0.044^*$  |              |
|                      | $(-1.98)$   | $(-1.83)$   | $(-1.92)$   |              |
| $PA_{it}$            | $-0.052^{**}$| $-0.046^{**}$| $-0.049^{**}$|              |
|                      | $(-2.25)$   | $(-1.96)$   | $(-2.07)$   |              |
| $G\text{New}_{it} \times NIC_{it}$ | 0.037       | 0.039*      |              |              |
|                      |              | (1.63)      | (1.73)      |              |
| $B\text{New}_{it} \times NIC_{it}$ | 0.054**     | 0.057**     |              |              |
|                      |              | (2.40)      | (2.50)      |              |
| $G\text{New}_{it} \times PA_{it}$ | $-0.059^{**}$| $-0.063^{***}$|              |              |
|                      | $(-2.56)$   | $(-2.70)$   |              |              |
| $B\text{New}_{it} \times PA_{it}$ | $-0.044^*$  | $-0.046^*$  |              |              |
|                      | $(-1.86)$   | $(-1.95)$   |              |              |
| Constant and $Re_{it-1}$ | Yes         | Yes         | Yes         | Yes         |
| Stock fixed effect   | Yes         | Yes         | Yes         |              |
| Adjusted $R^2$       | 0.04        | 0.06        | 0.08        | 0.08        |

Panel B: Expected and unexpected public attention

|                      | $Re_{it}$   |
|----------------------|-------------|
|                      | (1)         | (2)         | (3)         | (4)         |
| $G\text{New}_{it}$  | 0.062***    | 0.059***    | 0.054**     | 0.055**     |
|                      | (2.73)      | (2.60)      | (2.33)      | (2.40)      |
| $B\text{New}_{it}$  | $-0.049^*$  | $-0.047^{**}$| $-0.042^*$  | $-0.045^{**}$|
|                      | $(-2.09)$   | $(-2.02)$   | $(-1.80)$   | $(-1.96)$   |
| $EPA_{it}$           | $-0.043^*$  | $-0.039^*$  | $-0.041^*$  |              |
|                      | $(-1.90)$   | $(-1.71)$   | $(-1.80)$   |              |
| $UPA_{it}$           | $-0.058^{***}$| $-0.052^{**}$| $-0.055^{**}$|              |
|                      | $(-2.60)$   | $(-2.30)$   | $(-2.42)$   |              |
| $G\text{New}_{it} \times EPA_{it}$ | 0.035       | 0.038*      |              |              |
|                      |              | (1.56)      | (1.67)      |              |
| $B\text{New}_{it} \times EPA_{it}$ | 0.052**     | 0.054**     |              |              |
|                      |              | (2.29)      | (2.38)      |              |
| $G\text{New}_{it} \times UPA_{it}$ | $-0.071^{***}$| $-0.076^{***}$|              |              |
|                      | $(-3.03)$   | $(-3.26)$   |              |              |
| $B\text{New}_{it} \times UPA_{it}$ | $-0.047^*$  | $-0.050^*$  |              |              |
|                      | $(-1.98)$   | $(-2.12)$   |              |              |

(continued)
In sum, our findings in this section not only confirm the negative effects of epidemic infection scale and its public attention on stock returns but also demonstrate that the public concern about COVID-19 reduces the stock market response to firm-specific news whereas the pandemic itself enhances such response. Moreover, the effect of unexpected public attention beyond the pandemic on the stock market is much greater than that of the aggregate attention. Finally, we show that the effect of epidemic infection scale on stock market response to firm-specific news articles is more intensive to negatively toned news articles whereas the corresponding effect of (unexpected) public attention is stronger for positively toned news articles. Collectively, our findings suggest that COVID-19 and its public attention greatly distort the price discovery process in stock markets and complicate corporate’s information environment.

5. Momentum and reversal of return variation

As we have discussed in Section 4, the heterogeneous effects of epidemic infection scale and public attention on the stock market response to firm-specific news is probably because the effect of the former on the stock market is fundamental whereas that of the latter can be non-fundamental. To confirm this inference, we conduct the analysis for future stock returns. The logic is that the return variations are permanent if driven by fundamental shocks to stock prices, but they will be reversed if the shocks are non-fundamental. We focus on the post-outbreak period of the analysis and conduct the regressions of the returns over days from $t+1$ to $t+3$ and up to day $t+20$:

This table reports the results of estimating regressions (5) and (6) in Panels A and B, respectively. $G\text{News}_{i,t}^{std}$ and $B\text{News}_{i,t}^{std}$ indicate the standardised versions of firm-specific positive and negative news variables, respectively, measured by the numbers of positively toned and negatively toned firm-specific news articles. Other settings are the same as in Tables 3 and 4. The sample period starts in January 2020 and ends in August 2020. The $t$-statistics are reported in parentheses, and ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

| Constant and $Ret_{i,t-1}^{std}$ | Ret_{i,t}^{std} | (1) | (2) | (3) | (4) |
|----------------------------------|----------------|-----|-----|-----|-----|
| Stock fixed effect               | Yes            | Yes | Yes | Yes | Yes |
| Adjusted $R^2$                   | 0.04           | 0.06| 0.08| 0.08|     |

Table 5 (continued)
where $Y$ has four main specifications: $\text{Ret}_{i,t}^{\text{std}}$, $\text{Ret}_{i,(t+1,t+3)}^{\text{std}}$, $\text{Ret}_{i,(t+1,t+5)}^{\text{std}}$, $\text{Ret}_{i,(t+1,t+10)}^{\text{std}}$, and $\text{Ret}_{i,(t+1,t+20)}^{\text{std}}$. $\text{Lag}Y$ is the first lag of $Y$. Other settings are the same as previously. We tabulate the results in Table 6. The regression results for $\text{Ret}_{i,t}^{\text{std}}$ are also included in the table as a benchmark for comparison.

Table 6
Return momentum and reversal

| Panel A: Epidemic infection scale and public attention | $\text{Ret}_{i,t}^{\text{std}}$ | $\text{Ret}_{i,(t+1,t+3)}^{\text{std}}$ | $\text{Ret}_{i,(t+1,t+5)}^{\text{std}}$ | $\text{Ret}_{i,(t+1,t+10)}^{\text{std}}$ | $\text{Ret}_{i,(t+1,t+20)}^{\text{std}}$ |
|---|---|---|---|---|---|
| $\text{NIC}_{i,t}^{\text{std}}$ | -0.049** | -0.059*** | -0.049** | -0.043* | 0.041* |
| | (-2.13) | (-2.59) | (-2.16) | (-1.90) | (-1.79) |
| $\text{PA}_{i,t}^{\text{std}}$ | -0.056** | -0.033 | 0.013 | 0.042* | 0.039* |
| | (-2.50) | (-1.35) | (0.56) | (1.82) | (1.66) |
| $\text{News}_{i,t}^{\text{std}}$ | Yes | Yes | Yes | Yes | Yes |
| Constant and lagged dep. | Yes | Yes | Yes | Yes | Yes |
| Stock fixed effect | Yes | Yes | Yes | Yes | Yes |
| Adjusted $R^2$ | 0.06 | 0.04 | 0.04 | 0.03 | 0.03 |

| Panel B: Expected and unexpected public attention | $\text{Ret}_{i,t}^{\text{std}}$ | $\text{Ret}_{i,(t+1,t+3)}^{\text{std}}$ | $\text{Ret}_{i,(t+1,t+5)}^{\text{std}}$ | $\text{Ret}_{i,(t+1,t+10)}^{\text{std}}$ | $\text{Ret}_{i,(t+1,t+20)}^{\text{std}}$ |
|---|---|---|---|---|---|
| $\text{EPA}_{i,t}^{\text{std}}$ | -0.046** | -0.051** | -0.042* | -0.039* | -0.035 |
| | (-1.97) | (-2.24) | (-1.86) | (-1.67) | (-1.54) |
| $\text{UPA}_{i,t}^{\text{std}}$ | -0.065*** | -0.026 | 0.018 | 0.045** | 0.043* |
| | (-2.90) | (-1.05) | (0.79) | (1.96) | (1.85) |
| $\text{News}_{i,t}^{\text{std}}$ | Yes | Yes | Yes | Yes | Yes |
| Constant and lagged dep. | Yes | Yes | Yes | Yes | Yes |
| Stock fixed effect | Yes | Yes | Yes | Yes | Yes |
| Adjusted $R^2$ | 0.06 | 0.04 | 0.04 | 0.03 | 0.03 |

This table reports the results of estimating regressions (7) and (8) in Panels A and B, respectively. The dependent variables are, in turn, $\text{Ret}_{i,t}^{\text{std}}$, $\text{Ret}_{i,(t+1,t+3)}^{\text{std}}$, $\text{Ret}_{i,(t+1,t+5)}^{\text{std}}$, $\text{Ret}_{i,(t+1,t+10)}^{\text{std}}$ and $\text{Ret}_{i,(t+1,t+20)}^{\text{std}}$, which indicate the standardised close-to-close return of stock $i$ over day $t$, days from $t+1$ to $t+3$, from $t+1$ to $t+5$, from $t+1$ to $t+10$, and from $t+1$ to $t+20$, respectively. Other settings are the same as in Tables 3 and 4. The sample period starts in January 2020 and ends in August 2020. The $t$-statistics are reported in parentheses, and ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.
The regression outcome in the table is consistent with our inference. We have shown that the coefficients of $NIC_{\text{std}}$ and $EPA_{\text{std}}$ in the regression of $Ret_{\text{std}}^i$ are significantly negative. Here, we show that all coefficients of $NIC_{\text{std}}$ and $EPA_{\text{std}}$ are also significantly negative in the regressions of future returns we consider, which suggests that there is systematic return momentum following the epidemic infection scale and the initial stock responses are permanent and not reversed. Turning to $PA_{\text{std}}$ and $UPA_{\text{std}}$, besides the significant negative coefficient in the regression of $Ret_{\text{std}}^i$, we only observe negative coefficients in the regression of $Ret_{i,(t+1,t+3)}^i$ but they are insignificant. More importantly, for the regressions of $Ret_{i,(t+1,t+10)}^i$ and $Ret_{i,(t+1,t+20)}^i$, the coefficients of $PA_{\text{std}}$ and $UPA_{\text{std}}$ are positive and significant, which demonstrates material return reversals following the (unexpected) public attention within 10 and 20 trading days. Therefore, the observations here are highly supportive of our contention that the impact of the (unexpected) public attention about the pandemic is non-fundamental and temporary.

6. Robustness checks

So far, we have provided evidence that the COVID-19 outbreak not only reduces stock returns but also affects the stock market reaction to firm-specific news. More specifically, we document that the stock price sensitivity to firm-specific news is weakened by the (unexpected) public attention to the pandemic but strengthened by the epidemic infection scale. Consistently, we observe price momentum following the infection scale but price reversal following the (unexpected) public attention. To ensure the robustness of these findings, we conduct various further tests in this section. They are summarised below.

First, we modify the cut-off date of the epidemic outbreak. For robustness, we replicate regression (1) many times by setting the alternative outbreak date to every trading day in December 2019. The results remain qualitatively similar with what we show in Section 3. Second, instead of using the Baidu Index sentiment, we also use pandemic-related rumours to capture the public attention to the pandemic. The rumour data are collected manually from state-controlled newspapers when a related news article is officially confirmed as fake. Then, we replicate regressions (2)–(5) with the alternative public attention measure. The regression outcome suggests no material difference from that based on the Baidu Index sentiment. Third, we adjust the measure of epidemic infection scale by taking the number of cured cases into account. That is, the infection scale is measured by the difference between the number of increased confirmed cases and the number of increased cured cases. Again, these replication regressions yield consistent observations. While these exercises are not tabulated here, they are available upon request from the authors.

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2 The date of each rumour is defined as the date when the rumour gains first exposure to the public rather than the date when it is officially identified as fake news.
7. Concluding remarks

This paper investigates into stock returns and stock market response to firm-specific news articles during the pandemic period. Focusing on the Chinese stock market, we first compare the stock returns and stock price sensitivity to firm-specific information before and after the COVID-19 outbreak. Then, we concentrate on the post-outbreak period and dig into the effects of epidemic infection scale and public attention about the pandemic on stock returns and stock market reaction to the release of firm-specific news. Next, we analyse future stock returns to seek momentum or reversal patterns. Finally, we consolidate our findings with further supporting evidence from various robustness experiments.

The key findings of our paper are summarised as follows. We find that the Chinese stock returns and stock price sensitivity to firm-specific information after the COVID-19 outbreak are significantly lower than before. It indicates that the outbreak hurts not only stock returns but also the stock price efficiency by slowing the incorporation of new information into the stock price. Focusing on the post-outbreak period, we confirm the damage of both epidemic infection scale and (unexpected) public attention (beyond the pandemic) on stock returns. Moreover, our evidence indicates their heterogeneous effects on the price discovery process: the stock price sensitivity to firm-specific information increases in epidemic infection scale but is damaged by (unexpected) public attention. Further experiments indicate that the increasing effect of epidemic infection scale on stock price sensitivity to firm-specific information is more intensive to adverse firm-specific news, whereas the decreasing effect of (unexpected) public attention is stronger for favourable firm-specific news. Finally, we observe price momentum for the effect of epidemic infection scale but price reversal for (unexpected) public attention.

Our findings enable academic researchers, industrial players and market regulators to understand the information role of firm-specific news articles more comprehensively in the context of the pandemic of COVID-19. The release of firm-specific information affects the stock return. This effect is, however, distorted by the COVID-19 outbreak. The additional effect of unexpected public sentiment creates an important caveat indicating the excess damage to stock market efficiency beyond the pandemic. Additionally, our evidence adds to the literature by exploring the heterogeneous impounding of positive and negative firm-specific information during the epidemic period.

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