

Elmarzouky, Mahmoud; Albitar, Khaldoon; Karim, Atm Enayet; Moussa, Ahmed Saber

**Article**

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Article

# COVID-19 Disclosure: A Novel Measurement and Annual Report Uncertainty

Mahmoud Elmarzouky <sup>1,\*</sup>, Khaldoun Albitar <sup>2</sup> , Atm Enayet Karim <sup>3</sup> and Ahmed Saber Moussa <sup>4</sup>

- <sup>1</sup> Department of Accounting, Finance & Informatics, Kingston Business School, Kingston University, London KT2 7LB, UK  
<sup>2</sup> Accounting and Financial Management Group, Faculty of Business and Law, University of Portsmouth, Portsmouth PO1 3DE, UK; khaldoun.albitar@port.ac.uk  
<sup>3</sup> School of Business and Law, Global Banking School, London B5 5SE, UK; enayet.karim786@gmail.com  
<sup>4</sup> Independent Researcher, Menoufia 32731, Egypt; ahmd.saber@hotmail.com  
\* Correspondence: M.Elmarzouky@kingston.ac.uk; Tel.: +44-(0)20-84-175-551

**Abstract:** This paper provides a unique COVID-19 disclosure measurement and investigates the association between the level of COVID-19 disclosure and uncertainty within annual reports for UK FTSE-All share non-financial firms. We used automated textual analysis to score the sampled annual reports. The results show that the level of COVID-19 disclosure varies from industry to industry. Furthermore, there is a positive relationship between COVID-19 disclosure and uncertainty in annual reports. Firms with larger boards exhibit more significant uncertainty in annual reports with COVID-19 disclosure. However, the significance of uncertainty in annual reports with COVID-19 disclosure remains at the same level with different board independence percentages. The unique findings of this paper are extremely relevant to governments, shareholders, policymakers, suppliers, and creditors.

**Keywords:** COVID-19 disclosure; annual report uncertainty; board size; independent directors; textual analysis



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## 1. Introduction

The COVID-19 pandemic set off the worst global economic crisis since the great depression (OECD 2020). As a result, Britain has been facing the deepest slump in its economy since the quarterly record began (The Guardian 2020). The gross domestic product (GDP) of the UK economy declined by 20.4% in the second quarter (May to June) in 2020, the largest decline occurring in the Organisation for Economic Co-operation and Development (OECD) countries, followed by a 13.8% decline occurring in France and a 12.8% decline occurring in Italy (ONS 2020). Moreover, the deadline for the UK's Brexit transition period ends on 31st December 2020 (BBC News 2020), which is also acting as a catalyst for increasing uncertainty. The recent Bank of England's Decision Maker Panel (DMP) survey provides evidence that from the 3rd to 17th July, 76% of UK firms viewed levels of economic uncertainty as high or very high (ONS 2020). Such uncertainty was heightened by the UK government's furlough scheme ending by October 2020 (GOV.UK 2020), as economic growth is related to labour market outcomes.

Unlike the global financial crisis (GFC), which was triggered by financial institution mismanagement, there is no sector to blame in the case of the COVID-19 pandemic. It is a natural disaster, and it hit the economy with astonishing speed. Several large institutions caused the GFC; therefore, it was easier to contain logistically than COVID-19 (Harvey 2020). At the start of the GFC, the UK's GDP fell by 2.6% in a single quarter, in contrast to the 20.6% fall experienced in the COVID-19 pandemic (Allen 2010). However, this decline in GDP growth in UK sectors has varied significantly. A massive 35% decline occurred in the construction sector followed by a 19.9% decline occurring in the service sector and a 16.9% decline occurring in the production sector

(ONS 2020). Due to higher uncertainty, the UK financial market is highly volatile, and the one-year return to September 2020 for the FTSE index is approximately 20.27% negative (London Stock Exchange 2020).

The UK is one of the major European economies and is considered a global financial hub. Therefore, the significant economic collapse of the UK stock market will have a knock-on effect across the region and the global economy. However, the literature argues that COVID-19 poses a systematic risk, as it affects all business entities worldwide (Harvey 2020; Elmarzouky et al. 2021), which is also supported by Sharif et al. (2020). Therefore, businesses should be able to mitigate this systematic risk. Although such risk is systematic, organisations cannot handle it due to impending uncertainty. The UK government has imposed local level lockdown in several counties, changing rapidly. Because of that, there is an anticipation of higher national-level restrictions being placed on economic activity to contain the virus, which has created a significant degree of uncertainty among business organisations and in the labour market.

Under these volatile conditions, the UK government issued the COVID-19 Secure Guidelines to ensure safe working environments (GOV.UK 2020). Fourteen guides have been published based on the different activities businesses are engaged in. Some firms are involved in more than one activity; for instance, the manufacturing sector is engaged in factory work, office work, and logistics. Therefore, such firms follow several COVID-19 guidelines to ensure that their workforces and working environments are safe. However, such practices are not strictly enforced, and there is no mandatory requirement for entities to disclose information on such activities or how they are operating in this volatile environment. However, business entities must disclose COVID-19 related information to send positive signals to stakeholders and markets.

Signalling theory explains how reducing information asymmetry signals the two concerned parties (Spence 2002). Some information is available publicly, and some are private. Connelly et al. (2011) argue that information asymmetry arises when people could have made a better-informed decision if they had access to private information. Therefore, a CEO often discloses unobservable information as observable information through financial statements (Zhang and Wiersema 2009).

Under the UK government's current COVID-19 guidelines, different companies follow different procedures based on their working practices. Therefore, their disclosure levels will vary significantly across the firm level, even within the same industry. Due to this variability, the relevance of such information might decrease, as it is not comparable to the other firms in the same industry. This motivates us to understand how COVID-19 disclosure may increase the uncertainty in the annual reports across industries. According to signalling theory (Connelly et al. 2011), disclosing more information will reduce information asymmetry. However, if investors evaluate this information as a firm's deficiency, market uncertainty will increase. More COVID-19 disclosure will reduce information asymmetry, but at the same time, this will lead to more uncertainty. COVID-19 disclosure is not driven by governance mechanisms but by market expectations.

Recent literature of the business domain related to the COVID-19 pandemic has also mostly focused on market reactions. Erdem (2020) finds that COVID-19 negatively affects the market and increases volatility. Mazur et al. (2020) also support the argument that extreme asymmetric volatility is negatively related to stock returns. More volatility is the causal effect of uncertainty. Salisu and Vo (2020) found that the information sought from health-related news is negatively significant with stock market returns during a pandemic. Goodell (2020) provides theoretical perceptions of the COVID-19 pandemic across financial markets, banking and insurance, and government and public entities. Other work has focused on ESG disclosure impacts on financial performance during the COVID-19 crisis (Broadstock et al. 2020). The above works on COVID-19 converge on how uncertainty impacts the attributes of the business entities and their environments, which raises the question of whether COVID-19 related information increases uncertainty in annual reporting. We developed a measure of the COVID-19 disclosure based on

annual report word frequency measures. In addition to that, we examined how COVID-19 disclosure affects the uncertainty in the annual report. We use the 'uncertainty index' developed by [Loughran and McDonald \(2011\)](#) to measure uncertainty in annual reports.

We found that COVID-19 disclosure varies significantly across different industries in the UK. Additionally, we found a significantly positive association between the level of COVID-19 disclosure and uncertainty in annual reports. Moreover, following the literature, we use a subsample group to understand whether the effect of COVID-19 disclosure on uncertainty varies with changes in board size and board independence. Interestingly, our results show an increase in uncertainty with increasing board size. Corroborating the existing literature, larger boards disclose more information ([Ahmed and Courtis 1999](#); [Chen and Jaggi 2000](#)). As COVID-19 disclosure is positively related to uncertainty, larger boards increase uncertainty in annual reports by disclosing more information. We also found that with an increase in board independence, uncertainty decreases. However, following the existing literature, we expect more independent non-executive directors to disclose more information ([Santhosh and Cox 2007](#); [Ntim et al. 2013](#); [Albitar et al. 2021](#)); as a result, more COVID-19 related information will positively contribute to uncertainty. Therefore, this result contradicts our expectations.

Our study makes several contributions. First, as our theoretical contribution, signaling theory suggests that providing more information will reduce information asymmetry. Our findings show that an increase in disclosure will lead to less information asymmetry, but it also increases uncertainty in annual reports. Our finding suggests that reducing information asymmetry in COVID-19 disclosure creates more uncertainty in annual reports because signalling here is driven by the market expectations instead of the governance mechanism. Second, as our empirical contribution to index development, we use the UK government's COVID-19 guidelines to determine the most frequently used words for different industries. Then, we apply this list of words by using CFIE software (developed by the University of Lancaster) to score the annual reports of FTSE All-Share companies in the UK. Our index is the first of its kind for COVID-19 disclosure. We also contribute by showing how reactions to the pandemic have varied across the UK's industries and how firm corporate governance mechanisms are associated with the level of COVID-19 disclosure and uncertainty in annual reports.

The rest of the paper is structured as follows: Section 2 presents the research design, Section 3 presents the empirical results and a robustness check, and Section 4 presents conclusions and implications.

## 2. Research Method

### 2.1. Sample and Data Collection

The narrative section of annual reports has increasingly been used to communicate between management and stakeholders ([Fisher et al. 2019](#)). The central bank of England estimated that 90% of financial information from 2017 was taken from text rather than from financial statements. Textual analysis has become a trend in research on accounting and finance ([Loughran and McDonald 2016](#); [Fisher et al. 2019](#)). We used CFIE<sup>1</sup> (Corporate Financial Information Environment) software to extract the narrative sections of annual reports and then measure COVID-19 disclosure and uncertainty scores. We were interested only in narrative disclosures related to COVID-19 and uncertainty. We studied UK FTSE-All share non-financial firms for the financial year ending in 2019 to cover all annual reports published after March 2020. This selection ensured that we included all firms that have communicated any COVID-19 related information with their stakeholders. We excluded firms not yet publishing annual reports for the current financial year. We also excluded financial firms because these firms are subject to different sets of disclosure regulations. We collected FTSE All-share listed firms financial information from the Eikon database. We applied our research to the UK context for two reasons: the disclosure market in the UK proved sensitive to any crisis, and the UK followed the principle-based governance approach in contrast with the rules-based approach of the Sarbanes Oxley act

2002. Therefore, studying the voluntary COVID-19 disclosure in the UK context will be interesting.

## 2.2. Research Models and Variable Measurement

This paper uses a regression model to test the hypotheses based on FTSE All-share non-financial listed firms with firm uncertainty measured by “Loughran and McDonald’s (2011)” dictionary as the dependent variable and COVID-19 disclosure used as the independent variable measured by the developed disclosure index as follows:

### 2.2.1. COVID-19 Disclosure Measurement

We developed a unique measurement based on the employed wordlist related to COVID-19. To measure levels of COVID-19 voluntary disclosure in annual reports, we used a wordlist based on the ‘COVID-19 Secure Guidelines’ published by the UK government. The guideline provides detailed guidance for different industries across the UK. We investigate the extent of COVID-19 disclosure by reading a sample of randomly selected corporate annual reports from the UK. The most critical stage was determining words likely to be relevant to COVID-19 disclosure.

Disclosure wordlists usually measure the extent of corporate disclosure by counting the frequency of a word/words. We used LancsBox software (developed by Lancaster University) to find the most frequent words in the annual reports of FTSE all-share non-financial firms. We performed this step individually, and we crossed-checked our word choices, which agreed with the shared word choices. We assessed the reliability of the measurement by manually double-checking the score for a random annual report sample, and the outcomes remained consistent. We also validated the measurement by using NVivo 12 Pro to rescore a random sample of the annual reports, and the outcomes remained consistent.

### 2.2.2. Scoring the Annual Reports

CFIE 2019, software developed by Lancaster University, was used for scoring the level of COVID-19 disclosure within the annual report. The software automatically encodes UK annual report PDF files, and it breaks down the content of annual reports in subsections. Also, it counts any given word list uploaded in the software. To score the annual report; therefore, we uploaded our developed index in CFIE 2019. The software generates its predetermined uncertainty score for UK annual reports based on the dictionary developed by Loughran and McDonald (2011). Appendix A shows the original word list used for COVID-19 disclosure.

### 2.2.3. Research Model

We use a multivariate regression model to investigate the relationship between COVID-19 disclosure and uncertainty in annual reports. To measure the industry effect, we controlled for the industry fixed effect. We used an industry classification to create dummies based on the SIC one-digit industry classification. The model is as follows:

$$\text{Uncertainty} = \beta_0 + \beta_1 \text{COVID-19} + \beta_2 \text{BS} + \beta_3 \text{IND} + \beta_4 \text{ROA} + \beta_5 \text{TA} + \text{Industry Fixed Effects} + \varepsilon$$

Uncertainty: We measured the uncertainty using the Loughran and McDonald’s dictionary (Loughran and McDonald 2011).

COVID-19: The authors self-constructed the disclosure index (see Appendix A).

BS: The number of directors on the firm’s board is used to measure board size (Allegrini and Greco 2011; Ntim et al. 2013; Javaid Lone et al. 2016; Husted and Sousa-Filho 2018; Orazalin 2019).

IND: Non-executive director measured by the percentage of independent non-executive directors (Lim et al. 2007; Ntim et al. 2013; Samaha et al. 2015; Salem et al. 2019).

ROA: Return on assets used as control variables (Bernardi and Stark 2018; Kao et al. 2018).



TA: Total assets used as a proxy for the firm size (Ahmed and Courtis 1999; Chen and Jaggi 2000; Bernardi and Stark 2018; Kao et al. 2018; Karim et al. 2021).

### 3. Empirical Results

#### 3.1. Descriptive Statistics

Table 1 presents the mean for COVID-19 disclosure and uncertainty across the studied industries. Both COVID-19 disclosure and uncertainty scores vary across industries. Some industries have been more sensitive to the COVID-19 crisis, while others show less response. We found that industries such as telecommunications are likely to provide more COVID-19 in the annual report but demonstrate a lower level of uncertainty. This shows that; even some industries provide more COVID-19 related information, but it decreases uncertainty in the annual report. It is thus evident that the telecommunications sector has enjoyed advantages since a broad sector of the UK economy has shifted toward using more telecommunications tools, from online GP appointment services to educational tools. Telecommuting is also becoming more embedded in day-to-day activities. The disclosure of more COVID-19 in these businesses will create a self-commercial benefit and attract more potential investors. The telecommunications industry leads in providing COVID-19 related information with a low uncertainty score, showing that this sector has benefitted from the crisis.

The utility sector also shows a high level of COVID-19 disclosure, which can be explained by increasing demand for gas and electricity since the lockdown, as much of the public is staying at home. The UK government introduced universal gas credit to support unexpected increases in electricity use with the lockdown. People are using more devices for more extended periods. In addition, reduced affordability due to job cuts has increased uncertainty in public service sectors such as utilities. The government also passed a law preventing anyone from becoming homeless due to an inability to pay personal bills. These factors have influenced the volume of COVID-19 communicated from management to stakeholders within annual reports.

Further, utilities and the health care industries rank second and third, respectively. It is undeniable that health care provides a high volume of COVID-19. The industrial sector ranks last with the lowest means for COVID-19 and uncertainty, showing that this industry is relatively stable and has not been greatly affected by the COVID-19 crisis. This might also result from the national lockdown, placing such businesses off the market.

**Table 1.** COVID-19 disclosure and uncertainty score across industries.

Industry	COVID-19	Uncertainty
Basic Materials	38.667	28.905
Consumer Discretionary	54.136	20.576
Consumer Staples	51.882	28.176
Energy	50.889	28.333
Health Care	98.111	33.889
Industrials	33.038	24.000
Real Estate	59.719	17.313
Telecommunications	137.500	26.250
Utilities	103.833	44.500

Table 2 presents descriptive statistics for the variables used in this study, including mean, SD, min, and maximum values. The table shows that the mean COVID-19 disclosure score obtained using our developed measurement is 52.9, with a maximum value of 594 and a minimum value equal to zero, which indicates that some firms have not disclosed any COVID-19 related information. Furthermore, the mean value of uncertainty measured

following Loughran and McDonald (2011) equals 24 with maximum and minimum values of 116 and 0, respectively, which is in line with the observed patterns of COVID-19 disclosure. Besides, the mean values of board size, board independence, return on assets, and total assets are 8.7, 59, 7.9, and 21.2, respectively.

**Table 2.** Descriptive Statistics.

Variable	Mean	Std. Dev.	Min	Max
Uncertainty	24.004	16.409	0.000	116.000
COVID-19	51.942	79.295	0.000	594.000
BS	8.662	2.109	5.000	16.000
IND	58.929	14.101	0.000	81.818
ROA	6.911	17.594	−15.350	240.296
TA	21.185	1.472	17.673	26.365

COVID-19: covid-19 disclosure, BS: Board size, IND: Board independent, ROA: return on assets, TA: total assets.

Table 3 shows the correlation matrix for the dependent and independent variables. The correlation matrix shows a correlation between uncertainty, COVID-19 disclosure, and the other control variables: board size, the percentage of independent directors on a board, the return on assets, and total assets. This result validates the statistical relationship between the dependent and independent variables and whether signs of collinearity may be present. The correlation coefficients provided in Table 2 do not demonstrate any multi-collinearity problems. Additionally, from the VIF results, multi-collinearity does not appear to be a concern in explaining the regression results tested separately.<sup>2</sup>

**Table 3.** Correlations matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) uncertainty	1.000					
(2) COVID-19	0.342 *	1.000				
	(0.000)					
(3) BS	0.388 *	0.234 *	1.000			
	(0.000)	(0.003)				
(4) IND	0.244 *	0.052	0.190 *	1.000		
	(0.002)	(0.518)	(0.018)			
(5) ROA	−0.020	0.018	0.130	−0.060	1.000	
	(0.774)	(0.793)	(0.107)	(0.459)		
(6) TA	0.484 *	0.183 *	0.599 *	0.196 *	0.035	1.000
	(0.000)	(0.007)	(0.000)	(0.014)	(0.610)	

\*  $p < 0.1$ . COVID-19: covid-19 disclosure, BS: Board size, IND: Board independent, ROA: return on assets, TA: total assets.

### 3.2. Multivariate Analysis

Table 4, which shows the regression results for the constructed model, demonstrates that COVID-19 disclosure significantly increases uncertainty in annual reports. We used different regressions (OLS, Tobit, 2sls, and Robust) to reduce the standard error, and the results remain consistent. The coefficient of the COVID-19 disclosure score is positive and significant at 1% in all models. This indicates that the relationship between COVID-19 disclosure and uncertainty in annual reports remains positively significant at the 99% level. The results suggest that the more the firms disclose COVID-19 related information, the more stakeholders might face adverse selection and experience more uncertainty. This will affect their financial decisions and behaviours. In the absence of a clear direction out of the COVID-19 pandemic, management may try to increase the level of disclosure. However, the quality of this information might be poor; due to a lack of clarity about how COVID-19 will affect businesses. Therefore, the characteristics of information matter than its quantity.

**Table 4.** Regression results.

Variables	OLS	Tobit	2SLS	Robust
	Uncertainty	Uncertainty	Uncertainty	Uncertainty
COVID-19	0.0682 *** (0.0174)	0.0682 *** (0.0170)	0.0682 *** (0.0170)	0.0682 *** (0.0233)
BS	2.078 *** (0.632)	2.078 *** (0.620)	2.078 *** (0.620)	2.078 *** (0.667)
IND	0.194 ** (0.0874)	0.194 ** (0.0857)	0.194 ** (0.0857)	0.194 ** (0.0841)
ROA	0.670 (1.140)	0.670 (1.117)	0.670 (1.117)	0.670 (0.728)
TA	0.0688 (0)	0.0671 (0)	0.0622 (0)	0.0610 (0)
Constant	−6.171 (6.896)	−6.171 (6.760)	−6.171 (6.760)	−6.171 (6.097)
R-squared	0.267		0.267	0.267

Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ . COVID-19: COVID-19 disclosure, BS: Board size, IND: Board independent, ROA: return on assets, TA: total assets.

Overall, it is evident that COVID-19 disclosure increases uncertainty in the annual report. As shown in the table, the control variables show that the coefficient of board size is positive and significant at 1%, suggesting that firms with larger boards of directors report a higher level of uncertainty in annual reports compared to firms with smaller boards of directors. The results also suggest that the coefficient of board independence is positive and significant at 5%. Suggesting that; firms with a higher percentage of independent directors on the board are more associated with uncertainty in annual reports compared to firms with a lower percentage of independent directors on their boards of directors. We also control for profitability using the ROA and for firm size using total assets. Both of them show an insignificant relationship.

### 3.3. Robustness Check

Previous research has focused on the relationship between corporate governance mechanisms and risk disclosure (Elshandidy and Neri 2015; Allini et al. 2016; Salem et al. 2019). Specifically, regarding UK corporate governance, the existing literature shows a significant positive relationship between corporate size and disclosure (Ahmed and Courtis 1999; Chen and Jaggi 2000). Additionally, with an increase in the number of independent directors, there is an increase in corporate risk reporting (Santhosh and Cox 2007). Ntim et al. (2013) also show that board size and independent non-executive directors are positively associated with risk disclosure. Consistent with these arguments, we conduct a robustness check by investigating whether COVID-19 disclosure impacts uncertainty in annual reports when considering different board sizes and different percentages of independent directors.

We divided our sample into two sub-samples based on the mean of board size. The first sample group for the firm with less than or equal to the mean (which is 8.0). Other sample groups were based on the firms with board sizes bigger than the mean. This is conducted to assess how the COVID-19 disclosure score could affect uncertainty in annual reports when considering boards of directors of different sizes. Table 5 demonstrates the result of the regression. The results show that firms with larger boards tend to disclose more COVID-19, and likewise, firms with fewer directors on their boards of directors tend to disclose less COVID-19 related information. The table also shows that the effect of the level of COVID-19 disclosure on uncertainty in annual reports is always statistically positively significant.

Furthermore, the significance level is higher for firms with larger boards of directors. This finding is consistent with the literature (Elshandidy and Neri 2015; Allini et al. 2016; Salem et al. 2019); board size is the main factor in shaping governance mechanisms, and corporate governance contributes to the effectiveness of narrative disclosure. As COVID-19 disclosure is classified as a form of voluntary disclosure, a larger board of directors places



more pressure on management to increase voluntary narrative discourse in general. Firms with more robust corporate governance will thus have a more transparent relationship with their shareholder by disclosing more COVID-19.

**Table 5.** Regression for  $BS > \text{the mean}$  vs.  $BS \leq \text{the mean}$ .

Variables	BS > 8	BS ≤ 8
	Uncertainty	Uncertainty
COVID-19	0.0700 *** (0.0236)	0.0641 ** (0.0305)
BS	1.909 (1.401)	1.260 (1.619)
IND	0.221 (0.155)	0.167 * (0.0966)
ROA	−0.363 (3.050)	0.770 (1.011)
TA	0.0626 (0.0622)	0.0131 (0.0546)
Constant	−6.010 (17.49)	−1.479 (10.86)
R-squared	0.210	0.216

Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . COVID-19: COVID-19 disclosure, BS: Board size, IND: Board independent, ROA: return on assets, TA: total assets.

We also followed the same approach for the independent directors. We divide our sample into two sub-groups based on the mean of the independent directors (59%). Then we run the regression to assess how the COVID-19 disclosure score could affect uncertainty in annual reports; when considering different percentages of independent directors on boards of directors. Table 6 demonstrates the result of the regression:

**Table 6.** Regression for  $IND > \text{the mean}$  vs.  $IND \leq \text{the mean}$ .

Variables	IND > 59%	IND ≤ 59%
	Uncertainty	Uncertainty
COVID-19	0.0582 ** (0.0227)	0.0878 ** (0.0361)
BS	3.277 *** (1.129)	0.700 (0.693)
IND	0.249 (0.309)	0.0705 (0.134)
ROA	−1.698 (3.025)	1.146 (1.003)
TA	0.0621 (0.0591)	0.0110 (0.0395)
Constant	−18.51 (21.54)	6.026 (7.890)
R-squared	0.270	0.244

Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ . COVID-19: COVID-19 disclosure, BS: Board size, IND: Board independent, ROA: return on assets, TA: total assets.

Although both samples are significant at the 5% level, there is a difference in the coefficient. The table shows that firms with a higher percentage of independent members on the boards are associated with less COVID-19 disclosure and vice versa. Firms with a lower percentage of independent directors on the boards are associated with a higher level of COVID-19 disclosure. The results also suggest that the effect of the level of COVID-19 disclosure on uncertainty in annual reports is always statically positively significant. Furthermore, the significance level is higher for firms with fewer independent directors on the boards. This result is consistent with the argument that firms with more independent

directors will have more power to demonstrate the impact of the COVID-19 disclosure on firm uncertainty. Stakeholders have a stronger belief that firms with a higher percentage of independent directors will minimise the impact of COVID-19 disclosure on the uncertainty in annual reports. This finding is consistent with the literature (Allini et al. 2016). A board with more independent directors will reduce information asymmetry and, thus, uncertainty.

### 3.4. Endogeneity

To tackle the endogeneity issues, we have performed DID regression, Table 7 shows us that the mean difference before COVID-19 is 9.104 while it becomes 12.559 after COVID-19. The mean difference increased by 3.455, which explains that COVID-19 increased the uncertainty in the annual report. We included the data for the year 2018 as per the shock event of COVID-19, and we also considered the healthcare industry as the treated group that would not face much uncertainty like other industries.

**Table 7.** DID regression.

Variables	(1)
adoption	−3.347 *** (1.215)
treatment	9.104 ** (3.742)
_diff	3.455 (6.152)
Constant	27.22 *** (0.776)
Observations	470
R-squared	0.041

Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ .

## 4. Conclusions

Due to pressures from stakeholders to reduce uncertainty caused by the COVID-19 pandemic, there has been an increasing interest in including more COVID-19 related information in annual reports. Managers tend to provide more COVID-19 related information. This paper constructs a unique measurement for assessing the levels of COVID-19 disclosure. Additionally, we examined the association between the level of COVID-19 disclosure and uncertainty in annual reports. We studied a sample from the UK context for the financial year of 2019. The results show that the level of COVID-19 disclosure varies by industry. Some industries have been more affected by the COVID-19 pandemic, while others are less responsive. We also found that COVID-19 disclosure is statistically associated with uncertainty in annual reports. Our data show that firms disclosing more COVID-19 related information tend to show higher levels of uncertainty and vice versa. The role of the board of directors significantly contributes to this relationship. Firms with larger boards show a stronger relationship between COVID-19 disclosure and uncertainty in annual reports. When we consider different percentages of independent directors on boards, the results show that firms with a higher percentage of independent directors tend to show a less significant relationship between COVID-19 disclosure and uncertainty in annual reports. However, the relationship remains significant.

This paper contributes to the literature by introducing a unique measurement for COVID-19 disclosure. The index will be essential for any future COVID-19 narrative disclosure research in this domain. This paper also makes an empirical contribution by bridging the essential link between COVID-19 disclosure and uncertainty. To date, research exploring this relationship has been virtually non-existent. The outcome of this work will benefit governments, regulators, shareholders, investors, creditors, suppliers,

customers, decision-makers, and researchers. For instance, governments should provide clear guidelines for mandatory disclosure related to COVID-19. This guideline will help reduce inconsistency in COVID-19 disclosure. With standardised guidelines on COVID-19 disclosure, both creditors and investors can assess financial positioning and performance and reduce adverse selection. Management can then also realise that COVID-19 disclosure is associated with uncertainty and consider how they can communicate COVID-19 related information to reduce uncertainty.

This paper provides evidence for the UK and specifically for FTSE All-share non-financial firms. Future research could include FTSE-Aim firms and assess whether small businesses show the same relationship between COVID-19 disclosure and uncertainty. Additionally, future research might consider different disclosure regimes, such as those of developing countries. Our CFIE tool is limited to UK annual reports. Furthermore, it would be interesting to assess the determinants and consequences of COVID-19 disclosure.

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## Appendix A

Covid#  
Virus  
Corona#  
Pandemic  
Retention  
Lockdown  
Outbreak  
Epidemic  
Disaster  
Sars-cov-2  
Social distancing  
Hand washing  
Face covering  
Face mask  
Prevention  
Closure  
Respiratory  
Safety measures  
Working from home  
Working online  
Herd Immunity  
Furlough scheme  
Redundancy  
Infectious  
Pneumonia  
Reopen  
Safe returning  
Isolation  
Quarantine

## Notes

- <sup>1</sup> CFIE is a research programme exploring accounting and financial market text using natural language processing (NLP) and corpus linguistics methods (El-Haj et al. 2019).
- <sup>2</sup> We do not report VIF test results in this section for brevity.

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