Post-Earnings Announcement Drift, Systemic Shock, and Limited Attention: Evidence from COVID-19 Pandemic

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Abstract

This paper examines the post-earnings announcement drift (PEAD) under the systemic shock by taking the COVID-19 pandemic as an example. Though much prior literature has proved the decline of PEAD, I find this anomaly still existed during the global pandemic. Based on the limited attention theory, I investigate the cause of such a phenomenon. From the perspective of signaling, the empirical results show that the broad disclosure of unexpected systemic shock leads to a stronger PEAD. However, firms with negative disclosure about COVID-19 have weaker PEAD due to the negative bias. On the other hand, I find that a later convening of the earnings conference, a larger time gap, and more inconsistent emotional expressions between the earnings call and Forms 10-K & 10-Q strengthen the PEAD by increasing the investors' information processing cost.

Keywords: Limited attention, Post-earnings announcement drift (PEAD), Information overload, Negative bias, Information processing cost.

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1 Introduction

The sudden outbreak of the global epidemic, COVID-19, hit the financial markets worldwide in 2020. As a systemic shock, this pandemic caused intense fluctuations trend in the U.S. stock market. Under such circumstances, the financial disclosures about COVID-19 are important information sources for market participants, which provides a great chance to examine the market efficiency under concentrated disclosure of a large amount of information about the systemic hit. Therefore, this paper focuses on the existence and causes of a well-known anomaly, post-earnings announcement drift (PEAD), during the COVID-19 pandemic.

To measure the earnings surprise, this paper constructs the standardized unexpected earnings (SUE) based on I/B/E/S by following Livnat and Mendenhall (2006) and the scaled quintile rank of SUE (QSUE) by following Hung et al. (2015). Different from prior literature proving the decline of PEAD (Martineau, 2021; Kettell et al., 2022), my results support the existence of PEAD during COVID-19. The QSUE has a significantly positive impact on the post-earnings annualized quarterly return after controlling the firm characteristics and fixed effects of quarter and industry.

According to a large amount of related literature, PEAD anomaly is mainly led by two causes: the limited attention of investors (i.e., limited attention theory, Hirshleifer and Teoh, 2003; Hirshleifer et al., 2011; Li et al., 2020) and the limits of arbitrage (Kettell et al., 2022). According to the limited attention theory (Hirshleifer and Teoh, 2003; Hirshleifer et al., 2011), the investors' attention allocation greatly impacts market efficiency. Focusing on this, I investigate the causes by deconstructing PEAD from two perspectives: information cognition on systemic shock disclosure and information processing on incomplete disclosure. To better evaluate the pandemic disclosure, I follow Hassan et al. (2023) and Fang et al. (2023) to construct the event-related linguistic measures by natural language processing (NLP).

The first part of the empirical analysis focuses on the disclosure of COVID-19 in the earnings calls. In the era of information explosion, the rapid and widespread outbreak of the epidemic prompted a large amount of related information everywhere. For investors surrounded by pandemic news, information processing and analysis are huge challenges (Mao et al., 2022). Especially when there are scarce historical references for investors regarding the unprecedented global pandemic, firms' simultaneous and extensive disclosure about the pandemic makes it more challenging. I thus examine whether the mentioning of COVID-19 in earnings calls influences the PEAD. The empirical results show that, due to the information overload, the broad discussion about the pandemic distracts investors' attention, leading to an increased PEAD. Furthermore, there exists a cognitive bias influencing this anomaly. Because of the negative bias, investors allocate more attention to firms with negative expressions on COVID-19 in earnings calls, weakening the PEAD as a result.

The second part cut into the results from another angle, the disclosure strategies of earnings calls and Form 10-Ks & 10-Qs. As a preliminary financial disclosure, a firm's earnings call efficiently reveals information on time. The timing of convening an earnings call, measuring the waiting time by investors after the end of the financial quarter, is a good proxy of their information processing cost. The result shows that a longer waiting time (i.e., a later convening of earnings call) strengthens the PEAD by increasing the cognitive burden.

On the other hand, the sequential disclosure between two disclosures, along with one serving as highlights while the other provides comprehensive details, makes the information from both sources complementary to each other. Therefore, as two parts of "incomplete disclosure", the time gap between these releases becomes a factor influencing investors' information processing costs. It is more possible for investors to place irrational attention with higher cognitive costs, leading to market inefficiency. I find that a firm with a longer time gap between two disclosures has a stronger PEAD, which supports the statement about the cognitive cost.

Besides, by extending the analysis on incomplete disclosure, I examine the inconsistent linguistic expressions between earnings calls and financial reports. A larger difference in constructed linguistic variables based on different sources implies more inconsistency (or even contradictions) that confuse the investors, which also plays as a proxy of higher cognitive cost. The empirical results support this statement. The difference in conditional sentiments between earnings calls and financial filings has a significantly positive impact on the PEAD anomaly.

The contributions of this paper include the following three aspects. First of all, this paper contributes to the related literature about financial disclosures by exploring the impact of COVID-19 from the perspective of cognitive bias and information processing.

Secondly, the empirical results provide more evidence to support the widely-discussed limited attention theory by examining the impacts of negative bias and information processing cost on PEAD, which sheds more light on the research about behavioral finance. The finding of weakening PEAD by negative expression in earnings calls also contributes to the research focusing on the decline of PEAD.

Last but not least, this paper provides more investigations on comparing the disclosure power of earnings calls and financial filings. The empirical results not only support that earnings calls serve as a more effective financial disclosure channel, but also find that earnings calls and financial filings complement each other as financial information disclosures. The timing strategies of these disclosures significantly affect the market efficiency.

The rest of the paper is organized as follows. Section 2.2 provides a review of related literature. Section 2.3 introduces the theoretical foundation and develops the hypotheses for systemic shock disclosure and incomplete disclosure. Section 2.4 introduces the data and the methodologies to measure earnings surprise and to construct linguistic metrics. Section 2.5 shows the empirical results and analyzes them in two parts: the information overload and negative bias in systemic shock disclosure and the information processing cost from incomplete disclosure. Section 2.6 concludes.

2 Literature Review

2.1 Post earnings announcement drift (PEAD)

As a “granddaddy of underresponse events” (Fama, 1998), the PEAD has been widely discussed during the past several decades (Ball and Brown, 1968; Bernard and Thomas, 1989; Bernard and Thomas, 1990; Taylor, 2012; and Fink, 2021). The PEAD is also called the standardized unexpected earnings effect (SUE effect) or earnings momentum effect since it is generally considered a result of earnings surprise. This phenomenon is defined as a firm’s stock price (or cumulative abnormal return) drifting in the direction of the firm’s earnings surprise for a time horizon (e.g., several weeks, months, or even a quarter). Generally speaking, a firm with a positive earnings surprise would have a positive price drift while a firm with a negative earnings surprise would have a negative one. As an anomaly in financial markets, the PEAD is contrary to the efficient market hypothesis since it is not a fully instantaneous response. According to Chen and Kim (2020), the PEAD represents a behavioral risk that cannot be explained by fundamental risk in asset pricing.

Previous literature mainly explains the PEAD as a result of two causes, including the limited attention of investors and the limits of arbitrage. For the limited attention, when too many companies release earnings announcements at the same time, investors are unable to process such a large amount of information immediately, which leads to underresponse to the events (Bernard and Thomas, 1989; Hirshleifer et al., 2009; and DellaVigna and Pollet, 2009). On the other hand, the limits of arbitrage in reality also induce the PEAD. High transaction costs and illiquidity restrict rational investors from carrying out arbitrage trades immediately after the earnings announcement (Bhushan, 1994; Sadka, 2006; Ng et al., 2008).

However, more and more recent research has examined the disappearance of the

PEAD. With more than 40 years of data, Martineau (2021) finds that financial markets are more efficient at incorporating earnings surprises at the announcement time, leading to the decline of PEAD over time. Kettell et al. (2022) explain the PEAD decline as a result of increased arbitraging activities. They further find that the persistence of standardized unexpected earnings (SUE) declines over time, which provides another explanation for the reduction of PEAD.

2.2 Limited attention theory

As a precious resource, the investor's limited attention and its impact on capital markets have been investigated by prior literature. Both in theoretical and empirical research, there is evidence supporting that inattentive investors have an incomplete response to market news, and stock prices exhibit post-announcement drifts (Nekrasov, et al., 2023). Hirshleifer and Teoh (2003), Hirshleifer et al. (2011), and Li et al. (2020) developed the limited attention model to explain the PEAD patterns. By segmenting market investors into two groups, fully-attentive investors and inattentive investors, Li et al. (2020) examine the effect of delayed disclosure of financial items in earnings announcements. By constructing two disclosure regimes, timely disclosure (TD) and delayed disclosure (DD), they measure the immediate response to the earnings news under two different regimes as the earnings response coefficient (ERC). Their empirical finding is consistent with their theoretical prediction. The response under the DD regime is incomplete even after the delayed items are fully disclosed in the corresponding filings.

Under the scope of limited attention, a large scope of research has investigated this issue from different perspectives. From competing stimuli, Hirshleifer et al. (2009) find that investor attention to the earnings announcement of a target firm can be distracted by others who release the announcement on the same day. DellaVigna and Pollet (2009) find that the upcoming weekend can distract investors' attention from the earnings announcement released on Friday. With a daily news pressure measure, Israeli et al.

(2021) find that investor has weaker attention on days with high unexpected distractions. Some researchers also examine the attention distraction from externality non-information events, including the NCAA basketball tournament (Drake et al., 2016) and exogenous outages of the Blackberry Internet Service (BIS) (Brown et al., 2022).

From different roles of market participants, some research has investigated the limited attention effects of sophisticated financial analysts (Koester et al., 2016; Driskill et al., 2020; Choi and Gupta-Mukherjee, 2022), large institutional investors (Kempf et al., 2017), and loan officers (Cambell et al., 2019).

Other research explores different causes, including geographic location (Dyer, 2021), investor sophistication (Lu et al., 2016; Kempf et al., 2017; Driskill et al., 2020; and Chiu et al., 2021), news salience and information processing ease (Aboody, 1996; Amir, 1993; Ahmed et al., 2006; Lawrence et al., 2018; and Miao et al., 2016).

2.3 Information disclosure in earnings calls and Forms 10-K & 10-Q

A large amount of literature investigates the role of information disclosure in the accounting area. Some pay attention to the accounting fillings (Li, 2006; Li, 2010; Brown and Tucker, 2011; Loughran and McDonald, 2011; Li et al., 2013; and Campbell et al., 2014), while others focus on the earnings calls (Davis et al., 2015; Ramelli and Wagner, 2020; and Hassan et al., 2023).

Different from the research mentioned above, You and Zhang (2011) and Davis and Tama-Sweet (2012) compare the differences between earnings announcements and Forms 10-K and 10-Q. You and Zhang (2007) find that investors are more under-responsive to the information contained in Form 10-K than earnings announcements. This pattern is stronger for small firms than for large ones. Davis and Tama-Sweet (2012) find that firms try to express more extreme sentiments in earnings press than MD&A disclosures in filings, which means a higher level of optimistic expression and a lower level of pessimistic expression.

3 Theoretical Foundation and Hypotheses Development

To investigate the PEAD under the systemic shock caused by the COVID-19 pandemic, I develop the hypotheses from two different directions: the first one is the signaling of the systemic shock disclosure, while the other one is the incomplete disclosure (or the disclosure roles of earnings calls and the 10-K & 10-Q filings).

3.1 Hypotheses for systemic shock disclosure

As a systemic shock that greatly impacted the global economy, the COVID-19 pandemic swiftly and significantly affected the U.S. financial markets. In the rapidly changing era of the pandemic, information must be disclosed and updated on time. The SEC's disclosure guidance in March 2020 required companies to analyze the financial impact of and responses to COVID-19 as much as possible during financial reporting (SEC, 2020). Associate with this, the discussion about (or just mentioning) the pandemic during the earnings calls is a signal of systemic shock disclosure.

The heightened uncertainties of both the pandemic and the market made the dynamic processing and timely updating of information a necessity. However, coupled with the world's struggle to cope with the sudden variants of the pandemic, the information overload of COVID-19 was a significant condition affecting the cognitive and processing abilities of market participants. Mao et al. (2022) showed that the information overabundance on media channels hampered individuals' ability and motivation to process COVID-19 prevention information.

Therefore, as a signal of systemic shock, the explosive disclosure about the COVID-19 pandemic can lead to a greater PEAD by distracting the investors' precious limited attention, from traditionally essential financial indicators. Hence, I propose the first two hypotheses.

Hypothesis 1a. (Information overload) During the earnings call, a firm that mentions COVID-19 has a stronger PEAD than a firm that does not.

Hypothesis 1b. (Information overload) During the earnings call, a firm that mentions COVID-19 more times has a stronger PEAD than others.

On the other hand, this paper focuses on another well-known cognitive bias, the negative bias (also known as the negative effect). Many psychological studies have found that things with a more negative nature (e.g., trauma, unpleasant thoughts, and bad feedback) have a greater effect on one's psychological state than neutral or positive things (Baumeister et al., 2001; Rozin and Royzman, 2001; Lewicka et al., 1992). With the results of psychological experiments, Fiske (1980) and Ohira et al. (1998) suggested that negativity is an attention magnet. Compared with positive information, negative information has a stronger attraction to attention in general (Baumeister et al., 2001). Besides, many studies have examined the negative bias in financial markets (Akhtar et al., 2011; Reyes, 2019; Sias et al., 2023). By taking the swine flu pandemic as an example, Sias et al. (2023) found that the negative bias can explain heterogeneity in return beliefs, overly bearish return beliefs, and the corresponding low stock market participants.

Based on previous research, market participants can have a negative bias when facing bad information disclosed in earnings calls. As a global shock hits the market, the negative discussion about the COVID-19 pandemic in earnings calls can draw investors more attention and impact their decision-making. According to the limited attention theory, a firm that gains more attention will have a weaker PEAD. Thus, I propose the following hypothesis.

Hypothesis 2. (Negative bias) During the earnings call, a firm that has a negative expression when discussing COVID-19 has a weaker PEAD than a firm with a neutral (or positive) expression.

3.2 Incomplete disclosure model

Before illustrating the hypotheses for incomplete disclosure, I develop the theoretical model first. To investigate the disclosure roles of the earnings calls and Forms 10-K &

10-Q and their impacts on the PEAD, this paper extends the delayed disclosure model proposed by Li et al. (2020), which is an extension to the limited attention model developed by Hirshleifer and Teoh (2003) and Hirshleifer et al. (2011). I start by briefly introducing the Li et al. (2020) model (LNT model) and then illustrate how to extend it to investigate three issues about the disclosures, including timings of disclosure, time gap, and inconsistent expressions.

[Insert Figure 1 here]

The subfigure (a) in Figure 1 presents the timeline of the LNT model. Li et al. (2020) designed the model with two different regimes (TD-Regime and DD-Regime) to examine the role of delayed disclosure of financial items in earnings announcements. The delayed disclosure ratio (DD) is defined as the number of delayed disclosed financial statement items divided by the number of total financial statement items disclosed in 10-Q filings. Under the TD-Regime, the firm releases both earnings e and other financial statement items δ at the earnings announcement, while under the DD-Regime, the firm releases earnings (e) at the earnings announcement and releases other financial statement items (δ) at the filing date separately. Li et al. (2020) find that firms with higher DD ratios tend to have a greater delay in investors and analyst's responses to earnings surprises.

Under the model extended by this paper, the timeline of the incomplete disclosure model is described as subfigure (b) in Figure 1. Since the investor's attention is limited and precious resource, my research focuses on the optimal allocation of investor's attention to earnings calls and 10-K & 10-Q filings. I investigate the incomplete disclosure from two perspectives, timing of disclosure and inconsistent statements between different disclosures.

From the first perspective, the timing of information release can affect the effective reception and information processing by recipients. I first sort out the financial information disclosure timeline that this article focuses on. For a firm c, the date 0 (T_0)

is the end of the filing period (a fiscal quarter or year). At date 1 $(T_1, T_1 > T_0)$, the management of firm c conducts the earnings conference call to highlight the firm's performance during the filing period, which can be regarded as a summary of the fiscal filing released later. At date 2 $(T_2, T_2 > T_1)$, the firm submit the corresponding fiscal filing to the SEC. The length of the time intervals $[T_0, T_1]$ and $[T_0, T_2]$, $\tau_1 = T_1 - T_0$ and $\tau_2 = T_2 - T_0$, are days between the ending of filing period and information release, representing the timing of disclosure. The timely disclosure and the pace of disclosures can impact the degree to which market participants accept the disclosed financial information. In other words, this influences investors' attention allocations during information reception and digestion, as well as subsequent investment decisions. These timing effects, in turn, can affect the changes in the stock returns following the earnings announcements.

Besides, the 10-K and 10-Q filings are submitted later than the earnings call in general, implying a delayed time interval $[T_1, T_2]$ between these two disclosures. The length of this time interval, $\Delta T = T_2 - T_1$, is the time gap between earnings call and Forms 10-K and 10-Q. Since the conference call can be regarded as a condensed version of fiscal filing, summarizing and distilling all the financial information, the differences in information coverage between the conference call and the complete financial report can also affect the timing issues for investors in decision-making. For example, should investors buy stocks immediately based on the (one-sided) positive news from the conference call, or wait until the formal release of the complete financial information for a comprehensive assessment? However, the information volume covered by each disclosure is extensive, making it impractical to directly and effectively compare their information coverage.

Nevertheless, the time gap between the two disclosures serves as a good proxy. A larger time gap implies that investors need to wait longer to merge and compare the two disclosures, leading to greater cognitive costs. Since human attention and memory are limited, a longer time gap means investors must recall memories from a more distant past, thereby influencing their ability to make rational decisions, leading to a more persistent underreaction to earnings releases.

From the second perspective, this paper focuses on the inconsistent statement between earnings calls and fiscal filings. Considering that earnings calls and fiscal filings are different forms of vehicles for evaluating company performance, the former involves oral expressions, while the latter consists of formal written documents. On one hand, the oral nature of earnings calls makes the expression more vivid, while financial reports generally adhere to established formats and convey a more formal and neutral expression. On the other hand, however, earnings calls are constrained by time limits, resulting in a more limited amount of information conveyed compared to financial reports. Therefore, even when addressing the same topic or content, disclosures in these two different materials may exhibit distinct expressions. Furthermore, as mentioned earlier, coupled with the time delay between earnings calls and 10-K and 10-Q filings, inconsistent expressions can easily confuse investors, increasing the burden of information identification. In such a scenario, it can lead to more irrational reactions to earnings announcements, reinforcing the PEAD.

Under the structure of the incomplete disclosure model in Figure 1, this paper adopts the linguistic differences between the earnings call and the financial filings as a proxy to measure the inconsistent expressions. For a linguistic measure i (e.g., sentiment or risk), the management discusses the same specific topic A with different levels in earnings call ($i = v_1$) and in the MD&A section of 10-K or 10-Q filings ($i = v_2$). Under this situation, a larger difference between v_1 and v_2 (i.e., $\Delta i = v_1 - v_2$), increases the cognitive burden and requires more attention-consuming analysis to figure out the inconsistency (or even contradicts) of information disclosed before and after, strengthening the PEAD by worsening the underresponse. On the contrary, if the difference is smaller, meaning the linguistic features of the two materials are more consistent, the investors have a lower chance of underresponse, leading to the decline of the PEAD.

3.3 Hypotheses for incomplete disclosure

According to the incomplete disclosure model mentioned above, I propose three hypotheses for incomplete disclosure. The first one focuses on the timing of disclosure. A longer time interval $[T_0, T_1]$ (i.e., a larger τ_1) indicates a time-consuming disclosure of earnings call, leading to more waiting time and more attention consumption for market participants. Therefore, the first hypothesis for incomplete disclosure is as follows.

Hypothesis 3a. (Timing of disclosure) A later convening of the earnings conference call strengthens the PEAD. In other words, a firm with a larger τ_1 *has a stronger PEAD.*

Secondly, since the earnings call plays as a streamlined version of the information disclosed in the corresponding financial report, a larger time gap ΔT indicates more processing cost for the information receiver to combine the financial disclosures from different materials and to evaluate the corporate performance with a whole picture. Thus, I propose the following hypothesis:

Hypothesis 3b. (Time gap between disclosures) A larger time gap between earnings calls and financial reports strengthens the PEAD. In other words, a firm with a larger ΔT *has a stronger PEAD.*

Last but not least, the incomplete disclosure model focuses on the inconsistent expressions of two disclosures on a specific topic. In this paper, I adopt the COVID-19 pandemic as the chosen topic to investigate. Due to more confusing (or even contradicting) and attention-consuming expressions before and after, a larger difference in linguistic variables (e.g., conditional exposure, conditional sentiment, or conditional risk) increases the cognitive burden and decreases the quality of decisions for investors, leading to a greater PEAD. Therefore, the hypothesis about inconsistent expression is:

Hypothesis 4. (Inconsistent expression) A firm with more inconsistent expressions on a specific topic between earnings calls and financial reports has a greater PEAD. In *other words, a firm with a larger Δi has a stronger PEAD.*

4 Data and Methodologies

4.1 Data

To focus on the systemic shock from the COVID-19 pandemic, the sample period selected in this paper is from March 1, 2020, to December 31, 2020[2], a total of 10 months. I use the data of firms listed on NYSE, NASDAQ, and AMEX in the U.S. stock market. The filing dates and text contents of financial filings (including Form 10-K and Form 10-Q) are downloaded from the SEC's EDGAR, a database that originally stored and published the official financial filings. The release dates and transcripts of earnings calls are collected from Advance Event Search (ADVEV), an application in Eikon. The firms' financial data is obtained from CRSP and Compustat databases on WRDS, including stock prices (to calculate the annualized quarterly returns), SIC code (for sector fixed effect), market value, ROA, ROE, PE ratio, BM ratio, and cash/debt (as control variables). The data of earnings per share, including estimates and actuals, are collected from I/B/E/S on WRDS. After data merging and cleaning, there are 2,718 firm-quarter level data in the sample.

Though there can be audit completeness issues at the announcements of annual earnings (Schroeder, 2016 and Marshall et al., 2018), I do not examine the Form 10-K and Form 10-Q separately since there are only nearly 100 10-K flings in the sample set.

4.2 Measuring earnings surprise

According to Daniel et al. (2020), previous studies of earnings momentum have used return-based surprise measures, such as CAR, and earnings-based measures, such as the standardized unexpected earnings (SUE) (Chan et al., 1996). In this paper, I mainly

[2] On March 12, 2020, the WHO declared the outbreak of COVID-19 a pandemic. In October, WHO reported that one in ten people around the world, or 780 million people, may have been infected. Since December 2020, the COVID-19 vaccines have been approved and widely distributed in various countries, which reducing the severity and death caused by this pandemic.

adopt the earnings-based measure of surprise to construct the PEAD. The earnings-based measure necessarily compares the announced earnings to analyst-forecasted earnings (or to a time-series historical proxy for the earnings expectation).

Livnat and Mendenhall (2006) considered three different methods to construct the earnings surprise: (1) by assuming a rolling seasonal random walk model, (2) by excluding “special items” from the Compustat Data, and (3) solely based on I/B/E/S median estimates/actuals. In this paper, I adopt the third method to construct the *SUE*, which is a simple but useful approach. This method includes the following six steps.

[Step 1] Extract unadjusted estimates from I/B/E/S (on WRDS). Here I should notice that I need to distinguish between primary and diluted earnings per share (EPS). Following Livnat and Mendenhall (2006), I determine whether most analysts report estimates on a primary or diluted basis.

[Step 2] Link estimates with actuals. I link unadjusted estimates with unadjusted actuals and only keep the estimates issued within 90 days before the report date.

[Step 3] Adjust estimates with a cumulative adjustment factor for shares (CFACSHR). In this step, I put the estimate on the same per-share basis as the company reported EPS using CRSP adjustment factors.

[Step 4] Compute the median forecast based on estimates in the 90 days prior to the earnings announcement date.

[Step 5] Calculate the *SUE*s as following equation

$$SUE_{j,t} = \frac{ActualEPS_{j,t} - EstimatedEPS_{j,t-1}}{P_{j,t}}, \quad (1)$$

where t is the disclosure quarter, and $P_{j,t}$ is the close price of the quarter, *prccq* (price close – Quarter, from Compustat).

[Step 6] Merge *SUE*s with lexicon-based measures through CIK-CUSIP mapping[3].

Following Hung et al. (2015), I construct the scaled quintile rank of *SUE*, *QSUE*, based on the calculated *SUE*. For each quarter in the sample period, I sort the firms' *SUE*s and rank them into five quintiles, ranging from 0.2 to 1.

4.3 Constructing linguistic metrics

To evaluate the inconsistent expression between earnings calls and Forms 10-K and 10-Q, I construct the linguistic metrics by following Fang et al. (2023). To capture the information related to the COVID-19 pandemic precisely, I construct the keyword lists in Table 1. Based on the words used by Hassan et al. (2023) and Stephany et al. (2022), I summarize specific words that directly define the corresponding topic by adopting the official names defined by the World Health Organization (WHO) and those usually appear in newspaper articles, earnings calls, and Forms 10-K & 10-Q, such as "covid-19", "coronavirus" and "sars-cov-2".

[Insert Table 1 here]

Next, Three linguistic measures, conditional exposure, conditional sentiment, and conditional risk are constructed according to Hassan et al. (2023) and Chapter 1 of this dissertation. Having compiled my keywords list, I measure a time-varying conditional exposure from the disclosure e (e equals to "EC" for earnings call or "KQ" for Forms 10-K & 10-Q), denoted by $Con.Expoure_{i,t}^{e}$, by counting the number of times the event-related synonyms appear in the text. To remove the effect of the text length, I divide the number by the total word count:

$$Con.Exposure_{i,t}^{e} = \frac{1}{B_{i,t}} \sum_{b=1}^{B_{i,t}} 1[b \in L_e], \qquad (2)$$

[3] This is a CIK-CUSIP mapping tool developed by Prof. Leo Liu at the University of Technology Sydney. https://github.com/leoliu0/cik-cusip-mapping

where $1[\cdot]$ is the indicator function, $b = 1, 2, \ldots, B_{i,t}$ index the words contained in the text (earnings call transcript or MD&A session of Form 10-K or 10-Q) of firm i in quarter t, $B_{i,t}$ is the total word count of the text, and L_e is the set of keywords for the corresponding event e. The conditional exposure measures how much a firm suffers from the impact of the specific economic recession. In other words, it reflects how much the firm's management is concerned about the corresponding event.

Since I have known the firm's concertation about the pandemic, it is important to figure out if the management responds to the impact optimistically or pessimistically. Hence, I construct the conditional sentiment by calculating the managers' tone when they mention the corresponding event. Focusing on the neighborhood of 10 words before and after the keyword appears in the text, I count the positive-tone words and negative-tone words within the range. These positive- or negative-tone words are identified according to the Master Dictionary by Loughran and McDonald (2011). For a given firm i, the conditional sentiment of the disclosure e at time t, denoted by $Con.Sentiment_{i,t}^{e}$, is calculated as the number of positive-tone words minus the number of negative-tone words. Similar to the conditional exposure, I also exclude the effect of the text length:

$$Con.Sentiment_{i,t}^{e} = \frac{1}{B_{i,t}} \sum_{b=1}^{B_{i,t}} \left(1[b \in L_e] \sum_{c=b-10}^{b+10} S(c) \right), \tag{3}$$

where $S(c)$ is a function that equals 1 when word c is a positive-tone word, -1 when word c is is a negative-tone word and 0 otherwise. Besides, to further examine the different roles of different tones, I also split the conditional sentiment into a positive sentiment and a negative sentiment as follows:

$$Con.Positive_{i,t}^{e} = \frac{1}{B_{i,t}} \sum_{b=1}^{B_{i,t}} \left(1[b \in L_e] \sum_{c=b-10}^{b+10} 1\left[c \in D_{pos}\right] \right), \tag{4}$$

$$Con.Negative^{e}_{i,t} = -\frac{1}{B_{i,t}}\sum_{b=1}^{B_{i,t}}\left(1[b \in L_e]\sum_{c=b-10}^{b+10}1\left[c \in D_{neg}\right]\right), \quad (5)$$

where D_{pos} is the set of positive-tone words and D_{neg} is the set of negative-tone words. It should be noted that $Con.Positive^{e}_{i,t} > 0$ and $Con.Negative^{e}_{i,t} < 0$. A higher conditional sentiment reflects a more optimistic attitude the management holds towards the extreme event, while a lower conditional sentiment reflects a more pessimistic one.

To disclose information, the managers would discuss the firm's current status, potential challenges, and future expectations in MD&A sessions and earnings calls. According to Li (2006), Kravet and Muslu (2013), and Campbell et al. (2014), these contents can reveal rich information about the risks the firm faces. It thus provides us a chance to evaluate the management's response to the risks caused by the event through these texts. Similar to the above measures, the conditional risk, denoted by $Con.Risk^{e}_{i,t}$, is constructed by counting the number of keywords that are in proximity to a synonym for "risk" or "uncertainty"[4] within 10-words range. Same as the measures above, the text-length effect is removed:

$$Con.Risk^{e}_{i,t} = \frac{1}{B_{i,t}}\sum_{b=1}^{B_{i,t}}(1[b \in L_e] \times 1[|b-r| < 10]), \quad (6)$$

where r is the position of the nearest synonyms of "risk" or "uncertainty" and $1[|b-r| < 10]$ identifies if any risk synonym exists within the 10-words neighborhood of the keyword. A higher conditional risk score implies more risks the

[4] Instead of following Li (2006), I use the same list of risk synonyms as Hassan et al. (2023) to better compare our results with theirs. The words used by Li (2006), "risk" (including "risk", "risks", and "risky") and "uncertainty" (including "uncertain", "uncertainty", and "uncertainties"), are also included in this list, while misleading words mentioned by Li (2006), such as "may", "might", and "could", are not included. The risk synonyms list is obtained from Tarek A. Hassan's website and GitHub: https://github.com/mschwedeler/firmlevelrisk

firm faces under the impact of the extreme event.

Though the earnings call conveys similar information as the MD&A session in Forms 10-K and 10-Q, the distinctive features of the earnings call (i.e., prerelease timing, limited length, and additional participants) can lead to the managers' different expressions. To better understand these differences, I construct the difference measures, denoted by $Diff.Measure_{i,t}$, which are based on similar mechanism as Hassan et al. (2023) but in different scope.

$$Diff.Measure_{i,t} = Con.Measure_{i,t}^{EC} - Con.Measure_{i,t}^{KQ}, \quad (7)$$

where the difference measure $Diff.Measure_{i,t}$ is $Diff.Exposure_{i,t}$, $Diff.Sentiment_{i,t}$, or $Diff.Risk_{i,t}$ with respect to conditional exposure, conditional sentiment, or conditional risk. $Con.Measure_{i,t}^{EC}$ is the linguistic measure from earnings call, and $Con.Measure_{i,t}^{KQ}$ is from Forms 10-K & 10-Q, respectively.

5 Empirical Results

5.1 Descriptive statistics

According to Sections 2.4.2 and 2.4.3, I calculate the earnings surprise and the linguistic metrics. The linguistic variables are standardized and winsorized. The descriptive statistics of the variables used in this paper are presented in Table 2, and the definitions of these variables are summarized in Appendix A. According to the result, the average of SUE is close to 0.00 (0.000886 in detail), indicating a relatively accurate estimation in general by analysts according to I/B/E/S data.

[Insert Table 2 here]

For the indicator variables, *COVID* equals 1 when the earnings call mentioned COVID-19, and *COVID_NEG* equals 1 when earnings calls expressed negative sentiment in general when discussing the pandemic. Other indicators are equal to 1 when the corresponding variable (linguistic variable or timing of disclosure) is larger than the median level of the whole sample. The average of *COVID* is 0.99, which means that nearly 99% of the earnings call mentioned the COVID-19 pandemic during our sample period. This result supported my idea that the discussion about COVID-19 provides a great chance to examine the disclosure powers between earnings calls and financial reports. The average of *COVID_NEG*, is 0.64, implying that nearly 64% of the earnings call expressed negative sentiment when discussing about COVID-19 pandemic during our sample period.

The negative averages of $Con.Sentiment^{EC}$ and $Con.Sentiment^{KQ}$ (-0.49 and -0.47) indicate that the management majorly expressed negative signals when mentioning the pandemic in the earnings calls. Besides, the positive averages of $Con.Risk^{EC}$ and $Con.Risk^{KQ}$ (0.89 and 0.26) imply that the management did reveal pandemic-related risks they faced in the disclosures.

When turning focus to the differences between earnings calls and financial filings, the average of *Diff.Exposure*, *Diff.Sentiment*, and *Diff.Risk* are 0.67, -0.02, and 0.63 respectively, implying that when discussing COVID-19, the earnings calls mentioned the pandemic more times, had a more negative disclosure, and more discussed the relative risks than the financial reports. These observations are intuitive. On one hand, with an oral and informal format, the earnings call can more vividly convey emotions. On the other hand, the time advantage of early disclosure allows earnings calls to encompass a broader range of information expressions than 10-K and 10-Q filings. However, the time gap between the disclosures of these two materials is smaller than in previous years[5], implying a more efficient timing structure in financial disclosures.

5.2 Systemic shock disclosure: Information overload and negative bias

Following Hung et al. (2015), I construct the SUE according to Livnat and Mendenhall

[5] According to You and Zhang (2011), the average time gap was 37.04 days from Jan. 1, 1995, to Dec. 31, 2005, while the average time gap in this paper is 3.16 days.

(2006) and calculate the scaled quintile rank of SUE (*QSUE*) on the quarter level. Hypotheses 1a, 1b, and 2 are examined through following regressions.

$$R_{i,t}^{Q} = \delta_{industry} + \delta_{quarter} + \beta_1 QSUE_{i,t} + \sum\beta_k \, Controls + \epsilon_{i,t}, \qquad (7)$$

$$R_{i,t}^{Q} = \delta_{industry} + \delta_{quarter} + \beta_1 QSUE_{i,t} + \beta_2 QSUE_{i,t} \times COVID_{i,t} + \sum\beta_k \, Controls + \epsilon_{i,t}, \qquad (8)$$

$$R_{i,t}^{Q} = \delta_{industry} + \delta_{quarter} + \beta_1 QSUE_{i,t} + \beta_2 QSUE_{i,t} \times COVID\_M_{i,t} + \sum\beta_k \, Controls + \epsilon_{i,t}, \qquad (9)$$

$$R_{i,t}^{Q} = \delta_{industry} + \delta_{quarter} + \beta_1 QSUE_{i,t} + \beta_2 QSUE_{i,t} \times COVID\_NEG_{i,t} + \sum\beta_k \, Controls + \epsilon_{i,t}, \qquad (10)$$

where $R_{i,t}^{Q}$ is the annualized quarterly return of firm i at the time of earnings call t. The fixed effects of industry and quarter are considered. The industry fixed effect ($\delta_{industry}$) is based on the first two numbers of SIC code, when the quarter fixed effect ($\delta_{quarter}$) is based on the calendar quarter of the earnings calls. The dummy variables $COVID_{i,t}$, $COVID\_M_{i,t}$, and $COVID\_NEG_{i,t}$ indicate the situations of the hypotheses. The variable $COVID_{i,t}$ equals to one when the earnings call mentions the COVID-19 pandemic. In other word, $COVID_{i,t} = 1$ when $Con.Exposure_{i,t}^{EC} < 0$. The variable $COVID\_M_{i,t}$ equals to one when the firm mentions the pandemic more times than the median level of the whole sample. The variable $COVID\_NEG_{i,t}$ equals to one when the earnings call expresses the COVID-19 pandemic in a negative tone in general. In other word, $COVID\_NEG_{i,t} = 1$ when $Con.Sentiment_{i,t}^{EC} < 0$. The control variables are *Market value*, *ROA*, *ROE*, *P/E ratio*, *B/M ratio*, and *cash/debt*.

Note that since the *QSUE* ranges from 0.2 to 1, the coefficient, β_1, represents the magnitude of PEAD when moving from the bottom quintile to the top quintile. In

Equation (7), the interaction term, β_2, captures the change in PEAD for the treatment that the earnings call mentioned COVID-19 pandemic; in Equation (9), the coefficient, β_2, captures the change in PEAD for the treatment that the earnings call mentioned the pandemic more times than the median level; in Equation (10), the interaction term, β_2, captures the incremental change in PEAD for treatment group of earnings calls that generally discussed the pandemic with a negative tone. For hypotheses 1a and 1b, if there are information overload, no matter in Equations (8) and (9), the coefficients β_2 is expected to be positive. For hypothesis 2, if there are negative bias, the coefficient β_2 in Equation (10) is expected to be negative.

[Insert Table 3 here]

The estimates of Equation (7) are presented in Columns (1) and (2) in Table 3. Column (1) shows a significantly positive coefficient on *QSUE*, when Column (2) hold the same result after controlling the firm characteristics. This result indicates that the PEAD still existed during COVID-19 pandemic. According to Column (3) and Column (4), the significantly positive coefficients on $QSUE_{i,t} \times COVID_{i,t}$ and $QSUE_{i,t} \times COVID\_M_{i,t}$ show that firms that mentioned the pandemic in the earnings calls experienced a stronger PEAD. This result supports my hypotheses about information overload during the pandemic (Hypotheses 1a and 1b). When nearly all the firms in the market disclose their situation about the sudden systematic shock, investors face a big challenge in attention allocation. It limits their efficiency to processing the large amount of pandemic-related information, strengthening the PEAD.

The result of Column (5) in Table 3 supports the hypothesis about negative bias (hypothesis 2). The significantly negative coefficient on $QSUE_{i,t} \times COVID\_NEG_{i,t}$ implies that firms negatively discussing the pandemic in the earnings call experienced a decline in PEAD. This result can be explained from the perspective of the limited attention theory and a cognitive bias in psychology. Firms that disclosed bad information about COVID-19 pandemic can draw more attention from market participants due to the negative bias. Since the limited attention is one of the main drivers of PEAD anomaly, the biased allocation of this precious resource can weaken such anomaly for firms with negative expressions.

5.3 Incomplete disclosure: Information processing cost

According to the proposed incomplete disclosure model, this section examines the hypotheses for incomplete disclosure (hypotheses 3a, 3b, and 4) from the perspective of information processing cost. Firstly, I focus on the impact of disclosure timing on PEAD. Following regressions are run to examine the hypotheses 3a and 3b.

$$R_{i,t}^{Q} = \delta_{industry} + \delta_{quarter} + \beta_1 QSUE_{i,t} + \beta_2 QSUE_{i,t} \times TIMING_{i,t} + \sum \beta_k \, Controls + \epsilon_{i,t}, \tag{11}$$

where the interaction term $QSUE_{i,t} \times TIMING_{i,t}$ is either $QSUE_{i,t} \times TIMING\_EC_{i,t}$, $QSUE_{i,t} \times TIMING\_KQ_{i,t}$, or $QSUE_{i,t} \times TIMING\_GAP_{i,t}$ for different hypotheses. Two dummy variables, $TIMING\_EC_{i,t}$ and $TIMING\_KQ_{i,t}$, measure whether firm i convene the earnings call ("*EC*") or release Forms 10-K & 10-Q ("*KQ*") faster than the median level in quarter t, respectively. These two variables take the value of one when the firm has a quicker disclosure after the end of the financial quarter, meaning a smaller τ_1 (or τ_2). The indicator variable $TIMING\_GAP_{i,t}$ represents the disclosure time gap between earnings call and the financial filings. It takes the value of one when the firm makes these two disclosures with a shorter time gap (ΔT) than the median level in quarter t.

[Insert Table 4 here]

The results are summarized in Columns (2), (3), and (4) in Table 4. Both coefficients for timings of earnings calls and financial filings are positive, supporting the hypothesis 3a. A longer waiting time after the end of the financial quarter more consumes market participants' patience to investigate the disclosure, which represents a higher processing cost of disclosed information. As a result, a heavier information processing burden to the firm with a longer releasing period strengthens the PEAD anomaly.

Besides, the coefficient on *QSUE* $\times$ *TIMING_EC* in Column (2) is significant, while it is not on *QSUE* $\times$ *TIMING_KQ* in Column (3). These results are consistent with prior research on the disclosure efficiencies of earnings calls and financial reports. Due to the timing advantage of earnings calls, investors and financial analysts more focus to the information disclosed in the oral conference than the complicated formal filings with rich information, leading to a stronger market response to the former disclosure (You and Zhang, 2007). Therefore, the call of earnings conference greatly influence the PEAD while the publishing of 10-K & 10-Q filings does not play a such crucial role.

According to the hypothesis 3b, a larger timing gap between earnings call and 10-K & 10-Q flings can lead to a greater PEAD since it represents a heavier processing cost to combine the information revealed before and after. The result of Column (4) in Table 4 supports this hypothesis. The coefficient on *QSUE* $\times$ *TIMING_GAP* is 7.7875, which is significantly positive, implying that a longer than median timing gap increases the PEAD by 7.7875%. Overall, the evidences from Table 4 suggest that the timing of disclosure greatly influences the PEAD anomaly. As a proxy of information processing cost, the time gap between earnings call and financial filings is positively related with the PEAD, supporting the limited attention theory.

To investigate the complementary roles of two information disclosures, I examine the explanation power of the differences in lexicon expressions between two materials. The results of the following regressions are presented in Table 5.

$$R_{i,t}^{Q} = \delta_{industry} + \delta_{quarter} + \beta_1 QSUE_{i,t} + \beta_2 QSUE_{i,t} \times DIFF\_LING_{i,t} + \sum \beta_k \, Controls + \epsilon_{i,t}, \qquad (12)$$

where the interaction term $QSUE_{i,t} \times DIFF\_LING_{i,t}$ is either $QSUE_{i,t} \times DIFF\_EXP_{i,t}$, $QSUE_{i,t} \times DIFF\_SENT_{i,t}$, or $QSUE_{i,t} \times DIFF\_RISK_{i,t}$ for different linguistic measures ($Diff.Exposure_{i,t}$, $Diff.Sentiment_{i,t}$, or $Diff.Risk_{i,t}$), respectively. With respect to $Con.Exposure_{i,t}$, $Con.Sentiment_{i,t}$, and $Con.Risk_{i,t}$, the indicator variables, $DIFF\_EXP_{i,t}$, $DIFF\_SENT_{i,t}$, and $DIFF\_RISK_{i,t}$, measure whether the related linguistic expressions of earnings calls and financial filings have a difference that is larger than the median level. These variables equal to one when the linguistic differences do so.

[Insert Table 5 here]

According to the results in Columns (2) to (4) in Table 5, the difference in sentiments between two materials can significantly increase the PEAD by 16.828%. It supports the statement that the larger inconsistence in lexicon sentiments between earnings call and financial filings can confuse the investors, increasing the cognitive cost and leading to a larger PEAD. However, the impacts from the differences in conditional exposure and conditional risk are limited and insignificant. A larger difference in conditional exposure only increases the post-earnings return by 1.4946%, when that in conditional risk decreases the return by -0.7674%. It shows that when comparing (or combining) different information sources, investors are more sensitive to the sentiment difference in expressions rather than the number of event mentions.

6 Conclusion

This paper focuses on the impact of the systemic shock on the PEAD anomaly during the COVID-19 pandemic. The empirical result proves the existence of PEAD during COVID-19 and investigates the causes of such observation from two perspectives: the disclosure of systemic shock and the incomplete disclosure between earnings calls and 10-K & 10-Q filings.

On one hand, as a result of information overload, the broad discussion about the pandemic distracts investors' limited attention, strengthening the PEAD. However, due to the negative bias, investors pay more attention to firms that discuss the pandemic with a negative tone, weakening the PEAD of these firms.

On the other hand, the disclosure strategies of earnings calls and financial filings play an important role in the PEAD. The empirical results show that a later convening of the earnings call, a larger time gap between two disclosures, or a larger inconsistency in the lexicon sentiments of two materials can strengthen the PEAD by increasing the investors' cognitive burden.

This research can be extended from the following aspects. First of all, other alternative proxies can be considered, no matter in measuring the systemic shock, the information overload, or the information processing cost. Secondly, future research can examine the hypotheses with different PEAD measures and different methodologies in constructing SUEs. Last but not least, other pandemics or systemic shocks (e.g., financial crises) can be examined to investigate the existence and causes of PEAD anomaly under different market situations.

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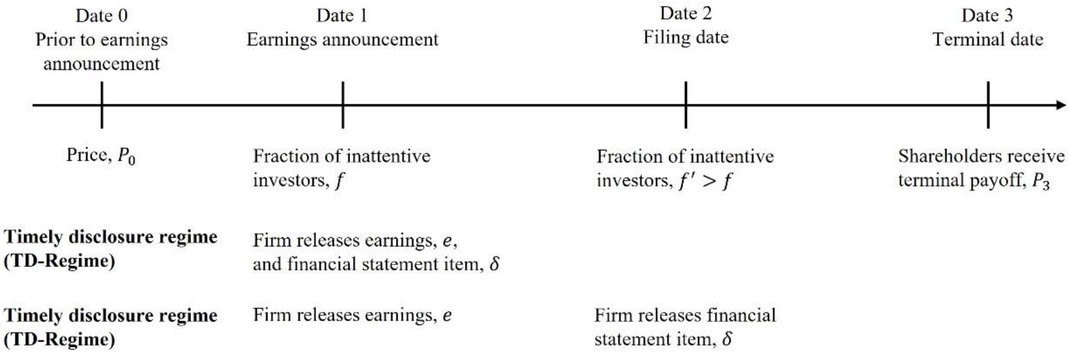
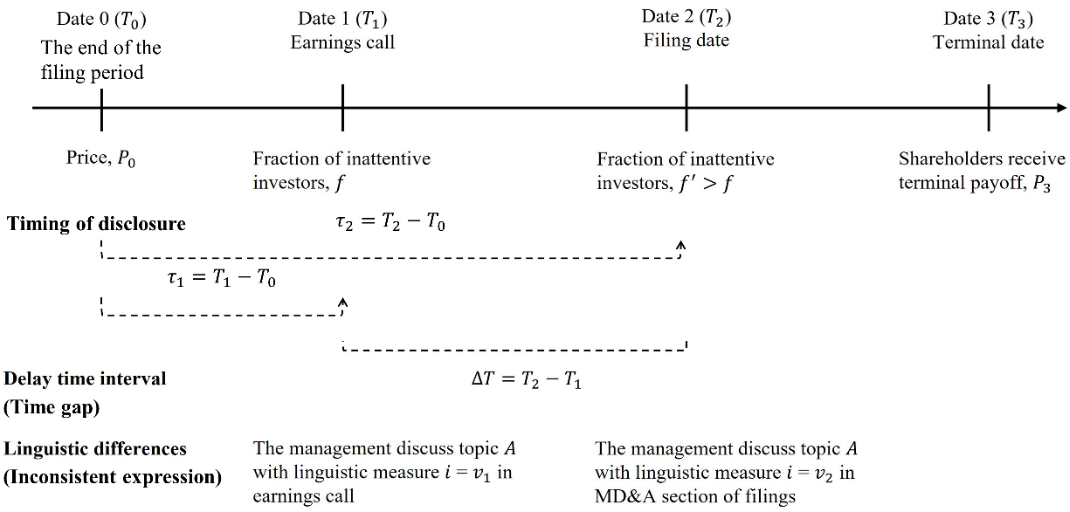


(a) The timeline of the delayed disclosure model by Li et al. (2020)



(b) The timeline of the incomplete disclosure model developed in this paper

Figure 1. Limited attention models: LNT model (Li et al., 2020) and incomplete disclosure model

This figure presents the timeline of the limited attention model by Li et al. (2020) as subfigure (a) and the timeline of the new limited attention model developed in this paper as subfigure (b). The timings of financial disclosures, τ_1 and τ_2, are the dates between the end of the filing period and the release of the disclosure (earnings call or Forms 10-K and 10-Q). The delay time interval, ΔT, is the days between the earnings call date T_1 and the filing date of corresponding Form 10-Q (or 10-K) T_2. The linguistic measure, i, is either conditional exposure, conditional sentiment, or conditional risk. The values, v_1 and v_2 are values of corresponding linguistic measure respectively.

Table 1. Keyword lists

This table shows the keywords I used to identify the related information in the MD&A section of Form 10-K/10-Q and earnings call transcripts. I summarize specific words that directly define the corresponding topic. For epidemics, based on the words used by Hassan et al. (2023) and Stephany et al. (2022), I adopt the official names defined by the World Health Organization (WHO) and those usually appeared in newspaper articles, earnings calls, and Forms 10-K & 10-Q. Besides, I also use general words that are widely used to describe the event type. It should be noted that the text recognition in this paper is case-insensitive.

Event	Keywords
COVID-19	Specific words: Coronavirus, Corona virus, COVID-19, COVID19, SARS-CoV-2, 2019-nCoV, Wuhan virus, virus General words: pandemic, epidemic, outbreak, plague, contagious disease, contagious illness, infectious disease, infectious outbreak

Table 2. Descriptive statistics

This Table presents the mean, median (Med.), standard deviation (SD), and the number of observations (N) for earnings surprise, linguistic variables, timing of disclosures, indicator variables, and control variables. The definitions of these variables are summarized in Appendix A. The earnings surprise and linguistic variables are calculated according to Section 2.4.2 and 2.4.3.

Variables	Mean	Med.	SD	N	Variables	Mean	Med.	SD	N	Variables	Mean	Med.	SD	N
Panel A. Earnings surprise					Panel C. Timing of disclosures					*B/M ratio*	0.85	0.55	1.51	2,718
EstimatedEPS	0.45	0.30	1.23	2,718	τ_1	32.58	33.00	7.49	2,718	*cash/debt*	0.12	0.12	0.43	2,718
ActualEPS	0.54	0.39	2.11	2,718	τ_2	35.74	36.00	7.22	2,718					
SUE	0.00	0.00	0.07	2,718	ΔT	3.16	0.00	5.48	2,718					
QSUE	0.60	0.60	0.28	2,718	Panel D. Indicator variables									
Panel B. Linguistic variables					*COVID*	0.99	1.00	0.09	2,718					
$Con.Exposure^{EC}$	1.47	1.25	1.00	2,718	*COVID_M*	0.50	0.50	0.50	2,718					
$Con.Sentiment^{EC}$	-0.49	-0.35	1.00	2,718	*COVID_NEG*	0.64	1.00	0.48	2,718					
$Con.Positive^{EC}$	1.11	0.86	1.00	2,718	*TIMING_EC*	0.48	0.00	0.50	2,718					
$Con.Negative^{EC}$	-1.25	-1.03	1.00	2,718	*TIMING_KQ*	0.45	0.00	0.50	2,718					
$Con.Risk^{EC}$	0.89	0.63	1.00	2,718	*TIMING_GAP*	0.49	0.00	0.50	2,718					
$Con.Exposure^{KQ}$	0.80	0.61	1.00	2,718	*DIFF_EXP*	0.50	0.50	0.50	2,718					
$Con.Sentiment^{KQ}$	-0.47	0.00	1.00	2,718	*DIFF_SENT*	0.50	0.50	0.50	2,718					
$Con.Positive^{KQ}$	0.20	0.00	1.00	2,718	*DIFF_RISK*	0.50	0.50	0.50	2,718					
$Con.Negative^{KQ}$	-0.51	0.00	1.00	2,718	Panel E. Control variables									
$Con.Risk^{KQ}$	0.26	0.00	1.00	2,718	*Market value*	7.61	7.64	1.90	2,718					
Diff.Exposure	0.67	0.66	1.35	2,718	*ROA*	0.06	0.08	0.14	2,718					
Diff.Sentiment	-0.02	-0.07	1.40	2,718	*ROE*	0.00	0.07	0.86	2,718					
Diff.Risk	0.63	0.53	1.39	2,718	*P/E ratio*	12.24	12.37	71.78	2,718					

Table 3. The effects of the systemic shock disclosure on PEAD

This Table presents the results of Equation (7) to (10) from columns (1) to (5), respectively. Columns (1) and (2) show the results of Equation (7) but different in whether including control variables or not. The control variables are market value, ROA, ROE, PE ratio, BM ratio, and cash/debt. The quarter and industry fixed effects are included. Standard errors in parentheses are clustered at the firm level. Superscripts ***, **, and * denote significance levels of 1, 5, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)
QSUE	32.366***	32.224***	19.538***	27.169***	34.516***
	(6.641)	(7.386)	(5.727)	(9.238)	(8.185)
QSUE × *COVID*			13.271***		
			(1.798)		
QSUE × *COVID_M*				11.192*	
				(5.718)	
QSUE × COV*ID_NEG*					-3.860**
					(1.620)
Controls	No	Yes	Yes	Yes	Yes
Fixed effects			Quarter, industry		
No. of obs.	2,718	2,718	2,718	2,718	2,718
Adj. R^2	0.0160	0.0647	0.0673	0.0062	0.0649

Table 4. The effects of the disclosure timing and time gap on PEAD

This Table presents the results of Equation (11). Columns (1) to (4) present the results of different timing variables, including the timing of earnings calls, $TIMING\_EC_{i,t}$, the timing of 10-K & 10-Q filings, $TIMING\_KQ_{i,t}$, and the timing gap between two disclosures, $TIMING\_GAP_{i,t}$, respectively. The control variables used are market value, ROA, ROE, PE ratio, BM ratio, and cash/debt. The quarter and industry fixed effects are included. Standard errors in parentheses are clustered at the firm level. Superscripts ***, **, and * denote significance levels of 1, 5, and 10%, respectively.

	(1)	(2)	(3)	(4)
QSUE	32.224***	22.682***	32.035***	28.695***
	(7.3869)	(5.4677)	(8.1694)	(7.5903)
QSUE × *TIMING_EC*		17.281***		
		(4.1557)		
QSUE × *TIMING_KQ*			0.3998	
			(3.6600)	
QSUE × *TIMING_GAP*				7.7875***
				(1.0784)
Controls	Yes			
Fixed effects	Quarter, industry			
No. of obs.	2,718	2,718	2,718	2,718
Adj. R^2	0.0647	0.0679	0.0647	0.0656

Table 5. The effects of the inconsistent expression on PEAD

This Table presents the results of Equation (12). Columns (1) to (4) present the results of linguistic difference variables, including $DIFF\_EXP_{i,t}$, $DIFF\_SENT_{i,t}$, and $DIFF\_RISK_{i,t}$ with respect to linguistic measures $Con.Exposure_{i,t}$, $Con.Sentiment_{i,t}$, and $Con.Risk_{i,t}$ accordingly. The control variables used are market value, ROA, ROE, PE ratio, BM ratio, and cash/debt. The quarter and industry fixed effects are included. Standard errors in parentheses are clustered at the firm level. Superscripts ***, **, and * denote significance levels of 1, 5, and 10%, respectively.

	(1)	(2)	(3)	(4)
QSUE	32.224***	41.546***	23.672***	32.568***
	(7.3869)	(8.8683)	(5.6856)	(7.7709)
QSUE × *DIFF_EXP*		1.4946		
		(5.1027)		
QSUE × *DIFF_SENT*			16.828***	
			(3.1883)	
QSUE × *DIFF_RISK*				-0.7674
				(1.4840)
Controls			Yes	
Fixed effects			Quarter, industry	
No. of obs.	2,718	2,718	2,718	2,718
Adj. R^2	0.0647	0.0647	0.0690	0.0647

Appendix A. Variable definitions

Variables	Definitions
Panel A. Return and earnings surprise	
$R_{i,t}^{Q}$	The annualized quarterly return of firm i at time t (%)
EstimatedEPS	The median estimation of EPS adjusted according to Section 2.4.2
ActualEPS	The actural EPS
SUE	The earnings surprise calculated according to Equation (1)
QSUE	The scaled quintile rank of *SUE*, ranging from 0.2 to 1
Panel B. Linguistic variables	
$Con.Exposure^{EC}$	The conditional exposure constructed based on earnings calls transcript according to Equation (2)
$Con.Sentiment^{EC}$	The conditional exposure sentiment based on earnings calls transcript according to Equation (3)
$Con.Positive^{EC}$	The conditional positive sentiment constructed based on earnings calls transcript according to Equation (4)
$Con.Negative^{EC}$	The conditional negative sentiment constructed based on earnings calls transcript according to Equation (5)
$Con.Risk^{EC}$	The conditional risk constructed based on earnings calls transcript according to Equation (6)
$Con.Exposure^{KQ}$	The conditional exposure constructed based on MD&A section in financial reports according to Equation (2)
$Con.Sentiment^{KQ}$	The conditional exposure sentiment based on MD&A section in financial reports according to Equation (3)
$Con.Positive^{KQ}$	The conditional positive sentiment constructed based on MD&A section in financial reports according to Equation (4)
$Con.Negative^{KQ}$	The conditional negative sentiment constructed based on MD&A section in financial reports according to Equation (5)
$Con.Risk^{KQ}$	The conditional risk constructed based on MD&A section in financial reports according to Equation (6)
Diff.Exposure	The difference of conditional exposures between earnings calls and financial reports, calculated according to Equation (7)
Diff.Sentiment	The difference of conditional sentiments between earnings calls and financial reports, calculated according to Equation (7)
Diff.Risk	The difference of conditional risks between earnings calls and financial reports, calculated according to Equation (7)
Panel C. Timing of disclosures	
τ_1	The number of days between the end of filing period and the convening of earnings calls
τ_2	The number of days between the end of filing period and the release of financial reports (10-K and 10-Q filings)

ΔT	The time gap between earnings call and 10-K and 10-Q filings
Panel D. Indicator variables	
COVID	Whether the earnings call mentions the COVID-19 pandemic. It equals to 1 when mentioning ($Con.Exposure^{EC} > 0$) and 0 otherwise ($Con.Exposure^{EC} = 0$).
COVID_M	Whether the earnings call i mentions the COVID-19 pandemic more times than median level of the whole sample. It equals to 1 when $Con.Exposure_i^{EC}$ is larger than the median of $Con.Exposure^{EC}$ and 0 otherwise.
COVID_NEG	Whether the earnings call expresses the COVID-19 pandemic in a negative tone in general. It equals to 1 when the overall sentiment is negative ($Con.Sentiment^{KQ} < 0$) and 0 otherwise ($Con.Sentiment^{KQ} \geq 0$).
TIMING_EC	Whether the firm takes more time to convene the earnings call than the median level. It equals to 1 when τ_1 is larger than the median of τ_1 and 0 otherwise.
TIMING_KQ	Whether the firm takes more time to release the financial reports than the median level. It equals to 1 when τ_2 is larger than the median of τ_2 and 0 otherwise.
TIMING_GAP	Whether the time gap between earnings calls and financial reports is larger than the median level. It equals to 1 when ΔT is larger than the median of ΔT and 0 otherwise.
DIFF_EXP	Whether the difference measure *Diff.Exposure* is larger than the median level. It equals to 1 when *Diff.Exposure* is larger than the median of *Diff.Exposure* and 0 otherwise.
DIFF_SENT	Whether the difference measure *Diff.Sentiment* is larger than the median level. It equals to 1 when *Diff.Sentiment* is larger than the median of *Diff.Sentiment* and 0 otherwise.
DIFF_RISK	Whether the difference measure *Diff.Risk* is larger than the median level. It equals to 1 when *Diff.Risk* is larger than the median of *Diff.Risk e* and 0 otherwise.
Panel E. Control variables	
Market value	The firm's market value (Billion)
ROA	Return on Assets (ROA)
ROE	Return On Equity (ROE)
P/E ratio	Price to Earnings (P/E) Ratio
B/M ratio	Book to Market (B/M) ratio
cash/debt	Cash/debt ratio