

## **The Effect of CEO Overconfidence on Corporate Disclosures Amid a Pervasive Shock: Evidence from the COVID-19 Pandemic**

**Abstract:** We investigate how CEO overconfidence affects firms' voluntary reporting of COVID-19 exposure using five text-based measures of firm-level COVID-19 pandemic exposure reports by Hassan et al. (2020). Our analysis of 3,038 firm-quarter earnings conference calls in 2020 reveals that overconfident CEOs express a less pessimistic tone compared to non-overconfident CEOs when discussing their firms' exposure to the pandemic, and these results hold under various robustness checks. Additionally, this more pronounced negative pandemic exposure sentiment predicts weaker subsequent operating performance among non-overconfident and overconfident CEOs alike. While increased negative sentiment leads to weaker stock performance among firms with non-overconfident CEOs, this predictive power is significantly weakened for overconfident CEOs. Our findings provide insights into how CEO overconfidence can affect firms' disclosure behavior during a crisis and contribute to the literature on CEO overconfidence and pandemic-related disclosures.

## **I. Introduction**

Management voluntary disclosure in earnings conference calls aims to provide guiding information for market participants to gauge any potential going concerns, consequently mitigating the information asymmetry between managers and outside investors as suggested by Bushee, Matsumoto and Miller (2003) and Brown, Hillegeist and Lo (2004). However, prior studies show that management voluntary disclosure is not always credible. Merkl-Davies et al. (2007) show that managers might use voluntary disclosure for impression management rather than for providing incremental information. Hutton, Miller and Skinner (2003) document that managers spend significant effort to discuss good news forecasts and provide verifiable forward-looking statements to support these forecasts while avoiding doing so when bad news is involved. Hollander, Pronk and Roelofsen (2010) show that managers frequently do not answer questions by participants in conference calls and that investors interpret such silence as bad news. Ge and Lennox (2011) examine management earnings forecasts around mergers and acquisitions. They document that management of stock acquirers is more likely to withhold impending bad news about future earnings to avoid plunging stock prices prior to the acquisition, since the stock is the payment medium in the acquisition. Management voluntary disclosure is only helpful if it is credible and reflects the true view of the management about any potential going concerns. Unreliable voluntary disclosure by management can exacerbate information asymmetry between management and outsider investors, resulting in a misallocation of resources.

As a result, a stream of research has emerged to dissect the tone and language choices of CEOs in earnings conference calls and annual reports in order to gauge the credibility of their voluntary disclosure. Since CEOs are the key decision makers in voluntary disclosures, their tone and language choice can relay important signals about the future earnings of the

firms. Davis, Piger and Sedor (2012) and Price et al. (2012) document that stock market reacts positively to the positive tone of CEOs in earnings conference calls. Is such a positive tone driven by firm fundamentals or by other factors? Davis, Ge and Matsumoto (2015) find that manager-specific characteristics can influence the choice of language and tone in these earnings conference calls. CEOs with early career experiences and involvement in charitable organizations display more positive tone, while female CEOs and younger CEOs display less optimistic tone. Hribar and Yang (2016) find that overconfident CEOs are more likely to issue voluntary upward-biased earnings forecasts. Marquez-Illescas, Zebedee and Zhou (2019) document that narcissistic CEOs display more positive tone in earnings announcement, consistent with their self enhancement trait.

In this study, we add to this stream of literature by examining the association between CEO overconfidence and management voluntary reporting of firm exposure to the COVID-19 pandemic. Specifically, we seek to answer the following questions. First, do overconfident CEOs voluntarily disclose as much firm pandemic exposure and in the same manner as non-overconfident CEOs? A blunt way for an overconfident CEO to deal with an impending potential problem would be to either ignore it (if it is not assumed as common knowledge among investors) or present it in a positive light (if its negative nature cannot be assumed). A pervasive and obviously negative event might invite a more subtle approach, such as reducing the number of negative words used when describing it. Second, does overconfident CEO disclosure accord with the reality of subsequent performance of the firm?

While prior studies by Davis et al. (2012) and Price et al. (2012) examine the overall tone of management in earnings conference calls or annual reports, this study focuses specifically on management voluntary reporting of firm exposure to the COVID-19 pandemic.

Two reasons set this specific disclosure apart. First, earnings conference calls are conducted voluntarily, and management can cherry pick which information to disclose. If investors are not aware of potential concerns regarding the firm and management chooses not to disclose the information, then analyzing management tone in earnings conference calls as in prior studies might not pick up unfavorable information about the firm. Indeed, Hutton, Miller and Skinner (2003) document that managers are more likely to discuss at length (and provide verifiable forward-looking statements to support) good news forecasts while avoiding doing so with bad news forecasts. The pandemic, however, presents a systematic, pervasive exogenous shock to all economic entities in the U.S. (Coibion, Gorodnichenko and Weber, 2020a, 2020b; Pindyck, 2020; Rojas et al., 2020; Barrero et al., 2020), too big for the investors to not be cognizant of the threat. The magnitude of this macroeconomic uncertainty was such that a majority of S&P<sub>500</sub> firms that normally provide earnings guidance avoided doing so during the 2020 second quarter earnings releases, explicitly due to “the uncertainty of the future economic impacts of COVID-19.”<sup>1</sup> Hence, discussion of firm exposure to the COVID-19 pandemic was not easily avoidable. Indeed, Hassan et al. (2020) report an overwhelming 80% of U.S. firms discussing the effects of the pandemic in their earnings conference calls in the first three quarters of 2020. Such extensive voluntary reporting of firm exposure to the pandemic allows us to compare side-by-side the disclosure strategies of overconfident vs. non-overconfident CEOs regarding this seemingly pervasive and obvious risk to the firm, with particular attention paid to any nuance exhibited in the way the risk is reported.

---

<sup>1</sup> <https://insight.factset.com/more-than-one-in-four-sp-500-companies-are-still-not-providing-eps-guidance-for-2020-or-2021>

Second, each firm is exposed to unique sources of risks; hence, management tone in earnings conference calls in a general context might be attributed to a greater extent to such idiosyncratic shocks the firm faces. It is difficult to discern whether the differential tone of overconfident vs. non-overconfident CEOs in earnings conference calls is driven simply by the CEO characteristics or by the idiosyncratic shocks the firm faces. The quasi-natural attribute of the COVID-19 pandemic provides a unique experimental setting whereby all firms are facing the same source of risk, though to different extents. We can hold the source of risk constant and examine how overconfident vs. non-overconfident CEOs adopt similar or different disclosure strategies to the same exogenous shock instead of to different idiosyncratic shocks as in prior studies.

Overconfidence is a psychological trait that describes the tendency of individuals to subjectively “*think that they are better than they really are in terms of characteristics such as ability, judgment or prospects of successful life outcomes*” (Hirshleifer, Low and Teoh, 2012). Top executives and entrepreneurs are especially prone to overconfidence, as noted by Graham, Harvey and Puri (2013). Attribution error and illusion of control - the two main cognitive biases that constitute overconfidence (Lovallo and Kahneman, 2013) - lead to optimism and miscalibration of chance events among overconfident CEOs. They are more likely to underestimate the role of chance/luck in their success and overestimate their capability to weather shocks and lead firms successfully. We hypothesize that these CEOs are more likely to deliver rosier-glassed opinions about how their firms can weather the impacts of the COVID-19 pandemic. This conjecture is consistent with prior evidence provided by Davis et al. (2012) and Price et al. (2012) who document that overconfident CEOs are more likely to adopt a positive tone in

earnings conference calls and by Hribar and Yang (2016) who find that overconfident CEOs are more likely to issue voluntary upward-biased earnings forecasts.

To conduct the empirical analyses, we first obtain the five text-based measures of firms reporting their exposure to COVID-19 pandemic, constructed by Hassan et al. (2020).

$COVID\_EXPOSURE_{it}$  is the self-reported exposure of firm  $i$  in quarter  $t$  to the pandemic, calculated as the ratio of the number of times the word “COVID-19” and its synonyms appear in the firm’s earnings conference call to the total number of words in the transcript. COVID-19 pandemic risk ( $COVID\_RISK_{it}$ ) is the augmented version of  $COVID\_EXPOSURE_{it}$ , calculated as the number of times the word “COVID-19” and its synonyms appear within the set of 10 words surrounding a synonym for “risk” or “uncertainty” on either side in the firm’s earnings conference call transcript, scaled by the total number of words in the transcript. Positive pandemic sentiment ( $COVID\_POS\_SENT_{it}$ ) and negative pandemic sentiment ( $COVID\_NEG\_SENT_{it}$ ) are similarly augmented version of  $COVID\_EXPOSURE_{it}$ , but with “COVID-19” and its synonyms counted when in proximity to words with positive and negative tone, relative to total words in earnings conference calls. Net pandemic sentiment ( $COVID\_NET\_SENT_{it}$ ) is the difference between positive and negative pandemic sentiments.

Since these measures are constructed from the number of times “COVID-19” and its synonyms are mentioned by firm management in the firm’s earnings conference call transcript, they reflect the management voluntarily discussing their firm’s exposure to the pandemic. Lopatta et al. (2020) and Stephany et al. (2020) adopt a similar approach to Hassan et al. (2020) to examine firm disclosure of the pandemic risk in their annual reports.

Second, we calculate an option-based proxy for CEO overconfidence using executive stock option data from the Execucomp database. Developed initially by Malmendier and Tate

(2005), this proxy has been used in many studies: Jin and Kothari (2008), Campbell et al. (2011), Galasso and Simcoe (2011), Hirshleifer, Low and Teoh (2012), Deshmukh, Goel and Howe (2013), Huang et al. (2016), Hribar and Yang (2016) and Chen, Ho and Yeh (2020) among others. While we only need the data for CEO overconfidence for the year before the COVID-19 outbreak (year 2019), we identify overconfident CEOs using their stock option timing behavior in the whole Execucomp database period from 1992 to 2019 since prior studies suggest that overconfidence is a permanent trait.

After merging data on firm-level reports of exposure to the COVID-19 pandemic with data on CEO overconfidence, we obtain a final sample of 3,056 firm-quarter observations (774 unique firms) in the year 2020. While prior studies find management prone to under-reporting bad news, we find no effect of CEO overconfidence on the degree of reported exposure to the pandemic. Different from the evidence documented in prior studies on general conference calls, we also document that overconfident CEOs do not display significantly more positive sentiment (i.e. insignificantly different  $COVID\_POS\_SENT_{i,t}$  values), at least not in the specific context of the pervasive shock of the pandemic. They only show significantly inhibited negative sentiment (i.e. lower  $COVID\_NEG\_SENT_{i,t}$  values) toward the impact of the pandemic as compared to non-overconfident CEOs; we view this as the most subtle method of downplaying the pandemic impact, or at least more subtle than ignoring it or trying to convince the investors it's actually a positive development. Since there is no significant difference in the positive tone frequencies in pandemic discussions between overconfident CEOs and non-overconfident CEOs, it's the lesser use of negative-sentiment words that helps uplift the overall (net) sentiment of overconfident CEOs in their earnings conference call attempts to assuage investors' concerns about the firm's exposure to the pandemic.

In prior studies, CEOs can cherry pick what going concerns to disclose to investors who have no beforehand information about such concerns. Furthermore, different firms face different sources of risk. The documented evidence of significantly more positive sentiment displayed by overconfident CEOs in prior studies might very well be confounded by these two complexities. In this study, however, we employ the unique experimental setting presented by the COVID-19 pandemic in which all firms face the same source of risk to different extents and investors have some ex ante information about such risk. The results here suggest that overconfident CEOs are not irrationally overoptimistic in all situations, at least not outwardly. They do not always adopt a significantly more positive tone than non-overconfident CEOs, as suggested in prior studies. Rather, when dealing with a pervasive and systemic exogenous shock, their overconfidence manifests itself more subtly in their inhibited use of negative tone.

We perform several robustness checks. First, we address potential measurement error issues by employing two alternative option moneyness thresholds to identify overconfident CEOs. In addition, we follow Schrand and Zechman (2012) to construct a firm-based proxy for CEO overconfidence. Second, we add two sets of control variables, including CEO characteristics and corporate governance proxies, to mitigate potential omitted variable issues. Third, it is possible that the documented results might be driven by certain firm characteristics that attract overconfident CEOs to firms with generally less negative sentiment in their disclosures. Therefore, we implement a weighted regression based upon the entropy balancing procedure to rule out this possibility. Fourth, we implement Heckman two-step self-selection correction method to address potential self-selection issue whereby firms with less exposure to the COVID-19 pandemic choose to conduct earnings conference calls voluntarily. Last, we examine whether other firm characteristics might moderate the effect of CEO overconfidence



on firm disclosure policy. All these robustness checks point to solid evidence that overconfident CEOs are more likely to avoid pessimistic language when discussing firm exposure to the pandemic in their earnings conference calls.

We then examine whether the effect of CEO overconfidence on firm disclosure policy differs among industry subsamples. We find that the negative relationship between overconfident CEOs and COVID-19 negative sentiment, along with the positive net COVID-19 sentiment, continues to hold when we focus our subsample analyses on companies that report the highest levels of COVID-19 exposure within their respective 4-digit SIC industry. We also examine each of the four quarters of 2020 separately. In those quarter subsamples, we find that our main result (overconfident CEOs employing less negative sentiment when discussing the pandemic) is confined to the 2020 quarter with the highest reported pandemic exposure. This suggests that overconfident CEOs reduce the negative pandemic sentiment in earnings conference calls only when such reduction is most likely to be needed (when pandemic exposure is deemed most prevalent).

Finally, we examine whether overconfident CEOs do not use pessimistic language when discussing firm exposure to the COVID-19 pandemic in their earnings conference calls simply because they have favorable inside information about future earnings of their firms. Indeed, during the pandemic, some firms have performed better than others. To explore this possibility, we examine the association between management disclosure of their firms' pandemic exposure and firms' subsequent returns on assets/stock returns.

We observe that investors should take the cues reliably provided by negative sentiments, as the coefficient of the variable representing COVID\_NEG\_SENT demonstrates a

significant inverse relationship with the subsequent quarter's ROA; the interaction with CEO overconfidence is insignificant, suggesting that CEO overconfidence makes no discerning difference in this relationship. The relationship between negative sentiments and stock returns suggests, however, that investors do actually take the CEO overconfidence into account. While the main effect of negative sentiment is significantly negative, suggesting lower (higher) subsequent stock returns for more (less) pronounced negative sentiments delivered by non-overconfident CEOs, the negative sentiment – CEO overconfidence interaction factor is positive and significant, corresponding to a weakened main effect of negative sentiment among overconfident CEOs. Investors appear skeptical of over-confident CEOs' negative tone accurately reflecting future operating performance, despite the negative tone's relationship to subsequent operating performance, suggesting that such skepticism is not warranted.

This paper contributes to the broader body of literature on the influence of managerial psychology on corporate decisions and specifically to the emergent research on managerial psychology and corporate disclosure policy (for example, Presley and Abbott (2013)). By focusing on the uniform potential exposure faced by all firms in 2020 – the COVID-19 pandemic – we create an experimental setting with a constant source of risk, allowing us to disentangle the effect of CEO overconfidence on firm disclosure. Our findings indicate that overconfident CEOs tend to avoid pessimistic language in earnings conference calls and aim to convey a more positive message when discussing their firm's exposure to a pervasive event like the pandemic.

Our documented findings set our research apart from existing literature by explicitly examining the effect of CEO overconfidence on the relationship between management reporting of pandemic exposure and subsequent firm performance. While the literature has

examined the impact of CEO overconfidence on firm decision-making and performance (for example, Malmendier and Tate (2005)), the effect on pandemic-related disclosures and subsequent performance remains relatively unknown. Hribar and Yang (2016) studied the link between CEO overconfidence and management forecasting accuracy. On the other hand, our research explores how overconfident CEOs influence the tone and content of projections. Our study also contributes to the literature on the relationship between pandemic-related disclosures and subsequent firm performance. For instance, Gul et al. (2020) find that valuation impact is contingent on CEO overconfidence. Our study extends this literature by demonstrating the importance of the tone and accuracy of these disclosures in the context of CEO overconfidence.

The remaining of the paper includes the following sections. Section 2 reviews the related literature and develops the hypotheses. Section 3 describes the sample and the data. Section 4 outlines the statistical model, the results, and robustness tests. Section 5 concludes the paper.

## **2. Related Literature and Hypothesis Development**

Previous literature suggests managers are prone to ignoring bad news. Hutton et al. (2003) show that managers discuss good news forecasts at significantly more length than bad news forecasts. Hollander et al. (2010) show that managers frequently ignore conference call questions. Ge and Lennox (2011) document that stock acquirers are more likely to withhold impending bad news about future earnings. Prior studies also show that CEO overconfidence influences corporate decisions. Overconfident CEOs undertake more investments and mergers and acquisitions when they have access to internal funding (see Malmendier and Tate, 2005 and

Malmendier and Tate, 2008). These CEOs are more willing to take on risky projects, invest more in innovation (Hirshleifer, Low and Teoh, 2012) and receive more patents and citations per patent (Galasso and Simcoe, 2011). They issue less equity than their peers because they overestimate the value of their firms and believe that their firm stocks are undervalued (Malmendier, Tate and Yan, 2011). They pay smaller dividends to build up financial slack for future investments to avoid having to resort to external financing (Deshmukh et al. 2013).

Most related to this study is the literature on how CEO overconfidence affects corporate information disclosure. Using abstract experiment and a survey of experienced financial managers, Libby and Rennekamp (2012) show that overconfident CEOs are more likely to attribute their firms' success to themselves. The optimism and mis-calibration facets of overconfidence traits predict that these CEOs are more willing to issue earnings forecasts. Hribar and Yang (2016) provide empirical evidence supporting this prediction by Libby and Rennekamp (2012). Accordingly, we expect optimism and illusion that they can control future firm performance might lead overconfident CEOs (as compared to non-overconfident CEOs) to discuss more about their firms' exposure to the COVID-19 pandemic. Mis-calibration leads to overconfident CEOs' underestimation of the variance of the future earnings and further bolsters these CEOs' willingness to provide voluntary disclosure. Accordingly, we expect a positive relation between the *COVID\_EXPOSURE* variable and CEO overconfidence. On the other hand, it is possible that the very optimism and illusion nature of CEO overconfidence might lead them to dismiss the pandemic as a potential threat to the firm operations, or at least to hope that ignoring it may make the problem go away, and hence result in less discussion of firm exposure to the pandemic. Therefore, we are agnostic about the relation between CEO

overconfidence and firm reporting of their exposure to the pandemic and leave the answer to empirical analysis.

*Hypothesis 1: Overconfident CEOs are more likely to disclose firm exposure to the COVID-19 pandemic.*

While greater confidence could plausibly result in either more or less likely disclosure of a risk, the effect on disclosure tone is easier to hypothesize. Marquez-Illenas et al. (2019) find that narcissistic CEOs display more positive tone in earnings announcements, while Davis et al. (2012) and Price et al. (2012) find the same for overconfident CEOs in earnings conference calls. Overconfidence influences the CEOs' assessment of the impacts of events and of their own capability to resolve such impacts, leading to their optimistic language choice and tone in public disclosures. We therefore expect CEO overconfidence to result in higher positive pandemic sentiment (*COVID\_POS\_SENT*) and net pandemic sentiment (*COVID\_NET\_SENT*) variables.

*Hypothesis 2: Overconfident CEOs are more likely to project optimism when discussing firm exposure to the COVID-19 pandemic.*

Davis and Tama-Sweet (2012) find that managers are more likely to omit or shift pessimistic language from earnings press releases when they barely meet analyst forecasts. Broadly consistent with the evidence on positive tone, we expect overconfident CEOs to be less likely to use risk-related language and negative tone when discussing their firms' exposure to the COVID-19 pandemic in earnings conference calls. We therefore expect a negative relation between the reported pandemic risk (*COVID\_RISK*) and negative pandemic sentiment (*COVID\_NEG\_SENT*) variables and CEO overconfidence.

*Hypothesis 3: Overconfident CEOs are less likely to project pessimism when discussing firm exposure to the COVID-19 pandemic.*

Lastly, a potential explanation for any negative relationship between CEO overconfidence and the extent of reported pandemic exposure, and conversely for any positive relationship between CEO overconfidence and the tone of reported pandemic exposure, may lie in the overconfident CEOs' insider knowledge of their firms' future performance. In other words, what may seem to an outsider as misplaced overconfidence may in fact be properly placed confidence. If so, the risk disclosure and the displayed tone when discussing it may simply indicate future firm performance. If, on the other hand, the confidence is a function of personal CEO traits, the relationship between disclosure extent/tone and future performance would weaken (or altogether disappear) among overconfident CEOs.

*Hypothesis 4: The relationship between reporting of firm exposure to the COVID-19 pandemic and its subsequent operating/stock performance is weaker among overconfident CEOs.*

### **3. Sample and Data**

#### **3.1. Sample**

This study examines the relation between CEO overconfidence prior to the outbreak of the COVID-19 pandemic and management reporting of firm exposure to the pandemic in 2020. We obtain the initial sample of 23,137 firm-quarter earnings call observations from Hassan et al. (2020)<sup>2</sup> for the four quarters of 2020. We merge this initial sample with Execucomp database. While our primary objective necessitates only the utilization of Execucomp data to quantify CEO overconfidence for the year preceding the COVID-19 outbreak (i.e., the year 2019), our

---

<sup>2</sup> Available at <https://www.firmlevelrisk.com/>

methodology involves distinguishing overconfident CEOs via an examination of their stock option timing behavior throughout the entirety of the available Execucomp database period, spanning from 1992 to 2019. As postulated by Malmendier and Tate (2005), overconfidence is characterized as a stable, enduring trait rather than a transient one, indicating its consistent presence in an individual over time. Therefore, a comprehensive and longitudinal examination of behavior is pivotal in affirming the categorization of a CEO as overconfident with a significant degree of confidence. The final screening requires a firm to have accounting and market value data from Compustat Fundamental Quarterly database in 2019 and 2020. After merging of the Hassan et al. (2020), Execucomp and Compustat Fundamental Quarterly databases, the final sample includes 3,038 firm-quarter observations (774 unique firms) from the four quarters of 2020.

In Panel A of Table I, we report the number of firms with vs. firms without disclosed pandemic exposure in each of the quarters of 2020. At the outset of the COVID-19 pandemic (i.e., 2020q1), only about 50% of the firms discuss the potential effects of the pandemic in their earnings conference calls. In each of the remaining three quarters of 2020, over 95% of the firms disclose their potential exposure to the pandemic, with the peak of more than 99% in the second quarter. In Panel B of Table I, we present the number of firms with vs. firms without reported pandemic exposure for each Fama-French sector classification. Based on the Fama-French 48-industry classifications, the industries exhibiting the highest number of firms reporting exposure to COVID-19 include Business Services, Pharmaceuticals, and Machinery. Conversely, the industries with the smallest number of firms reporting COVID-19 exposure comprise Gold & Silver, Fabricated Products, Defense, Real Estate, and Soft Drinks. This evidence delineates the differential impact of the pandemic across various industry sectors.

(INSERT TABLE I ABOUT HERE)

Our research shows that firms reporting the highest COVID-19 exposure are predominantly from the Business Services, Pharmaceuticals, and Machinery industries, according to the Fama-French 48-industry classifications. This could be due to these sectors' direct interaction with global supply chains, consumers, or their pivotal role in responding to the pandemic, making them more susceptible to its impacts.

On the other hand, industries reporting the least COVID-19 exposure include Gold & Silver, Fabricated Products, Defense, Real Estate, and Soft Drinks. These sectors may have faced less exposure due to their nature of operations which could be more insulated from direct pandemic effects. For example, the Gold & Silver industry could have benefited from the market instability, and the Defense industry's largely government-contracted operations may have provided a buffer against the immediate shocks of the pandemic.<sup>3</sup>

This divergence underscores the differential impact of the pandemic across industries, with some being more affected due to their inherent operational structures and business models.

### **3.2. Firm reporting of COVID-19 pandemic exposure, risk and sentiment**

Hassan et al. (2020) construct five measures of firm-level reports of exposure to COVID-19 pandemic. First,  $COVID\_EXPOSURE_{i,t}$ , i.e., the reported exposure of firm  $i$  in quarter  $t$  of the year 2020 to the pandemic, is the ratio of the number of times the word “COVID-19”

---

<sup>3</sup> For example, US regulations (10 U.S. Code, <https://www.law.cornell.edu/uscode/text/10/8679>), prevent US Navy ships from being built overseas, therefore insulating the Navy shipbuilding from the pandemic-related global supply chain issues.



and its synonyms appear in the firm's earnings conference call transcript to the total number of words in the transcript.

$$(1) \quad COVID\_EXPOSURE_{i,t} = \frac{1}{B_{i,t}} \sum_{b=1}^{B_{i,t}} 1[b = Covid],$$

Where  $b = 0, 1, \dots, B_{i,t}$  represents the words in the earnings conference call transcripts for firm  $i$  in quarter  $t$ . Second,  $COVID\_RISK_{i,t}$  is the augmented measure of  $COVID\_EXPOSURE_{i,t}$ . It is the number of times the word "COVID-19" and its synonyms appear within the set of 10 words surrounding a synonym for "risk" or "uncertainty" on either side in the firm's earnings conference call transcript scaled by the total number of words in the transcript.

$$(2) \quad COVID\_RISK_{i,t} = \frac{1}{B_{i,t}} \sum_{b=1}^{B_{i,t}} \{1[b = Covid] \times 1[|b - r| < 10]\},$$

where  $r$  is the position of the nearest synonym of risk or uncertainty.

The last three measures  $COVID\_POS\_SENT_{i,t}$ ,  $COVID\_NEG\_SENT_{i,t}$  and  $COVID\_NET\_SENT_{i,t}$  capture the positive, negative, and net effect of COVID-19 pandemic on firm future earnings as perceived by the firm management.  $COVID\_POS\_SENT_{i,t}$  and  $COVID\_NEG\_SENT_{i,t}$  are constructed in the same manner as  $COVID\_RISK_{i,t}$ , except the word count is conditioned on the proximity of Covid mentions to positive- vs negative- toned words (instead of proximity to risk synonyms). Net pandemic sentiment ( $COVID\_NET\_SENT_{i,t}$ ) is the difference between positive ( $COVID\_POS\_SENT_{i,t}$ ) and negative ( $COVID\_NEG\_SENT_{i,t}$ ) pandemic sentiment.

Since these measures are constructed from the number of times that firm management uses "COVID-19" and its synonyms in earnings conference calls, they reflect firm management's perception of firm exposure to the pandemic. Smaller values of reported pandemic exposure

( $COVID\_EXPOSURE_{i,t}$ ) and reported pandemic risk ( $COVID\_RISK_{i,t}$ ) and higher values of positive ( $COVID\_POS\_SENT_{i,t}$ ) and net ( $COVID\_NET\_SENT_{i,t}$ ) pandemic sentiments suggest that firm management see potentially mitigated effects of the pandemic on firm future earnings. Higher values of reported pandemic exposure ( $COVID\_EXPOSURE_{i,t}$ ), reported pandemic risk ( $COVID\_RISK_{i,t}$ ) and negative pandemic sentiment ( $COVID\_NEG\_SENT_{i,t}$ ) and lower values of net pandemic sentiment ( $COVID\_NET\_SENT_{i,t}$ ), on the other hand, imply greater detrimental effects of the pandemic on firm future earnings as perceived by firm management.

The proxies, largely based on word counts, may not entirely capture the depth or context of COVID-19 discussions during earnings calls. For example, a company making a brief mention of COVID-19 and another providing an in-depth analysis could have the same score, even though the informational value of their disclosures significantly differs. A more comprehensive measure might take into account the number of words in sentences or paragraphs related to COVID-19, offering a more accurate reflection of the information conveyed about the pandemic's impacts on their operations. Although we follow the approach of Hassan, Hollander, Van Lent, Schwedeler, and Tahoun (2020) in our measurements, we understand that our approach may carry some inherent limitations. Also, note that the negative and positive sentiment proxies may overlap if a single COVID-19 mention is surrounded by both negative and positive tone words. This could indeed raise questions about the distinctiveness of these proxies. As such, the NET proxy, i.e., ( $COVID\_NET\_SENT_{i,t}$ ), which combines the two, may provide a more robust measure.

### **3.3. CEO overconfidence**

Malmendier and Tate (2005) suggest that CEO overconfidence can be measured by how CEOs make decisions on their personal portfolio of company stock options. CEOs face under-diversification problems for two reasons. First, while stock options have increasingly accounted for a significant part of CEO compensation packages, they are not tradable and come with restrictions on exercising timeline and short selling. Second, both CEOs' financial capital and their human capital are tied to their firms' success. Therefore, rational CEOs would have the incentives to exercise these options soon after they vest and become in-the-money. However, Malmendier and Tate surmise that overconfident CEOs might overestimate their capability to lead their firm successfully, and therefore overestimate their firm future stock returns. As a result, they are more likely to postpone exercising their stock options, even if the stock options are deep in the money. Accordingly, the delay in exercising in-the-money stock options can be a proxy for CEO overconfidence.

Since we do not have detailed option-grant-specific exercise price data that Malmendier and Tate (2005) use, we follow the modified procedure by Campbell et al. (2011) to construct a proxy for CEO overconfidence (*CONFID67*). First, we compute the ratio of the total realizable value of the exercisable options (ExecuComp variable *OPT\_UNEX\_EXER\_EST\_VAL*) to the number of exercisable options (ExecuComp variable *OPT\_UNEX\_EXER\_NUM*). This ratio captures the realizable value per option and helps identify CEOs who choose to hold options that could have been exercised. Second, we estimate the average exercise price of the options as the difference between the per-option realizable value and the stock price at the fiscal year's end (Compustat variable *PRCC\_F*). Finally, we divide the realizable value per option by the estimated average exercise price to obtain the average percent moneyness of the options.

Malmendier and Tate (2005) perform calibration analyses and suggest 67% moneyness as the threshold for indication of CEO overconfidence. In other words, an observation of moneyness greater or equal to 67% indicates an overconfident CEO (i.e., the CEO has not exercised the option even though it is 67% in the money). Campbell et al. (2011) propose a higher threshold of 100% since it should identify highly overconfident CEOs. In this study, we follow Malmendier and Tate (2005) and use the 67% threshold as the key indicator of overconfident CEOs. We also use the 100% and 150% thresholds for robustness checks.

Besides the option moneyness threshold, Malmendier and Tate (2005) also impose the requirement that a CEO exhibits such option holding behavior at least two times in the sample period in order to associate that CEO with overconfidence. This requirement ensures that such stock option exercise decision is not random but true to the nature and personality of the CEO. Once CEO meets both criteria (i.e. option holding above-threshold-in-the-money and holding such options twice in the sample), Malmendier and Tate (2005) classify the CEO as being overconfident from the very first time the CEO exhibits the above option-holding behavior, since they argue that overconfidence is a permanent rather than a transient trait. Following the method described above by Malmendier and Tate (2005) and Campbell et al. (2011), we create an indicator variable *CONFID67* equal to 1 beginning with the first time the CEO exhibits the above option-holding behavior (i.e., holding an above-67%-in-the-money option and holding such options twice in the sample), and zero otherwise. While at minimum we only need the data for CEO overconfidence for the year before the COVID-19 outbreak (i.e., year 2019), we use the whole Execucomp database period from 1992 to 2019 to identify overconfident CEO using their stock option timing behavior, since overconfidence is a

consistent personality trait and not a transient one as suggested by Malmendier and Tate (2005).

Our methodology is based on research conducted by several scholars, including Malmendier and Tate (2005), Campbell et al. (2011), Huang et al. (2016), Hribar and Yang (2016), and Chen, Ho, and Yeh (2020). We have chosen this approach for two reasons. Firstly, option exercise is infrequent and challenging to observe in a short period, so analyzing data from only a few years surrounding the COVID outbreak may not accurately capture patterns in CEOs' option exercise habits. Secondly, to identify consistent behavior or permanent traits in CEOs, it is essential to observe their decision-making over time rather than just one-time or random decisions. This approach is also supported by studies in psychology, such as Costa and McCrae (2008), which suggest that examining a CEO's habits over a long period is more reliable in determining consistent behavior and permanent traits.

### **3.4. Firm operating performance, stock return performance and other control variables**

To evaluate firm operating performance and valuation, we calculate return on assets (ROA) and stock returns (*RETURN*) for each firm in each quarter subsequent to the quarterly pandemic disclosures in 2020<sup>4</sup>. The paper includes a range of control variables in the different analyses presented. These control variables consist of: the natural logarithm of total assets (LNASSET), the ratio of net property, plant, and equipment to total asset (FIXEDASSET),

---

<sup>4</sup> Therefore, quarters 2-4 of 2020 and quarter 1 of 2021. When ROA and RETURN are not dependent variables but are used as explanatory variables in regressions of COVID exposure variables, they are computed in 2019 like the remaining independent variables in those regressions.

return on asset (ROA), cash-to-asset ratio (CASH), total debt to total asset ratio (LEV), and R&D expenses plus capital expenditures minus sales of fixed assets scaled by total assets (INVEST), all using the average values of each variable in the fiscal year 2019.

Additionally, the analysis also includes other variables such as RETURN, which represents the average quarterly stock return of each firm in 2019; SENTIMENT, which is the standardized difference between positive-sentiment and negative-sentiment word counts in all earnings conference calls of each firm in 2019; BUSSEG and GEOSEG, which are the logarithms of 1 plus each firm's business and geographic segments, respectively, in 2019. Other variables included are CEO\_CHAIR, which is a dummy variable for CEOs who also serve as the board of director chair; LOGTENURE, which is the logarithm of one plus the CEO tenure; FEMALE, which is a dummy variable equal to one for female CEOs; LOGAGE, which is the logarithm of one plus the CEO age; CEOPAY, which is the percentage equity-based incentives in CEO compensation; CEOOWN, which is the percentage of firm shares held by the CEOs; TOPAUDITORS, which is a dummy variable for firms audited by the top four auditors; INSTOWN, which is the percentage of institutional ownership; and RATED, which is a dummy variable for firms with long-term S&P credit ratings.

The rationale for including the aforementioned control variables is as follows. Firms with more assets in place, higher cash holdings and lower leverage have more financial flexibility to weather the pandemic impacts at least in the short term and experience milder pandemic-induced drop in stock prices as suggested by Ding et al. (2020) and Fahlenbrach, Raeth and Stulz (2020). Therefore, we expect the CEOs of these firms are likely to deemphasize the effects of COVID-19 pandemic on their firms in earnings conference calls. Buchheim et al. (2020) show that weakly performing firms expect more difficulties for their businesses in the

future; management of firms with higher (lower) profitability in 2019 is therefore less (more) likely to display negative sentiment about the impact of the pandemic.

To address potential omitted variable concerns, we included the control variables for CEO characteristics. Prior studies show that a variety of CEO personal traits (other than CEO overconfidence) can affect corporate information disclosure policies. First, Francis et al. (2008) suggest that longer tenured CEOs are more likely to deliver high-quality financial reporting to maintain the reputation they have built over a long time. Accordingly, we expect longer tenured CEOs to disclose more extensively about their firms' exposure to the COVID-19 pandemic than shorter tenured CEOs. We therefore control for the logarithm of one plus CEO tenure (LOGTENURE2019). Second, Bertrand and Schoar (2003) and Bamber et al. (2010) document that older CEOs are more likely to adopt more conservative investment policies as well as financial reporting policies than younger CEOs. Such evidence suggests that these older CEOs may be more reserved in discussing the potential exposure of their firms to the pandemic. Accordingly, we include the logarithm of one plus CEO age (LOGAGE2019) to control for CEO age.

Third, Francis et al. (2009) and Ho et al. (2015) document that female CEOs and CFOs follow more conservative financial reporting as compared to their male counterparts. Jia, Vanlent and Zeng (2014) further show that firms with CEOs with more masculine faces are associated with more incidences of financial misreporting. To the extent that a CEO's gender can affect their financial reporting styles, it may affect their disclosure of COVID-19 pandemic effects as well. We control for an indicator variable equal to one for female CEO and zero otherwise (FEMALE2019).

Fourth, Nagar, Nanda, and Wysocki (2003) argue that CEO ownership can affect CEO information disclosure choices. CEOs with higher ownership of their firms' shares have more incentives to release good news and stay muted on bad news; news can affect the stock price, which in turn affects the CEOs' wealth. Hollander, Pronk and Roelofsen (2010) examine earnings conference call transcript and document that CEOs with higher ownership of the firm are more likely to avoid answering participants' questions. Accordingly, we control for the equity-based proportion of CEO compensation (CEOPAY2019) and CEO ownership of firm shares (CEOOWN2019).

Following Beyer et al. (2010), a set of proxies for corporate governance is included to reflect its importance as a determinant of corporate disclosure policies. Bens (2002) documents more voluntary information disclosure among firms with greater monitoring. Whether such monitoring is effective depends on the degree of independence of the board from executive management. Since we do not have access to board structure data, we proxy for board (in)dependence by an indicator variable equal to one for firms in which the CEOs also chair the boards of directors and zero otherwise (CEO\_CHAIR2019). Han, Kang and Yoo (2012) show that corporate disclosure transparency increases with auditor size. Thus, we include a control variable equal to one for firms audited by the top 4 auditors in 2019 (TOPAUDIT2019), specifically by Ernst & Young, Deloitte & Touche, KPMG and Pricewaterhouse-Coopers. The data on auditing firms is from Audit Analytics database. Bushee and Noe (2000) show that the pressure of institutional investors promotes more firm disclosure. Thus, we control for the percent of institutional ownership of the firm's stock in 2019 from SEC Form 13-F filings (INSTOWN2019). Finally, Jensen (1989) and Ofek (1993) suggest that creditors have strong incentives to monitor their borrower firms. Uang et al. (2006) show that lenders can put



pressure on management to disclose more of firm going concerns. We control for this creditor monitoring pressure with an indicator variable equal to one for firms with long-term credit ratings in S&P Credit Ratings database (RATED2019) and zero otherwise.

We report the summary statistics of the key variables in Panel A of Table 2. The average firm asset ( $ASSET_{2020}$ ) and market capitalization ( $MARKET\ CAP_{2020}$ ) are \$28,726 million and \$20,416 million, respectively, in the four quarters of 2020. Similar to Hassan et al. (2020), we multiply the reported COVID-19 pandemic firm-level exposure, sentiment, and risk variables by 100 for easier exposition. Thus, the average reported pandemic exposure ( $COVID\_EXPOSURE_{2020}$ ) of 1.344 suggests that 1.344% of words in earnings conference call transcripts are synonyms for coronavirus. Similarly, the number of times pandemic-induced risk-related words ( $COVID\_RISK_{2020}$ ) are mentioned accounts for 0.1% of total word count in earnings conference call transcripts on average. The median reported pandemic exposure is 1.033 while the median reported pandemic risk is 0.000. CEOs seem to acknowledge the potential exposure of firm operations to the pandemic while they largely avoid framing this pandemic exposure as risk-enhancing. When discussing the pandemic, negative sentiment (mean  $COVID\_NEG\_SENT_{2020} = 0.551\%$ ) outweighs positive sentiment (mean  $COVID\_POS\_SENT_{2020} = 0.330\%$ ) in an average earnings conference call transcript, resulting in the average net pandemic sentiment ( $COVID\_NET\_SENT_{2020}$ ) of -0.221%. The average operating performance in 2020 (ROA) is 1.2% while the average return (RETURN) is 4.3%. We obtain the reported pandemic exposure variables and firm performance variables for each firm in each of the quarters of 2020.

(INSERT TABLE 2 ABOUT HERE)

Although the difference in the percentage of negative words between overconfident CEOs (0.495%) and non-overconfident CEOs (0.579%) may appear small, our research aligns

with previous studies that have identified subtle variations in the tone of disclosures among different CEOs or firms, such as Li (2010). In Li's study, 30,000 sentences from the Management Discussion and Analysis (MD&A) section of 10-K and 10-Q filings were manually categorized based on their tone and content. The results revealed that positive tones exceeded negative tones by less than 2%. Despite these minor differences, Li's research found that markets react more positively to good news than negative news during uncertain times. Similarly, Hirshleifer, Low, and Teoh (2012) found that overconfident CEOs are linked to greater innovation output, as measured by the number of patents and patent citations. While the differences in innovation measures between overconfident and non-overconfident CEOs are statistically significant, the magnitudes are still relatively modest. Our research aligns with previous studies that suggest that in times of uncertainty, such as a global pandemic, the tone of communication can have a significant impact on investors' risk perception and decision-making, even small differences in tone can make a difference.

The independent variable of interest is the CEO overconfidence measure *CONFID67*<sub>2019</sub> obtained at the end of the fiscal year 2019. Overconfident CEOs account for 33.5% of the CEOs in the sample. Malmendier and Tate (2005) report 28% of overconfident CEOs for their 1984-1994 sample, while Campbell et al. (2011) report 34% of overconfident CEOs for their 1992-2005 sample. The representation of overconfident CEOs in our sample is therefore broadly similar to previous studies. An average firm in the sample has a fixed asset ratio of 23.6%, return on asset of 1.2%, cash holding ratio of 11.7%, total debt ratio of 31.3% and quarterly stock return of 4.3% in the year 2019 prior to the outbreak of COVID-19.

Panel B of Table 2 describes the results from the univariate comparison of management reporting of COVID-19 pandemic exposure between firms with overconfident CEOs and firms

with non-overconfident CEOs. There is no significant difference between the two groups of firms in terms of reported pandemic exposure, reported pandemic risk, and positive pandemic sentiment. Thus, there is no univariate evidence to support *Hypotheses 1 and 2*. However, consistent with the conjecture in *Hypothesis 3*, negative pandemic sentiment is significantly lower among firms with overconfident CEOs as compared to firms with non-overconfident CEOs. Overconfident CEOs reportedly use 0.495% negative-sentiment words when discussing pandemic exposure in their earnings conference calls, as compared to 0.579% for non-overconfident CEOs. Since there is no significant difference in the positive tone frequencies between overconfident CEOs and non-overconfident CEOs (see  $COVID\_POS\_SENT_{2020}$  variable), the lesser use of negative-sentiment words helps uplift the overall message of overconfident CEOs in their earnings conference call pandemic discussions as compared non-overconfident CEOs. The difference in net pandemic sentiment ( $COVID\_NET\_SENT_{2020}$ ) variable is statistically significant at the 1% level.

#### 4. Results

##### 4.1. *The relation between CEO overconfidence and management reporting of COVID-19 pandemic exposure – Baseline regression results.*

In this section, we examine the relation between CEO overconfidence and management reporting of COVID-19 pandemic exposure in a multivariate framework. We estimate the following baseline regression and present the results in Table 3.

$$(3) COVID_{i,2020t} = \alpha + \beta_1 CONFID_{i,2019} + \sum_{k=1}^K \beta_k Control Variable_{k,i,2019} + \gamma_s + \delta_t + \varepsilon_{i,t}$$

In the above equation (3), the dependent variable -  $COVID_{i,2020t}$  - captures management reporting of firm  $i$ 's exposure to COVID-19 pandemic in quarter  $t$  of 2020 where  $t = 1, 2$  and  $3$ . We employ the five versions of the dependent variable including reported pandemic exposure ( $COVID\_EXPOSURE_{i,2020t}$ ), reported pandemic risk ( $COVID\_RISK_{i,2020t}$ ), positive pandemic sentiment ( $COVID\_POS\_SENT_{i,2020t}$ ), negative pandemic sentiment ( $COVID\_NEG\_SENT_{i,2020t}$ ) and net pandemic sentiment ( $COVID\_NET\_SENT_{i,2020t}$ ) as explained in section 3.2 above. Smaller values of reported pandemic exposure ( $COVID\_EXPOSURE_{i,t}$ ), reported pandemic risk ( $COVID\_RISK_{i,t}$ ) and negative pandemic sentiment ( $COVID\_NEG\_SENT_{i,t}$ ) and higher values of positive ( $COVID\_POS\_SENT_{i,t}$ ) and net ( $COVID\_NET\_SENT_{i,t}$ ) pandemic sentiments indicate that firm management perceive mitigated effects of the pandemic on firm future earnings. Higher values of reported pandemic exposure ( $COVID\_EXPOSURE_{i,t}$ ), reported pandemic risk ( $COVID\_RISK_{i,t}$ ) and negative pandemic sentiment ( $COVID\_NEG\_SENT_{i,t}$ ) and lower values of positive ( $COVID\_POS\_SENT_{i,t}$ ) and net ( $COVID\_NET\_SENT_{i,t}$ ) pandemic sentiments imply greater detrimental effects of the pandemic on firm's future earnings in firm management's view.

When reported pandemic exposure ( $COVID\_EXPOSURE_{i,t}$ ), pandemic risk ( $COVID\_RISK_{i,t}$ ), positive pandemic sentiment ( $COVID\_POS\_SENT_{i,t}$ ) and negative pandemic sentiment ( $COVID\_NEG\_SENT_{i,t}$ ) are the dependent variables, we estimate equation (3) using Tobit regressions with the lower bound of zero because these variables are censored at zero at the lower bound (i.e. firms that disclose no exposure to COVID-19 pandemic in their earnings conference calls). When the dependent variable is net pandemic sentiment ( $COVID\_NET\_SENT_{2020}$ ), we estimate equation (3) using an OLS regression. The independent variable of interest is the CEO overconfidence of firm  $i$  at the end of the fiscal year 2019 ( $CONFID67_{2019}$ ). We control for other firm and CEO characteristics, as explained in Section 3.4.

All control variables are calculated as the average values of the characteristics in the four quarters of 2019.

Hassan et al. (2020) study indicates that only about 50% of the earnings conference call transcripts in the first quarter of 2020 contain management disclosure of COVID-19 pandemic exposure; disclosure peaks at almost 100% in the second and third quarters of 2020 and 95% in the fourth quarter of 2020. Our sample follows a broadly similar quarterly distribution: in the first quarter about 50% of the sample earnings calls involve a pandemic exposure discussion, with more than 99% exposure discussion in quarter 2 and more than 95% in quarters 3 and 4 of 2020. Therefore, we incorporate quarter fixed effects ( $\delta_t$ ) into our analysis to adjust for unobserved, quarter-specific influences that remain constant over time. Additionally, this control helps to neutralize the effects of the observable trends in reporting as previously discussed. Moreover, acknowledging that the impacts of the pandemic can be divergent across various sectors, we account for industry fixed effects using the Fama-French 5-sector classification ( $\gamma_s$ ). In subsequent analyses, we also perform regression analyses separately for subsamples by quarters and by industry<sup>5</sup>.

In Table 3, the coefficient on the CEO overconfidence ( $CONFID67_{2019}$ ) variable is insignificant in the regression of reported pandemic exposure ( $COVID\_EXPOSURE_{2020}$ , (see Model 1)), providing no evidence to support *Hypothesis 1* that overconfident CEOs disclose less about firm exposure to the COVID-19 pandemic compared to non-overconfident CEOs. The

---

<sup>5</sup> There are two reasons we cannot control for firm and/or managerial fixed effects. First, this panel dataset includes firm observations over the four quarters of 2020. Thus, there are at most only four valid observations per firm for most firms in the sample, making it difficult to control for firm or CEO fixed effects. For the same reason, we calculate heteroscedasticity-consistent standard errors instead of firm-clustering standard errors, even though the firm-clustering standard errors yield qualitatively similar results. Second, the independent variable of interest, CEO overconfidence, is only available at annual frequency [e.g. at the end of the fiscal year 2019]. Therefore, the value of this variable is the same for each firm in each of the quarters of 2020.

pervasiveness of the pandemic does not appear to allow even the overconfident CEOs to simply ignore it. There is also no significant relation between CEO overconfidence and reported pandemic risk ( $COVID\_RISK_{2020}$ ) and positive pandemic sentiment ( $COVID\_POS\_SENT_{2020}$ ) variables (see Models 2 and 3). The coefficient on the CEO overconfidence, however, is negative and significant at 5% level in the regression of negative pandemic sentiment ( $COVID\_NEG\_SENT_{2020}$ , (see Model 4)). Overconfident CEOs use 7% fewer negative-sentiment words (in Model 4) in earnings conference calls when discussing the pandemic, as compared to non-overconfident CEOs. Different from the evidence documented in prior studies, overconfident CEOs do not display significantly more positive sentiment in the specific context of the pandemic in this study. They only show significantly inhibited negative sentiment toward the impact of the pandemic as compared to non-overconfident CEOs. The reduced usage of negative words is perhaps a more subtle way for the CEO overconfidence to be expressed, or at least more subtle than outright ignoring the pandemic or spinning it into a positive. The net effect is that overconfident CEOs still deliver a more uplifting message when discussing pandemic exposure; the coefficient on the  $CONFID67_{2019}$  is positive and significant at the 1% level in the regression of net pandemic sentiment ( $COVID\_NET\_SENT_{2020}$ , (see Model 5)). Overconfident CEOs project 7.6% more positive overall tone (in Model 5) in earnings conference calls as compared to non-overconfident CEOs, with the effect driven by the reduced negative tone. The results lend support for *Hypothesis 3*.

(INSERT TABLE 3 ABOUT HERE)

Among the remaining (control) variables, the coefficient on the  $LNASSET_{2019}$  variable is negative in Models 2 and 4 and weakly positive in Model 5, suggesting larger firms are less likely to disclose their risk and negative sentiment to COVID-19 pandemic and more likely to exhibit

a positive overall pandemic sentiment in their earnings conference calls. Based on the regression analysis using the *LNASSET2019* variable, it appears that bigger companies tend to avoid expressing concerns and negative opinions regarding the COVID-19 pandemic during their earnings conference calls. This might be due to their ability to handle potential risks caused by the pandemic, resulting in lower risk disclosure and negativity. Furthermore, the slightly positive correlation in Model 5 could imply that these larger firms tend to have a positive outlook towards the pandemic's impact. This could be an authentic expression of their optimism based on their strong resources and resilience, or it could be a strategic communication tactic aimed at maintaining stakeholders' confidence.

Next, CEOs of firms with higher profitability ( $ROA_{2019}$ ) display less of negative sentiment words and more positive net sentiment in pandemic disclosure (see Models 4 and 5). The positive and significant coefficient on the past general/overall sentiment in prior-year conference calls (the *SENTIMENT* variable) in Models 1, 3 and 5 underscores the temporal consistency in CEO sentiment. Essentially, this indicates that the tone of a CEO's communication tends to be stable over time. CEOs of more geographically diversified firms (see variable *GEOSEG*) report more exposure to the pandemic (see Model 1) and employ more optimistic (see Model 3) and more pessimistic words (see Model 4) than less geographically diversified firms.

Drawing from the personal characteristics of CEOs, when a CEO serves as the board chairperson, there is a decrease in *COVID\_RISK2020* measures, as indicated by the negative coefficient of *CEO\_CHAIR\_2019* in Model 2. Additionally, firms with longer-tenured CEOs exhibit lower *COVID\_EXPOSURE2020* and *COVID\_RISK2020* measures, as shown by the negative coefficient of *LOGTENURE\_2019* in Models 1 and 2. Conversely, older CEOs are

associated with higher COVID\_EXPOSURE2020, COVID\_POS\_SENT2020, and COVID\_NEG\_SENT2020 measures, as evidenced by the positive and statistically significant coefficient of LOGAGE\_2019 in Models 1, 3, and 4.

Lastly, the evidence suggests that COVID-19 exposure reporting is influenced by factors such as the presence of top auditors, institutional ownership, and whether a firm's bonds are rated. For instance, firms with top auditors exhibit higher COVID\_POS\_SENT2020 and COVID\_NEG\_SENT2020 measures, as indicated by positive and statistically significant coefficients in Models 3 and 4. Moreover, a negative relationship with COVID\_NET\_SENT2020 is observed, significant at the 10% level in Model 5. Increased institutional ownership is linked to a decrease in COVID\_NEG\_SENT2020, as shown by a negative and statistically significant coefficient in Model 4. A positive relationship with COVID\_NET\_SENT2020 is also evident, significant at the 5% level in Model 5. Rated firms demonstrate higher COVID\_EXPOSURE2020 and COVID\_POS\_SENT2020 measures, as indicated by positive and statistically significant coefficients in Models 1 and 3.

The results so far show that overconfident CEOs are more likely to avoid using negative tone language when discussing the impacts of the COVID-19 pandemic on their firm operations, even though they do not necessarily employ more positive sentiment language in their discussion than non-overconfident CEOs. This result is consistent with the finding by Banerjee et al. (2018) that overconfident CEOs are more likely to conceal negative information since they are confident that they can somehow resolve such negative outcomes. The net effect is that these overconfident CEOs still strike a more uplifting message to investors as compared to non-overconfident CEOs. Being overconfident, these CEOs are likely to be more optimistic about how their skills can help weather the firms from the impact of the pandemic.



## **4.2. The relation between CEO overconfidence and management reporting of COVID-19 pandemic exposure – Addressing potential endogeneity concerns.**

According to Roberts and Whited (2013), endogeneity is the most important and pervasive issue in empirical corporate finance studies. The three sources of endogeneity are measurement error, omitted variables, and simultaneity. In this section, we attempt to address these three sources of endogeneity.

### *4.2.1. Measurement errors*

To address potential measurement errors, we create additional indicator variables as proxies for CEO overconfidence. We first adjust the threshold in our option-moneyness-based overconfidence proxy: we set  $CONFID100_{2019}$  and  $CONFID150_{2019}$ , equal to 1 for observations with the average percent moneyness of the options greater or equal to 100% or 150%, respectively, and 0 otherwise. We present the regression results in Table 4. Consistent with the results in Table 3, the coefficients on the  $CONFID100_{2019}$  and  $CONFID150_{2019}$  variables are negative and significant in the negative pandemic sentiment ( $COVID\_NEG\_SENT_{2020}$ ) regressions in Model 4 while being positive and significant in the net pandemic sentiment ( $COVID\_NET\_SENT_{2020}$ ) regressions in Model 5, in Panels A and B, respectively. This confirms that overconfident CEOs deliver less pessimistic and hence more uplifting overall pandemic-related messages in earnings conference calls as compared to non-overconfident CEOs<sup>6</sup>.

(INSERT TABLE 4 ABOUT HERE)

---

<sup>6</sup> In Panel B of Table 5,  $CONFID150_{2019}$  is negative and significant in Model 1. This suggests that extremely overconfident CEOs (with average option moneyness of 150%) are also less likely to discuss their firms' exposure to the pandemic and offers some support for Hypothesis 1.

Schrand and Zechman (2012) develop a firm-based indicator of CEO overconfidence. They posit that CEO overconfidence can be observed via financing and investing decisions made at the firm level. They construct a firm-based overconfidence score set equal to 1 if the firm meets the requirements of at least three of the following five criteria and zero otherwise: (i) excess investment is in the highest quartile in each industry in each year, where excess investment is the residual from a regression of total asset growth on sales growth; (ii) cash flows from acquisition activities are in the highest quartile in each industry in each year; (iii) the debt-to-equity ratio is in the highest quartile in each industry in each year; (iv) either convertible debt or preferred stock is greater than zero; and (v) the dividend yield is zero. We label this firm-based indicator of CEO overconfidence as  $OC\_SZ_{2019}$  and employ this variable instead of the option-based indicators of CEO overconfidence. The results in Table 5 show a negative and significant relation between  $OC\_SZ_{2019}$  and negative pandemic sentiment ( $COVID\_NEG\_SENT_{2020}$ ) (Model 4). The coefficient on  $OC\_SZ_{2019}$  in the net pandemic sentiment ( $COVID\_NET\_SENT_{2020}$ ) regression (Model 5) is positive and significant. These results are consistent with the results in Tables 3 and 4. Thus, the documented relation between CEO overconfidence and corporate disclosing of firm exposure to the pandemic, in particular the reduced likelihood of expressing negative sentiment when discussing the pandemic, is not sensitive to alternative measures of overconfidence.

(INSERT TABLE 5 ABOUT HERE)

#### 4.2.2. Omitted variables

Our analysis includes additional control variables for CEO characteristics to address concerns about potential omitted variables. As we explained in Section 3.4, a variety of CEO personal traits, other than overconfidence, can affect corporate information disclosure policies.

We also include a set of proxies for corporate governance in the analysis. The results in Tables 3 to 5 show that CEOs who also chair the boards of directors discuss significantly less about the risk of the COVID-19 pandemic on their firms. Firms with the top 4 auditors exhibit more positive and negative sentiment, while firms with more institutional ownership exhibit less negative sentiment. Our primary findings remain consistent despite controlling for CEO and corporate governance proxies. The variables indicating overconfident CEOs are linked to a notably lower negative pandemic sentiment and a positive overall net sentiment.

#### 4.2.3. *Simultaneity*

Simultaneity occurs when the dependent variable (e.g., management reporting of firm exposure to the COVID-19 pandemic) and the independent variable of interest (e.g. CEO overconfidence) are simultaneously determined. It is possible that firms with certain characteristics are more likely to attract overconfident CEOs, and that the same characteristics are associated with management reporting of firms' exposure to the pandemic. These characteristics can be observable or unobservable. In Table 6, we implement a weighted regression after an entropy balancing procedure to address simultaneity issues based upon observable firm characteristics. In Table 7, we implement Heckman self-selection two-stage model to address simultaneity issues based upon unobservable firm characteristics.

In Table 6, we perform regressions of firm reporting of their exposure to the COVID-19 pandemic using a weighted sample derived from entropy balancing. Propensity score matching is typically used in finance research to preprocess data prior to the estimation of the treatment effects. In the propensity score matching approach, each treated firm (e.g. a firm disclosing more about its exposure to the pandemic) is matched with one non-treated firm (e.g. a firm with less disclosure) with the closest propensity score. The goal is to improve the

covariate balance between the treatment and control firms such that the treatment variable becomes closer to being independent of the other observable firm characteristics (Hainmueller, 2012). Hainmueller (2012) suggest entropy balancing as another method for preprocessing with several advantages over propensity score matching. First, entropy balancing identifies continuous weights for every control firm such that their first, second, and third moments (i.e. mean, variance and skewness) equal those of the treated firm, which in turn allows comparisons of firms with more disclosure to firms with less disclosure weighted to have similar covariates. Since the weights are calculated to ensure similar higher order moments of covariate distributions between treated and control firms, entropy balancing provides near perfect covariate balance, while propensity score matching does not (Canil, Karpavičius and Yu, 2019). Second, entropy balancing allows all control firms, instead of just control firms closest in propensity score, to remain in the sample, maintaining statistical power and generalizability.

(INSERT TABLE 6 ABOUT HERE)

Panel A of Table 6 presents the distribution of control variables after the entropy balancing procedure. The standardized differences between the treated subsample (e.g. subsample of firms disclosing more about their exposure to the COVID-19 pandemic than the sample median) and control subsample (e.g. subsample of firms with less disclosure than the sample median) are the differences in means between two subsamples divided by the standard deviation of the treated sample for each covariate. According to Normand et al. (2001) and Austin (2011), a standardized difference less than 10% indicates a negligible difference in the mean of a covariate between treatment groups and control groups, which is the case in Panel A of Table 6. Panel B of Table 6 presents the results from the weighted regressions. The results are qualitatively similar to the baseline results. The association between CEO overconfidence

(*CONFID67*<sub>2019</sub>) and negative pandemic sentiment (*COVID\_NEG\_SENT*<sub>2020</sub>) continues to be significantly negative, while CEO overconfidence is consistently positively related to net pandemic sentiment. Thus, our result is robust to a weighted sample design.

Self-selection bias might pose a further confounding problem. In anticipation of the potentially damaging effects of the pandemic on firm operations, a CEO might choose not to conduct voluntary earnings conference calls in the first place. CEOs who believe the pandemic will not have much effect on firm operations, on the other hand, might be more likely to conduct voluntary earnings conference calls. To address such potential confounding self-selection issue, we implement Heckman self-selection two-stage method in Table 7.

(INSERT TABLE 7 ABOUT HERE)

In Panel A of Table 7, we conduct a logistic regression of the probability that a firm would provide voluntary earnings conference calls in 2020. The regression in Panel A is conducted using all firms in Compustat in 2020 (i.e., firms with and firms without voluntary earnings conference calls), and therefore the number of observations in this regression is higher than that in the regressions of COVID-19 pandemic disclosure (which includes only firms with voluntary earnings conference calls). The dependent variable is equal to 1 for firms that conduct at least one earnings conference call in the year 2020 and 0 otherwise. We control for the percentage of firms in the same industry that conduct earnings conference call in the preceding year (*CONF\_PERCENT*<sub>2019</sub>), excluding the focal firm. Industry practice of providing earnings conference calls might pressure a firm to do the same, while it does not directly affect firm performance. Thus, *CONF\_PERCENT*<sub>2019</sub> satisfies the exclusion criteria. The inclusion of the remaining control firm characteristics is guided by Frankel, Johnson and Skinner (1999), including the natural logarithm of firm assets in 2019 (*LNASSET*<sub>2019</sub>), the market-to-book ratio

( $MKBK_{2019}$ ), the return on assets ( $ROA_{2019}$ ), the standard deviation of the quarterly ROA in the preceding 4 quarters ( $STDROA_{2019}$ ), the ratio of debt to equity ( $DEBT/EQUITY_{2019}$ ), the ratio of special items scaled by total assets ( $SPI_{2019}$ ) and the dummy variable for firms with stock issuance in 2019 ( $STOCKISSUE_{2019}$ ). The coefficient on the  $CONF\_PERCENT_{2019}$  variable is positive and significant, suggesting that firms are more likely to conduct voluntary earnings conference calls when more industry peers do. Consistent with Frankel, Johnson and Skinner (1999), larger firms ( $LNASSET_{2019}$ ), firms with less volatile profitability ( $STDROA_{2019}$ ) and firms that issue stock in the preceding year are more likely to conduct voluntary earnings conference calls<sup>7</sup>.

We obtain the predicted probabilities from the logistic regression in Panel A of Table 7 to calculate the inverse Mills ratio ( $MILLS_{2019}$ ) and include it in the regression of management reporting of COVID-19 pandemic exposure in Panel B of Table 7 to control for potential self-selection bias. The coefficient on the  $MILLS_{2019}$  variable is positive and significant in three out of five models, confirming potential self-selection issue. Still, consistent with the results in prior tables, the  $CONFID67_{2019}$  variable continues to be inversely related to the negative sentiment word counts in management reporting of pandemic exposure (see variable  $COVID\_NEG\_SENT_{2020}$  in Model 4 of Panel B) and positively related to the overall (net) sentiment of their pandemic disclosure (see variable  $COVID\_NET\_SENT_{2020}$  in Model 5 of Panel B). Thus, after controlling for potential self-selection issue, the results stay qualitatively robust.

#### **4.3. The relation between CEO overconfidence and management reporting of COVID-19 pandemic exposure – Detangling confounding firm characteristics.**

---

<sup>7</sup> Market-to-book ratio and SPI are weakly significant.

In this section, we aim to detangle the potential confounding effects of other firm characteristics. Larger firms, more profitable firms, and cash-rich firms have more solid financial footing to weather COVID-19 pandemic impacts, which in turn might bolster the confidence of the CEOs in future firm earnings. Debt-laden firms, on the other hand, face financial obligations, which might require firms to cut down on their investment in the midst of the pandemic. As a result, CEOs of larger firms, more profitable firms, cash-rich firms and less leveraged firms might discuss their firms' exposure to the pandemic differently than CEOs of smaller, less profitable, cash-strapped, and debt-laden firms. If there are more overconfident CEOs among the former firms, then the effects of CEO overconfidence documented in previous tables might be a manifestation of these firm characteristics rather than of overconfidence itself.

To address such potential confounding effects, we re-estimate equation (3) and include the interaction terms between each of the above-mentioned firm characteristics and the CEO overconfidence measure  $CONFID67_{2019}$ . We present the results in Table 8. If the interaction terms between  $CONFID67_{2019}$  and the firm characteristics are significant and the main effect ( $CONFID67_{2019}$  by itself) becomes insignificant, then firm characteristics, instead of CEO overconfidence, drive the results documented in the previous tables. The coefficient on the variable  $CONFID67_{2019}$  is negative and significant in Model 4 in all four panels<sup>8</sup> and is positive and significant in Model 5 in all four panels (albeit weakly in Panels A and D). Thus, our main finding that overconfident CEOs avoid sharing negative sentiment and aim for more uplifting net

---

<sup>8</sup> The interaction factor between  $CONFID67$  and  $LNASSET$  (ROA) in Panel A (B) is positive and significant, indicating that while CEO overconfidence still reduces the negative sentiment when discussing the pandemic, this effect of CEO overconfidence is less pronounced in larger (more profitable) firms.

sentiment when discussing firm exposure to the COVID-19 pandemic is not a simple byproduct of firm characteristics.

(INSERT TABLE 8 ABOUT HERE)

#### **4.4. The relation between CEO overconfidence and management reporting of COVID-19 pandemic exposure – Subsample Analyses.**

##### *4.4.1. Industry subsamples*

While some companies' performance has been buoyed during the COVID-19 pandemic<sup>9</sup>, either by their own resilience or government action, many companies have suffered losses from closures. In this section, we examine whether the relation between CEO overconfidence and management reporting of pandemic exposure varies by industry subsamples. We rank the median COVID\_EXPOSURE / COVID\_RISK/ COVID\_POS\_SENT / COVID\_NEG\_SENT / COVID\_NET\_SENT values for each 4-digit SIC code in each quarter into terciles and creating dummy variables for the highest terciles (HI\_COVID\_EXPOSURE2020, HI\_COVID\_RISK2020, HI\_COVID\_POS\_SENT2020, HI\_COVID\_NEG\_SENT2020, and HI\_COVID\_NET\_SENT2020). We include interaction terms between the dummy variables and CEO overconfidence to examine if the relationship between CEO overconfidence and management reporting of COVID-19 exposure differs across industries. The coefficients on the interaction terms between the dummy variables for firms in the industries in the highest terciles of COVID\_RISK2020, COVID\_POS\_SENT2020, COVID\_NEG\_SENT2020, and COVID\_NET\_SENT2020 and CONFID672019 are statistically significant in Models 2 to 5 in Table 9, respectively, indicating that the effect of CEO

---

<sup>9</sup> Many tech firms such as Amazon, Microsoft and Zoom have survived and even prospered very well during the pandemic due to the increased demand for online shopping and remote communications.



overconfidence is more pronounced in industries with high levels of COVID-19 risk and related sentiments reported.

(INSERT TABLE 9 ABOUT HERE)

In industries heavily impacted by the pandemic, CEO overconfidence plays a more significant role. This is because when an industry is severely affected, CEOs may feel pressured to downplay the impact of the pandemic to ease investor fears and appear resilient. This behavior is comparable to "disclosure herding," which refers to the tendency of CEOs who are overly confident to alter their disclosures in response to the discussion of pandemic exposure. The disclosure pattern occurs when external factors, like the severity of the pandemic's impact, interact with internal factors, such as the CEO's overconfidence.

#### 4.4.2. *Quarter-by-quarter regressions*

Hassan et al. (2020) show relatively low management reporting of COVID-19 pandemic exposure in earnings conference calls in the first quarter of 2020 (about 50% of the transcripts), which then grows to almost 100% in the second and third quarters of 2020 and 95% in the fourth quarter. The quarterly distribution of our sample shows a similar pattern: management reporting of pandemic exposure goes from about 50% in quarter 1 to the peak of more than 99% in quarter 2 (and stays above 95% in the remaining two quarters of 2020). In this section, we examine whether overconfident CEOs consistently downplay firm exposure to the pandemic throughout the four quarters of 2020. The results are presented in Table 10. The coefficient on the CEO overconfidence ( $CONFID67_{2019}$ ) variable in the regressions of negative and net pandemic sentiments is only significant in the second quarter of 2020 (see Models 4 and

5 of Panel B), when the discussion of pandemic exposure was most likely to happen (see Panel A of Table 1).

(INSERT TABLE 10 ABOUT HERE)

The results from Tables 9 and 10 suggest that the deleterious effect of overconfidence on expressed pandemic sentiment was confined to the subsamples with high levels of COVID-19 risk and related sentiments reported, and the highest reported pandemic exposure. The effect of overconfidence on the sentiment of pandemic discussions appears to be a function of both CEO self-esteem (be it illusion error or attribution of control; Lovallo and Kahneman, 2013) and perceived company needs. High CEO self-esteem may result in overconfidence, but the CEOs don't act on that overconfidence (moderating the negative sentiment in pandemic discussions) until the need for it is sufficiently large (highest levels of pandemic exposure)<sup>10</sup>.

The fluctuating effects of overconfidence might be connected to the changing circumstances of the pandemic over time, which ties into our earlier point about the unique nature of COVID-19 as a shock. Initially, in the first quarter, there was doubt about whether the virus would result in a global pandemic. At this stage, the disclosure model was consistent with typical information asymmetry scenarios, with overconfidence not expected to have any specific bearing on COVID-related disclosures.

However, by the second quarter, there was no doubt about the serious negative impacts of the virus. In this context, our findings suggest that overconfident CEOs were more

---

<sup>10</sup> In untabulated results, we regress the exposure sentiment variables (positive/negative/net) on the same set of independent variables as in our mainline regressions from Table 3, but this time including reported exposure and the interaction between overconfidence and exposure. This new interaction factor is significantly negative (positive) as a predictor of negative (net) sentiment, which confirms that the adverse (positive) effect of overconfidence on negative (net) sentiment is exacerbated by the magnitude of reported pandemic exposure.

likely to avoid negative COVID-related disclosures, possibly in an attempt to manage perceptions of their firm's situation.

In the third and fourth quarters, new uncertainties began to emerge, such as the duration of the pandemic and the effectiveness of firms' response strategies. These changes could have potentially brought the disclosure model back to a more traditional setting, leading to an absence of distinct predictions about the influence of overconfidence on COVID-related disclosures.

#### **4.5. Do overconfident CEOs have favorable inside information about firm future earnings?**

A potential concern for our study is that if overconfident CEOs, as we define them, have more favorable inside information about future earnings of the firms, they will naturally use less pessimistic language when discussing firm exposure to the COVID-19 pandemic in their earnings conference calls. If so, what Malmendier and Tate (2005) and similar studies see as potentially misplaced confidence (hence dubbing it overconfidence) and a CEO characteristic may in fact be properly placed confidence and a firm characteristic. To explore this possibility, we examine if and how the relation between management reporting of pandemic exposure and firm operating performance/stock price performance differs by CEO overconfidence.

The findings in Table II suggest there is a significant inverse correlation between reporting negative pandemic sentiment by management and subsequent firm operating performance. The coefficient of the COVID\_NEG\_SENT2020 variable in Model 4, focusing on observations where CONFID67 (and subsequently the CONFID67\* COVID\_NEG\_SENT2020 interaction factor) is zero and therefore non-overconfident CEOs, is statistically significant and

negatively associated with the subsequent quarter ROA. This implies that firms with non-overconfident CEOs report negative sentiment accurately in relation to their exposure to COVID-19 pandemic, as more negative sentiment leads to poorer operating performance in the following quarter. As the CONFID67\* COVID\_NEG\_SENT2020 interaction factor is statistically insignificant in the same model, CEO overconfidence does not appear to affect this informative relationship between negative sentiment and future operating performance. The coefficient of the variable COVID\_NET\_SENT2020 in Model 5 is positive and statistically significant, suggesting that firms that report a net positive sentiment in their discussions of COVID-19 exposure are more likely to experience better subsequent operating performance. Similar to our findings in Model 4, the interaction with CEO overconfidence is insignificant. As the results on positive sentiment (Model 3) are insignificant, the net sentiment's effect on operating performance appears driven by differences in negative sentiment. Overall, the findings suggest that negative sentiment in earnings call discussions of COVID-19 exposure is informative for predicting future firm performance, irrespective of CEO overconfidence.

[INSERT TABLE 11 ABOUT HERE]

The results in Table 12 reveal that the variables negative sentiment (COVID\_NEG\_SENT\_2020) and net sentiment (COVID\_NET\_SENT\_2020) as main effects (and therefore corresponding to observations with non-overconfident CEOs) are associated with a negative and positive relationship with next quarter stock return, respectively. Looking in particular at the Model 4 results, the coefficient on the variable COVID\_NEG\_SENT2020 is negative and significant at the 5% level, suggesting that firms with non-overconfident CEOs which expressed a higher proportion of negative sentiment related to the COVID-19 pandemic in their earnings calls subsequently experienced lower stock returns.

Unlike in Table 11, the interaction term  $CONFID_{672019} \times COVID\_NEG\_SENT_{2020}$  is positive and significant at the 1% level. This suggests that firms with overconfident CEOs who expressed more (less) negative sentiment related to the pandemic, subsequently experienced higher (lower) stock returns than would be expected from the impact of negative sentiment alone. While we don't test this conjecture explicitly, this is probably driven by the weaker positive stock price effect of less negative sentiment (at least when compared to non-overconfident CEOs).

In Model 5, the coefficient on  $COVID\_NET\_SENT_{2020}$ , which represents the overall sentiment about COVID-19 (positive sentiment minus negative sentiment), is positive and significant at the 5% level. This suggests that as a main effect (and therefore corresponding to observations with non-overconfident CEOs) firms expressing a more positive net sentiment in their earnings calls about COVID-19 had higher subsequent stock returns. However, as with negative sentiment, the interaction factor with CEO overconfidence is significant and of the opposite sign, suggesting that this positive relationship between net sentiment and subsequent stock performance is weakened for over-confident CEOs.

[INSERT TABLE 12 ABOUT HERE]

Taken together, results from Tables 11 and 12 offer an interesting picture of the relationship between operating and stock performance, viewed through the prism of informativeness of earnings calls, in particular the negative tone expressed in those calls by the CEOs. For a pervasive exogenous shock such as the initial stages of the COVID-19 pandemic, Table 11 suggests that negative tone in earnings conference calls appears informative of future operating performance. As current and potential stock investors always look for signals in CEO disclosures, it would stand to reason that in an efficient market this more (less) pronounced

negative CEO tone would lead to weaker (stronger) future stock performance. Table 12 suggests that while this is true for non-overconfident CEOs, stock markets discount the informativeness of negative tone expressed by overconfident CEOs. Since our findings from Table 11 of no discerning difference in the effect of negative tone on subsequent operating performance between overconfident and non-overconfident CEOs suggest such discounting may not be warranted, it appears that stock markets unnecessarily (at least in this case) penalize the firms with overconfident CEOs. While this perceived market overadjustment provides a limited perspective on market efficiency, it should serve as a warning to CEOs about how personal biases can impact their financial decisions.

## **5. Conclusion**

In this study, we examine the association between CEO overconfidence and management voluntary reporting of firm exposure to the COVID-19 pandemic. The pandemic presents a systematic and pervasive shock on all economic entities in the U.S. Therefore, an overwhelming number of U.S. firms discuss the effects of the pandemic in their earnings conference calls in the first three quarters of 2020 as shown by Hassan et al. (2020). Such extensive voluntary reporting of firm exposure to the pandemic allows us to examine whether overconfident vs. non-overconfident CEOs adopt the same disclosure strategies to the same external shock, instead of idiosyncratic shocks unique to each firm, as in prior studies.

We find that CEOs identified as being overconfident prior to the outbreak of the COVID-19 pandemic are less likely to display negative sentiment when discussing their firms' exposure to the pandemic in their earnings conference calls; no effect of overconfidence is shown on the mere reporting of the exposure or (unlike in prior studies) on the usage of

positive tone words. These CEOs still aim to deliver a more optimistic overall tone to assuage investors' concerns about the firm's exposure to the pandemic, but in a perhaps more subtle way, through reduced usage of negative tone words when discussing the COVID-19 pandemic. In additional analyses, we also document that the anticipated negative associations between management disclosure of their firm's exposure to the COVID-19 pandemic (and particularly the use of negative sentiment in such disclosures) and subsequent operating performance hold broadly, indicating the informativeness of CEOs negative tone when addressing a pervasive exogenous shock. The informativeness of the negative tone of CEO sentiment with respect to stock performance is reduced among the overconfident CEOs, with the implication that overconfident CEOs' disclosures are treated as potentially misleading despite this overconfidence not resulting in depreciable weaker operating performance. This paper adds to the mounting evidence on how managerial psychology can affect corporate decisions in general and corporate disclosure policy specifically, as well as on market reactions to such disclosures.

Our research delves into the communication strategies of businesses during the COVID-19 pandemic. Typically, companies tend to have an information gap between internal and external stakeholders when sharing news about specific events. However, given the global nature of the pandemic, most people were already aware of it, which has significantly reduced this gap. A key takeaway from our study is the crucial role that a CEO plays in a company's communication during such a crisis. Our findings indicate that a CEO's unique personality traits considerably impact how a company discusses a pandemic. By focusing on the CEO's role, we were able to isolate their influence from other factors that may have affected communication. Furthermore, a pandemic can amplify a CEO's traits, which can more profoundly affect a company's messaging. With the CEO leading the charge during the COVID crisis, we had a

valuable opportunity to analyze how their traits shape a company's response during significant events such as a pandemic.



## References

- Austin, P.C., 2011. An introduction to propensity score methods for reducing the effects of confounding in observational studies. *Multivariate Behavioral Research* 46, 399–424.
- Bamber, L.S., Jiang, J., and Wang, Y. 2010. What's my style? The influence of top managers on voluntary corporate financial disclosure. *The Accounting Review* 85(4): 1131-1162.
- Banerjee, S., Humphery-Jenner, M., Nanda, V., & Tham, T. M. 2018. Executive overconfidence and securities class actions. *Journal of Financial and Quantitative Analysis* 53(6), 2685.
- Barrero, J.M., Bloom, N., and Davis, S.J. (2020), COVID-19 is also a reallocation shock, NBER Working Paper No. 27137.
- Bens, D. 2002. The determinants of the amount of information disclosed about corporate restructuring. *Journal of Accounting Research* 40:1–20.
- Bertrand, M. and Schoar, A. 2003. Managing with style: The effect of managers on firm policies, *The Quarterly Journal of Economics* 118(4):1169-1208.
- Bowen, R. Davis, A. and Matsumoto, D. 2002. Do conference calls affect analysts' forecasts? *The Accounting Review* 77(2): 285-316.
- Brown, S., Hillegeist, S.A., Lo, K., 2004. Conference calls and information asymmetry. *Journal of Accounting and Economics* 37 (3): 343–366.
- Buchheim, L., Doern, J., Krolage, C. and Link, S. 2020. Firm-level expectations and behavior in response to the COVID-19 crisis. CESifo Working Paper Series No. 8304.
- Bushee, B., Noe, C.F. 2000. Corporate disclosure practices, institutional investors, and stock return volatility. *Journal of Accounting Research* 38: 171–202.
- Bushee, B., Matsumoto, D., Miller, G., 2003. Open versus closed conference calls: The determinants and effects of broadening access to disclosure. *Journal of Accounting and Economics* 34 (1–3): 149–180
- Campbell, T. C., M. Gallmeyer, S. A. Johnson, J. Rutherford, and B. W. Stanley. 2011. CEO optimism and forced turnover. *Journal of Financial Economics* 101 (3): 695–712.
- Canil, J., Karpavičius, S. and Yu, C-F. 2019. Are shareholders gender neutral? Evidence from say on pay. *Journal of Corporate Finance* 58, 169–186.
- Chen, Y-R., Ho, K-Y, Yeh, CW. 2020. CEO overconfidence and corporate cash holdings. *Journal of Corporate Finance* 62, 101577.
- Coibion, O., Gorodnichenko Y., and Weber M. 2020a. The cost of the covid-19 crisis: lockdowns, macroeconomic expectations, and consumer spending, BFI Working Paper 2020-60.
- Coibion, O., Gorodnichenko Y., and Weber M. 2020b. Labor markets during the COVID-19 crisis: A preliminary view, NBER Working Paper No. 27017.

- Davis, A.K., Ge, W., Matsumoto, D. 2015. The effect of manager-specific optimism on the tone of earnings conference calls. *Review of Accounting Studies* 20: 639–673.
- Davis, A., Piger, J., & Sedor, L. 2012. Beyond the numbers: Measuring the information content of earnings press release language. *Contemporary Accounting Research* 29(3): 845–868.
- Davis, A. and Tama-Sweet, I. 2012. Managers' use of language across alternative disclosure outlets: Earnings press releases versus MD&A. *Contemporary Accounting Research* 29 (3): 804-837.
- Deshmukh, S., Goel, A. and Howe, K. 2013. CEO overconfidence and dividend policy. *Journal of Financial Intermediation* 22: 440–463.
- Ding, W., Levine, R., Lin, C. and Xie, W. 2020. Corporate immunity to the COVID-19 pandemic, National Bureau of Economic Research Working Paper Series No. 27055.
- Ertugrul, M., 2013. Employee-friendly acquirers and acquisition performance. *Journal of Financial Research* 36, 347–370.
- Fabian Stephany, F., Stoehr, N., Darius, P., Neuhäuser, L., Teutloff, O. and Braesemann, F. 2020. The CoRisk-Index: A data-mining approach to identify industry-specific risk assessments related to COVID-19 in real-time. Available at SSRN: <https://ssrn.com/abstract=3607228> or <http://dx.doi.org/10.2139/ssrn.3607228>
- Fahlenbrach, R., Rageth, K. and Stulz, R. 2020. How valuable is financial flexibility when revenue stops? Evidence from the COVID-19 crisis. National Bureau of Economic Research Working Paper Series No. 27106.
- Francis, W., Hasan, I., Park, J. C., & Qiang, W. 2009. Gender differences in financial reporting decision making: Evidence from accounting conservatism. *Contemporary Accounting Research* 32(3):1285–1318.
- Francis, J., Huang, A. H., Rajgopal, S., & Zang, A. Y. 2008. CEO reputation and earnings quality. *Contemporary Accounting Research* 25(1): 109-147.
- Frankel, R., Johnson, M., & Skinner, D. J. 1999. An empirical examination of conference calls as a voluntary disclosure medium. *Journal of Accounting Research* 37(1), 133-150.
- Galasso, A. and Simcoe, T. 2011. CEO overconfidence and innovation. *Management Science* 57(8):1469-1484.
- Ghaly, M., Dang, V. A., & Stathopoulos, K. 2015. Cash holdings and employee welfare. *Journal of Corporate Finance*, 33, 53-70.
- Ge, R. and Lennox, C. 2011. Do acquirers disclose good news or withhold bad news when they finance their acquisitions using equity? *Review of Accounting Studies* 16: 183–217.
- Graham, J. R., Harvey, C. R., & Puri, M. 2013. Managerial attitudes and corporate actions. *Journal of Financial Economics* 109(1): 103-121.

- Hainmueller, J. 2012. Entropy balancing for causal effects: A multivariate reweighting method to produce balanced samples in observational studies. *Political Analysis*: 25-46.
- Han, S., Kang, T., and Yoo, Y. K. 2012. Governance role of auditors and legal environment: Evidence from corporate disclosure transparency. *European Accounting Review* 21(1): 29-50.
- Hassan, T., Hollander, S., Lent, L., Schwedeler, M. and Tahounk. A. 2020. Firm-level exposure to epidemic diseases: Covid-19, SARS, and H1N1. Working paper. Available at <https://www.firmlevelrisk.com/>
- Hirshleifer, D., Low, A., & Teoh, S. H. (2012). Are overconfident CEOs better innovators? *The Journal of Finance* 67(4): 1457-1498.
- Ho, S.S., Li, A.Y., Tam, K. and Zhang, F. 2015. CEO gender, ethical leadership, and accounting conservatism, *Journal of Business Ethics* 127(2): 351-370.
- Hollander, S., Pronk, M., Roelofsen, E., 2010. Does silence speak? An empirical analysis of disclosure choices during conference calls. *Journal of Accounting Research* 48 (3): 531–563.
- Hribar, P. and Yang, H. 2016. CEO overconfidence and management forecasting, *Contemporary Accounting Research* 33(1): 204–227.
- Huang, R., Jui, K., Tan, K. and Faff, R. 2016. CEO overconfidence and corporate debt maturity. *Journal of Corporate Finance* 36: 93–110
- Hutton, A.P., Miller, G.S., Skinner, D.J., 2003. The role of supplementary statement with management earnings forecasts. *Journal of Accounting Research* 41 (5): 867–890.
- Jegadeesh, N., and Wu, D. 2013. Word power: A new approach for content analysis. *Journal of Financial Economics* 110(3): 712-729.
- Jensen, M. 1989. Active investors, LBOs and privatization of bankruptcy. *Journal of Applied Corporate Finance* 2: 35–44.
- Jia, Y., Van lent, I., & Zeng, Y. 2014. Masculinity, testosterone, and financial misreporting. *Journal of Accounting Research*, 52(5): 1195-1246.
- Jin, L., & Kothari, S. P. 2008. Effect of personal taxes on managers' decisions to sell their stock. *Journal of Accounting and Economics* 46(1): 23-46.
- Kile, C. O., & Phillips, M. E. 2009. Using industry classification codes to sample high-technology firms: Analysis and recommendations. *Journal of Accounting, Auditing & Finance*, 24(1), 35-58.
- Kim, J. B., Wang, Z. and Zhang, L. 2016. CEO overconfidence and stock price crash risk. *Contemporary Accounting Research* 33 (4): 1720-1749.
- Libby, R. and Rennekamp, K. 2012. Self-serving attribution bias, overconfidence, and the issuance of management forecasts. *Journal of Accounting Research*, 50(1), 197-231.

Lopatta, K. and Alexander, E-K. and Gastone, M. and Tammen, T. 2020. To report or not to report about coronavirus? the role of periodic reporting in explaining capital market reactions during the covid-19 pandemic. Available at SSRN: <https://ssrn.com/abstract=3567778> or <http://dx.doi.org/10.2139/ssrn.3567778>

Lovullo, D. and Kahneman, D. 2003. Delusions of success. *Harvard Business Review* 81 (7): 56-63.

Malmendier, U. and Tate, G. 2005. CEO overconfidence and corporate investment. *Journal of Finance* 60 (6): 2661- 2700.

Malmendier, U. and Tate, G. 2008. Who makes acquisitions? CEO overconfidence and the market's reaction. *Journal of Financial Economics* 89 (1): 20-43.

Malmendier, U., Tate, G. and Yan, J. 2011. Overconfidence and early-life experiences: The effect of managerial traits on corporate financial policies. *Journal of Finance* 66(5): 1687-1733.

Marquez-Illescas, C., Zebedee, A. and Zhou, L. 2019. Hear me write: Does CEO narcissism affect disclosure? *Journal of Business Ethics* 159: 401–417.

Mayew, W. J., and Venkatachalam, M. 2012. The power of voice: Managerial affective states and future firm performance. *Journal of Finance* 67(1): 1-43.

Merkl-Davies, Doris M; Brennan, Niamh M. 2007. Discretionary disclosure strategies in corporate narratives: Incremental information or impression management? *Journal of Accounting Literature* 26: 116-194.

Nagar, V., Nanda, D. and Wysocki, D. 2003. Discretionary disclosure and stock-based incentives. *Journal of Accounting and Economics* 34: 283-309.

Normand, S. L. T., Landrum, M. B., Guadagnoli, E., Ayanian, J. Z., Ryan, T. J., Cleary, P. D., & McNeil, B. J. 2001. Validating recommendations for coronary angiography following an acute myocardial infarction in the elderly: A matched analysis using propensity scores. *Journal of Clinical Epidemiology* 54, 387–398.

Ofek, E. 1993. Capital structure and firm response to poor performance: An empirical analysis, *Journal of Financial Economics* 34: 3– 30.

Pindyck, R.S. 2020, COVID-19 and the welfare effects of reducing contagion, NBER Working Paper No. 27121.

Price, S., Doran, J., Peterson, D., and Bliss, B. 2012. Earnings conference calls and stock returns: the incremental informativeness of textual tone. *Journal of Banking & Finance* 36(4): 992–1011.

Roberts, M. and Whited, T. 2013. Chapter 7 - Endogeneity in Empirical Corporate Finance, *Handbook of the Economics of Finance Volume 2, Part A, 2013, Pages 493-572.*

Rojas, F., Jiang, X., Montenovo, L., Simon, K.I., Weinberg, B.A., and Wing, C. 2020, Is the cure worse than the problem itself? immediate labor market effects of COVID-19 case rates and school closures in the U.S., NBER Working Paper No. 27127

Schrand, C. M., & Zechman, S. L. 2012. Executive overconfidence and the slippery slope to financial misreporting. *Journal of Accounting and Economics* 53(1-2): 311-329.

Stephany, F., Stoehr, N., Darius, P., Neuhäuser, L., Teutloff, O., & Braesemann, F. 2020. The CoRisk-Index: A data-mining approach to identify industry-specific risk assessments related to COVID-19 in real-time. arXiv preprint arXiv:2003.12432.

Uang, J. Y., Citron, D. B., Sudarsanam, S., & Taffler, R. J. 2006. Management going-concern disclosures: Impact of corporate governance and auditor reputation. *European Financial Management* 12(5): 789-816.

**Table I - Sample Distribution**

This table presents the distribution of firm reporting of exposure to COVID-19 pandemic for each of the quarters of 2020 (in Panel A) and the industry distribution (in Panel B).

**Panel A - Distribution of firm reporting of exposure to COVID-19 pandemic in 2020**

Firm groups	Quarter 1 - 2020		Quarter 2 - 2020		Quarter 3 - 2020		Quarter 4 - 2020	
	N	Percent	N	Percent	N	Percent	N	Percent
Firms with exposure	400	51.68	765	99.09	749	98.94	709	96.46
Firms without exposure	374	48.32	7	0.91	8	1.06	26	3.54
Total	774	100	772	100.00	757	100.00	735	100.00

**Panel B - Distribution of firm reporting of exposure to COVID-19 pandemic by industry**

Fama-French 48-industry classifications	Firms with exposure	Firms without exposure	Percent Exposed
AERO	24	3	88.89
AUTOS	61	4	93.85
BANKS	149	46	76.41
BEER	12	4	75.00
BLDMT	58	4	93.55
BOOKS	12	3	80.00
BOXES	15	1	93.75
BUSSV	246	44	84.83
CHEM	118	5	95.93
CHIPS	149	14	91.41
CLTHS	34	4	89.47
CNSTR	41	10	80.39
COMPS	89	7	92.71
DRUGS	151	30	83.43
ELCEQ	32	7	82.05
FABPR	4	0	100.00
FIN	57	14	80.28
FOOD	43	4	91.49
FUN	22	6	78.57
GOLD	3	1	75.00
GUNS	7	1	87.50
HLTH	49	8	85.96
HSHLD	67	5	93.06
INSUR	135	39	77.59
LABEQ	72	3	96.00
MACH	149	13	91.98
MEALS	84	10	89.36
MEDEQ	115	13	89.84
MINES	20	4	83.33
OIL	94	31	75.20
PAPER	35	5	87.50
PERSV	18	6	75.00
RLEST	7	1	87.50
RTAIL	137	11	92.57
RUBBR	17	2	89.47
SODA	8	0	100.00
STEEL	39	9	81.25
TELCM	39	10	79.59
TOYS	24	0	100.00
TRANS	64	12	84.21
UTIL	27	12	69.23
WHLST	70	8	89.74
OTHER	26	1	96.30

**Table 2 - Sample Descriptive Statistics**

This table presents the summary statistics of the variables in this study (in Panel A) and the comparisons of firm reporting of its exposure to the COVID-19 pandemic (in Panel B). The subscript 2020 indicates the variable is calculated for each firm in each of the quarters in 2020; the exceptions are ROA and RETURN variables, where the subscript 2020 indicates a quarter subsequent to a particular quarter of 2020. The subscript 2019 indicates the variable is calculated as the average of the four quarters in 2019.  $ASSET_{2020}$  is firm asset in quarter t of 2020.  $MKCAP_{2020}$  is firm market capitalization in quarter t of 2020.  $COVID\_EXPOSURE_{2020}$  is the count of the number of earnings call mentions of COVID-19 and its synonyms, relative to total words.  $COVID\_RISK_{2020}$  is the count of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a synonym for risk/uncertainty, relative to total words. The  $COVID\_POS\_SENT_{2020}$ ,  $COVID\_NEG\_SENT_{2020}$  and are the counts of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a positive- or a negative-toned word, relative to total words;  $COVID\_NET\_SENT_{2020}$  is the difference between  $COVID\_POS\_SENT_{2020}$  and  $COVID\_NEG\_SENT_{2020}$ .  $ROA_{2020}$  and  $RETURN_{2020}$  are the return on asset and quarterly stock return of each firm in each quarter of the year 2020.  $CONFID67_{2019}$  is a dummy variable equal to one for CEOs that have chosen not to exercise their 67%-in-the-money stock options at least twice in the 1992-2019 period and 0 otherwise. To control for firm characteristics prior to the pandemic, we calculate the natural logarithm of total asset ( $LNASSET_{2019}$ ), ratio of net property, plant and equipment to total asset ( $FIXEDASSET_{2019}$ ), return on asset ( $ROA_{2019}$ ), cash-to-asset ratio ( $CASH_{2019}$ ), total debt to total asset ratio ( $LEV_{2019}$ ) and R&D expenses plus capital expenditures minus sales of fixed assets scaled by total assets ( $INVEST_{2019}$ ), using the average values of each of these variables in the fiscal year 2019.  $RETURN_{2019}$  is the average quarterly stock return of each firm in 2019.  $SENTIMENT_{2019}$  is the standardized difference between positive-sentiment word counts and negative-sentiment word counts in all earnings conference calls of each firm in 2019.  $BUSSEG_{2019}$  and  $GEOSEG_{2019}$  are the logarithms of 1 plus the number of business and geographic segments, respectively, of each firm in 2019. Additional control variables include a dummy variable for CEOs who also serve as the board of director chair ( $CEO\_CHAIR_{2019}$ ), the logarithm of one plus the CEO tenure ( $LOGTENURE_{2019}$ ), a dummy variable equal to one for female CEOs ( $FEMALE_{2019}$ ), the logarithm of one plus the CEO age ( $LOGAGE_{2019}$ ), the percentage equity-based incentives in CEO compensation ( $CEOPAY_{2019}$ ), the percentage of firm shares held by the CEOs ( $CEOWN_{2019}$ ), a dummy variable for firms audited by the top four auditors ( $TOPAUDITORS_{2019}$ ), the percentage institutional ownership ( $INSTOWN_{2019}$ ), and a dummy variable for firms with long-term S&P credit ratings ( $RATED_{2019}$ ). \*, \*\* and \*\*\* indicate the significance levels of 10%, 5% and 1%, respectively.

**Panel A – Summary statistics for the full sample**

Variables	N	Mean	Median	Stdev.	p10	p25	p75	p90
$ASSET_{2020}$ (\$ million)	3,038	28,787.260	4,879.299	136,197.700	684.492	1,541.739	17,053.910	61,509.700
$MKCAP_{2020}$ (\$ million)	3,038	20,415.810	3,972.008	56,829.250	455.771	1,249.820	16,174.770	47,008.770
$COVID\_EXPOSURE_{2020}$	3,038	1.344	1.033	1.317	0.000	0.350	1.919	3.065
$COVID\_RISK_{2020}$	3,038	0.100	0.000	0.166	0.000	0.000	0.153	0.313
$COVID\_POS\_SENT_{2020}$	3,038	0.330	0.181	0.435	0.000	0.000	0.500	0.869
$COVID\_NEG\_SENT_{2020}$	3,038	0.551	0.337	0.669	0.000	0.000	0.829	1.394
$COVID\_NET\_SENT_{2020}$	3,038	-0.221	-0.100	0.540	-0.851	-0.402	0.000	0.220
$ROA_{2020}$	3,038	0.009	0.009	0.026	-0.018	0.000	0.021	0.038
$RETURN_{2020}$	3,038	0.077	0.074	0.348	-0.365	-0.132	0.258	0.478
$CONFID67_{2019}$	3,038	0.335	0.000	0.472	0.000	0.000	1.000	1.000
$LNASSET_{2019}$	3,038	8.492	8.410	1.728	6.374	7.244	9.683	10.873
$FIXEDASSET_{2019}$	3,038	0.236	0.149	0.229	0.022	0.073	0.329	0.625
$ROA_{2019}$	3,038	0.012	0.011	0.022	-0.006	0.003	0.023	0.035
$CASH_{2019}$	3,038	0.117	0.064	0.139	0.014	0.031	0.145	0.295
$LEV_{2019}$	3,038	0.313	0.296	0.220	0.042	0.144	0.428	0.592
$RETURN_{2019}$	3,038	0.043	0.048	0.096	-0.077	-0.005	0.102	0.149

SENTIMENT <sub>2019</sub>	3,038	0.003	-0.017	1.001	-1.221	-0.665	0.662	1.308
BUSSEG <sub>2019</sub>	3,038	0.496	0.477	0.199	0.301	0.301	0.699	0.778
GEOSEG <sub>2019</sub>	3,038	0.558	0.477	0.226	0.301	0.301	0.699	0.845
CEO_CHAIR <sub>2019</sub>	3,038	0.343	0.000	0.475	0.000	0.000	1.000	1.000
LOGTENURE <sub>2019</sub>	3,038	1.817	1.792	0.842	0.693	1.099	2.398	2.890
FEMALE <sub>2019</sub>	3,038	0.052	0.000	0.222	0.000	0.000	0.000	0.000
LOGAGE <sub>2019</sub>	3,038	4.063	4.060	0.114	3.912	3.989	4.127	4.190
CEOPAY <sub>2019</sub>	3,038	0.148	0.000	0.250	0.000	0.000	0.318	0.591
CEOOWN <sub>2019</sub>	3,038	1.731	0.446	4.612	0.049	0.163	1.332	3.702
TOPAUDITORS <sub>2019</sub>	3,038	0.898	1.000	0.302	0.000	1.000	1.000	1.000
INSTOWN <sub>2019</sub>	3,038	0.585	0.639	0.315	0.230	0.293	0.873	0.958
RATED <sub>2019</sub>	3,038	0.108	0.000	0.310	0.000	0.000	0.000	1.000

**Panel B – Comparison of management reporting of firm exposure to COVID-19 - Overconfident CEO vs. non-overconfident CEOs**

	Non-overconfident CEOs		Overconfident CEOs		Mean Diff.	Median Diff.	t-stats	Wilcoxon-stats
	Mean	Median	Mean	Median				
COVID_EXPOSURE <sub>2020</sub>	1.339	1.049	1.352	1.000	0.012	-0.048	0.24	-0.49
COVID_RISK <sub>2020</sub>	0.103	0.000	0.096	0.000	-0.007	0.000	-1.1	0.249
COVID_POS_SENT <sub>2020</sub>	0.326	0.185	0.336	0.175	0.010	-0.010	0.61	-2.5
COVID_NEG_SENT <sub>2020</sub>	0.579	0.351	0.495	0.316	-0.084	-0.035	-3.26***	-2.12**
COVID_NET_SENT <sub>2020</sub>	-0.253	-0.105	-0.159	0.000	0.094	0.105	4.54***	3.078***



**Table 3 - Baseline Regressions of COVID-19 Exposure Reporting on CEO Overconfidence**

This table presents the results from the baseline regressions of management reporting of firm exposure to COVID-19 pandemic on CEO overconfidence and other control variables. The subscript 2020 indicates the variable is calculated for each firm in each of the quarters in 2020. The subscript 2019 indicates the variable is calculated as the average of the four quarters in 2019. The dependent variables are  $COVID\_EXPOSURE_{2020}$ ,  $COVID\_RISK_{2020}$ ,  $COVID\_POS\_SENT_{2020}$ ,  $COVID\_NEG\_SENT_{2020}$  and  $COVID\_NET\_SENT_{2020}$ , alternatively.  $COVID\_EXPOSURE_{2020}$  is the count of the number of earnings call mentions of COVID-19 and its synonyms, relative to total words.  $COVID\_RISK_{2020}$  is the count of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a synonym for risk/uncertainty, relative to total words. The  $COVID\_POS\_SENT_{2020}$ ,  $COVID\_NEG\_SENT_{2020}$  and are the counts of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a positive- or a negative-toned word, relative to total words;  $COVID\_NET\_SENT_{2020}$  is the difference between  $COVID\_POS\_SENT_{2020}$  and  $COVID\_NEG\_SENT_{2020}$ . Please see Table 2 for the definitions of the control variables. The significance levels are based upon heteroscedasticity-consistent standard errors. \*, \*\* and \*\*\* indicate the significance levels of 10%, 5% and 1%, respectively.

Variables	Model 1 $COVID\_EXPOSURE_{2020}$	Model 2 $COVID\_RISK_{2020}$	Model 3 $COVID\_POS\_SENT_{2020}$	Model 4 $COVID\_NEG\_SENT_{2020}$	Model 5 $COVID\_NET\_SENT_{2020}$
$CONFID67_{2019}$	0.007 (0.126)	0.011 (0.706)	0.004 (0.177)	-0.070** (-2.187)	0.076*** (3.440)
$LNASSET_{2019}$	-0.036* (-1.940)	-0.018*** (-3.101)	-0.009 (-1.043)	-0.040*** (-3.467)	0.019** (2.243)
$FIXEDASSET_{2019}$	-0.392** (-2.360)	-0.006 (-0.110)	-0.219*** (-2.919)	-0.254** (-2.417)	0.025 (0.335)
$ROA_{2019}$	-3.585*** (-3.068)	-0.627* (-1.803)	-0.719 (-1.242)	-3.154*** (-3.605)	1.772*** (2.733)
$CASH_{2019}$	0.058 (0.246)	-0.011 (-0.179)	-0.024 (-0.251)	-0.242** (-2.006)	0.134* (1.697)
$LEV_{2019}$	-0.031 (-0.241)	-0.048 (-1.233)	0.031 (0.497)	-0.067 (-0.824)	0.058 (0.932)
$RETURN_{2019}$	-0.214 (-0.777)	0.056 (0.669)	-0.137 (-1.077)	-0.173 (-0.981)	0.000 (0.002)
$SENTIMENT_{2019}$	0.080*** (3.158)	0.010 (1.252)	0.072*** (5.880)	0.010 (0.605)	0.040*** (3.389)
$BUSSEG_{2019}$	-0.026 (-0.201)	-0.015 (-0.385)	-0.013 (-0.224)	-0.039 (-0.503)	0.046 (0.845)
$GEOSEG_{2019}$	0.310** (2.493)	0.037 (0.990)	0.135** (2.403)	0.123 (1.569)	0.022 (0.394)
$CEO\_CHAIR_{2019}$	-0.052 (-1.031)	-0.036** (-2.293)	-0.046* (-1.903)	-0.049 (-1.474)	0.026 (1.103)
$LOGTENURE_{2019}$	-0.073** (-2.145)	-0.022** (-2.019)	-0.022 (-1.291)	-0.003 (-0.151)	-0.019 (-1.236)
$FEMALE_{2019}$	0.119 (1.078)	-0.001 (-0.043)	0.025 (0.503)	0.039 (0.580)	-0.006 (-0.156)
$LOGAGE_{2019}$	0.881***	0.095	0.346***	0.394***	-0.138

	(3.955)	(1.363)	(3.256)	(2.881)	(-1.401)
<i>CEOPAY</i> <sub>2019</sub>	-0.064	-0.007	-0.047	-0.092*	0.021
	(-0.704)	(-0.234)	(-1.140)	(-1.659)	(0.549)
<i>CEOOWN</i> <sub>2019</sub>	0.001	0.002	0.000	0.001	0.001
	(0.215)	(0.822)	(0.007)	(0.148)	(0.256)
<i>TOPAUDITORS</i> <sub>2019</sub>	0.044	0.026	0.078**	0.168***	-0.058*
	(0.561)	(1.065)	(2.039)	(3.494)	(-1.835)
<i>INSTOWN</i> <sub>2019</sub>	-0.017	-0.019	-0.028	-0.144***	0.088**
	(-0.216)	(-0.827)	(-0.771)	(-2.761)	(2.569)
<i>RATED</i> <sub>2019</sub>	0.140*	0.021	0.067*	0.030	0.012
	(1.855)	(0.919)	(1.880)	(0.620)	(0.357)
Constant	-3.932***	-0.678**	-1.871***	-1.793***	0.347
	(-4.257)	(-2.212)	(-4.297)	(-3.186)	(0.827)
Observations	3,038	3,038	3,038	3,038	3,038
R-squared	0.166	0.195	0.249	0.201	0.135
Quarter fixed effect	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes

---

**Table 4 - Relation between COVID-19 Exposure Reporting and CEO Overconfidence - Alternative Thresholds of Option-Based CEO Overconfidence Measures**

This table presents the results from the regressions of management reporting of firm exposure to COVID-19 pandemic on alternative measures of CEO overconfidence. The subscript 2020 indicates the variable is calculated for each firm in each of the quarters in 2020. The subscript 2019 indicates the variable is calculated as the average of the four quarters in 2019. The dependent variables are *COVID\_EXPOSURE*<sub>2020</sub>, *COVID\_RISK*<sub>2020</sub>, *COVID\_POS\_SENT*<sub>2020</sub>, *COVID\_NEG\_SENT*<sub>2020</sub> and *COVID\_NET\_SENT*<sub>2020</sub>, alternatively. *COVID\_EXPOSURE*<sub>2020</sub> is the count of the number of earnings call mentions of COVID-19 and its synonyms, relative to total words. *COVID\_RISK*<sub>2020</sub> is the count of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a synonym for risk/uncertainty, relative to total words. The *COVID\_POS\_SENT*<sub>2020</sub>, *COVID\_NEG\_SENT*<sub>2020</sub> and are the counts of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a positive- or a negative-toned word, relative to total words; *COVID\_NET\_SENT*<sub>2020</sub> is the difference between *COVID\_POS\_SENT*<sub>2020</sub> and *COVID\_NEG\_SENT*<sub>2020</sub>. Please see Table 2 for the definitions of the control variables. The significance levels are based upon heteroscedasticity-consistent standard errors. \*, \*\* and \*\*\* indicate the significance levels of 10%, 5% and 1%, respectively.

<b>Panel A – CONFID100</b> <sub>2019</sub>					
Variables	<u>Model 1</u> <i>COVID_EXPOSURE</i> <sub>2020</sub>	<u>Model 2</u> <i>COVID_RISK</i> <sub>2020</sub>	<u>Model 3</u> <i>COVID_POS_SENT</i> <sub>2020</sub>	<u>Model 4</u> <i>COVID_NEG_SENT</i> <sub>2020</sub>	<u>Model 5</u> <i>COVID_NET_SENT</i> <sub>2020</sub>
<i>CONFID67</i> <sub>2019</sub>	-0.029 (-0.487)	0.008 (0.432)	-0.009 (-0.326)	-0.063* (-1.851)	0.050** (2.075)
<i>LNASSET</i> <sub>2019</sub>	-0.036* (-1.905)	-0.018*** (-3.120)	-0.009 (-1.011)	-0.039*** (-3.368)	0.018** (2.145)
<i>FIXEDASSET</i> <sub>2019</sub>	-0.397** (-2.388)	-0.007 (-0.137)	-0.221*** (-2.938)	-0.249** (-2.362)	0.017 (0.232)
<i>ROA</i> <sub>2019</sub>	-3.510*** (-3.015)	-0.608* (-1.757)	-0.689 (-1.195)	-3.240*** (-3.702)	1.896*** (2.924)
<i>CASH</i> <sub>2019</sub>	0.071 (0.299)	-0.010 (-0.165)	-0.019 (-0.203)	-0.239** (-1.982)	0.137* (1.735)
<i>LEV</i> <sub>2019</sub>	-0.030 (-0.232)	-0.047 (-1.226)	0.031 (0.501)	-0.068 (-0.833)	0.059 (0.959)
<i>RETURN</i> <sub>2019</sub>	-0.194 (-0.706)	0.059 (0.698)	-0.130 (-1.021)	-0.182 (-1.028)	0.019 (0.156)
<i>SENTIMENT</i> <sub>2019</sub>	0.081*** (3.171)	0.010 (1.285)	0.072*** (5.896)	0.009 (0.537)	0.041*** (3.498)
<i>BUSSEG</i> <sub>2019</sub>	-0.029 (-0.229)	-0.014 (-0.366)	-0.015 (-0.243)	-0.046 (-0.586)	0.051 (0.918)
<i>GEOSEG</i> <sub>2019</sub>	0.305** (2.454)	0.036 (0.977)	0.133** (2.369)	0.124 (1.582)	0.018 (0.313)
<i>CEO_CHAIR</i> <sub>2019</sub>	-0.052 (-1.033)	-0.036** (-2.284)	-0.046* (-1.904)	-0.050 (-1.516)	0.027 (1.149)
<i>LOGTENURE</i> <sub>2019</sub>	-0.068** (-1.982)	-0.021* (-1.940)	-0.019 (-1.138)	-0.008 (-0.348)	-0.012 (-0.756)
<i>FEMALE</i> <sub>2019</sub>	0.120	-0.001	0.025	0.039	-0.006

	(1.084)	(-0.039)	(0.506)	(0.580)	(-0.152)
LOGAGE <sub>2019</sub>	0.873***	0.095	0.343***	0.390***	-0.138
	(3.925)	(1.362)	(3.223)	(2.844)	(-1.402)
CEOPAY <sub>2019</sub>	-0.065	-0.007	-0.047	-0.094*	0.021
	(-0.725)	(-0.234)	(-1.157)	(-1.686)	(0.550)
CEOOWN <sub>2019</sub>	0.001	0.002	-0.000	0.001	0.000
	(0.170)	(0.783)	(-0.029)	(0.271)	(0.030)
TOPAUDITORS <sub>2019</sub>	0.044	0.027	0.079**	0.163***	-0.054*
	(0.562)	(1.096)	(2.047)	(3.400)	(-1.691)
INSTOWN <sub>2019</sub>	-0.013	-0.020	-0.027	-0.139***	0.085**
	(-0.169)	(-0.845)	(-0.733)	(-2.641)	(2.450)
RATED <sub>2019</sub>	0.139*	0.021	0.067*	0.031	0.011
	(1.846)	(0.907)	(1.871)	(0.635)	(0.313)
Constant	-3.913***	-0.679**	-1.864***	-1.778***	0.343
	(-4.245)	(-2.213)	(-4.282)	(-3.156)	(0.817)
Observations	3,038	3,038	3,038	3,038	3,038
R-squared	0.166	0.195	0.249	0.201	0.133
Quarter fixed effect	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes

**Panel B - CONFID150<sub>2019</sub>**

Variables	<u>Model 1</u> COVID_EXPOSURE <sub>2020</sub>	<u>Model 2</u> COVID_RISK <sub>2020</sub>	<u>Model 3</u> COVID_POS_SENT <sub>2020</sub>	<u>Model 4</u> COVID_NEG_SENT <sub>2020</sub>	<u>Model 5</u> COVID_NET_SENT <sub>2020</sub>
CONFID150 <sub>2019</sub>	-0.135**	0.022	-0.034	-0.132***	0.075***
	(-2.027)	(1.078)	(-1.040)	(-3.338)	(2.674)
Constant	-3.874***	-0.687**	-1.854***	-1.757***	0.341
	(-4.212)	(-2.239)	(-4.262)	(-3.122)	(0.810)
Observations	3,038	3,038	3,038	3,038	3,038
R-squared	0.166	0.196	0.249	0.202	0.134
Other control variables	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes

**Table 5 - Relation between COVID-19 Exposure Reporting and CEO Overconfidence – Firm-Based Measure of CEO Overconfidence**

This table presents the results from the regressions of management reporting of firm exposure to COVID-19 pandemic on a firm-based measure of CEO overconfidence. The subscript 2020 indicates the variable is calculated for each firm in each of the quarters in 2020. The subscript 2019 indicates the variable is calculated as the average of the four quarters in 2019. The dependent variables are *COVID\_EXPOSURE<sub>2020</sub>*, *COVID\_RISK<sub>2020</sub>*, *COVID\_POS\_SENT<sub>2020</sub>*, *COVID\_NEG\_SENT<sub>2020</sub>* and *COVID\_NET\_SENT<sub>2020</sub>*, alternatively. *COVID\_EXPOSURE<sub>2020</sub>* is the count of the number of earnings call mentions of COVID-19 and its synonyms, relative to total words. *COVID\_RISK<sub>2020</sub>* is the count of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a synonym for risk/uncertainty, relative to total words. The *COVID\_POS\_SENT<sub>2020</sub>*, *COVID\_NEG\_SENT<sub>2020</sub>* and are the counts of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a positive- or a negative-toned word, relative to total words; *COVID\_NET\_SENT<sub>2020</sub>* is the difference between *COVID\_POS\_SENT<sub>2020</sub>* and *COVID\_NEG\_SENT<sub>2020</sub>*. Please see Table 2 for the definitions of the control variables. The significance levels are based upon heteroscedasticity-consistent standard errors. \*, \*\* and \*\*\* indicate the significance levels of 10%, 5% and 1%, respectively.

Variables	<b>Model 1</b> <i>COVID_EXPOSURE<sub>2020</sub></i>	<b>Model 2</b> <i>COVID_RISK<sub>2020</sub></i>	<b>Model 3</b> <i>COVID_POS_SENT<sub>2020</sub></i>	<b>Model 4</b> <i>COVID_NEG_SENT<sub>2020</sub></i>	<b>Model 5</b> <i>COVID_NET_SENT<sub>2020</sub></i>
<i>OC_SZ<sub>2019</sub></i>	-0.076 (-1.105)	-0.058 (-1.507)	-0.004 (-0.122)	-0.068*** (-3.249)	0.050* (1.942)
<i>LNASSET<sub>2019</sub></i>	-0.086*** (-5.163)	-0.023*** (-4.734)	-0.025*** (-3.340)	-0.047*** (-4.784)	0.011* (1.792)
<i>FIXEDASSET<sub>2019</sub></i>	-0.666*** (-6.038)	-0.048 (-1.469)	-0.275*** (-5.657)	-0.369*** (-5.391)	0.066 (1.592)
<i>ROA<sub>2019</sub></i>	-2.548** (-2.212)	-0.414 (-1.218)	-0.554 (-0.983)	-3.113*** (-3.733)	1.956*** (3.159)
<i>CASH<sub>2019</sub></i>	0.120 (0.517)	-0.003 (-0.044)	0.062 (0.671)	-0.296*** (-2.590)	0.220*** (3.130)
<i>LEV<sub>2019</sub></i>	0.175 (1.545)	-0.027 (-0.783)	0.122** (2.251)	0.012 (0.170)	0.056 (1.068)
<i>RETURN<sub>2019</sub></i>	-0.509* (-1.882)	-0.002 (-0.022)	-0.224* (-1.798)	-0.259 (-1.595)	0.007 (0.063)
<i>SENTIMENT<sub>2019</sub></i>	0.082*** (3.376)	0.010 (1.435)	0.075*** (6.619)	0.002 (0.158)	0.051*** (4.817)
<i>BUSSEG<sub>2019</sub></i>	0.239* (1.922)	-0.012 (-0.329)	0.071 (1.261)	0.102 (1.409)	-0.016 (-0.324)
<i>GEOSEG<sub>2019</sub></i>	0.327*** (2.976)	0.038 (1.216)	0.158*** (3.266)	0.048 (0.696)	0.086* (1.793)
<i>CEO_CHAIR<sub>2019</sub></i>	-0.046 (-0.825)	-0.031** (-1.978)	-0.039 (-1.557)	-0.081** (-2.517)	0.053** (2.369)
<i>LOGTENURE<sub>2019</sub></i>	-0.077** (-2.254)	-0.022** (-2.248)	-0.025 (-1.554)	-0.028 (-1.269)	0.001 (0.082)
<i>FEMALE<sub>2019</sub></i>	0.017 (0.157)	-0.019 (-0.679)	-0.029 (-0.613)	0.051 (0.809)	-0.056 (-1.517)
<i>LOGAGE<sub>2019</sub></i>	1.190*** (4.844)	0.084 (1.240)	0.441*** (3.981)	0.550*** (3.842)	-0.186* (-1.852)

<i>CEOPAY</i> <sub>2019</sub>	-0.245** (-2.640)	-0.013 (-0.453)	-0.110** (-2.651)	-0.187** (-3.312)	0.052 (1.421)
<i>CEOOWN</i> <sub>2019</sub>	-0.005 (-0.978)	0.000 (0.221)	-0.003 (-1.105)	0.002 (0.761)	-0.003 (-1.524)
<i>TOPAUDITORS</i> <sub>2019</sub>	0.206** (2.487)	0.035 (1.414)	0.131** (3.340)	0.227** (4.583)	-0.065** (-2.091)
<i>INSTOWN</i> <sub>2019</sub>	-0.010 (-0.120)	-0.023 (-1.010)	-0.048 (-1.334)	-0.141*** (-2.742)	0.078** (2.378)
<i>RATED</i> <sub>2019</sub>	0.113 (1.517)	0.026 (1.175)	0.049 (1.369)	0.007 (0.148)	0.008 (0.240)
Constant	-4.427** (-4.452)	-0.431 (-1.576)	-2.159** (-4.804)	-2.197** (-3.826)	0.466 (1.138)
Observations	3,038	3,038	3,038	3,038	3,038
R-squared	0.114	0.147	0.192	0.168	0.116
Other control variables	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes

---

**Table 6 - Relation between COVID-19 Exposure Reporting and CEO Overconfidence – Entropy Balancing**

This table presents the results from the entropy balancing procedure and the regressions of management reporting of firm exposure to COVID-19 pandemic on CEO overconfidence and other control variables after entropy balancing. The subscript 2020 indicates the variable is calculated for each firm in each of the quarters in 2020. The subscript 2019 indicates the variable is calculated as the average of the four quarters in 2019. Panel A presents the comparison between the subsample of overconfident CEOs and the subsample of non-overconfident CEOs after entropy balancing. Please see Table 2 for the definitions of the control variables in Panel A. In Panel B, the dependent variables are *COVID\_EXPOSURE<sub>2020</sub>*, *COVID\_RISK<sub>2020</sub>*, *COVID\_POS\_SENT<sub>2020</sub>*, *COVID\_NEG\_SENT<sub>2020</sub>* and *COVID\_NET\_SENT<sub>2020</sub>*, alternatively. *COVID\_EXPOSURE<sub>2020</sub>* is the count of the number of earnings call mentions of COVID-19 and its synonyms, relative to total words. *COVID\_RISK<sub>2020</sub>* is the count of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a synonym for risk/uncertainty, relative to total words. The *COVID\_POS\_SENT<sub>2020</sub>*, *COVID\_NEG\_SENT<sub>2020</sub>* and are the counts of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a positive- or a negative-toned word, relative to total words; *COVID\_NET\_SENT<sub>2020</sub>* is the difference between *COVID\_POS\_SENT<sub>2020</sub>* and *COVID\_NEG\_SENT<sub>2020</sub>*. *ROA<sub>2020</sub>* and *RETURN<sub>2020</sub>* are the return on asset and quarterly stock return of each firm in each quarter of the year 2020. *CONFID67<sub>2019</sub>* is a dummy variable equal to one for CEOs that have chosen not to exercise their 67%-in-the-money stock options at least twice in the 1992-2019 period and 0 otherwise. Please see Table 2 for the definitions of the control variables. The significance levels are based upon heteroscedasticity-consistent standard errors. \*, \*\* and \*\*\* indicate the significance levels of 10%, 5% and 1%, respectively.

**Panel A - After entropy balancing**

	Overconfident CEOs			Non-overconfident CEOs			Std. diff.
	Mean	Variance	Skewness	Mean	Variance	Skewness	
<i>LNASSET<sub>2019</sub></i>	8.427	3.033	0.388	8.426	3.033	0.388	0.001
<i>FIXEDASSET<sub>2019</sub></i>	0.177	0.037	1.906	0.177	0.037	1.906	0.000
<i>ROA<sub>2019</sub></i>	0.018	0.000	0.139	0.018	0.000	0.139	0.000
<i>CASH<sub>2019</sub></i>	0.155	0.030	1.556	0.155	0.030	1.556	0.000
<i>LEV<sub>2019</sub></i>	0.290	0.045	1.004	0.290	0.045	1.005	0.000
<i>RETURN<sub>2019</sub></i>	0.074	0.007	-0.193	0.074	0.007	-0.193	0.000
<i>SENTIMENT<sub>2019</sub></i>	0.091	0.843	0.308	0.091	0.843	0.308	0.000
<i>BUSSEG<sub>2019</sub></i>	0.494	0.039	0.380	0.494	0.039	0.380	0.000
<i>GEOSEG<sub>2019</sub></i>	0.548	0.053	0.692	0.548	0.053	0.693	0.000
<i>CEO_CHAIR<sub>2019</sub></i>	0.416	0.243	0.341	0.416	0.243	0.341	0.000
<i>LOGTENURE<sub>2019</sub></i>	2.204	0.453	-0.144	2.204	0.453	-0.145	0.000
<i>FEMALE<sub>2019</sub></i>	0.039	0.038	4.740	0.039	0.038	4.739	0.000
<i>LOGAGE<sub>2019</sub></i>	4.075	0.014	-0.251	4.075	0.014	-0.248	0.000
<i>CEOPAY<sub>2019</sub></i>	0.134	0.061	1.550	0.134	0.061	1.550	0.000
<i>CEOOWN<sub>2019</sub></i>	2.027	24.190	6.329	2.027	24.190	6.329	0.000
<i>TOPAUDITORS<sub>2019</sub></i>	0.904	0.087	-2.736	0.904	0.087	-2.735	0.000
<i>INSTOWN<sub>2019</sub></i>	0.613	0.094	-0.153	0.613	0.094	-0.153	0.000
<i>RATED<sub>2019</sub></i>	0.075	0.069	3.235	0.075	0.069	3.234	0.000

**Panel B – Regressions of COVID-19 Exposure Reporting after Entropy Balancing**

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
	<i>COVID_EXPOSURE<sub>2020</sub></i>	<i>COVID_RISK<sub>2020</sub></i>	<i>COVID_POS_SENT<sub>2020</sub></i>	<i>COVID_NEG_SENT<sub>2020</sub></i>	<i>COVID_NET_SENT<sub>2020</sub></i>
<i>CONFID67<sub>2019</sub></i>	0.063 (0.732)	0.018 (1.003)	0.026 (0.680)	-0.040** (-2.190)	0.057** (2.023)
<i>LNASSET<sub>2019</sub></i>	0.007 (0.191)	-0.009 (-1.232)	-0.009 (-0.553)	-0.007 (-0.933)	-0.002 (-0.164)
<i>FIXEDASSET<sub>2019</sub></i>	-0.019	-0.063	-0.100	0.043	-0.065

	(-0.075)	(-0.870)	(-0.856)	(0.543)	(-0.640)
<i>ROA</i> <sub>2019</sub>	-3.692	-0.097	0.696	-1.096**	1.072
	(-1.487)	(-0.208)	(0.610)	(-2.158)	(1.492)
<i>CASH</i> <sub>2019</sub>	0.433	0.080	0.149	-0.179**	0.264**
	(1.184)	(1.124)	(0.964)	(-2.435)	(2.565)
<i>LEV</i> <sub>2019</sub>	0.321	0.016	0.109	0.004	0.070
	(1.178)	(0.302)	(0.918)	(0.067)	(0.793)
<i>RETURN</i> <sub>2019</sub>	-0.361	0.185*	-0.044	-0.294**	0.086
	(-0.635)	(1.751)	(-0.181)	(-2.345)	(0.555)
<i>SENTIMENT</i> <sub>2019</sub>	0.116**	0.020*	0.089***	-0.005	0.065***
	(2.475)	(1.923)	(4.594)	(-0.427)	(3.211)
<i>BUSSEG</i> <sub>2019</sub>	0.199	-0.014	0.130	0.071	0.045
	(0.720)	(-0.304)	(1.058)	(1.264)	(0.581)
<i>GEOSEG</i> <sub>2019</sub>	0.145	-0.017	0.060	0.002	0.047
	(0.598)	(-0.367)	(0.675)	(0.035)	(0.627)
<i>CEO_CHAIR</i> <sub>2019</sub>	0.031	-0.025	-0.004	-0.024	0.036
	(0.357)	(-1.204)	(-0.099)	(-1.095)	(1.059)
<i>LOGTENURE</i> <sub>2019</sub>	-0.010	0.016	0.043	0.028	-0.027
	(-0.141)	(0.966)	(1.263)	(1.538)	(-1.063)
<i>FEMALE</i> <sub>2019</sub>	-0.141	-0.028	-0.074	-0.081	0.034
	(-0.883)	(-0.734)	(-0.895)	(-1.606)	(0.633)
<i>LOGAGE</i> <sub>2019</sub>	0.841**	0.171*	0.268*	0.210**	0.016
	(2.470)	(1.930)	(1.795)	(2.160)	(0.119)
<i>CEOPAY</i> <sub>2019</sub>	0.050	-0.041	-0.007	-0.030	0.030
	(0.302)	(-1.178)	(-0.079)	(-0.742)	(0.479)
<i>CEOOWN</i> <sub>2019</sub>	-0.003	0.000	-0.005	-0.001	-0.002
	(-0.356)	(0.047)	(-1.139)	(-0.517)	(-0.653)
<i>TOPAUDITORS</i> <sub>2019</sub>	0.075	0.080***	0.123**	0.092**	-0.026
	(0.540)	(2.627)	(2.057)	(2.534)	(-0.628)
<i>INSTOWN</i> <sub>2019</sub>	0.213	-0.005	0.060	-0.004	0.036
	(1.275)	(-0.168)	(0.863)	(-0.113)	(0.679)
<i>RATED</i> <sub>2019</sub>	-0.116	-0.064**	0.002	-0.108***	0.114*
	(-0.745)	(-2.111)	(0.030)	(-2.789)	(1.698)
Constant	-4.638***	-1.086***	-1.784***	-0.909**	-0.129
	(-3.296)	(-3.110)	(-2.759)	(-2.041)	(-0.235)
Observations	3,038	3,038	3,038	3,038	3,038
R-squared	0.139	0.164	0.172	0.306	0.145
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes



**Table 7 - Relation between COVID-19 Exposure Reporting and CEO Overconfidence – Heckman Self-Selection Model**

In this table, we present the results from the Heckman self-selection two-stage model. The subscript 2020 indicates the variable is calculated for each firm in each of the quarters in 2020. The subscript 2019 indicates the variable is calculated as the average of the four quarters in 2019. In the first stage, we perform a logistic regression of the probability for a firm to voluntarily conduct earnings conference call in the year 2020 in Panel A. This analysis employs all firms in Compustat that conduct and do not conduct any earnings conference call in the year 2020.  $CONF\_PERCENT_{2019}$  is the percentage of firms in the same industry that conducted earnings conference calls in 2019.  $LNASSET_{2019}$  is the natural logarithm of firm asset in 2019.  $MKBK_{2019}$  and  $ROA_{2019}$  are the market-to-book ratio and the return on asset in 2019.  $STDROA_{2019}$  is the standard deviation of the quarterly ROA in the preceding 4 quarters.  $DEBT/EQUITY_{2019}$  is the ratio of debt to equity.  $SPI_{2019}$  is the ratio of special item scaled by total asset.  $STOCKISSUE_{2019}$  is the dummy variable for firms with stock issuance in 2019. We obtain the predicted probabilities from the logistic regression to calculate the inverse Mills ratio ( $MILLS_{2019}$ ) and include it in the regression of management reporting of COVID-19 exposure. Panel B presents the results from the regressions of management reporting of firm exposure to COVID-19 pandemic on CEO overconfidence, other control variables and the inverse Mills ratio. The dependent variables in Panel B are  $COVID\_EXPOSURE_{2020}$ ,  $COVID\_RISK_{2020}$ ,  $COVID\_POS\_SENT_{2020}$ ,  $COVID\_NEG\_SENT_{2020}$  and  $COVID\_NET\_SENT_{2020}$ , alternatively.  $COVID\_EXPOSURE_{2020}$  is the count of the number of earnings call mentions of COVID-19 and its synonyms, relative to total words.  $COVID\_RISK_{2020}$  is the count of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a synonym for risk/uncertainty, relative to total words. The  $COVID\_POS\_SENT_{2020}$ ,  $COVID\_NEG\_SENT_{2020}$  and are the counts of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a positive- or a negative-toned word, relative to total words;  $COVID\_NET\_SENT_{2020}$  is the difference between  $COVID\_POS\_SENT_{2020}$  and  $COVID\_NEG\_SENT_{2020}$ . Please see Table 2 for the definitions of the control variables. The significance levels are based upon heteroscedasticity-consistent standard errors. \*, \*\* and \*\*\* indicate the significance levels of 10%, 5% and 1%, respectively.

**Panel A - Stage 1 - Logistic regression of the probability of conducting earnings conference calls**

	Coefficients	Z-stats
$CONF\_PERCENT_{2019}$	3.616	4.747***
$LNASSET_{2019}$	4.898	28.851***
$MKBK_{2019}$	-0.103	-1.939*
$ROA_{2019}$	11.034	0.376
$STDROA_{2019}$	-52.794	-2.561**
$DEBT/EQUITY_{2019}$	-0.022	-0.552
$SPI_{2019}$	0.076	1.923*
$STOCKISSUE_{2019}$	0.796	10.419***
Constant	-8.306	-17.220***
Observations	6,640	
Pseudo R-squared	0.444	
Wald-Chi-squared	1532***	
% correct classification	83.70%	
Industry fixed effects	Yes	

**Panel B - Stage 2 - Relation between COVID-19 Exposure Reporting and CEO Overconfidence**

Variables	Model 1 $COVID\_EXPOSURE_{2020}$	Model 2 $COVID\_RISK_{2020}$	Model 3 $COVID\_POS\_SENT_{2020}$	Model 4 $COVID\_NEG\_SENT_{2020}$	Model 5 $COVID\_NET\_SENT_{2020}$
$CONFID67_{2019}$	0.014 (0.266)	0.013 (0.774)	0.007 (0.266)	-0.063*** (-2.583)	0.072*** (3.262)
$LNASSET_{2019}$	0.030 (1.204)	-0.013* (-1.663)	0.020* (1.717)	0.000 (0.037)	0.012 (1.128)
$FIXEDASSET_{2019}$	-0.378** (-2.276)	-0.005 (-0.086)	-0.212*** (-2.806)	-0.145* (-1.804)	0.021 (0.285)
$ROA_{2019}$	-2.916** (-2.462)	-0.564 (-1.576)	-0.432 (-0.730)	-2.233*** (-3.022)	1.751*** (2.670)
$CASH_{2019}$	0.064	-0.010	-0.023	-0.152	0.142*

	(0.274)	(-0.167)	(-0.240)	(-1.645)	(1.794)
<i>LEV</i> <sub>2019</sub>	-0.021	-0.044	0.034	-0.050	0.072
	(-0.166)	(-1.131)	(0.559)	(-0.766)	(1.154)
<i>RETURN</i> <sub>2019</sub>	-0.199	0.056	-0.129	-0.135	0.001
	(-0.725)	(0.672)	(-1.014)	(-0.930)	(0.006)
<i>SENTIMENT</i> <sub>2019</sub>	0.080***	0.010	0.071***	0.009	0.041***
	(3.162)	(1.299)	(5.879)	(0.760)	(3.459)
<i>BUSSEG</i> <sub>2019</sub>	-0.072	-0.019	-0.034	-0.062	0.048
	(-0.562)	(-0.500)	(-0.558)	(-0.993)	(0.856)
<i>GEOSEG</i> <sub>2019</sub>	0.314**	0.039	0.137**	0.055	0.029
	(2.536)	(1.038)	(2.435)	(0.899)	(0.512)
<i>CEO_CHAIR</i> <sub>2019</sub>	-0.062	-0.038**	-0.049**	-0.047*	0.025
	(-1.219)	(-2.398)	(-2.028)	(-1.806)	(1.068)
<i>LOGTENURE</i> <sub>2019</sub>	-0.074**	-0.022**	-0.021	0.001	-0.020
	(-2.163)	(-2.033)	(-1.276)	(0.042)	(-1.267)
<i>FEMALE</i> <sub>2019</sub>	0.144	0.002	0.034	0.020	0.002
	(1.289)	(0.073)	(0.701)	(0.371)	(0.055)
<i>LOGAGE</i> <sub>2019</sub>	0.936***	0.103	0.364***	0.401***	-0.130
	(4.188)	(1.477)	(3.405)	(3.815)	(-1.325)
<i>CEOPAY</i> <sub>2019</sub>	-0.056	-0.007	-0.043	-0.052	0.022
	(-0.623)	(-0.236)	(-1.046)	(-1.250)	(0.568)
<i>CEOOWN</i> <sub>2019</sub>	0.002	0.002	0.000	-0.001	0.001
	(0.325)	(0.846)	(0.078)	(-0.555)	(0.256)
<i>TOPAUDITORS</i> <sub>2019</sub>	0.088	0.027	0.100**	0.127***	-0.062*
	(1.111)	(1.067)	(2.527)	(3.458)	(-1.827)
<i>INSTOWN</i> <sub>2019</sub>	0.011	-0.016	-0.017	-0.105**	0.089***
	(0.141)	(-0.691)	(-0.471)	(-2.549)	(2.650)
<i>RATED</i> <sub>2019</sub>	0.129*	0.020	0.063*	0.029	0.011
	(1.719)	(0.865)	(1.760)	(0.752)	(0.333)
<i>MILLS</i>	3.137***	0.237	1.403***	1.377***	-0.270
	(3.747)	(0.843)	(3.407)	(3.095)	(-0.669)
Constant	-6.079***	-0.858**	-2.801***	-2.202***	0.483
	(-5.470)	(-2.453)	(-5.242)	(-4.361)	(1.011)
Observations	3,020	3,020	3,020	3,020	3,020
R-squared	0.167	0.194	0.251	0.276	0.135
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes

**Table 8 - Regressions of the Relation between COVID-19 Exposure Reporting and CEO Overconfidence – Detangling of Confounding Firm Characteristics**

This table presents the results from the regressions of management reporting of firm exposure to COVID-19 pandemic on CEO overconfidence and other control variables with the addition of interaction terms between CEO overconfidence and firm characteristics. The subscript 2020 indicates the variable is calculated for each firm in each of the quarters in 2020. The subscript 2019 indicates the variable is calculated as the average of the four quarters in 2019. The dependent variables are COVID\_EXPOSURE2020, COVID\_RISK2020, COVID\_POS\_SENT2020, COVID\_NEG\_SENT2020 and COVID\_NET\_SENT2020, alternatively. COVID\_EXPOSURE2020 is the count of the number of earnings call mentions of COVID-19 and its synonyms, relative to total words. COVID\_RISK2020 is the count of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a synonym for risk/uncertainty, relative to total words. The COVID\_POS\_SENT2020, COVID\_NEG\_SENT2020 and are the counts of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a positive- or a negative-toned word, relative to total words; COVID\_NET\_SENT2020 is the difference between COVID\_POS\_SENT2020 and COVID\_NEG\_SENT2020. ROA2020 and RETURN2020 are the return on asset and quarterly stock return of each firm in each quarter of the year 2020. CONFID672019 is a dummy variable equal to one for CEOs that have chosen not to exercise their 67%-in-the-money stock options at least twice in the 1992-2019 period and 0 otherwise. Please see Table 2 for the definitions of the control variables. The significance levels are based upon heteroscedasticity-consistent standard errors. \*, \*\* and \*\*\* indicate the significance levels of 10%, 5% and 1%, respectively.

**Panel A – Firm size effects**

Variables	Model 1 COVID_EXPOSURE <sub>2020</sub>	Model 2 COVID_RISK <sub>2020</sub>	Model 3 COVID_POS_SENT <sub>2020</sub>	Model 4 COVID_NEG_SENT <sub>2020</sub>	Model 5 COVID_NET_SENT <sub>2020</sub>
CONFID67 <sub>2019</sub>	-0.916*** (-3.724)	-0.096 (-1.303)	-0.290** (-2.534)	-0.480*** (-3.276)	0.177* (1.850)
LNASSET <sub>2019</sub>	-0.071*** (-3.297)	-0.022*** (-3.300)	-0.020** (-2.064)	-0.055*** (-4.150)	0.022** (2.346)
CONFID67 <sub>2019</sub> × LNASSET <sub>2019</sub>	0.109*** (3.876)	0.013 (1.531)	0.035*** (2.678)	0.049*** (2.865)	-0.012 (-1.093)
Constant	-3.514*** (-3.819)	-0.630** (-2.046)	-1.731*** (-3.982)	-1.605*** (-2.818)	0.301 (0.709)
Other control variables	Yes	Yes	Yes	Yes	Yes
Observations	3,038	3,038	3,038	3,038	3,038
R-squared	0.168	0.196	0.250	0.202	0.135
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes

**Panel B – Firm profitability**

Variables	Model 1 COVID_EXPOSURE <sub>2020</sub>	Model 2 COVID_RISK <sub>2020</sub>	Model 3 COVID_POS_SENT <sub>2020</sub>	Model 4 COVID_NEG_SENT <sub>2020</sub>	Model 5 COVID_NET_SENT <sub>2020</sub>
CONFID67 <sub>2019</sub>	0.006 (0.090)	0.003 (0.131)	-0.009 (-0.296)	-0.146*** (-3.679)	0.115*** (4.199)
ROA <sub>2019</sub>	-3.598** (-2.563)	-0.798* (-1.798)	-0.980 (-1.360)	-4.602*** (-4.000)	2.540*** (2.950)
CONFID67 <sub>2019</sub> × ROA <sub>2019</sub>	0.043 (0.018)	0.555 (0.770)	0.849 (0.743)	4.814*** (3.146)	-2.496** (-2.239)
Constant	-3.931*** (-4.247)	-0.673** (-2.197)	-1.859*** (-4.262)	-1.728*** (-3.072)	0.312 (0.741)
Other control variables	Yes	Yes	Yes	Yes	Yes
Observations	3,038	3,038	3,038	3,038	3,038

R-squared	0.166	0.196	0.249	0.203	0.137
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes

**Panel C – Firm cash holdings**

Variables	<u>Model 1</u> COVID_EXPOSURE <sub>2020</sub>	<u>Model 2</u> COVID_RISK <sub>2020</sub>	<u>Model 3</u> COVID_POS_SENT <sub>2020</sub>	<u>Model 4</u> COVID_NEG_SENT <sub>2020</sub>	<u>Model 5</u> COVID_NET_SENT <sub>2020</sub>
CONFID67 <sub>2019</sub>	-0.020 (-0.299)	0.020 (0.977)	0.021 (0.667)	-0.099** (-2.430)	0.111*** (4.014)
CASH <sub>2019</sub>	-0.054 (-0.168)	0.025 (0.281)	0.044 (0.306)	-0.362** (-2.074)	0.283** (2.563)
CONFID67 <sub>2019</sub> × CASH <sub>2019</sub>	0.209 (0.540)	-0.067 (-0.632)	-0.127 (-0.800)	0.227 (1.135)	-0.277** (-2.110)
Constant	-3.940*** (-4.269)	-0.676** (-2.206)	-1.865*** (-4.293)	-1.803*** (-3.204)	0.357 (0.851)
Other control variables	Yes	Yes	Yes	Yes	Yes
Observations	3,038	3,038	3,038	3,038	3,038
R-squared	0.166	0.196	0.249	0.201	0.136
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes

**Panel D – Firm leverage**

Variables	<u>Model 1</u> COVID_EXPOSURE <sub>2020</sub>	<u>Model 2</u> COVID_RISK <sub>2020</sub>	<u>Model 3</u> COVID_POS_SENT <sub>2020</sub>	<u>Model 4</u> COVID_NEG_SENT <sub>2020</sub>	<u>Model 5</u> COVID_NET_SENT <sub>2020</sub>
CONFID67 <sub>2019</sub>	-0.001 (-0.010)	-0.017 (-0.665)	0.028 (0.688)	-0.262** (-2.138)	0.145* (1.822)
LEV <sub>2019</sub>	-0.038 (-0.262)	-0.077* (-1.690)	0.053 (0.759)	-0.000 (-0.002)	0.019 (0.265)
CONFID67 <sub>2019</sub> × LEV <sub>2019</sub>	0.025 (0.117)	0.096 (1.475)	-0.078 (-0.767)	-0.228* (-1.680)	0.128 (1.346)
Constant	-3.928*** (-4.261)	-0.666** (-2.175)	-1.882*** (-4.322)	-1.826*** (-3.246)	0.364 (0.868)
Other control variables	Yes	Yes	Yes	Yes	Yes
Observations	3,038	3,038	3,038	3,038	3,038
R-squared	0.166	0.196	0.249	0.201	0.136
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes

**Table 9 - Relation between COVID-19 Exposure Reporting and CEO Overconfidence – Industry effects**

This table presents the results from the regressions of management reporting of firm exposure to COVID-19 pandemic on CEO overconfidence and other control variables controlling for industry disclosure. The subscript 2020 indicates the variable is calculated for each firm in each of the quarters in 2020. The subscript 2019 indicates the variable is calculated as the average of the four quarters in 2019. The dependent variables are *COVID\_EXPOSURE*<sub>2020</sub>, *COVID\_RISK*<sub>2020</sub>, *COVID\_POS\_SENT*<sub>2020</sub>, *COVID\_NEG\_SENT*<sub>2020</sub> and *COVID\_NET\_SENT*<sub>2020</sub>, alternatively. *COVID\_EXPOSURE*<sub>2020</sub> is the count of the number of earnings call mentions of COVID-19 and its synonyms, relative to total words. *COVID\_RISK*<sub>2020</sub> is the count of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a synonym for risk/uncertainty, relative to total words. The *COVID\_POS\_SENT*<sub>2020</sub>, *COVID\_NEG\_SENT*<sub>2020</sub> and are the counts of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a positive- or a negative-toned word, relative to total words; *COVID\_NET\_SENT*<sub>2020</sub> is the difference between *COVID\_POS\_SENT*<sub>2020</sub> and *COVID\_NEG\_SENT*<sub>2020</sub>. We first calculate the median *COVID\_EXPOSURE* / *COVID\_RISK* / *COVID\_POS\_SENT* / *COVID\_NEG\_SENT* / *COVID\_NET\_SENT* values for each 4-digit SIC code in each quarter. We then rank the median industry-quarter *COVID\_EXPOSURE* / *COVID\_RISK* / *COVID\_POS\_SENT* / *COVID\_NEG\_SENT* / *COVID\_NET\_SENT* values into terciles and create dummy variables for the highest terciles (*HI\_COVID\_EXPOSURE*<sub>2020</sub>, *HI\_COVID\_RISK*<sub>2020</sub>, *HI\_COVID\_POS\_SENT*<sub>2020</sub>, *HI\_COVID\_NEG\_SENT*<sub>2020</sub> and *HI\_COVID\_NET\_SENT*<sub>2020</sub>) We then interact the dummy variables for firms in the industries in the highest terciles of *COVID\_EXPOSURE* / *COVID\_RISK* / *COVID\_POS\_SENT* / *COVID\_NEG\_SENT* / *COVID\_NET\_SENT*, alternatively. Because the *HI\_COVID\_EXPOSURE*<sub>2020</sub>, *HI\_COVID\_RISK*<sub>2020</sub>, *HI\_COVID\_POS\_SENT*<sub>2020</sub>, *HI\_COVID\_NEG\_SENT*<sub>2020</sub> and *HI\_COVID\_NET\_SENT*<sub>2020</sub> are calculated by industry and by quarter, we do not control for industry fixed effects and quarter fixed effects in the regressions to avoid multicollinearity. Please see Table 2 for the definitions of the control variables. The significance levels are based upon heteroscedasticity-consistent standard errors. \*, \*\* and \*\*\* indicate the significance levels of 10%, 5% and 1%, respectively.

Variables	Model 1 <i>COVID_EXPOSURE</i> <sub>2020</sub>	Model 2 <i>COVID_RISK</i> <sub>2020</sub>	Model 3 <i>COVID_POS_SENT</i> <sub>2020</sub>	Model 4 <i>COVID_NEG_SENT</i> <sub>2020</sub>	Model 5 <i>COVID_NET_SENT</i> <sub>2020</sub>
<i>CONFID67</i> <sub>2019</sub>	-0.015 (-0.330)	0.021 (1.408)	0.005 (0.240)	0.003 (0.111)	0.086*** (3.337)
<i>HI_COVID_EXPOSURE</i> <sub>2020</sub>	1.845*** (23.815)				
<i>CONFID67</i> <sub>2019</sub> × <i>HI_COVID_EXPOSURE</i> <sub>2020</sub>	0.092 (0.653)				
<i>HI_COVID_RISK</i> <sub>2020</sub>		0.480*** (24.253)			
<i>CONFID67</i> <sub>2019</sub> × <i>HI_COVID_RISK</i> <sub>2020</sub>		-0.040** (-1.974)			
<i>HI_COVID_POS_SENT</i> <sub>2020</sub>			0.803*** (25.493)		
<i>CONFID67</i> <sub>2019</sub> × <i>HI_COVID_POS_SENT</i> <sub>2020</sub>			0.007 (0.150)		
<i>HI_COVID_NEG_SENT</i> <sub>2020</sub>				0.883*** (34.738)	
<i>CONFID67</i> <sub>2019</sub> × <i>HI_COVID_NEG_SENT</i> <sub>2020</sub>				-0.146*** (-3.270)	
<i>HI_COVID_NET_SENT</i> <sub>2020</sub>					0.597*** (27.986)
<i>CONFID67</i> <sub>2019</sub> × <i>HI_COVID_NET_SENT</i> <sub>2020</sub>					0.077* (1.938)
<i>LNASSET</i> <sub>2019</sub>	-0.011	-0.003	-0.002	0.003	0.008

	(-0.820)	(-0.931)	(-0.319)	(0.415)	(1.279)
<i>FIXEDASSET</i> <sub>2019</sub>	-0.292***	-0.021	-0.073*	-0.158***	0.070
	(-3.195)	(-0.861)	(-1.952)	(-3.352)	(1.635)
<i>ROA</i> <sub>2019</sub>	-1.591	-0.319	-0.579	-1.368***	0.881
	(-1.442)	(-1.093)	(-1.221)	(-2.900)	(1.289)
<i>CASH</i> <sub>2019</sub>	0.134	0.002	0.032	-0.042	0.181**
	(0.591)	(0.036)	(0.382)	(-0.510)	(2.463)
<i>LEV</i> <sub>2019</sub>	0.086	-0.023	0.059	-0.041	0.042
	(0.886)	(-0.933)	(1.349)	(-0.835)	(0.831)
<i>RETURN</i> <sub>2019</sub>	-0.055	0.039	-0.008	0.004	-0.024
	(-0.231)	(0.573)	(-0.075)	(0.041)	(-0.217)
<i>SENTIMENT</i> <sub>2019</sub>	0.004	0.006	0.018**	-0.008	0.024**
	(0.182)	(1.241)	(2.160)	(-0.800)	(2.024)
<i>BUSSEG</i> <sub>2019</sub>	0.069	-0.013	0.066	0.018	-0.007
	(0.641)	(-0.493)	(1.476)	(0.345)	(-0.131)
<i>GEOSEG</i> <sub>2019</sub>	0.047	0.007	0.026	-0.086*	0.050
	(0.528)	(0.314)	(0.697)	(-1.904)	(0.928)
<i>CEO_CHAIR</i> <sub>2019</sub>	0.030	0.008	0.011	-0.044*	0.044*
	(0.624)	(0.645)	(0.582)	(-1.927)	(1.928)
<i>LOGTENURE</i> <sub>2019</sub>	-0.036	-0.009	-0.011	-0.011	-0.010
	(-1.121)	(-1.119)	(-0.805)	(-0.768)	(-0.614)
<i>FEMALE</i> <sub>2019</sub>	0.131	-0.018	0.037	0.055	-0.017
	(1.439)	(-0.870)	(1.142)	(1.244)	(-0.423)
<i>LOGAGE</i> <sub>2019</sub>	0.456***	0.043	0.185**	0.368***	-0.121
	(2.086)	(0.834)	(2.077)	(3.865)	(-1.134)
<i>CEOPAY</i> <sub>2019</sub>	-0.087	0.002	-0.038	-0.041	0.056
	(-1.153)	(0.097)	(-1.221)	(-1.004)	(1.502)
<i>CEOOWN</i> <sub>2019</sub>	-0.003	0.000	-0.002	-0.000	-0.002
	(-0.899)	(0.031)	(-1.350)	(-0.142)	(-1.244)
<i>TOPAUDITORS</i> <sub>2019</sub>	0.026	0.034*	0.010	0.072**	-0.064**
	(0.364)	(1.798)	(0.300)	(2.043)	(-2.102)
<i>INSTOWN</i> <sub>2019</sub>	0.019	0.000	-0.022	-0.090***	0.056
	(0.263)	(0.005)	(-0.736)	(-2.779)	(1.613)
<i>RATED</i> <sub>2019</sub>	0.036	0.000	-0.009	0.004	-0.028
	(0.576)	(0.025)	(-0.352)	(0.132)	(-0.840)
Constant	-1.117	-0.330	-0.797**	-1.107***	-0.019
	(-1.274)	(-1.589)	(-2.231)	(-2.901)	(-0.044)
Observations	3,038	3,038	3,038	3,038	3,038
R-squared	0.142	0.692	0.312	0.365	0.222

**Table 10 - Relation between COVID-19 Exposure Reporting and CEO Overconfidence – Quarter-by-Quarter Regressions**

This table presents the results from the regressions of management reporting of firm exposure to COVID-19 pandemic on CEO overconfidence and other control variables for the 1<sup>st</sup> quarter of 2020 (in Panel A), the 2<sup>nd</sup> quarter of 2020 (in Panel B), the 3<sup>rd</sup> quarter (in Panel C) and the 4<sup>th</sup> quarter (in Panel D), separately. The subscript 2020 indicates the variable is calculated for each firm in each of the quarters in 2020. The subscript 2019 indicates the variable is calculated as the average of the four quarters in 2019. The dependent variables are *COVID\_EXPOSURE*<sub>2020</sub>, *COVID\_RISK*<sub>2020</sub>, *COVID\_POS\_SENT*<sub>2020</sub>, *COVID\_NEG\_SENT*<sub>2020</sub> and *COVID\_NET\_SENT*<sub>2020</sub>, alternatively. *COVID\_EXPOSURE*<sub>2020</sub> is the count of the number of earnings call mentions of COVID-19 and its synonyms, relative to total words. *COVID\_RISK*<sub>2020</sub> is the count of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a synonym for risk/uncertainty, relative to total words. The *COVID\_POS\_SENT*<sub>2020</sub>, *COVID\_NEG\_SENT*<sub>2020</sub> and are the counts of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a positive- or a negative-toned word, relative to total words; *COVID\_NET\_SENT*<sub>2020</sub> is the difference between *COVID\_POS\_SENT*<sub>2020</sub> and *COVID\_NEG\_SENT*<sub>2020</sub>. *ROA*<sub>2020</sub> and *RETURN*<sub>2020</sub> are the return on asset and quarterly stock return of each firm in each quarter of the year 2020. *CONFID67*<sub>2019</sub> is a dummy variable equal to one for CEOs that have chosen not to exercise their 67%-in-the-money stock options at least twice in the 1992-2019 period and 0 otherwise. Please see Table 2 for the definitions of the control variables. The significance levels are based upon heteroscedasticity-consistent standard errors. \*, \*\* and \*\*\* indicate the significance levels of 10%, 5% and 1%, respectively.

**Panel A - Quarter 1 of 2020**

Variables	Model 1 <i>COVID_EXPOSURE</i> <sub>2020</sub>	Model 2 <i>COVID_RISK</i> <sub>2020</sub>	Model 3 <i>COVID_POS_SENT</i> <sub>2020</sub>	Model 4 <i>COVID_NEG_SENT</i> <sub>2020</sub>	Model 5 <i>COVID_NET_SENT</i> <sub>2020</sub>
<i>CONFID67</i> <sub>2019</sub>	-0.009 (-0.113)	0.025 (0.427)	-0.037 (-0.762)	-0.018 (-0.907)	0.012 (0.638)
Constant	-4.344*** (-7.946)	-2.429*** (-6.338)	-2.114 (-0.005)	0.197 (1.269)	-0.197 (-1.163)
Other control variables	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	774	774	774	774	774
R-squared	0.154	0.238	0.238	0.0743	0.0319

**Panel B - Quarter 2 of 2020**

Variables	Model 1 <i>COVID_EXPOSURE</i> <sub>2020</sub>	Model 2 <i>COVID_RISK</i> <sub>2020</sub>	Model 3 <i>COVID_POS_SENT</i> <sub>2020</sub>	Model 4 <i>COVID_NEG_SENT</i> <sub>2020</sub>	Model 5 <i>COVID_NET_SENT</i> <sub>2020</sub>
<i>CONFID67</i> <sub>2019</sub>	-0.125 (-1.316)	-0.033 (-1.217)	-0.034 (-0.872)	-0.157*** (-2.750)	0.133** (2.387)
Constant	1.587*** (2.707)	-1.407*** (-10.247)	0.400 (1.125)	0.578* (1.881)	-0.155 (-0.303)
Other control variables	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	772	772	772	772	772
R-squared	0.0955	0.137	0.154	0.0876	0.0435

**Panel C - Quarter 3 of 2020**

Variables	Model 1 <i>COVID_EXPOSURE</i> <sub>2020</sub>	Model 2 <i>COVID_RISK</i> <sub>2020</sub>	Model 3 <i>COVID_POS_SENT</i> <sub>2020</sub>	Model 4 <i>COVID_NEG_SENT</i> <sub>2020</sub>	Model 5 <i>COVID_NET_SENT</i> <sub>2020</sub>
<i>CONFID67</i> <sub>2019</sub>	0.115 (1.153)	0.002 (0.066)	0.064 (1.448)	-0.019 (-0.338)	0.065 (1.291)
Constant	1.507*** (3.854)	0.076 (0.452)	0.350 (0.889)	0.837*** (2.704)	-0.460 (-1.006)
Other control variables	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	757	757	757	757	757

R-squared	0.108	0.171	0.138	0.102	0.0240
<b>Panel D - Quarter 4 of 2020</b>					
Variables	Model 1 <i>COVID_EXPOSURE</i> <sub>2020</sub>	Model 2 <i>COVID_RISK</i> <sub>2020</sub>	Model 3 <i>COVID_POS_SENT</i> <sub>2020</sub>	Model 4 <i>COVID_NEG_SENT</i> <sub>2020</sub>	Model 5 <i>COVID_NET_SENT</i> <sub>2020</sub>
<i>CONFID67</i> <sub>2019</sub>	-0.084 (-0.877)	0.020 (0.735)	-0.034 (-0.705)	-0.073 (-1.552)	0.055 (1.299)
Constant	1.350** (2.398)	0.084 (0.394)	0.101 (0.240)	0.640** (2.384)	-0.456 (-1.186)
Other control variables	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	735	735	735	735	735
R-squared	0.116	0.156	0.133	0.114	0.0755



**Table 11 – Relation between Subsequent Firm Operating Performance and Firm Reporting of Exposure to COVID-19 Pandemic**

This table presents the results from the regressions of firm operating performance on management reporting of firm exposure to COVID-19 pandemic and other control variables. The subscript 2020 indicates the variable is calculated for each firm in each of the quarters in 2020; the exceptions are ROA and RETURN variables, where the subscript 2020 indicates a quarter subsequent to a particular quarter of 2020. The subscript 2019 indicates the variable is calculated as the average of the four quarters in 2019. The dependent variable is the return on asset for each firm in the quarter subsequent to the measurement of the independent variables, which are measured in each of the quarters in 2020.

*COVID\_EXPOSURE*<sub>2020</sub> is the count of the number of earnings call mentions of COVID-19 and its synonyms, relative to total words. *COVID\_RISK*<sub>2020</sub> is the count of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a synonym for risk/uncertainty, relative to total words. The *COVID\_POS\_SENT*<sub>2020</sub>, *COVID\_NEG\_SENT*<sub>2020</sub> and are the counts of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a positive- or a negative-toned word, relative to total words; *COVID\_NET\_SENT*<sub>2020</sub> is the difference between *COVID\_POS\_SENT*<sub>2020</sub> and *COVID\_NEG\_SENT*<sub>2020</sub>. *ROA*<sub>2020</sub> and *RETURN*<sub>2020</sub> are the return on asset and quarterly stock return of each firm in each quarter of the year 2020. *LNASSET*<sub>2020</sub> is the natural logarithm of total asset. *CASH*<sub>2020</sub>, *LEV*<sub>2020</sub> and *SALEGRWTH*<sub>2020</sub> are the cash-to-asset ratio, total debt to total asset ratio and sales growth rate. *INVEST*<sub>2020</sub> is the R&D expenses plus capital expenditures minus sales of fixed assets scaled by total. The significance levels are based upon heteroscedasticity-consistent standard errors. \*, \*\* and \*\*\* indicate the significance levels of 10%, 5% and 1%, respectively.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
<i>CONFID67</i> <sub>2019</sub>	0.008*** (5.551)	0.008*** (6.595)	0.007*** (5.872)	0.007*** (5.483)	0.007*** (6.285)
<i>COVID_EXPOSURE</i> <sub>2020</sub>	-0.001* (-1.716)				
<i>CONFID67</i> <sub>2019</sub> × <i>COVID_EXPOSURE</i> <sub>2020</sub>	-0.000 (-0.451)				
<i>COVID_RISK</i> <sub>2020</sub>		0.003 (0.826)			
<i>CONFID67</i> <sub>2019</sub> × <i>COVID_RISK</i> <sub>2020</sub>		-0.004 (-0.703)			
<i>COVID_POS_SENT</i> <sub>2020</sub>			-0.001 (-0.621)		
<i>CONFID67</i> <sub>2019</sub> × <i>COVID_POS_SENT</i> <sub>2020</sub>			0.000 (0.006)		
<i>COVID_NEG_SENT</i> <sub>2020</sub>				-0.002*** (-3.172)	
<i>CONFID67</i> <sub>2019</sub> × <i>COVID_NEG_SENT</i> <sub>2020</sub>				0.000 (0.066)	
<i>COVID_NET_SENT</i> <sub>2020</sub>					0.003*** (3.061)
<i>CONFID67</i> <sub>2019</sub> × <i>COVID_NET_SENT</i> <sub>2020</sub>					-0.001 (-0.402)
<i>LNASSET</i> <sub>2020</sub>	0.002*** (6.112)	0.002*** (6.175)	0.002*** (6.116)	0.002*** (5.926)	0.002*** (5.869)
<i>CASH</i> <sub>2020</sub>	0.007 (1.419)	0.007 (1.340)	0.007 (1.342)	0.007 (1.331)	0.007 (1.313)
<i>LEV</i> <sub>2020</sub>	-0.002 (-0.531)	-0.002 (-0.560)	-0.002 (-0.557)	-0.002 (-0.544)	-0.002 (-0.592)
<i>SALEGRWTH</i> <sub>2020</sub>	0.008*** (3.206)	0.008*** (3.279)	0.008*** (3.275)	0.008*** (3.213)	0.008*** (3.219)
<i>INVEST</i> <sub>2020</sub>	0.078** (2.548)	0.082*** (2.645)	0.081*** (2.628)	0.078** (2.523)	0.080*** (2.588)
Constant	-0.022***	-0.022***	-0.022***	-0.021***	-0.020***

	(-3.157)	(-3.172)	(-3.157)	(-3.103)	(-3.044)
Observations	3,038	3,038	3,038	3,038	3,038
Adj. R-squared	0.160	0.158	0.158	0.161	0.160
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes

---

**Table 12 – Relation between Subsequent Stock Returns and Firm Reporting of Exposure to COVID-19 Pandemic**

This table presents the results from the regressions of firm stock returns on management reporting of firm exposure to COVID-19 pandemic and other control variables. The subscript 2020 indicates the variable is calculated for each firm in each of the quarters in 2020; the exceptions are ROA and RETURN variables, where the subscript 2020 indicates a quarter subsequent to a particular quarter of 2020. The subscript 2019 indicates the variable is calculated as the average of the four quarters in 2019. The dependent variable is the quarterly stock return for each firm in the quarter subsequent to the measurement of the independent variables, which are measured in each of the quarters in 2020. *COVID\_EXPOSURE*<sub>2020</sub> is the count of the number of earnings call mentions of COVID-19 and its synonyms, relative to total words. *COVID\_RISK*<sub>2020</sub> is the count of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a synonym for risk/uncertainty, relative to total words. The *COVID\_POS\_SENT*<sub>2020</sub>, *COVID\_NEG\_SENT*<sub>2020</sub> and are the counts of the number of earnings call mentions of COVID-19 and its synonyms within 10 words of a positive- or a negative-toned word, relative to total words; *COVID\_NET\_SENT*<sub>2020</sub> is the difference between *COVID\_POS\_SENT*<sub>2020</sub> and *COVID\_NEG\_SENT*<sub>2020</sub>. *ROA*<sub>2020</sub> and *RETURN*<sub>2020</sub> are the return on asset and quarterly stock return of each firm in each quarter of the year 2020. *LNMKCAP*<sub>2020</sub> is the natural logarithm of total market capitalization. *ROA*<sub>2020</sub>, *CASH*<sub>2020</sub> and *LEV*<sub>2020</sub> are the return on asset, cash-to-asset ratio and total debt to total asset ratio. *INVEST*<sub>2020</sub> is the R&D expenses plus capital expenditures minus sales of fixed assets scaled by total. *MKBK*<sub>2020</sub> is the market-to-book ratio. The significance levels are based upon heteroscedasticity-consistent standard errors. \*, \*\* and \*\*\* indicate the significance levels of 10%, 5% and 1%, respectively.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
<i>CONFID67</i> <sub>2019</sub>	0.017 (1.147)	0.021* (1.719)	0.024* (1.787)	0.007 (0.532)	0.018* (1.657)
<i>COVID_EXPOSURE</i> <sub>2020</sub>	-0.010 (-1.429)				
<i>CONFID67</i> <sub>2019</sub> × <i>COVID_EXPOSURE</i> <sub>2020</sub>	0.009 (1.137)				
<i>COVID_RISK</i> <sub>2020</sub>		-0.055 (-1.312)			
<i>CONFID67</i> <sub>2019</sub> × <i>COVID_RISK</i> <sub>2020</sub>		0.081 (1.360)			
<i>COVID_POS_SENT</i> <sub>2020</sub>			-0.030 (-1.525)		
<i>CONFID67</i> <sub>2019</sub> × <i>COVID_POS_SENT</i> <sub>2020</sub>			0.015 (0.676)		
<i>COVID_NEG_SENT</i> <sub>2020</sub>				-0.029** (-2.530)	
<i>CONFID67</i> <sub>2019</sub> × <i>COVID_NEG_SENT</i> <sub>2020</sub>				0.041*** (2.655)	
<i>COVID_NET_SENT</i> <sub>2020</sub>					0.026** (2.166)
<i>CONFID67</i> <sub>2019</sub> × <i>COVID_NET_SENT</i> <sub>2020</sub>					-0.057*** (-3.269)
<i>LNMKCAP</i> <sub>2020</sub>	-0.028*** (-7.492)	-0.028*** (-7.469)	-0.028*** (-7.379)	-0.029*** (-7.675)	-0.028*** (-7.483)
<i>ROA</i> <sub>2020</sub>	0.094 (0.420)	0.103 (0.462)	0.096 (0.428)	0.101 (0.452)	0.088 (0.396)
<i>CASH</i> <sub>2020</sub>	0.035 (0.804)	0.036 (0.818)	0.036 (0.828)	0.036 (0.834)	0.035 (0.811)
<i>BKMK</i> <sub>2020</sub>	0.048*** (3.666)	0.048*** (3.673)	0.048*** (3.681)	0.048*** (3.749)	0.049*** (3.733)
<i>LEV</i> <sub>2020</sub>	0.152*** (4.288)	0.151*** (4.235)	0.154*** (4.340)	0.154*** (4.373)	0.153*** (4.308)
<i>INVEST</i> <sub>2020</sub>	0.196	0.218	0.187	0.191	0.208

Constant	(0.674) 0.436*** (7.533)	(0.747) 0.436*** (7.586)	(0.643) 0.430*** (7.498)	(0.655) 0.450*** (7.719)	(0.714) 0.446*** (7.591)
Observations	3,038	3,038	3,038	3,038	3,038
Adj. R-squared	0.156	0.156	0.157	0.159	0.158
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes

---