

COVID-19 EFFECTS ON THE GOING CONCERN AUDIT OPINION IN MENA REGION: TEXT MINING APPROACH

Khalil Feghali *, Joe Hallak **, Samir Moussa ***

* Department of Accounting and Audit, Faculty of Economics and Business Administration, Lebanese University, Achrafieh, Beirut, Lebanon

** Corresponding author, Doctoral School of Law and Political, Administrative and Economic Sciences, Lebanese University, Sin El Fil, Metn, Lebanon

Contact details: Doctoral School of Law and Political, Administrative and Economic Sciences, Lebanese University, Nouman Abu Sulaiman Building, Sin El Fil, Metn, Lebanon

*** Department of Management Information System (MIS), Faculty of Economics and Business Administration, Lebanese University, Achrafieh, Beirut, Lebanon



Abstract

How to cite this paper: Feghali, K., Hallak, J., & Moussa, S. (2022). COVID-19 effects on the going concern audit opinion in MENA region: Text mining approach. *Risk Governance and Control: Financial Markets & Institutions*, 12(3), 49–60.
<https://doi.org/10.22495/rgcv12i3p4>

Copyright © 2022 The Authors

This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0).
<https://creativecommons.org/licenses/by/4.0/>

ISSN Online: 2077-4303

ISSN Print: 2077-429X

Received: 21.06.2022

Accepted: 03.10.2022

JEL Classification: H12, M42

DOI: 10.22495/rgcv12i3p4

The COVID-19 pandemic has affected the economic sector, especially the audit task that requires the physical intervention of the auditor. The aim of this paper is to study the effect of COVID-19 on audit opinion in the MENA region through a novel text mining approach. The collected data included 83 bank reports from 377 branches in 14 MENA countries. The text mining approach was employed using Python software via corpus creation, tokenization, stop words removal, stemming, and feature selection. Afterwards, a univariate analysis was performed to delineate the variables that are significantly associated with COVID-19, followed by a linear regression model quantifying the relationship of the variables. The results of the text mining process led to the creation of a dictionary composed of 8000 words. After the text mining steps, 10 variables were obtained. The univariate analysis showed that 3 out of 10 extracted variables were associated with COVID-19 and a linear regression equation was accordingly generated. Our research revealed that, in the MENA region, the COVID-19 pandemic led to an increase in the audit workload and risk assessment, yielding an overall unfavorable audit opinion. Finally, the authors used similar techniques to the research of Wei, Li, Zhu, and Li (2019) and Boskou, Kirkos, and Spathis (2018).

Keywords: COVID-19, Going Concern, Opinion, Assessment, Audit, ISA, Text Mining

Authors' individual contribution: Conceptualization — K.F.; Methodology — S.M. and J.H.; Software — S.M.; Validation — S.M. and J.H.; Formal Analysis — S.M. and J.H.; Investigation — J.H. and K.F.; Resources — K.F.; Data Curation — J.H., K.F., and S.M.; Writing — Original Draft — J.H., K.F., and S.M.; Writing — Review & Editing — S.M. and K.F.; Supervision — K.F.; Visualization — S.M.; Project Administration — K.F.

Declaration of conflicting interests: The Authors declare that there is no conflict of interest.

Acknowledgements: The Authors would like to show their gratitude to Dr. Anis Hoayek, Associate Professor at "Ecole des Mines of Saint Etienne", France, for his technical assistance and comments that greatly improved this paper.

1. INTRODUCTION

The global COVID-19 pandemic the whole world experienced since 2019 and started officially in China have changed people's life and behavior and continues to exert pressure on different sectors. This pandemic has had an effect on the economy in different sectors including banking. The audit is one of the sectors that has been challenged for decades with a series of issues and polemics (Cordoş & Fülöp, 2015). Those problems created the need to continue working on reforming the work processes to express auditors' opinions in their annual reports. Due to the previous multiple crises and to date many international academics, professionals, and practitioners have been concerned and expressed their insights and perspectives (Persakis & Iatridis, 2015). Hopwood (2009) discussed the implications caused by the finance professionals' failure to identify and assess risks related to the banking industry which was one of the major causes that led to the global financial crisis in 2007 in the United States. Also, De Ruijter, Beetsma, Burgoon, Nicoli, and Vandenbroucke (2020) have explained and elaborated on some ideas related to the companies' and banks' protection during the crisis and included also some other topics like the national budgets and sovereign debt (Nemec & Špaček, 2020).

In this study, we will examine the effect of the COVID-19 pandemic on the auditors to issue a going concern opinion within their annual audit report related to the bank sector in the Middle East and North Africa region — "MENA". Usually, a going concern modification involves the auditor judgment auditor in assessing and evaluating any substantial doubt, and also the threshold of evidence sufficiency to express such changes (Levitan & Knoblett, 1985). Previous research showed that auditors who face unstable events or during financial crises have a higher potential of issuing a going concern opinion (Butler, 2004; Herbohn & Ragunathan, 2008). In addition, other research indicates that in the last decade there was an increase in the number of going concern reports issued by the auditors (Carson et al., 2013). We do believe the current pandemic that's affecting the world might have an impact similar to the previous crisis which leads us to conduct the current research. We will rely on the results of the previous studies and try to use a new methodology that would help us in assessing whether the COVID-19 pandemic had the same effects on the going concern issuance in the auditors' reports. This topic became more interesting as already demonstrated by multiple pieces of research and studies in this field (Gold & Heilmann, 2019). The above observations opened the door to the below research question, which, in the authors' opinion, is intriguing and worth going into deeper studies:

RQ: How did the COVID-19 pandemic affect the going concern audit opinion and auditors' assessment of the MENA region banking sector?

The choice of the MENA region proceeds from the literature review we performed prior to initiating this work. The effect of COVID-19 on the audit work was largely analyzed in the United States (Harjoto & Laksmana, 2022), Europe (Pozzoli, Pagani, & Paolone, 2022), Australia (Kend & Nguyen, 2022), and New Zealand (Hay, Shires, & Van Dyk, 2021). However, there was a significant knowledge

gap regarding the effect of COVID-19 on the audit sector in the MENA region, and therefore we focused our empirical analysis on the MENA region.

The reason for using the text mining approach in our study is that such a technique has been limited to only a few studies done over the last ten years when it comes to the audit and accounting fields. Some of the research was the application of text mining for big analysis in the financial sector (Pejić Bach, Krstić, Seljan, & Turulja, 2019) and another study that also evaluated some internal audit aspects using the same technique (Boskou, Kirkos, & Spathis, 2018; Feghali & Hallak, 2019). In addition, Pan, Yang, Zhou, and Kong (2020) have tested the impact of the coronavirus on the agricultural economy in China. Finally, Wei, Li, Zhu, and Li (2019) have also used the text mining method to discover the bank risk factors.

Our work complements the above-mentioned research by bringing a new approach related to audit activity in bank sectors and evaluating the latest pandemic effects and their influence on the auditor's going concern. This study highlights the importance of using text mining not only for research purposes only but also for helping the auditors and banks to reassess and review many of the operational and strategic decisions.

The remainder of this paper is structured as follows. In Section 2, we will perform a directed literature review for the going concern concept and the audit opinion to formulate the research problem. We will then elaborate through an empirical analysis on hypotheses that will test the relation between the going concern variables and COVID-19. Thereafter, in Section 3, we will describe the methods by explaining the data collection and analysis processes that were performed on the extracted bank reports from the MENA region. In Section 4, we will perform a statistical analysis to validate the hypotheses and discuss the results from different perspectives. Finally, Section 5 will conclude the paper.

2. LITERATURE REVIEW AND THEORETICAL BACKGROUND

2.1. Basic relationship between going concern assumption and the audit mission

One of the effects of the "novel COVID-19 pandemic" was the increase in different risk management areas in addition to the uncertainty resulting from this pandemic. The auditors and many international boards like the International Accounting Standards Board (IASB) start revisiting their standards and their work processes in order to reduce the potential effects on the companies' and banks' operations as well as their financial performances. One of the many important topics that needed to be revisited was the ISA 570 *Going Concern*. The auditing standard ISA 570 is the norm that deals with the auditor's role and responsibility in reporting their concerns after executing their financial statements audit missions.

The new and revised standard proposes several changes. This standard was recently revised by the IASB in 2013 to bring more clarity and accuracy to the information provided to the public via audit reports (Chen et al., 2013). The Public Company Accounting Oversight Board (PCAOB) has shown

clearly its concern related to the basics of the ongoing concern assumptions used in the preparation of the audit reports. After the global financial crisis in 2008, the PCAOB revisited the audit practices related to the going concern audit opinions and issued many new documents (Geiger, Raghunandan, & Riccardi, 2014). ISA 570 stipulates that: “the assumption of the going concern should be based on the idea of business continuity of an enterprise at least for the foreseeable future, therefore the high management will be required to prepare their financials respecting the basics of the going concern. One exception to the above note is the existence of any intention by the company to discontinue their operations” (as cited in Socol, 2010, p. 293).

In addition to the above, the standard explains that an auditor must evaluate and assess the accuracy and appropriateness of the application of the going concern by the management when they prepare their financial statements. After that, the auditors must provide a conclusion about the going concern status of their clients (Fakhfakh, 2015). Normally, for an auditor to issue a going concern opinion he should rely on two factors: the recognition and the decision (Osman, Turmin, Muhamad, & Hussain, 2016). For the first part, the auditor will execute his/her audit activities to make sure the going concern assumptions could be applied to a particular entity. For the second part, the auditor should be able to make his/her decision related to the accuracy of this assumption (Nogler & Jang, 2012).

2.2. Previous studies on the going concern concept and audit opinion

The global financial crisis and the related failures that affected the corporations' and auditors' work processes, opened the windows for research to ask, “Where were the auditors?” (Sikka, 2009). Following the scandals of Enron and Andersen, the auditor perceptions of potential litigation risks have changed due to failure to issue a going concern opinion to their clients. Therefore, auditors today are more aware of any risk related to any legal liability, or reputation costs before issuing any going concern opinion (Myers, Schmidt, & Wilkins, 2014).

During the current COVID-19 pandemic, many authorities around the globe have initiated new strategies and measures to limit potential negative impacts (Allain-Dupré, Chatry, Michalun, & Moisiso, 2020). If we look at the major economic sectors, we notice there was a material business disruption in the whole environment. Today many banks started to closely supervise and monitor their portfolio and revisit their internal strategies and performance as well. Even big companies have created business continuity plans such as remote working and allowing their staff to work from home.

Prior studies found a going concern opinion is usually issued after the auditor's inspection work is achieved (Bruynseels, Knechel, & Willekens, 2013; Gramling, Krishnan, & Zhang, 2011). In addition, further researchers mentioned that the percentage of going concern reports issuance by the auditors increased in the last years (Carson et al., 2013). Other researchers discovered an important link between the structure of the entity's financials and

the going concern (Behn, Kaplan, & Krumwiede, 2001; Parker, Peters, & Turetsky, 2005). Also, Knechel and Vanstraelen (2007) proved that the length of the auditor-client relationship is negatively associated with the independence and competence factors of auditors which decrease the possibility of a going concern opinion issuance. Lately, some studies identified a relation between a weak internal control system and uncertainty in the accruals estimated by the high management. Such uncertainties would normally lead to a misstatement in the financial statements (Ashbaugh-Skaife, Collins, Kinney, & LaFond, 2008). Those decisions made by the management and directors can't always be verified during an audit process and anticipate their occurrence or their future impact and results (Francis & Krishnan, 1999). In addition, Levy (2020) recommended that due to the pandemic risks the auditors should virtually recheck on every issuance of the financial statements all the estimates brought forward from previous periods in the disclosure provisions of Accounting Standards Codification. Moreover, Baskan (2020) proposed that the effects of the pandemic may be included in the auditor's reports in compliance with the International Standards on Auditing related to the going concern (ISA 570). Also, Đorđević and Đukić (2021) have pointed out in their paper that the auditors should enhance the consideration level in assessing the going concern, to be able to face the new limitations caused by COVID-19.

Previous literature mentioned that litigation exposure has an important influence on the audit going concern reports, such as the analytical model created by Barnes (2004) that allows the prediction of an auditor behavior. Similarly, Tucker, Matsumura, and Subramanyam (2003) explained that any type of influence on the auditors like facing penalties, for example, will affect their behavior and then will impact their opinions in their audit report to the management. Finally, Blay (2005) has confirmed that any increase in audit risk, when it comes to mission and work processes, will affect the auditors' opinions and will increase the likelihood of suggesting modifications to their final audit reports.

2.3. Going concern and opinion framework during COVID-19 and research hypothesis development

COVID-19 has spread globally throughout all countries and regions of the world causing big changes in business activities and losses in the economy. Such a phenomenon creates many uncertainties and risks in the local and international economic environment. During a risk assessment process, the auditor should identify whether the upper management has already performed a business and operations continuity that is consistent with the going concern principle. That means the auditor needs to assure that all the events have been considered. The auditor must identify the availability of all relevant information.

During their assessment, the auditors should verify the management risk evaluation methods related to the continuity of the business operations (Dohrer, 2020). A draft was documented and published by the International Auditing and Assurance Standards Board (IAASB) related to the auditing standards entitled “Summary of COVID-19 Audit

Consideration” (Arnold, 2020). Another publication, by the Financial Reporting Council (FRC) entitled “Guidelines for Auditors and Issues to Consider in Engagements Influenced by COVID-19” (Barbour, 2020). Some of the recommendations that have been announced by both bodies’ documents are summarized in Appendix (Table A.1). In order to create some criteria for the hypothesis development below, we have checked additional requirements that were mentioned for the auditor’s work processes in relation with COVID-19 (FRC, 2020):

- the need for an audit risk assessment;
- sufficiency of audit evidence gathering and plan audit approach modification;
- the way of checking and testing the auditor’s work;
- reliability of the information included in the management’s disclosure of the impact of COVID-19 and the uncertainty level associated with the enterprise’s operations;
- reassess the initial audit key aspects in response to fast or dramatic changes in any situation.

Based on the above recommendations and enhancement of the international auditing standards provided by the professional bodies and the previous studies mentioned above because of the pandemic, the research hypotheses are announced below:

H1: There is a relationship between the uncertainty level in the audit opinion and COVID-19.

H2: There is a positive relationship between the pandemic and the increase in the need for risk assessment.

3. METHODOLOGY

A text mining method consists of extracting meaningful patterns from unstructured textual data to gain insight into knowledge. Text mining technique is a very useful process used to help in many areas and fields like fraud detection, product analysis, or even decision-making. Trying to extract

valuable information from a variety of documents could be laborious and time-consuming. Therefore, choosing the right technique to execute the text mining will help reduce the time and effort of finding the relevant data (Talib, Hanif, Ayesha, & Fatima, 2016). To mention that there exist many types of text mining approaches like document clustering and information retrieval and, finally, the text summarization that was used in this research and explained in detail in the subsections below.

3.1. Data collection

The data collection process is featured in Figure 1. Since the spread of COVID-19 started in March 2020, the external audit reports for the 2020 year were included. We adopted the United Nations High Commissioner for Refugees (UNHCR) definition of the MENA regions (Van Wass, 2010) which lists a total of 18 countries. Among those, 2 countries have prohibited online access to financial institutions and 2 others require user authentication prior to access, and thus cannot be included in the present study. The website of the national banks of the remaining 14 MENA countries was accessed and the list of banks from each country was then retrieved. The list included 377 active banks. Thereafter, we searched for the publicly available external audit reports for each bank.

We were able to obtain 97 published reports from the variant active banks.

After the filtering process, the list has been reduced to 83 bank reports represented in Table 1. The below criteria were considered for the items excluded:

- banks didn’t publish at the time their reports for 2020;
- banks published consolidated reports for the whole region (those types of banks were considered once to avoid duplication);
- banks published their reports in French or Arabic.

Figure 1. Flow chart of the data selection process

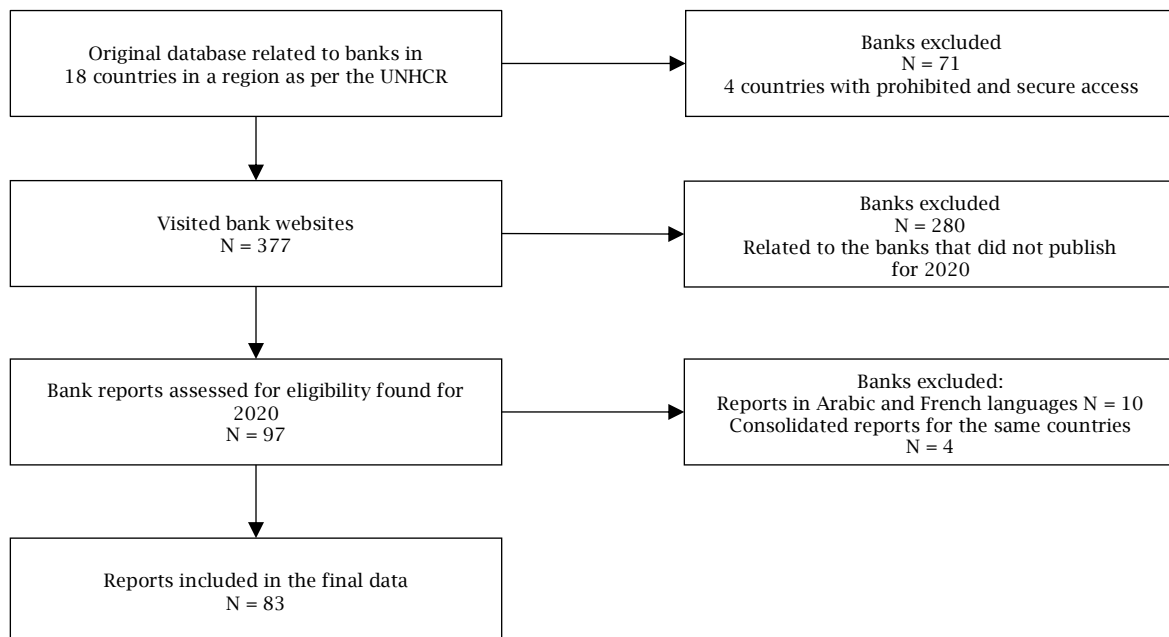


Table 1. List of banks by region and country

Countries by region	Total of visited banks	Financial statements for the year 2020 as per banks' websites	Excluded financial statements for the year 2020 in French and Arabic	Financial statements excluded (consolidated in one country)	Total financial statements used
<i>North Africa countries</i>					
Tunisia	23	2	2		0
Algeria	19	5	3		2
Morocco	20	2	2		0
Lybia	17	3	2		1
Egypt	43	7		1	6
<i>Gulf countries</i>					
Kuwait	17	8		1	7
Bahrain	50	15		1	14
Oman	14	7			7
The KSA	35	14			14
The UAE	30	19		1	18
<i>Mashreq countries</i>					
Jordan	21	8			8
Lebanon	45	4			4
Syria	8	1	1		0
Iraq	35	2			2
Total	377	97	10	4	83

3.2. Text mining preprocessing techniques

In this subsection, we will present a description of the text mining preprocessing techniques used for the assessment of the impact of the pandemic on the going concern audit opinion. We analyzed the textual parts referring to the going concern and the COVID-19 impact, which are found in the annual reports of around 83 banks in the MENA region. An aggregated measure of chosen criteria served as a proxy of the quality of going concern audit opinion (from the theory of going concern — ISA 570). Vijayarani, Ilamathi, and Nithya (2015) mentioned that the scraping model technique could be used to create the term-document matrix (the corpus), related to the term frequency and inverse document frequency (TF-IDF) values for the selected terms (the independent variables). We used those terms as predictors for the evaluation of the going concern audit opinion.

In summary, the 5 steps of text mining as defined below:

1. *Corpus creation* (identify the data and the documents).

2. *Tokenization*: This process helped to identify the necessary terms by breaking up a series of strings into parts such as words, keywords, sentences, and symbols. Those elements are called "tokens".

3. *Rare and stop words removals*: Unnecessary words were eliminated in this step. Rare words are the ones that present less than 3% or more than 50% in the list. Stop words are any words in a stop list that are excluded from the processing of natural language text.

4. *Stemming*: Consists in eliminating similar words, adverbs, adjectives, etc.

5. *Feature selection*: Applying the frequency of occurrences technique and then starting the regression analysis.

3.3. Text mining approach and corpus creation algorithm

The purpose of the research is to create a library to be used as a base for the strategic decision-making process to find the correlation between COVID-19 and the going concern audit opinion. A conceptual

approach has been chosen to gather the most common words used related to COVID-19. However, there are other alternative methods that would be suitable for conducting this research. For example, the data mining technique which in our case consists of using the financial statements ratios and processing it using specific software to data models and test them as well. Artificial intelligence (AI) techniques represent another approach that could be used. This technique consists of simulating human intelligence processes by robots or computers, such as decision-making and natural language processing.

This paragraph presents the methodology and the design used in the research, elaborates upon the rationale for the appropriateness of the research method, and includes a discussion regarding the reasoning behind adopting the text mining method. The results of the study will provide helpful information regarding the targeted correlation.

After finalizing the scrapping method described in the research method below, the researchers were able to create the corpus by identifying the data and documents related to this research. This corpus is represented by a dictionary extracted from around 50 previous studies related to the field of the going concern and the pandemic's impact on audit opinion.

The use of the scraping method is to allow the data to be parsed and reformed into a suitable format for searching. After this transformation, the user is able to navigate and select the useful and needed data. This process allows the researchers to automate the search for any utilized data.

The code used was to extract specific words that are related to COVID-19 and accounting and started by importing the needed library such as:

```
# import collections
# import re
```

The above codes were meant to pull up the library needed to fetch the data and compare it with the relevant words. After the import, the researchers needed to specify the pattern to collect the same information and disregard the unwanted data.

To separate and collect the AD_HOC words, we have imported two main libraries into Python to match all words and avoid neglecting relevant words. The collection library is essential to apply the methodology of storing and structuring data.

The NoSQL database used in Python is more flexible than relational databases and the data storage is mainly designed to optimize our requirements. The pattern was also crucial to separate the relevant words from the irrelevant words. We have also eliminated all words with letter count less than 4 letters as they will be irrelevant to our research. The code used for collecting relevant words according to useful pattern is depicted below:

```
# pattern = r'\w+'
# pattern = r'\*****'
# w = r'\5'
# pattern = r'(\s*([A-Za-z]{4,}))'
```

At the top of the above steps, the researchers needed to find the shortest and the length of the words in order to eliminate the non-relevant data to the topic. The following code was used:

```
# def findShortest(lst):
#     length = len(lst)
#     short = len(lst[5])
#     ret = 0
#     for x in range(1, length):
#         if len(lst[x]) < short:
#             short = lst[x]
#             ret = x
```

In order to count the occurrence in the file, the researchers have used:

```
# import nltk
# from nltk import word_tokenize
```

The key indicators and relevant factors were collected from the reports written by auditors who have experienced the issues caused by COVID-19. Those factors were identified by their reports. We have collected those factors and correlated them to COVID-19 to clarify their impact on operations and procedures used to solve the issues caused by the pandemic. After applying the above-described methods the corpus created was a dictionary.

Appropriateness of research design

When it comes to mining, the use of Python was appropriate due to its wide range of tools that allow you to reach your target. It is open-source and has international concerns on the table. The modules available allowed the researcher to use them in validating lots of websites and using regular expressions to arrange needed and various strings in the information data.

3.4. Statistical analysis

3.4.1. Definition of the variables

The first step in creating the research model was choosing and testing the variables that should be

selected to test the relations and the study hypotheses as well. In order to manually evaluate the going concern and audit opinion and their relationship with COVID-19, we defined ten criteria. Table 2 below represents a definition of every used variable from an audit angle and helps reorient our analysis later in the discussion section.

Table 2. Variable’s definitions

Variables	Definition
Assessment	Representing the procedures that the auditors should follow to obtain an understanding while executing their mission.
Audit	It’s an inspection process of a bank or a company performed by an independent body.
Concern	The going concern concept is an accounting principle that defines the ability of a company to continue its operations in the future.
Opinion	It represents an auditor’s statement on the financial statements because of his/her mission.
Report	Represent a document that states the auditor’s opinion related to the financial statements.
Risk	The audit risk represents the inappropriate opinion in case of any risk detected or misstatement in the accounting methods or in the financial statements.
Uncertainty	Related to the estimates and provisions that are based on uncontrollable events and that could influence the financial transaction of a company.
Impact	Represent the influence of the audit mission and processes on the future performance of a company.
COVID-19	In this research, it represents the dependent factor model for which we will measure the influence on the other independent factors listed above.

Using those keywords, we have calculated the frequencies of occurrences of the words by the bank using the last matching dictionary we have got as described in the above-mentioned technique (subsection 3.3). The methodology that the authors applied consisted of changing each unique word in the matching dictionary to a discrete numerical variable whose values are the number of occurrences of the word in each of the 83 reports, which helped us quantify the data for our statistical analysis. The words that have been selected as a result are represented in Table 3.

Table 3. Variable’s selection technique by frequency of occurrences

Variable	Total count	N	N*	Mean SE	Mean	St. dev.	Sum	Min.	Q1 median	Q3 maximum		
Assessment	83	81	2	15.111	0.945	8.506	1224.00	1.000	9.000	15.000	21.00	38.00
Audit	83	74	9	37.55	2.44	20.96	2779.00	1.00	23.00	40.00	49.25	107.00
Concern	83	67	16	7.284	0.393	3.214	488.000	1.000	6.000	6.000	10.000	20.000
Opinion	83	74	9	11.824	0.585	5.035	875.000	1.000	11.000	13.000	14.000	27.000
Report	83	82	1	20.83	1.45	13.15	1708.00	1.00	9.00	22.00	28.25	67.00
Risk	83	77	6	72.65	8.38	73.56	5594.00	4.00	29.00	46.00	90.50	404.00
Uncertainty	83	74	9	5.297	0.381	3.276	392.00	1.000	2.000	4.500	8.000	15.000
COVID-19	83	76	7	13.86	1.25	10.87	1053.00	1.00	6.00	12.00	19.00	75.00
Impact	83	83	0	14.07	1.02	9.31	1168.00	0.00	7.00	11.00	21.00	39.00

3.4.2. Definition of the statistical approach

We have run the regression analysis combining the variables together to try to identify whether the results represent any relation or influence. The factors that passed the screening with a p less than 0.05 were COVID-19 as an input factor, assessment opinion and risk as outputs.

$$y = b_0 + b_1x_1 + b_2x_2 + \dots + b_kx_n + \varepsilon_t \tag{1}$$

where,

- y is the dependent factor in the model;
- b_0 is the constant;
- $b_1, b_2 \dots b_k$ are the coefficients;
- $x_1, x_2 \dots x_n$ are the assigned values for each term;
- ε_t represents the residual model error.

We have used Minitab software to help us reduce the samples and only keep the variables that accurately represent the research model as well as the relation between the outputs and inputs factors.

A significance level of 95% was considered, yielding an alpha value of 0.05. The R-square (R^2) and variance inflation factor (VIF) were also evaluated.

4. RESULTS AND DISCUSSIONS

4.1. Text mining results

After applying the text mining approach via the scrapping method and tokenization coding presented and explained in the methodology, we created the matching dictionary composed of 8000 words. We have also run a routine using Python to basically filter the dictionary by using the rare and stop words removal technique which

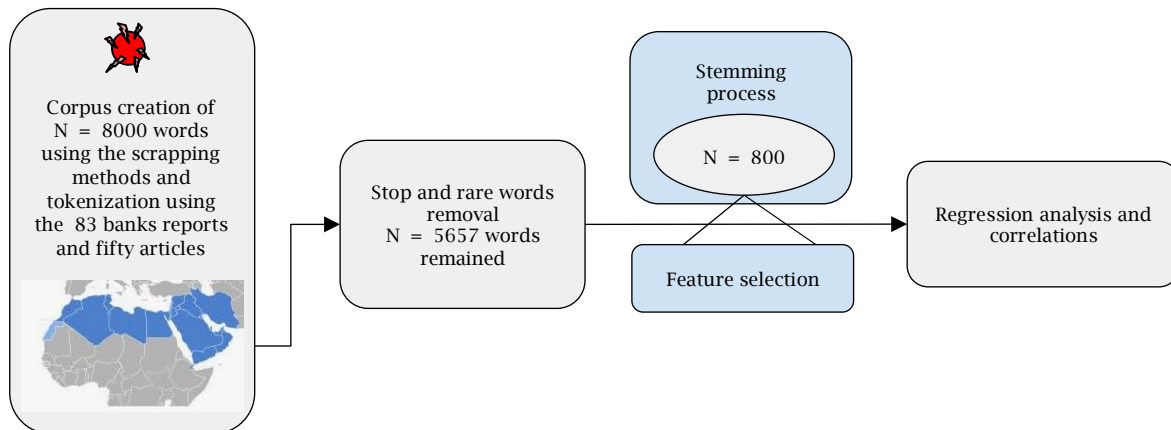
Linear regression is used to predict the value of a dependent variable based on the value of an independent variable. In the current case, the dependent variable is COVID-19 as defined in the table. The independent variables are listed in Table 2. The linear regression equation can be written as follows:

consists of eliminating unnecessary words. Those words usually do not add much information to the text like “the”, “a”, or “an”.

After this step, the dictionary was reduced to 5657 words. The next task was to use the stemming process which: consists in eliminating similar words adverbs, and adjectives (e.g., audit, auditing, auditor, etc.) which led us to eliminate 4855 words and reduced the library to only 800 words. Finally, in an attempt to reduce the large size of the remaining data we have performed the feature selection processing. This technique consists of using the criteria chosen by the author and applying them to the dictionary by executing the frequency of occurrences of the selected words.

The final results were 10 words which helped us later test and identify the existence of any possible relation between the selected words. The results have also helped us exclude some variables from the study before proceeding to the stage of creating the final regression model that was used to test the research hypotheses. The preprocessing steps results are presented in Figure 2.

Figure 2. Text mining techniques preprocessing steps results



4.2. Correlation results

In this section, we will present the results obtained after we have executed multiple statistical tests between the selected variables. The analysis was based on multiple statistical coefficients that helped us interpret the final outputs of this research. We have run the regression analysis combining the variables together to try to identify whether the results represent any relation or influence. The factors that passed the screening with a p less than 0.05 were COVID-19 as an input factor, assessment opinion and risk as outputs. We could

identify a linear relationship between the factors COVID-19 and opinion, assessment, and risk as output values which allow us to create the below linear regression equation. The final equation that was obtained is presented below:

$$COVID_{19} = 13.93 - 0.662 Opinion + 0.376 Assessment + 0.0623 Risk \tag{2}$$

The scatterplot between the COVID-19 (response) and the opinion and assessment variables shows a strong positive and linear relationship between those factors (Figure 3). Therefore,

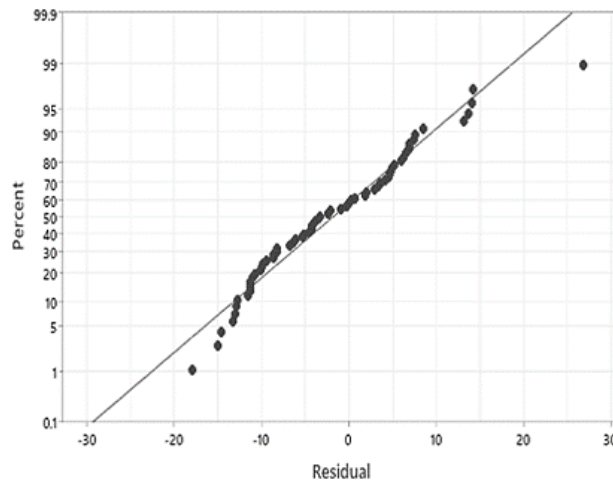
the COVID-19 variable has been a good predictor in this model. Also, in Figure 4, many of the points appear to be randomly distributed around the zero level. No clusters of points were identified in Figure 4 that would represent different groups in the data.

In addition, below is the table that shows the *p*-values for each variable as described above. The VIF measures the inflation level of each coefficient that is caused by the correlations among

the factors of the regression equation. Usually, a value between 1 and 5 indicates a moderate correlation which is statistically acceptable (Table 4).

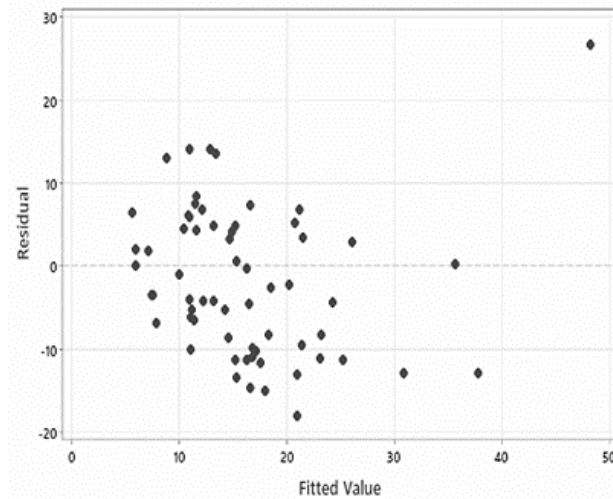
Finally, we calculated R^2 to indicate the percentage of variation in the response which is explained by the model. In other terms the adequacy of the chosen model which fits the data. A value of 49.54% (almost 50%) was obtained which shows clearly the promising results of the model (Table 5).

Figure 3. Linear regression equation graph



Note: This figure represents the linear relation between the going concern variables in the equation (2) and the COVID-19 output. The residuals appear to follow a straight line. There is no evidence of outliers or unidentified variables.

Figure 4. Residual versus fits graph



Note: This figure represents the residual elements of the model versus the fitted point that are randomly distributed and have constant variance.

Table 4. P-value and VIF coefficients

Team	Coefficient SE	Coefficient	T-value	P-value	VIF
Constant	13.93	4.86	2.87	0.006	
Opinion	-0.662	0.332	-2.00	0.051	1.09
Assessment	0.376	0.167	2.25	0.029	1.68
Risk	0.0623	0.0183	3.41	0.001	1.69

Table 5. Model summary

S	R-square	Adj. R-square	Pred. R-square
8.51865	49.54%	46.52%	15.34%

4.3. Discussion

The preliminary results of our text mining approach applied to the MENA region align with our proposed hypothesis that there is a relationship between the audit opinion uncertainty level and COVID-19 and another positive relationship between the pandemic and the increase in the need for risk assessment. The obtained equation (2) suggests a moderate ($XXX = 0.376$) increase in the workload needed for audit assessment, which engendered a minimal but significant risk increase ($XXX = 0.0623$) during the COVID-19 pandemic. Moreover, the advent of COVID-19 resulted in unfavorable opinion ($XXX = -0.662$), the results of which can negatively impact business continuity.

The univariate analysis showed that COVID-19 was associated with 3 out of the 10 extracted variables. A linear regression model was generated after elaboration and assessing all the selected factors analytically and visually.

The first hypothesis was proposed to test the influence of the pandemic on the audit opinion uncertainty level. The above results showed a possible relationship between both factors (COVID-19 and opinion). The negative sign in the equation (2) shows an effect of the auditor's opinion which means the pandemic has probably had some influence and created more worries and uncertainty when it comes to obtaining an auditors insurance related to the continuity of the bank's activities within the current situation.

Similarly, the second hypothesis tested the influence of the coronavirus on the assessment and risk when it comes to auditors executing their missions and following their normal work processes. Again, based on the regression equation (2), we identified a possible relation between COVID-19 and the risk and assessment. The positive sign in the equation (2) highlights the increase in the need of restructuring the work assessment of the auditors when executing their missions to be able to identify the increase in the audit risk that the pandemic might have caused.

Compared to the previously published papers, our results discussed above were similar to Pozzoli et al.'s (2022) in Europe; they found that the pandemic had a direct influence on the audit committee tenure associated with the company's performances. Same for the results obtained by Kend and Nguyen (2022) in Australia where they noticed a difference in the auditor's opinion words used in 2020 compared to the prior year. Also, Harjoto and Laksmana (2022) have confirmed that the lockdown and the public health restrictions have increased the audit delays for United States firms, specifically. Also, Hay et al. (2021) expected that after the pandemic a reform to the auditing work and assessment should take place in New Zealand's market.

In addition, other studies have also shown an impact of the pandemic on many of the finance and audit topics such as the desk study method which was meant to explore the possible impact of the COVID-19 crisis on five key considerations for audit quality during the pandemic (Albitar, Gerged, Kikhia, & Hussainey, 2020). Zeren and Hizarci (2020)

have also found an influence of the pandemic on the stock markets. Furthermore, Simamora and Hendarjatno (2019) have tested the effect of client tenure and audit lag, and another liquidity ratio on the going concern audit opinion. Also, we found other studies that have tested the influence of changes in agency costs and their impact on the auditors' concerns (Ismail, Mahmood, & Hussein, 2021).

In contrary with the findings, some authors find that a financial crisis has no impact on the association between audit quality and audit fee stickiness (Salehi, Komeili, & Daemi Gah, 2019). Moreover, Fahlenbrach, Rageth, and Stulz (2021) have mentioned in their study which is related to the influence of the virus on the stock markets that firms with higher stability in terms of their financial performance should be less affected by the COVID-19 crisis than less stable enterprises.

5. CONCLUSION

This manuscript aims to study the influence of the novel coronavirus on the audit going concern opinion and the auditor's work assessment. We have tested 83 bank reports from 377 active banks in the MENA region using text mining methods. As a result of applying the text mining approach, we created the preliminary matching dictionary composed of 8000 words and we applied the preprocessing steps to clean and filter the unnecessary words as explained in our methodology. Finally, we proceed to our univariate and regression analysis.

Our findings and regression analysis results have demonstrated the impact of the COVID-19 variable on the three assigned factors (opinion, risk, and assessment). Also, the results have shown a negative relationship between the pandemic and the audit opinion uncertainty level ($H1$) which led us to conclude that the going concern opinion in an audit report could be negatively affected by all the events that occurred post the pandemic. Moreover, the study results showed that the auditors' risk and work assessment has also been influenced by COVID-19 as well ($H2$). This influence is confirmed in the IAASB and FRC new publications related to the COVID-19 audit consideration as mentioned in the literature review section.

The main limitation of this work was the usage of Excel functions in removing the stop and rare words from the dictionary as well as the stemming process. We believe with future technologies those techniques could be achieved faster and also could include more space for more data which allow us to add more regions selected in this paper. Some bank reports were published in Arabic and French languages and, therefore, have been excluded from the analysis.

With the current advancement of technology, and especially the latest AI and machine learning techniques, future efforts will likely remodel some new paths to test new possible relations and links between multiple areas that could affect the audit activities as well as the auditors' work in banks or different business sectors and related economies. Finally, the next step would be a recommendation

to integrate and use the latest technologies and methods by the IASB and other organizations in the auditor's daily work. This would help to streamline the application of the international audit

standards and assist the auditors in their work processes and evaluations in providing an accurate going concern opinion, especially during pandemics and financial crises.

REFERENCES

- Albitar, K., Gerged, A. M., Kikhia, H., & Hussainey, K. (2020). Auditing in times of social distancing: The effect of COVID-19 on auditing quality. *International Journal of Accounting & Information Management*, 29(1), 169–178. <https://doi.org/10.1108/IJAIM-08-2020-0128>
- Allain-Dupré, D., Chatry, I., Michalun, V., & Moisis, A. (2020). *The territorial impact of COVID-19: Managing the crisis across levels of government* (OECD policy responses to coronavirus COVID-19). Retrieved from <https://www.oecd.org/coronavirus/policy-responses/the-territorial-impact-of-covid-19-managing-the-crisis-across-levels-of-government-d3e314e1/>
- Arnold, C. (2020, June 3). *Summary of Covid-19 audit considerations*. International Federation of Accountants. Retrieved from <https://www.ifac.org/knowledge-gateway/supporting-international-standards/discussion/summary-covid-19-audit-considerations>
- Ashbaugh-Skaife, H., Collins, D. W., Kinney, W. R., Jr., & LaFond, R. (2008). The effect of SOX internal control deficiencies and their remediation on accrual quality. *The Accounting Review*, 83(1), 217–250. <https://doi.org/10.2308/accr.2008.83.1.217>
- Barbour, J. (2020, April 2). FRC issues Bulletin: Guidance for auditors and matters to consider where engagements are affected by coronavirus (COVID-19). ICAS. Retrieved from <https://cutt.ly/MV7Xpz1>
- Barnes, P. (2004). The auditor's going concern decision and Types I and II errors: The Coase Theorem, transaction costs, bargaining power and attempts to mislead. *Journal of Accounting and Public Policy*, 23(6), 415–440. <https://doi.org/10.1016/j.jaccpubpol.2004.10.003>
- Baskan, T. D. (2020). Analyzing the going concern uncertainty during the period of COVID-19 pandemic in terms of independent auditor's reports. *ISPEC International Journal of Social Sciences & Humanities*, 4(2), 28–42. <https://doi.org/10.46291/ISPECIJSSHvol4iss2pp28-42>
- Behn, B. K., Kaplan, S. E., & Krumwiede, K. R. (2001). Further evidence on the auditor's going-concern report: The influence of management plans. *AUDITING: A Journal of Practice & Theory*, 20(1), 13–28. <https://doi.org/10.2308/aud.2001.20.1.13>
- Blay, A. D. (2005). Independence threats, litigation risk, and the auditor's decision process. *Contemporary Accounting Research*, 22(4), 759–789. <https://doi.org/10.1506/5FQ9-ANEA-T8J0-U6GY>
- Boskou, G., Kirkos, E., & Spathis, C. (2018). Assessing internal audit with text mining. *Journal of Information & Knowledge Management*, 17(2), 1850020. <https://doi.org/10.1142/S021964921850020X>
- Bruynseels, L., Knechel, W. R., & Willekens, M. (2013). Turnaround initiatives and auditors' going-concern judgment: Memory for audit evidence. *AUDITING: A Journal of Practice & Theory*, 32(3), 105–121. <https://doi.org/10.2308/ajpt-10346>
- Butler, T. (2004). Learning from Rowan ward — Developing an audit tool to improve the systems and processes for quality of care and safety of service users. *The Journal of Adult Protection*, 6(4), 22–26. <https://doi.org/10.1108/14668203200400024>
- Carson, E., Fargher, N. L., Geiger, M. A., Lennox, C. S., Raghunandan, K., & Willekens, M. (2013). Audit reporting for going-concern uncertainty: A research synthesis. *AUDITING: A Journal of Practice & Theory*, 32(Supplement 1), 353–384. <https://doi.org/10.2308/ajpt-50324>
- Chen, L., Jones, K. L., Lisic, L. L., Michas, P., Pawlewicz, R., & Pevzner, M. B. (2013). Comments by the Auditing Standards Committee of the Auditing Section of the American Accounting Association on the IAASB Proposal: Improving the auditor's report: Participating committee members and other contributors. *Current Issues in Auditing*, 7(1), C11–C20. <https://doi.org/10.2308/ciia-50336>
- Cordoş, G. S., & Fülöp, M. T. (2015). Understanding audit reporting changes: Introduction of Key Audit Matters. *Accounting & Management Information Systems/Contabilitate si Informatica de Gestione*, 14(1), 128–152. Retrieved from http://online-cig.ase.ro/RePEc/ami/articles/14_1_6.pdf
- De Ruijter, A., Beetsma, R., Burgoon, B., Nicoli, F., & Vandenbroucke, F. (2020). EU solidarity in fighting COVID-19: State of play, obstacles, citizens' attitudes, and ways forward. In A. Bénassy-Quéré & B. W. di Mauro (Eds.), *Europe in the time of COVID-19* (pp. 21–28). CEPR Press. Retrieved from <https://cepr.org/publications/books-and-reports/europe-time-covid-19>
- Dohrer, B. (2020, March 26). How auditors can test inventory without a site visit. *Journal of Accountancy*. Retrieved from <https://www.journalofaccountancy.com/news/2020/mar/auditing-how-to-observe-inventory-during-coronavirus-pandemic.html>
- Đorđević, M., & Đukić, T. (2021). Auditors' responsibility in assessing going concern assumption affected by COVID-19. *Economic Themes*, 59(1), 77–93. <https://doi.org/10.2478/ethemes-2021-0005>
- Fahlenbrach, R., Rageth, K., & Stulz, R. M. (2021). How valuable is financial flexibility when revenue stops? Evidence from the COVID-19 crisis. *The Review of Financial Studies*, 34(11), 5474–5521. <https://doi.org/10.1093/rfs/hhaa134>
- Fakhfakh, M. (2015). Legibilidad de la ilustración internacional de los informes de auditoría: una reflexión avanzada sobre el compromiso entre los principios normativos y los requisitos lingüísticos [The readability of international illustration of auditor's report: An advanced reflection on the compromise between normative principles and linguistic requirements]. *Journal of Economics, Finance and Administrative Science*, 20(38), 21–29. <https://doi.org/10.1016/j.jefas.2015.02.001>
- Feghali, K., & Hallak, J. (2019). International internal audit standards (IIA) and the geographical location of international groups: An application to the information technology sector. *Risk Governance and Control: Financial Markets & Institutions*, 9(3), 32–45. <https://doi.org/10.22495/rgcv9i3p3>

22. Financial Reporting Council (FRC). (2020). *Going concern, risk and viability: COVID-19 and reporting in times of uncertainty — A look forward*. Retrieved from <https://www.frc.org.uk/getattachment/1778c4a6-bb89-45f7-8de5-e4737545a98d/COVID-19-Going-concern,-risk-and-viability-a-look-forward.pdf>
23. Francis, J. R., & Krishnan, J. (1999). Accounting accruals and auditor reporting conservatism. *Contemporary Accounting Research*, 16(1), 135–165. <https://doi.org/10.1111/j.1911-3846.1999.tb00577.x>
24. Geiger, M. A., Raghunandan, K., & Riccardi, W. (2014). The global financial crisis: U.S. bankruptcies and going-concern audit opinions. *Accounting Horizons*, 28(1), 59–75. <https://doi.org/10.2308/acch-50659>
25. Gold, A., & Heilmann, M. (2019). The consequences of disclosing key audit matters (KAMs): A review of the academic literature. *Maandblad voor Accountancy en Bedrijfseconomie*, 93(1–2), 5–14. <https://doi.org/10.5117/mab.93.29496>
26. Gramling, A. A., Krishnan, J., & Zhang, Y. (2011). Are PCAOB-identified audit deficiencies associated with a change in reporting decisions of triennially inspected audit firms? *AUDITING: A Journal of Practice & Theory*, 30(3), 59–79. <https://doi.org/10.2308/ajpt-10048>
27. Harjoto, M. A., & Laksmana, I. (2022). The impact of COVID-19 lockdown on audit fees and audit delay: International evidence. *International Journal of Accounting & Information Management*, 30(4), 526–545. <https://doi.org/10.1108/IJAIM-02-2022-0030>
28. Hay, D., Shires, K., & Van Dyk, D. (2021). Auditing in the time of COVID — The impact of COVID-19 on auditing in New Zealand and subsequent reforms. *Pacific Accounting Review*, 33(2), 179–188. <https://doi.org/10.1108/PAR-09-2020-0155>
29. Herbohn, K., & Raganathan, V. (2008). Auditor reporting and earnings management: Some additional evidence. *Accounting & Finance*, 48(4), 575–601. <https://doi.org/10.1111/j.1467-629X.2007.00256.x>
30. Hopwood, A. G. (2009). Accounting and the environment. *Accounting, Organizations and Society*, 34(3–4), 433–439. <https://doi.org/10.1016/j.aos.2009.03.002>
31. Ismail, S. A. A., Mahmood, S. M., & Hussein, A. I. (2021). The impact of the agency costs on the going concern under the auditor industry specialization: An empirical study on private banks in Iraq. *Academy of Entrepreneurship Journal*, 27(5S), 1–11. Retrieved from <https://www.abacademies.org/articles/the-impact-of-the-agency-costs-on-the-going-concern-under-the-auditor-industry-specialization-an-empirical-study-on-private-banks-13033.html>
32. Kend, M., & Nguyen, L. A. (2022). Key audit risks and audit procedures during the initial year of the COVID-19 pandemic: An analysis of audit reports 2019–2020. *Managerial Auditing Journal*, 37(7), 798–818. <https://doi.org/10.1108/MAJ-07-2021-3225>
33. Knechel, W. R., & Vanstraelen, A. (2007). The relationship between auditor tenure and audit quality implied by going concern opinions. *AUDITING: A Journal of Practice & Theory*, 26(1), 113–131. <https://doi.org/10.2308/aud.2007.26.1.113>
34. Levitan, A. S., & Knoblett, J. A. (1985). Indicators of exceptions to the going concern assumption. *AUDITING: A Journal of Practice and Theory*, 5(1), 26–39.
35. Levy, H. B. (2020). Financial reporting and auditing implications of the COVID-19 pandemic: Some practical guidance. *The CPA Journal*, 90(5), 26–33. Retrieved from <https://www.cpapjournal.com/2020/06/08/financial-reporting-and-auditing-implications-of-the-covid-19-pandemic/>
36. Myers, L. A., Schmidt, J., & Wilkins, M. (2014). An investigation of recent changes in going concern reporting decisions among Big N and non-Big N auditors. *Review of Quantitative Finance and Accounting*, 43(1), 155–172. <https://doi.org/10.1007/s11156-013-0368-6>
37. Nemeč, J., & Špaček, D. (2020). The COVID-19 pandemic and local government finance: Czechia and Slovakia. *Journal of Public Budgeting, Accounting & Financial Management*, 32(5), 837–846. <https://doi.org/10.1108/JPBAFM-07-2020-0109>
38. Nogler, G., & Jang, I. (2012). Auditor's going-concern modification decision in the post-Enron era. *The Journal of Corporate Accounting & Finance*, 23(5), 53–60. <https://doi.org/10.1002/jcaf.21784>
39. Osman, M. N. H., Turmin, S. Z., Muhamad, H., & Hussain, R. (2016). Auditor characteristics and the issuance of going concern opinion. *International Business Management*, 10(17), 3733–3738. Retrieved from <https://cutt.ly/CVShUYs>
40. Pan, D., Yang, J., Zhou, G., & Kong, F. (2020). The influence of Covid-19 on agricultural economy and emergency mitigation measures in China: A text mining analysis. *PLoS ONE*, 15(10), e0241167. <https://doi.org/10.1371/journal.pone.0241167>
41. Parker, S., Peters, G. F., & Turetsky, H. F. (2005). Corporate governance factors and auditor going concern assessments. *Review of Accounting and Finance*, 4(3), 5–29. <https://doi.org/10.1108/eb043428>
42. Pejić Bach, M., Krstić, Ž., Seljan, S., & Turulja, L. (2019). Text mining for big data analysis in financial sector: A literature review. *Sustainability*, 11(5), 1277. <https://doi.org/10.3390/sul1051277>
43. Persakis, A., & Iatridis, G. E. (2015). Earnings quality under financial crisis: A global empirical investigation. *Journal of Multinational Financial Management*, 30, 1–35. <https://doi.org/10.1016/j.mulfin.2014.12.002>
44. Pozzoli, M., Pagani, A., & Paolone, F. (2022). The impact of audit committee characteristics on ESG performance in the European Union member states: Empirical evidence before and during the COVID-19 pandemic. *Journal of Cleaner Production*, 371, 133411. <https://doi.org/10.1016/j.jclepro.2022.133411>
45. Salehi, M., Komeili, F., & Daemi Gah, A. (2019). The impact of financial crisis on audit quality and audit fee stickiness: Evidence from Iran. *Journal of Financial Reporting and Accounting*, 17(2), 201–221. <https://doi.org/10.1108/JFRA-04-2017-0025>
46. Sikka, P. (2009). Financial crisis and the silence of the auditors. *Accounting, Organizations and Society*, 34(6–7), 868–873. <https://doi.org/10.1016/j.aos.2009.01.004>
47. Simamora, R. A., & Hendarjatno, H. (2019). The effects of audit client tenure, audit lag, opinion shopping, liquidity ratio, and leverage to the going concern audit opinion. *Asian Journal of Accounting Research*, 4(1), 145–156. <https://doi.org/10.1108/AJAR-05-2019-0038>
48. Socol, A. (2010). Significant doubt about the going concern assumption in audit. *Annales Universitatis Apulensis Series Oeconomica*, 12(1), 291–299. <https://doi.org/10.29302/oeconomica.2010.12.1.29>
49. Talib, R., Hanif, M. K., Ayesha, S., & Fatima, F. (2016). Text mining: Techniques, applications and issues. *International Journal of Advanced Computer Science and Applications*, 7(11), 291–299. Retrieved from <http://www.oeconomica.uab.ro/upload/lucrari/1220101/29.pdf>

50. Tucker, R. R., Matsumura, E. M., & Subramanyam, K. R. (2003). Going-concern judgments: An experimental test of the self-fulfilling prophecy and forecast accuracy. *Journal of Accounting and Public Policy*, 22(5), 401-432. <https://doi.org/10.1016/j.jaccpubpol.2003.08.002>
51. Van Wass, L. (2010). *The situation of stateless persons in the Middle East and North Africa*. United Nations High Commissioner for Refugees (UNHCR). Retrieved from <https://www.unhcr.org/protection/statelessness/4ce63e079/situation-stateless-persons-middle-east-north-africa-laura-van-waas.html>
52. Vijayarani, S., Ilamathi, J., & Nithya. (2015). Preprocessing techniques for text mining-an overview. *International Journal of Computer Science & Communication Networks*, 5(1), 7-16. Retrieved from <http://www.ttccenter.ir/ArticleFiles/ENARTICLE/3783.pdf>
53. Wei, L., Li, G., Zhu, X., & Li, J. (2019). Discovering bank risk factors from financial statements based on a new semi-supervised text mining algorithm. *Accounting & Finance*, 59(3), 1519-1552. <https://doi.org/10.1111/acfi.12453>
54. Zeren, F., & Hizarci, A. (2020). The impact of Covid-19 coronavirus on stock markets: Evidence from selected countries. *Muhasebe ve Finans İncelemeleri Dergisi*, 3(1), 78-84. <https://doi.org/10.32951/mufider.706159>

APPENDIX

Table A.1. Summary guidelines for auditors to consider the COVID-19 effect

<i>Standard</i>	<i>Related guidance</i>
Continuous consultation on going concern issues vs COVID-19	To improve their activities the audit firms have included new procedures as: Senior audit partners and directors are more involved in the consultation processes and execute a rotational audit missions system.
Keeping regular communication between audit teams on updates related to COVID-19	Special website creation related to the audit questions of going concern during the COVID-19 pandemic.
Audit report continuous development of disclosures	The audit firms start including in their reports the impact of COVID-19 and provide assurance that they have identified all the related risks that might lead to raising a going concern opinion.
Considering the risk in relation to COVID-19 during the total risk assessment	Enhance the follow-up and monitoring process of COVID-19 risks.
Enhancing the assessment of the economic assumptions	Future assumptions depend on each entity's circumstances, therefore, the Big 4 audit firms published a number of economic assumptions.
Include more details related to COVID-19 influence in going-concern working papers	Some audit firms require the partner or director to sign and complete the working papers.

Source: FRC (2020).