

Audit committee effectiveness in times of crisis: Empirical insights on key audit matters disclosure

Sajeed Mowafaq Alshdaifat^{*1}, Mohammed W.A. Saleh², Marwan Mansour^{3,4}, Abedulwale Khassawneh^{5,6}, Mohammad Fawzi Shubita⁷, Jalal Rajeh Hanaysha⁸, Ebrahim Mohammed Al-Matari⁹, Murad Abdulsalam Qamhan¹⁰, Mahmaod Alrawad¹¹

¹ Financial and Accounting Sciences Department, Faculty of Business, Middle East University, Amman, Jordan

² Department of Accounting and auditing, Palestine Technical University - Kadoorie, Palestine

³ Business Faculty, Accounting Department, Amman Arab University, Jordan

⁴ Jadara Research Center, Jadara University, Irbid, Jordan

⁵ Department of Accounting, College of Business, King Faisal University, Al-Ahsa, Saudi Arabia

⁶ Applied Science Research Center, Applied Science Private University, 11937, Jordan

⁷ Professor of Accounting, School of Business, Department of Accounting, Amman Arab University, Jordan

⁸ School of Business, Skyline University College, Sharjah, United Arab Emirates

⁹ Department of Accounting, College of Business, Jouf University, Saudi Arabia

¹⁰ Faculty of Administrative Sciences, Accounting Department, Ibb University, Yemen

¹¹ Quantitative Method Department, College of Business, King Faisal University, Al-Ahsa, Saudi Arabia

*Corresponding author E-mail: salshdaifat@aabu.edu.jo

Received Sep. 1, 2024

Revised Nov. 06, 2024

Accepted Dec. 17, 2024

Abstract

This study investigates the relationship between audit committee (AC) effectiveness and key audit matter (KAM) disclosure in non-financial listed companies in GCC countries with COVID-19 as a moderator. This study used a static and dynamic panel regression model with 2238 observations from 2017 to 2022. We found a negative relationship between the AC effectiveness index and KAM disclosure. However, the negative relationship between AC effectiveness and KAM disclosure is reduced by COVID-19, thus AC effectiveness decreased during the COVID-19 pandemic. Additional analysis shows that large companies with AC effectiveness disclose less KAM than small companies. Also, dynamic regression using two-step GMM results conforms to the main findings. This study is important for developing corporate governance strategies that will build stakeholders' trust and informed financial decision-making in this context. Moreover, it provides new evidence on the effectiveness of AC and KAM disclosure during a crisis and highlights the challenges and opportunities in emerging markets in GCC countries.

© The Author 2024.
Published by ARDA.

Keywords: Audit committee index, Key audit matter, COVID-19, GCC countries, Stakeholder-agency theory, Institutional theory

1. Introduction

Key audit matters (KAM) have a big impact on the audit process and provide insight into complex or subjective matters. According to ISA 701, KAM helps stakeholders understand key audit issues. This report is to help financial statement users understand how auditors manage material risks and uncertainties [1, 2]. Complex

valuations, prospective liabilities, and estimates require more auditor attention. Auditors should communicate to stakeholders what happened during the audit process and what was done to resolve it to support the financial reporting. Additionally, KAM is indicative of a shift from conventional audit reporting, which typically employs a pass/fail approach, to a more comprehensive approach that delineates specific areas that require attention. A significant transition is necessary for organizations that are economically vulnerable, regulated, or globally changing, as well as those that operate in hazardous or prolonged environments [3]. Nevertheless, the audit committee is charged with the responsibility of supervising the activities of the auditor as well as the KAM disclosure.

The audit committee (AC) is established with the objective of enhancing the credibility of financial reporting and the quality of external audits [4, 5]. AC has the capacity to evaluate and supervise the financial reporting process, evaluate internal controls, and engage with external auditors to enhance the corporate reporting process [6, 7]. Although supervisory activity intensity, independence, expertise, and the number of meetings conducted are critical factors in assessing the efficacy of AC. In complex and risky domains, auditors require an assurance of impartiality and diligence [8]. There is a critical relationship between the efficacy of AC and KAM. KAMs identify the audit areas that are highest risk and subjectivity, while the AC plays the role of the overseer to make sure that these areas are well dealt with and well communicated [9]. Thus, the AC plays an important role in overseeing the audit process and in dealing with these intricate matters which strengthen the credibility of the financial reporting [10]. Therefore, in periods of higher risk and fluctuations, including global crises or highly competitive and rapidly evolving industries, the function of the audit committee in monitoring the accuracy of KAM became more essential.

COVID-19 has significantly impacted the global economy and has posed new challenges for companies, auditors, and supervisory authorities. Auditors' responsibilities with regard to confirming the transparency and integrity of a firm's financial records remained relevant and essential as companies encountered unprecedented challenges [11]. The auditing profession, which was based on face-to-face evaluations and writing large reports and fieldwork, was forced to quickly embrace the unknowns of business, technologies, and remote audits [12]. Consequently, the requirement to identify KAM was again given new importance as it offered essential information on the specific areas of enhanced risk and complexity within the context of financial reports. KAM disclosures emerged as a subject of interest for those interested in understanding how COVID-19 had affected company revenues since the pandemic escalated uncertainties regarding certain organizational aspects, such as the recognition of this revenue. In the same way, audit committees, which had the functions regarding the supervision of financial reporting and the enhancement of the quality of audit, were required to adopt greater and evolving procedures and processes to their responsibilities. Thus, the present study aims to investigate the moderating effects of COVID-19 on the relationship between the AC effectiveness index and the KAM disclosures of the listed non-financial firms in the GCC countries.

This study provides several significant contributions. Firstly, it provides empirical evidence that the relationship between audit committee effectiveness and KAM disclosures is influenced by the distinctive context of GCC countries, thereby enhancing the existing literature by concentrating on a region that has not been extensively studied. Secondly, the study shows how external shocks can impact audit committee effectiveness and KAM disclosures and hence corporate governance mechanisms during a crisis. Thirdly, unlike previous research that focused on specific aspects of audit panels, this study uses an index to give a comprehensive view of the whole thing. Lastly, the findings emphasize the need for GCC boards, regulators, and policymakers to strengthen audit committee functions to ensure reliable financial reporting in times of uncertainty. A practical guide for audit committees is also available in this study which can be very useful in times of global crisis.

2. Theoretical framework, literature review, and hypotheses development

Stakeholder agency theory and institutional theory are used in this study to examine the impact of audit committee effectiveness on key audit matters. This paper looks at the moderating role of COVID-19. It has been

found that an effective audit committee reduces the information asymmetry between management and shareholders as per stakeholder agency theory [13]. Besides facilitating organizational objectives an effective audit committee is key to long-term success [14]. As per its mandate, the committee is responsible for internal audits, selection of external auditors, providing guidance on audit matters, and verifying that financial statements comply with accounting standards [15]. Fulfilling these responsibilities as a committee mitigates the agency issues that arise between management and shareholders in the agent-principal relationship. Stakeholders are expected to request adjustments to the audit opinion in the event that the external auditor has made material errors. According to [16], comprehensive financial reporting audits are also desirable. External auditors presenting "clean" (unmodified) reports may undermine stakeholder trust [17]. An important role played by audit committees is to mandate comprehensive external audits.

Institutional theory explains the COVID-19 situation. The theory asserts that companies should monitor how they adapt to changes in their environment, especially external factors like regulatory changes, market conditions, and social pressures [18]. A volatile economic environment generates so much uncertainty that companies need to reevaluate their governance and operational models. Audit committees need to adapt to new standards quickly to maintain their legitimacy and conformance to rapid regulatory changes [19]. With limited resources (reduced budgets and staff) they had to manage risks while meeting institutional expectations. The pandemic has brought about innovative audit practices like remote audits and the use of technology, showing how companies adapt to challenges [20]. Besides top-tier audits and enhanced communication with stakeholders, social relationships and responsiveness to stakeholder concerns are also important.

2.1. Audit committee effectiveness and key audit matters disclosure

The audit committee (AC) has been in the spotlight of corporate governance, particularly in relation to key audit matters (KAM) and financial reporting quality. When the AC is responsible for these matters, it can improve financial reporting transparency and reliability [21, 22]. KAM identifies some of the highest risks and most difficult judgments made during the audit. For example, effective audit committees will ensure KAM is identified and communicated, which allows for a more comprehensive review of the financial statements. Agency theory suggests that directors (principals) and shareholders (agents) may have conflicting interests. So, AC is basically a mechanism to mitigate these conflicts [23, 24]. By overseeing the audit and financial reporting process, the AC increases accountability and transparency within the organization by preventing agency-related issues such as earnings management and misreporting of financial results [25, 26]. The effectiveness of audit committees has been linked to financial reporting quality [27-29]. It is imperative that stakeholders be involved in the identification, communication, and resolution of KAM in order to ensure compliance with regulations and stakeholder confidence in the financial reporting process.

Independence is key to the audit committee's effectiveness. An independent committee member can challenge management's accounting judgments and decisions [30, 31]. This way you can identify potential issues early and reduce the need for KAMs. Authors [32] found that external audit committees have strong relationships with external auditors during the audit process. This enhances communication and transparency between the audit committee and external auditors [33]. By being proactive, independent committees reduce the opportunity for ongoing issues to escalate to KAMs. Besides independence, audit committee size also affects KAMs. The size of the committee allows tasks to be distributed more efficiently and more thorough reviews of complex financial issues before KAM. A bigger committee also benefits from the diversity of expertise, different perspectives facilitate more thorough discussion and risk assessment [34]. A well-sized committee can give valuable insights, improve auditor engagement, and mitigate significant risks [4]. KAMs are minimized when committee size and effectiveness interact.

Also, the knowledge base of accounting and industry professionals reduces KAM disclosures. Members know the industry regulations and specific risks so they can make informed decisions and identify potential problems early. According to [35], such expertise helps the committee to handle complexities and reduces KAM risks. Therefore, knowledgeable committee members facilitate better communication with external auditors and

improve financial reporting efficiency [36]. It is also important to hold regular audit committee meetings to oversee financial reporting [37]. In these meetings, committee members, auditors, and management have the opportunity to discuss in-depth, they can identify potential problems before they become KAM disclosures. By increasing collaboration in these meetings, auditors' concerns are addressed promptly, and proactive resolutions and thorough review of financial statements [38]. Effective oversight requires an action plan after the discussion to mitigate the risks and weaknesses in internal controls. Meeting frequency is therefore key to effective oversight. Also, recent studies have looked into the impact of gender diversity on audit committees and found that female members can reduce KAM frequency and duration [39]. Diverse perspectives and approaches to risk assessment and management may contribute to this effect. This suggests how diversity enhances committee effectiveness and contributes to better financial reporting. A theoretically based and empirically based study suggests that a functioning audit committee correlates with reduced KAM disclosure. As a result, the first hypothesis derived from this study is:

H1. The audit committee effectiveness index negatively affects Key audit matters disclosure in GCC non-financial listed firms.

2.2. Moderating role of COVID-19

There was considerable uncertainty in financial reporting and risk management for businesses during the COVID-19 pandemic, which made it difficult to assess continued concern and disclose issues [40, 41]. Organizations operate within a framework of norms, rules, and expectations formed by their environments, as explained by institutional theory. Managers and auditors must communicate effectively between themselves in remote work environments, as in-person collaboration becomes increasingly challenging [42]. Several companies have also experienced budget cuts and staff reductions, which have limited the resources available to audit committees and restricted their ability to supervise risks. Audit committees found it harder to meet evolving regulatory requirements without adequate guidance as regulations changed quickly [43]. Institution theory suggests that organizations sometimes conform to new expectations to maintain legitimacy in the face of external pressures, such as regulatory changes. During the transition to remote operations, internal controls may have weakened, leading to fraud and misstatements [44]. Audit committees need to monitor financial reporting practices more closely in their oversight roles.

The uncertainty associated with pandemics also led to an increase in the demand for high-quality audits [45]. A quality audit is critical to ensuring the reliability of financial statements as well as to assisting stakeholders in making informed decisions by highlighting critical areas that the auditing profession should focus on [46]. Auditor disclosures regarding going concern, valuations, and management estimates have increased as a result of increased awareness of risks [47]. COVID-19 led auditors to modify their risk assessment processes so that they would be able to identify potential vulnerabilities earlier [48]. As a consequence of revealing KAMs in a clear and transparent manner during the crisis, companies were able to better communicate their uncertainty to stakeholders. The pandemic has also led to innovative audit practices, such as remote audits and increased use of technology, which has enhanced audit quality [49]. A strong governance emphasis during this period led to more in-depth discussions about KAMs in audit reports, which in turn encouraged firms to strengthen their internal controls. This is aligned with institutional pressures to increase accountability and transparency in financial reporting [50]. Based on this, the second hypothesis is as follows:

H2. COVID-19 moderates the relationship between audit committee effectiveness index and Key audit matters disclosure in GCC non-financial listed firms.

3. Research method

3.1. Data and sample selection

As shown in Table 1, a preliminary sample of 427 firms was selected, resulting in 2562 observations. The final sample was reduced to 373 firms with 2238 observations after 54 firms were excluded due to missing data. Data

was collected from the annual report. Furthermore, Figure 1 shows that the Materials industry dominates the sample, representing 19.03% of the total firms, followed by Industrials at 18.23% and Real Estate at 17.16%. The Consumer Staples and Consumer Discretionary sectors also showed notable growth (12.60 %) and 11.26 %, respectively. Sectors with lower representation are Information Technology (1.34%), Health Care (4.02%), and Utilities (5.09%). In addition to capturing diverse industry dynamics, this distribution skews the results towards trends prevalent in industries like Materials and Industrials.

Table 1. Sample choice technique

Study's sample	Total firms	Pooled
Preliminary sample	427	2562
(-) Firms with missing data	(54)	(324)
Total sample	373	2238

Source: Authors' creation

In addition, Figure 1 shows the distribution of firms by GCC countries as shown in the study sample. With 42.09% of the total sample, the Kingdom of Saudi Arabia (KSA) has the largest representation, followed by Kuwait with 21.18%. In addition to the UAE, Oman, Qatar, and Bahrain contribute a smaller portion of 15.02%, 9.91%, 6.71%, and 5.09%, respectively. As shown here, the majority of data comes from the KSA and Kuwait, which may be a result of their larger and more diverse economies.

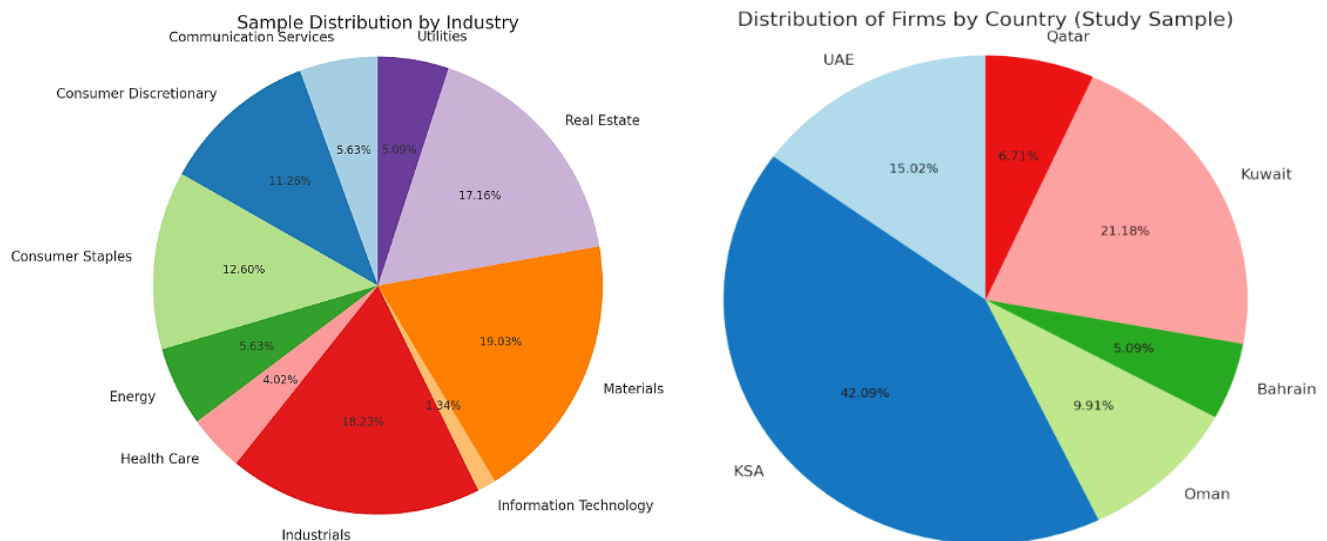


Figure 1. Sample distribution based on country

3.2. Variable definition

Key audit matters (KAM) are the dependent variable in this study, which is quantified by the number of KAM disclosed in the audit report. The independent variable is the audit committee effectiveness index (ACEF), which includes seven distinct variables: independence, size, financial expertise, industry expertise, accounting expertise for chairs, and independence for chairs [4]. The study also incorporates six control variables related to firm attributes: firm size (SIZE), firm leverage (LEV), firm liquidity (LIQ), sales revenue growth (GROWTH), audit quality (BIG4), family ownership (FAMOW), and CEO duality. Previous empirical studies have used these variables [51-56]. Table 2 provides a summary of the measurements used in this study.

Table 2. Variables definitions, acronyms, and measurements

Variable	Acronym	Measurement
Key audit matters disclosure	KAM	The number of KAMs disclosed in the audit report.
Audit committee effectiveness	ACEF	An audit committee's effectiveness is determined by the sum of its seven characteristics ranging from 0 to 7.
Covid- 19	COVID-19	1 for the years affected by COVID-19 which are 2020–2022, 0 otherwise.
Firm size	SIZE	The natural logarithm of total assets.
Leverage	LEV	The ratio of total liabilities to total assets.
Liquidity	LIQ	The ratio of current assets to total current liabilities.
Sales revenue growth	Growth	Total sales revenue in current year minus total sales in the previous year divided by total sales in current year.
Audit quality	Big-4	Firms audited by the Big-4 will score 1, and firms not audited by the Big-4 will score zero.
Family ownership	FAMOW	Percentage of total shares owned by family members
CEO duality	CEO duality	1 if the CEO and board chair are the same person, 0 otherwise.

Source: Authors' creation

3.3. Study model

Using panel data regression, this study examines the impact of audit committee effectiveness on key audit matters, highlighting COVID-19's moderating role. Two econometric models were developed to test the hypotheses: Model 1 analyzes the direct relationship, while Model 2 examines COVID-19's moderating effects.

Model 1:

$$KAM = \beta_0 + \beta_1 ACEF_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 LIQ_{it} + \beta_5 GROWTH_{it} + \beta_6 BIG4_{it} + \beta_7 FAMOW_{it} + \beta_8 CEO\ duality_{it} + YearEF + IndFE + \epsilon$$

Model 2:

$$KAM = \beta_0 + \beta_1 ACEF_{it} + \beta_2 COVID-19_{it} + \beta_3 ACEF * COVID-19_{it} + \beta_4 SIZE_{it} + \beta_5 LEV_{it} + \beta_6 LIQ_{it} + \beta_7 GROWTH_{it} + \beta_8 BIG4_{it} + \beta_9 FAMOW_{it} + \beta_{10} CEO\ duality_{it} + YearEF + IndFE + \epsilon$$

4. Results and discussion

4.1. Descriptive analysis

Table 3 presents descriptive statistics for a sample of 373 non-financial firms in GCC countries, covering 2,238 observations. There is a wide range of disclosures between 0 and 6, as indicated by the KAM variable, which averages 1.926. The mean AC effectiveness score is 3.01 on a scale of 2 to 7, indicating a moderate level of effectiveness. COVID-19 averages 0.5, reflecting the pandemic's significant impact on half of the observations. The average firm size is 19.952, and leverage is 0.437, demonstrating a variety of capital structures. The liquidity average is 2.044, with considerable variability, and the growth average is 0.045, showing mixed trends. Big4 audited firms average 0.565, indicating a significant percentage, while family ownership averages 0.126, suggesting some family influence. CEO duality is present in nearly half of the firms, averaging 0.481.

Table 3. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
KAM	2238	1.926	.975	0	6
ACEF	2238	3.01	.612	2	7
COVID 19	2238	.5	.5	0	1
SIZE	2238	19.952	1.71	15.135	27.221
LEV	2238	.437	.229	.075	.846
LIQ	2238	2.044	1.745	.33	7.13
GROWTH	2238	.045	.264	-.451	.679
Big4	2238	.565	.496	0	1
FAMOW	2238	.126	.213	0	.942
CEO duality	2238	.481	.136	0	1

Source: Authors' creation

4.2. Diagnostic tests

As part of the study, outliers, normality, multicollinearity, and heteroscedasticity were evaluated to assess the model's suitability for analysis [57]. All continuous variables were winsorized at the 1% level annually to address outliers. In Table 4, all correlation matrices and variance inflation factor (VIF) values remained below the threshold of 10 indicating no multicollinearity issues [57]. A robust cluster standard error was used to guarantee unbiased estimation of standard errors despite autocorrelation and heteroscedasticity being identified during tests.

Table 4. Pearson correlations and VIF

Variables	1	2	3	4	5	6	7	8	9	10	VIF
1 KAM	1.00										
2 ACEF	-0.16***	1.00									1.04
3 COVID_19	0.05**	-0.07*	1.00								1.00
4 SIZE	0.27***	0.13***	0.002	1.00							1.11
5 LEV	0.05***	0.05***	0.01	0.21***	1.00						1.45
6 LIQ	-0.09***	-0.07***	0.01	0.20***	0.53***	1.000					1.12
7 GROWTH	0.004	0.02	0.06***	0.10***	0.02	0.006	1.000				1.72
8 Big4	-0.02**	0.06**	-0.01	-0.02	0.06***	-0.01	0.016	1.00			1.02
9 FAMOW	-0.05***	-0.03	-0.01	-0.1***	0.11***	-0.07***	0.024	0.06***	1.00		1.04
10 CEO duality	0.013	0.14***	0.00	0.08***	-0.003	-0.054**	0.021	0.05**	-0.02	1.0	1.03

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

4.3. Regression results and discussion

Two primary tests were conducted to determine the best model for analysis. The Breusch and Pagan test was first used to assess the appropriateness of OLS versus random effects, followed by the Hausman test to differentiate between fixed and random effects models. Results of both tests, illustrated in Tables 5 and 6, indicated significant results ($p < 0.01$), supporting the use of the fixed effects panel model. Furthermore, fixed effects regression showed robust statistical significance ($p < 0.01$), with R-squared values of 23.14% and 19.28%, respectively. This R-squared value is modest, but it captures the variance very well, which is in line with existing literature in corporate governance research [4].

Table 5 shows a statistically significant negative relationship between ACEF and KAM disclosure, supporting H1. As evidenced by the coefficient of -0.110 ($p < 0.01$), stronger audit committee effectiveness is associated with a reduction in KAM disclosures. Thus, companies with stronger audit committees may be less inclined to

disclose extensive KAM, potentially indicating better internal controls. These results are in line with prior studies [38; 39; 27, 34; 35]. Furthermore, the results are reliable with agency theory, which asserts that firms can benefit from effective audit committee oversight when times of scrutiny and uncertainty are present [4]. According to agency theory, effective oversight by AC mitigates risks and improves financial reporting quality, resulting in benefits to firms during times of scrutiny and uncertainty [60-63]. In addition, institutional theory supports this perspective by suggesting that firms behave within a framework of norms and expectations. A culture of compliance and stability within an audit committee may reduce the importance of disclosing KAM, as they conform to the expectation of sound governance practices rather than merely complying with disclosure requirements.

Table 5. Fixed effect regression results for the direct relationship

VARIABLES	KAM Disclosure		
	Coefficients	t-stat	p-value
ACEF	-0.110	-2.21***	0.001
SIZE	0.130	1.22***	0.000
LEV	-0.0215	-0.19	0.224
LIQ	-0.0157	-1.34	0.180
GROWTH	-0.0179	-0.43	0.370
Big4	-0.128**	-0.47**	0.011
FAMOW	-0.0387	-2.56**	0.021
CEO duality	-0.151	-0.48	0.134
Constant	-0.873	-1.66**	0.007
Std. error adj		Robust Cluster	
Industry and year effect		Included	
R ² within	23.14		
N	2238		
Breusch and Pagan LM test	3009.31***		
Hausman test	13.27***		

Notes: *Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level

Source: Authors' creation

In addition, Table 6 demonstrates that COVID-19 positively moderates the relationship between audit committee effectiveness (ACEF) and KAM disclosures, with a coefficient of 0.0252 ($p < 0.01$), supporting H2. Accordingly, the COVID-19 pandemic reduced the audit committee's capacity to limit KAM disclosures during the crisis, indicating a diminished ability to manage financial reporting complexities. It is in accordance with the findings of previous research [42, 47, 49, 50]. As a result of remote audits, operational disruptions, and regulation changes during the pandemic, audit committee effectiveness might have been affected. In this case, institutional theory is very relevant, because it explains how external shocks like Covid-19 can mess up established governance practices, making audit committees less capable of managing risk and ensuring transparency. Due to new norms and uncertainties in financial reporting, the audit committee may not have been able to manage audit matters as effectively as during stable times [58, 59].

Table 6. Fixed effect regression results for the moderating role of COVID-19 on audit committee effectiveness and KAM

VARIABLES	KAM Disclosure		
	Coefficients	t-stat	p-value
ACEF	-0.130	-2.79***	0.001
COVID-19	0.0285	0.28**	0.046
ACEF*COVID-19	0.0252	1.20*	0.082
SIZE	0.132	2.53**	0.011
LEV	-0.0223	-0.20**	0.024

VARIABLES	KAM Disclosure		
	Coefficients	t-stat	p-value
LIQ	-0.0145	-1.26***	0.000
GROWTH	0.0119	0.47**	0.013
Big4	-0.124	-2.42	0.221
FAMOW	-0.0519	-0.30***	0.000
CEO duality	-0.194	-0.61	0.207
Constant	-0.858	-1.64***	0.000
Std. error adj		Robust Cluster	
Industry and Year Effect		Included	
R ² within	19.28		
N	2238		
Breusch and Pagan LM test	3015.79***		
Hausman test	29.70***		

Notes: *Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level

Source: Authors' creation

5. Further robustness tests

5.1. Endogeneity test using dynamic regression

To assess endogeneity, the paper uses a two-step GMM. Table 7 shows that the AC effectiveness index and KAM disclosures are negatively correlated, with a coefficient of -0.0899 ($p < 0.05$). It appears that an effective audit committee generally reduces the number of KAM disclosures. Furthermore, COVID-19 has a significant moderating effect, with a coefficient of 0.0545 ($p < 0.05$). In light of this, the effectiveness of the AC in mitigating KAM disclosures has decreased during the pandemic, reflecting a notable change in this period. A test for second-order autocorrelation (AR (2)) is insignificant, and a Sargan test confirms the model's validity.

Table 7. Endogeneity test using two-step system GMM

VARIABLES	KAM Disclosure	
	Two-step system GMM Model (1)	Two-step system GMM Model (2)
L.KAM	0.628*** (0.0618)	0.519*** (0.0683)
ACEF	-0.0899** (0.108)	-0.141* (0.120)
COVID_19	-	0.279* (0.189)
ACEF*COVID-19	-	0.0545** (0.0607)
SIZE	0.0159* (0.0464)	0.0168* (0.0451)
LEV	-0.0528* (0.220)	-0.0563* (0.212)
LIQ	-0.0106* (0.0137)	-0.0120* (0.0134)
GROWTH	-0.0263** (0.0538)	-0.0500* (0.0516)
Big4	-0.0212**	-0.0157*

VARIABLES	KAM Disclosure	
	Two-step system GMM Model (1)	Two-step system GMM Model (2)
	(0.0876)	(0.0849)
FAMOW	-0.441**	-0.603**
	(0.751)	(0.741)
CEO duality	-0.154	2.423
	(2.850)	(3.150)
Constant	0.937***	1.140***
	(3.043)	(3.333)
Observations	2238	2238
AR (1)	-5.5568***	-4.8751***
AR (2)	1.9322	-1.7172
Sargan test	34.430	26.751
Number of groups	31	31
Number of instruments	237	237

5.2. Analysis of small and large companies in subsamples

According to Table 8, both large and small firms are affected by AC effectiveness when it comes to KAM disclosures based on OLS regression. In large firms, the ACEF displays a significant negative coefficient of -0.284 ($p < 0.01$), indicating that a more effective audit committee results in fewer KAM disclosures. A smaller negative coefficient of -0.137 ($p < 0.05$) indicates that this effect is less pronounced for small firms. As a result of these findings, the effectiveness of audit committees plays a critical role in shaping KAM disclosures, especially in larger companies where this influence is more significant.

Table 8. OLS regression results for the effect of the audit committee on KAM in a large and small firm

VARIABLES	KAM Disclosure	
	Large	Small
ACEF	-0.284***	-0.137*
	(0.0517)	(0.0122)
LEV	0.0424	-0.189
	(0.170)	(0.128)
LIQ	-0.0332*	-0.0380**
	(0.0271)	(0.0149)
GROWTH	-0.0294	-0.0894
	(0.121)	(0.0945)
Big4	-0.141**	-0.0514*
	(0.0621)	(0.0527)
FAMOW	-0.317**	-0.117
	(0.153)	(0.117)
CEO duality	-0.840**	0.0476
	(0.326)	(0.159)
Constant	2.066***	1.232***
	(0.376)	(0.201)
Observations	1,119	1,119
R-squared	13.73	11.37

5.3. Additional analysis based on the periods before and during COVID-19

As shown in Table 9, OLS regression results assess AC effectiveness on KAM disclosures both before and during COVID-19. As a result of the pandemic, the ACEF reveals a negative coefficient of -0.213 ($p = 0.1$), suggesting that while effective audit committees are linked to lower KAM disclosures, this effect is less pronounced. However, before the pandemic, the ACEF showed a more significant negative coefficient of -0.342 ($p < 0.05$), which suggests that audit committee effectiveness had a greater impact on KAM disclosures.

Table 9. OLS regression results based on the periods before and during COVID-19

VARIABLES	KAM Disclosure	
	During COVID-19	Before COVID-19
ACEF	-0.213* (0.0394)	-0.342** (0.0589)
SIZE	0.145** (0.0151)	0.164*** (0.0223)
LEV	-0.167 (0.126)	-0.185* (0.191)
LIQ	-0.0282* (0.0162)	-0.0273* (0.0241)
GROWTH	0.0441 (0.0892)	-0.255 (0.156)
Big4	-0.0547** (0.0481)	-0.157** (0.0716)
FAMOW	-0.0888 (0.113)	-0.131 (0.171)
CEO duality	-0.286 (0.177)	-0.193 (0.263)
Constant	-1.231*** (0.349)	-1.760*** (0.513)
Observations	1119	1119
R-squared	12.59	10.14

6. Conclusions

This study examines the relationship between the audit committee (AC) effectiveness index and disclosure of key audit matters (KAM) among non-financial firms listed in the GCC, focusing on COVID-19's moderating effect. The findings of this study indicate a significant negative relationship between AC effectiveness and KAM disclosures based on both static and dynamic panel regression models on a sample of 2,238 firm-year observations from 2017 to 2022. Nevertheless, COVID-19 weakened this negative relationship, suggesting that AC effectiveness reduced KAM disclosures during the pandemic. A more detailed analysis shows that large firms were more likely to reduce KAM disclosures by effective ACs. According to the study, the use and efficacy of ACs decreased during COVID-19, as supported by the GMM analysis.

This study contributes to improving corporate governance across the GCC region, particularly during crises like COVID-19. Increasing transparency and improving financial decision-making require a stronger audit committee. The present study contributes to a limited body of literature concerning the relationship between AC effectiveness and KAM disclosures in emerging markets, providing novel insights into the challenges and opportunities that are specific to GCC countries. The study's implications suggest also that policymakers need to consider reinforcing corporate governance frameworks in order to mitigate the weakening impact of crises on the functioning of the audit committee as a result of the study's findings.

However, this study has some limitations. This study focuses mostly on the audit committee (AC), ignoring other key governance mechanisms like board independence and ownership structure. Moreover, the study examines only the non-financial sector, limiting its applicability. It would be beneficial to focus future research on the financial sector. Additionally, since the pandemic affects different countries differently, future research could compare results from GCC countries with those from other regions in order to identify potential discrepancies.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

Funding information

This research was funded through the annual funding track by the Deanship of Scientific Research, from the Vice Presidency for Graduate Studies and Scientific Research, King Faisal University, Saudi Arabia [Grant KFU250001].

Author contribution

Conceptualization, S.M.A and M.W.A.S; methodology, S.M.A, M.W.A.S and M.M; software, S.M.A, E.M.A, and M.F.S; validation, S.M.A and M.F.S.; formal analysis, S.M.A, M.M, A.L and E.M.A; investigation, S.M.A and M.A.Q.; resources, S.M.A and M.F.S; data curation, S.M.A, J.R.H, M.A and M.A.Q.; writing—original draft preparation, S.M.A, J.R.H and M.M; writing—review and editing, A.L and M.W.A.S; visualization, S.M.A, M.A and E.M.A; supervision, S.M.A; project administration, M.W.A.S; funding acquisition, M.A. All authors have read and agreed to the published version of the manuscript

References

- [1] M. A. Qamhan, "Internal audit sourcing and earnings management: Evidence from Oman," *Journal of Advanced Research in Dynamical and Control Systems*, vol. 12, no. 1, pp. 153–160, 2020.
- [2] A. Rautiainen, J. Saastamoinen, and K. Pajunen, "Do key audit matters (KAMs) matter? Auditors' perceptions of KAMs and audit quality in Finland," *Managerial Auditing Journal*, vol. 36, no. 3, pp. 386–404, 2021.
- [3] E. M. Al-Matari, "The determinants of bank profitability of GCC: The role of bank liquidity as moderating variable—further analysis," *International Journal of Finance & Economics*, vol. 28, no. 2, pp. 1423–1435, 2023.
- [4] S. M. Alshdaifat, M. A. A. Hamid, N. H. A. Aziz, S. F. Saidin, and M. Y. Alhasnawi, "Corporate governance effectiveness and firm performance in global crisis: Evidence from GCC countries," *Corporate Governance: The International Journal of Business in Society*, vol. ahead-of-print, no. ahead-of-print, 2024. <https://doi.org/10.1108/cg-12-2023-0518>.
- [5] M. W. A. Saleh and M. Mansour, "Is audit committee busyness associated with earnings management? The moderating role of foreign ownership," *Accounting Research Journal*, vol. ahead-of-print, no. ahead-of-print, 2024. <https://doi.org/10.1108/ARJ-04-2023-0106>.
- [6] A. Alzeban, "The impact of audit committee, CEO, and external auditor quality on the quality of financial reporting," *Corporate Governance: The International Journal of Business in Society*, vol. 20, no. 2, pp. 263–279, 2020.
- [7] M. F. Shubita and N. H. Alrawashedh, "Corporate governance components and intellectual capital: Evidence from Jordanian banks," *Investment Management and Financial Innovations*, vol. 20, no. 4, pp. 272–282, 2023. [https://doi.org/10.21511/imfi.20\(4\).2023.22](https://doi.org/10.21511/imfi.20(4).2023.22).

-
- [8] M. Gelter and A. Gurrea-Martínez, "Addressing the auditor independence puzzle: Regulatory models and proposal for reform," *Vanderbilt Journal of Transnational Law*, vol. 53, pp. 787–837, 2020.
- [9] S. M. Alshdaifat, M. A. A. Hamid, S. F. Saidin, and N. H. A. Aziz, "Insight of ISA 701: Key audit matter disclosure in extended audit report," *International Journal of Academic Research in Business and Social Sciences*, vol. 14, no. 2, 2024. <https://doi.org/10.6007/ijarbss/v14-i2/20482>.
- [10] J. Bédard and Y. Gendron, "Strengthening the financial reporting system: Can audit committees deliver?" *International Journal of Auditing*, vol. 14, no. 2, pp. 174–210, 2010.
- [11] E. E. Alharasis, A. F. Alkhwalidi, and K. Hussainey, "Key audit matters and auditing quality in the era of COVID-19 pandemic: The case of Jordan," *International Journal of Law and Management*, vol. 66, no. 4, pp. 417–446, 2024.
- [12] N. Farcane, O. C. Bunget, R. Blidisel, A. C. Dumitrescu, D. Deliu, O. Bogdan, and V. Burca, "Auditors' perceptions on work adaptability in remote audit: A COVID-19 perspective," *Economic Research-Ekonomska Istraživanja*, vol. 36, no. 1, pp. 422–459, 2023.
- [13] M. C. Jensen and W. H. Meckling, "Theory of the firm: Managerial behavior, agency costs and ownership structure," *Journal of Financial Economics*, vol. 3, no. 4, pp. 305–360, 1976. [https://doi.org/10.1016/0304-405x\(76\)90026-x](https://doi.org/10.1016/0304-405x(76)90026-x).
- [14] G. Drogalas, K. Arampatzis, and E. Anagnostopoulou, "The relationship between corporate governance, internal audit and audit committee: Empirical evidence from Greece," *Corporate Ownership and Control*, vol. 14, no. 1, pp. 569–577, 2016.
- [15] N. Martinov-Bennie, D. S. Soh, and D. Tweedie, "An investigation into the roles, characteristics, expectations and evaluation practices of audit committees," *Managerial Auditing Journal*, vol. 30, no. 8/9, pp. 727–755, 2015.
- [16] K. A. Houghton, C. Jubb, and M. Kend, "Materiality in the context of audit: The real expectations gap," *Managerial Auditing Journal*, vol. 26, no. 6, pp. 482–500, 2011.
- [17] T. Akther and F. Xu, "Existence of the audit expectation gap and its impact on stakeholders' confidence: The moderating role of the financial reporting council," *International Journal of Financial Studies*, vol. 8, no. 1, p. 4, 2020.
- [18] B. Galleli, E. Semprebon, J. A. R. D. Santos, N. E. B. Teles, M. S. D. Freitas-Martins, and R. T. D. S. Onevetch, "Institutional pressures, sustainable development goals and COVID-19: How are organisations engaging?," *Sustainability*, vol. 13, no. 21, p. 12330, 2021.
- [19] J. Cohen, L. M. Gaynor, G. Krishnamoorthy, and A. M. Wright, "Auditor communications with the audit committee and the board of directors: Policy recommendations and opportunities for future research," *Accounting Horizons*, vol. 21, no. 2, pp. 165–187, 2007.
- [20] P. Castka, C. Searcy, and S. Fischer, "Technology-enhanced auditing in voluntary sustainability standards: The impact of COVID-19," *Sustainability*, vol. 12, no. 11, p. 4740, 2020.
- [21] S. M. Alshdaifat, M. A. A. Hamid, S. F. Saidin, N. H. A. Aziz, and F. Al Qadi, "Strengths and weaknesses of integrated reporting: A comprehensive literature review," in *Sustainable Horizons for Business, Education, and Technology: Interdisciplinary Insights*, pp. 91–98, 2024.
- [22] E. M. Al-Matari, M. A. Al-Bukhrani, A. M. Omer, A. Alhebri, and T. K. Ibrahim, "The moderating effect of the role of accrual basis application controls on the association between government rules application controls and the quality of financial reporting," *Humanities and Social Sciences Letters*, vol. 12, no. 2, pp. 345–364, 2024.
- [23] M. Mansour, I. Y. Yamin, M. Saram, et al., "Capital structure and performance nexus: Insights from fixed-effects and quantile analysis," *Journal of Infrastructure, Policy and Development*, vol. 8, no. 7, p. 5119, 2024. <https://doi.org/10.24294/jipd.v8i7.5119>.
-

-
- [24] M. A. S. Al-Faryan, "Agency theory, corporate governance and corruption: An integrative literature review approach," *Cogent Social Sciences*, vol. 10, no. 1, 2024. <https://doi.org/10.1080/23311886.2024.2337893>.
- [25] Iriyadi, "Prevention of earnings management through audit committee and audit quality in the award-winning and non-winning companies," *Journal of Accounting Research Organization and Economics*, vol. 2, no. 2, pp. 155–169, 2019. <https://doi.org/10.24815/jaroe.v2i2.14631>.
- [26] M. A. Qamhan, M. H. Che Haat, H. A. Hashim, and Z. Salleh, "Earnings management: Do attendance and changes of audit committee members matter?," *Managerial Auditing Journal*, vol. 33, no. 8/9, pp. 760–778, 2018.
- [27] A. Gold, M. Heilmann, C. Pott, and J. Rematzki, "Do key audit matters impact financial reporting behavior?," *International Journal of Auditing*, vol. 24, no. 2, pp. 232–244, 2020. <https://doi.org/10.1111/ijau.12190>.
- [28] S. A. Qaderi, B. A. Ghaleb, A. Qasem, and S. S. S. Waked, "Audit committee effectiveness and integrated reporting quality: Does family ownership matter?," *Cogent Economics & Finance*, vol. 12, no. 1, 2023. <https://doi.org/10.1080/23322039.2023.2291893>.
- [29] Zgarni, K. Hlioui, and F. Zehri, "Effective audit committee, audit quality and earnings management," *Journal of Accounting in Emerging Economies*, vol. 6, no. 2, pp. 138–155, 2016. <https://doi.org/10.1108/jaee-09-2013-0048>.
- [30] F. N. Zadeh, D. Askarany, A. Shirzad, and M. Faghani, "Audit committee features and earnings management," *Heliyon*, vol. 9, no. 10, e20825, 2023. <https://doi.org/10.1016/j.heliyon.2023.e20825>.
- [31] H. A. Al-Rawashdeh, "The moderating role of professional commitment in the relationship between time budget pressure and sustainable audit quality: The mediating role of professional skepticism," *Heritage and Sustainable Development*, vol. 6, no. 1, pp. 365–378, May 2024.
- [32] S. Alhababsah and A. Azzam, "On the independence of audit committee in developing countries: Evidence from Jordan," *Journal of Applied Accounting Research*, 2024. <https://doi.org/10.1108/jaar-07-2023-0215>.
- [33] M. Al Qazaawi, N. Izadinia, and G. Kiani, "The effect of forensic accounting expertise on independent audit quality in Iraq and Iran: A comparative study," *Heritage and Sustainable Development*, vol. 5, no. 2, pp. 351–362, 2023.
- [34] Q. K. Nguyen, "Oversight of bank risk-taking by audit committees and Sharia committees: Conventional vs Islamic banks," *Heliyon*, vol. 7, no. 8, e07798, 2021. <https://doi.org/10.1016/j.heliyon.2021.e07798>.
- [35] P. F. Zhang and G. Shailer, "The impact of audit committee expertise on external auditors' disclosures of key audit matters," *International Journal of Auditing*, vol. 26, no. 2, pp. 151–170, 2021. <https://doi.org/10.1111/ijau.12256>.
- [36] M. Mansour, H. Hashim, Z. Salleh, W. M. Al-Ahdal, F. A. Almaqtari, and M. A. Qamhan, "Governance practices and corporate performance: Assessing the competence of principal-based guidelines," *Cogent Business & Management*, vol. 9, no. 1, 2105570, 2022. <https://doi.org/10.1080/23311975.2022.2105570>.
- [37] D. Dobija, "Exploring audit committee practices: Oversight of financial reporting and external auditors in Poland," *Journal of Management & Governance*, vol. 19, no. 1, pp. 113–143, 2013. <https://doi.org/10.1007/s10997-013-9281-6>.
- [38] Q. A. Alawaqleh, M. Aleqab, R. Bsoul, and S. Al-Tahat, "The impact of audit committee dimensions on financial reporting efficiency of limited partnership companies listed on the Amman Stock exchange," *Investment Management and Financial Innovations*, vol. 21, no. 1, pp. 407–416, 2024. [Online]. Available: [https://doi.org/10.21511/imfi.21\(1\).2024.31](https://doi.org/10.21511/imfi.21(1).2024.31)
- [39] M. K. Bepari, "Audit committee characteristics and Key Audit Matters (KAMs) disclosures," *Journal of Corporate Accounting & Finance*, vol. 34, no. 1, pp. 152–172, 2022. [Online]. Available: <https://doi.org/10.1002/jcaf.22587>
-

-
- [40] N. A. K. Al-Alawneh, M. S. Habibullah, A. Marei, and S. M. Alshdaifat, "Assessing the impact of the coronavirus pandemic and non-pharmaceutical interventions on Bursa Malaysia KLCI Index using GARCH-M (1, 1) models," *Investment Management & Financial Innovations*, vol. 21, no. 3, p. 222, 2024.
- [41] F. Fidiana, P. Yani, and D. H. Suryaningrum, "Corporate going-concern report in early pandemic situation: Evidence from Indonesia," *Heliyon*, vol. 9, no. 4, e15138, 2023. [Online]. Available: <https://doi.org/10.1016/j.heliyon.2023.e15138>
- [42] J. I. Lorentzon, L. E. Fotoh, and T. Mugwira, "Remote auditing and its impacts on auditors' work and work-life balance: auditors' perceptions and implications," *Accounting Research Journal*, vol. 37, no. 1, pp. 1–18, 2023. [Online]. Available: <https://doi.org/10.1108/arj-06-2023-0158>
- [43] B. Alshabibi, S. P. ria, and K. Hussainey, "Audit Committees and COVID-19-Related Disclosure Tone: Evidence from Oman," *Journal of Risk and Financial Management*, vol. 14, no. 12, p. 609, 2021. [Online]. Available: <https://doi.org/10.3390/jrfm14120609>
- [44] V. Munteanu, M. Zuca, A. Horaicu, L. Florea, C. Poenaru, and G. Anghel, "Auditing the risk of financial fraud using the red flags technique," *Applied Sciences*, vol. 14, no. 2, p. 757, 2024. [Online]. Available: <https://doi.org/10.3390/app14020757>
- [45] C. Hategan, R. Pitorac, and A. C. Crucean, "Impact of COVID-19 pandemic on auditors' responsibility: evidence from European listed companies on key audit matters," *Managerial Auditing Journal*, vol. 37, no. 7, pp. 886–907, 2022. [Online]. Available: <https://doi.org/10.1108/maj-07-2021-3261>
- [46] International Auditing and Assurance Standards Board (IAASB), "The new auditor's report: Enhancing auditor communications. Greater transparency into the financial statement audit," New York, USA: International Federation of Accountants (IFAC), 2015. [Online]. Available: <https://www.iaasb.org/publications/reporting-audited-financial-statements-new-and-revised-auditor-reporting-standards-and-related-11>
- [47] A. C. Crucean and C. Hategan, "Effects of the Covid-19 Pandemic Estimated in the Financial Statements and the Auditor's Report," *Audit Financiar*, vol. 19, no. 161, pp. 105–118, 2021. [Online]. Available: <https://doi.org/10.20869/auditf/2021/161/001>
- [48] E. E. Abdelhak, K. Hussainey, and K. Albitar, "Covid-19 disclosure: do internal corporate governance and audit quality matter?," *International Journal of Accounting and Information Management*, vol. 31, no. 1, pp. 170–194, 2023. [Online]. Available: <https://doi.org/10.1108/ijaim-05-2022-0108>
- [49] P. Murphy, C. McLaughlin, and A. A. Elamer, "Audit partner gender and the COVID-19 pandemic: the impact on audit fees and key audit matters," *Journal of Financial Reporting & Accounting*, 2023. [Online]. Available: <https://doi.org/10.1108/jfra-11-2022-0431>
- [50] E. Rainsbury, S. Bandara, and A. Perera, "Auditors' response to regulators during COVID-19: disclosures of key audit matters," *Asian Review of Accounting*, vol. 31, no. 1, pp. 42–56, 2022. [Online]. Available: <https://doi.org/10.1108/ara-04-2022-0106>
- [51] M. Y. Alhasnawi, R. M. Said, S. M. Alshdaifat, K. A. Elorabi, M. H. Al-Hasnawi, and A. H. Khudhair, "How does budget participation affect managerial performance in the higher education sector? A mediated-moderated model," *Asian Journal of Accounting Research*, 2024. [Online]. Available: <https://doi.org/10.1108/ajar-12-2023-0405>
- [52] N. H. A. Aziz, S. Alshdaifat, A. R. A. Latiff, and M. N. H. Osman, "ESG Controversies and Firm Performance with Moderating Role of Board Effectiveness: Evidence from ASEAN," in *Business Development via AI and Digitalization: Volume 2*, Cham: Springer Nature Switzerland, 2024, pp. 271–282.
- [53] M. Mansour, M. Al Zobi, A. Al-Naimi, and L. Daoud, "The connection between capital structure and performance: Does firm size matter?" *Investment Management and Financial Innovations*, vol. 20, no. 1, pp. 195–206, 2023. [Online]. Available: <https://doi.org/10.21511/imfi>
- [54] M. Shubita, "The ability of cash flows to predict earnings: Evidence from Jordan," *Investment Management and Financial Innovations*, vol. 18, no. 4, pp. 36–44, 2021. [Online]. Available: [https://doi.org/10.21511/imfi.18\(4\).2021.04](https://doi.org/10.21511/imfi.18(4).2021.04)
- [55] M. Shubita, "Relationship between marketing strategy and profitability in industrial firms: Evidence from Jordan," *Innovative Marketing*, vol. 19, no. 2, pp. 17–26, 2023. [Online]. Available: [https://doi.org/10.21511/im.19\(2\).2023.02](https://doi.org/10.21511/im.19(2).2023.02)
-

-
- [56] M. W. Saleh and Z. S. Maigoshi, "The nexus of ESG and environmental sustainability: Does gender diversity make a difference in Asian companies?" *Environment, Development and Sustainability*, pp. 1–21, 2024. [Online]. Available: <https://doi.org/10.1007/s10668-024-04498-5>
- [57] J. F. Hair, W. C. Black, B. J. Babin, and R. E. Anderson, *Multivariate Data Analysis*, 7th ed., Pearson, 2010.
- [58] A. Y. Alodat, H. Al Amosh, S. F. Khatib, and M. Mansour, "Audit committee chair effectiveness and firm performance: The mediating role of sustainability disclosure," *Cogent Business & Management*, vol. 10, no. 1, p. 2181156, 2023.
- [59] Z. A. L. A. I. L. A. H. Salleh, R. O. H. A. I. D. A. Seno, A. Y. M. Alodat, and H. A. Hashim, "Does the audit committee effectiveness influence the reporting practice of GHG emissions in Malaysia," *Journal of Sustainability Science and Management*, vol. 17, no. 1, pp. 204–220, 2022.
- [60] E. E. Alharasis, M. Prokofieva, C. Clark, H. Haddad, and N. Alramahi, "The development of international accounting and auditing standards for fair value accounting in the Arab Middle East, Jordan: a systematic review," *Cogent Business & Management*, vol. 11, no. 1, p. 2391564, 2024.
- [61] E. E. Alharasis, "The direct effect of the international standard on auditing–701 requirements on audit profession concerning the reimbursement costs: case study of Jordanian finance industry," *Asian Journal of Accounting Research*, 2024.
- [62] M. Alidarous, "Driving Venture Capital Interest: The Influence of the Big 4 Audit Firms on IPOs," *Journal of Risk and Financial Management*, vol. 17, no. 7, p. 292, 2024.
- [63] E. E. Alharasis, M. Alhadab, M. Alidarous, F. Jamaani, and A. F. Alkhwalidi, "The impact of COVID-19 on the relationship between auditor industry specialization and audit fees: empirical evidence from Jordan," *Journal of Financial Reporting and Accounting*, 2023.