The Effect of Corporate Governance Elements on Audit Risk

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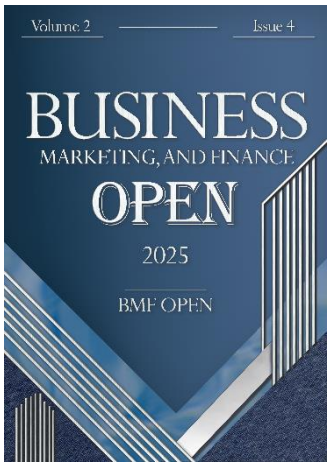

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Abstract: The auditor's opinion enhances the credibility of financial statements, enabling financial statement users to rely on them with greater confidence in their decision-making processes. The objective of this study is to examine the effect of corporate governance elements—including audit committee independence, board independence, CEO duality, ownership structure, and audit quality—on audit risk. The present research is applied in nature and follows an analytical approach. Data were collected from the financial statements of 105 companies listed on the Tehran Stock Exchange during the period 2015–2021. After testing the classical regression assumptions, a panel data regression model with fixed effects was employed to test the research hypotheses. The findings indicate a significant negative relationship between audit committee independence, board independence, audit quality, and institutional ownership with audit risk. However, a significant positive relationship was found between CEO duality and audit risk. Therefore, greater audit committee independence, higher board independence, a larger proportion of institutional ownership, and higher audit quality are associated with lower audit risk. Conversely, when the CEO simultaneously holds dual roles, such as serving as chairperson or vice-chairperson of the board, audit risk increases. The results of this study, by examining the impact of corporate governance elements on audit risk, can assist auditors in more effectively assessing audit risk.

Keywords: Audit Risk, Corporate Governance, Institutional Ownership, Audit Quality, Ownership Structure, Board Independence.

1. Introduction

Audit risk has long been recognized as one of the central constructs in auditing theory and practice, representing the probability that auditors may express an inappropriate opinion on financial statements that contain material misstatements. The concept of audit risk emerged as a response to the increasing complexity of financial reporting environments and the growing expectations placed upon auditors as guardians of financial transparency and accountability. Early theoretical formulations conceptualized audit risk as a composite of inherent risk, control risk, and detection risk, emphasizing that auditors must evaluate both organizational conditions and professional judgment factors when designing audit procedures [1]. In contemporary capital markets characterized by high information asymmetry, rapid technological transformation, and diversified ownership structures, audit risk has become not only an audit-planning issue but also a governance concern affecting investor confidence and market stability.

The increasing separation between ownership and management has intensified agency conflicts, thereby elevating the importance of corporate governance mechanisms in mitigating opportunistic managerial behavior. Corporate governance structures such as independent boards, audit committees, ownership concentration, and oversight mechanisms function as internal control systems that reduce informational asymmetry and enhance monitoring effectiveness. Research demonstrates that strong governance frameworks influence both audit quality and auditors' risk assessments by improving transparency and strengthening internal monitoring processes [2]. Similarly, governance quality affects auditors' willingness to rely on internal controls, which directly influences audit planning decisions and risk evaluations [3]. Consequently, corporate governance and audit risk are deeply interconnected, and understanding this relationship has become essential in emerging and developed markets alike.

Audit risk assessment is no longer limited to traditional financial indicators; instead, it increasingly incorporates organizational, behavioral, and institutional dimensions. Auditors evaluate governance effectiveness, litigation exposure, ownership characteristics, and management incentives when forming risk judgments. Empirical evidence indicates that external environmental factors, including macroeconomic volatility, regulatory changes, and institutional pressures, significantly influence auditors' perception of engagement risk [4]. Moreover, audit risk disclosure itself may influence audit quality and investment efficiency by shaping stakeholders' expectations and reinforcing accountability mechanisms [5]. These developments highlight the need to investigate governance determinants of audit risk within specific institutional contexts.

Among governance mechanisms, the effectiveness of the board of directors has attracted substantial scholarly attention. Board independence is widely regarded as a fundamental governance attribute that strengthens monitoring functions and constrains managerial opportunism. Independent directors provide objective oversight, enhance financial reporting reliability, and reduce the likelihood of earnings manipulation, thereby lowering perceived audit risk. Evidence from emerging economies confirms that board effectiveness contributes significantly to reducing audit risk through enhanced supervision and improved coordination with auditors [6]. Likewise, litigation risk environments demonstrate that stronger governance structures improve the association between auditor characteristics and audit quality outcomes [7]. These findings suggest that board independence plays a vital role in shaping auditors' risk assessments.

Another critical governance mechanism influencing audit risk is the audit committee. The audit committee acts as a specialized monitoring body responsible for overseeing financial reporting, internal controls, and the auditor–client relationship. Independent audit committees improve communication between auditors and management, reduce financial reporting irregularities, and strengthen internal oversight structures. Studies show that effective audit committees enhance audit quality and reduce information risk, particularly in firms with concentrated ownership structures [8]. By improving internal monitoring, audit committees reduce uncertainty surrounding financial statements, thereby lowering auditors' assessment of engagement risk.

Ownership structure represents an additional dimension affecting audit risk. Institutional investors typically possess superior monitoring capacity and professional expertise, enabling them to exert governance pressure on management and improve reporting transparency. Institutional ownership has been linked to higher audit quality and stronger demand for credible financial reporting practices [9]. Concentrated ownership can either mitigate or exacerbate agency conflicts depending on monitoring incentives, but empirical evidence generally indicates that institutional investors contribute to improved governance outcomes and reduced audit risk exposure [10]. Within

emerging markets, ownership characteristics have been shown to significantly shape auditors' risk perceptions and audit planning strategies.

Audit quality itself constitutes a central determinant of audit risk. High-quality auditors employ rigorous procedures, maintain independence, and possess industry expertise, thereby reducing the likelihood of audit failure. Research suggests that auditor conservatism and contracting arrangements influence risk evaluation processes and client acceptance decisions [11]. Auditor tenure, professional specialization, and continuity also affect audit outcomes and engagement risk assessments [12]. Studies conducted in Iranian capital markets further demonstrate that auditor characteristics and audit firm reputation significantly influence audit fees and risk evaluation practices [13]. Collectively, these findings emphasize that audit quality operates both as an outcome of governance mechanisms and as an independent factor shaping audit risk.

Recent advances in auditing research have expanded traditional perspectives by incorporating behavioral and technological dimensions into audit risk analysis. Auditors' cognitive and behavioral capabilities affect their tolerance for risk and professional judgment decisions, highlighting the human element of audit risk acceptance [14]. Simultaneously, digital transformation and information technologies have altered audit processes, introducing new risk sources related to data analytics, automation, and cybersecurity environments [15]. The emergence of e-auditing systems and IT governance frameworks has demonstrated significant potential for reducing audit risk through improved monitoring efficiency and real-time data verification [16]. These technological developments require auditors to integrate governance evaluation with advanced analytical tools.

The application of artificial intelligence and data mining techniques represents another transformative development in audit risk assessment. Neural-network-based models have been proposed as effective tools for predicting audit risk by analyzing complex financial and non-financial indicators [17]. Similar predictive frameworks employing machine learning algorithms have demonstrated improved accuracy in identifying high-risk engagements compared with traditional analytical methods [18]. Data mining approaches applied to capital market firms further confirm the usefulness of advanced analytics in enhancing audit risk assessment reliability [19]. These innovations signal a shift toward data-driven auditing environments where governance variables remain critical inputs for risk modeling.

Contemporary studies also emphasize the importance of corporate social responsibility (CSR) disclosures and ethical governance practices in shaping audit risk evaluations. CSR transparency reduces information asymmetry and enhances stakeholder trust, thereby influencing auditors' risk judgments and engagement strategies [20]. Empirical investigations show that CSR disclosure affects audit risk assessment procedures and audit planning decisions [21, 22]. These findings suggest that governance effectiveness extends beyond structural mechanisms to include ethical and social accountability dimensions.

The growing complexity of business environments has encouraged researchers to adopt interdisciplinary perspectives when analyzing audit risk. Risk assessment frameworks increasingly incorporate fuzzy logic, behavioral analysis, and planning judgment models to improve decision-making accuracy during audit planning stages [23]. Studies examining audit budgeting practices indicate that organizational constraints and planning heuristics may substitute formal risk assessment processes, potentially affecting audit quality outcomes [24]. Additionally, specialist auditors have been shown to reduce engagement risk in firms operating under complex regulatory or governmental environments [25]. These perspectives highlight that audit risk is influenced by both institutional governance structures and professional auditing practices.

In emerging economies and developing capital markets, audit risk assumes particular importance due to weaker institutional enforcement mechanisms, evolving governance regulations, and higher informational uncertainty. Evidence from tax auditing environments demonstrates that structured risk assessment models significantly improve regulatory oversight and compliance effectiveness [26]. Similarly, recent studies emphasize the role of ownership transparency, governance reforms, and institutional monitoring in enhancing financial reporting credibility and reducing audit-related uncertainty [27]. Research conducted in regional markets further confirms that governance effectiveness, organizational monitoring systems, and managerial accountability mechanisms collectively shape audit risk dynamics [18].

Beyond governance and technological considerations, audit risk is also influenced by legal exposure and litigation environments. Auditor litigation risk affects engagement acceptance decisions, audit effort allocation, and fee determination processes, demonstrating the interconnectedness of governance structures and professional accountability [28]. Auditors operating under higher litigation risk conditions tend to adopt more conservative audit strategies, thereby affecting both audit quality and risk assessment outcomes. These findings reinforce the importance of examining governance elements as key determinants of audit risk within institutional settings.

Recent scholarly contributions emphasize that corporate governance effectiveness must be evaluated holistically, integrating board structures, ownership characteristics, audit committees, auditor competence, technological infrastructure, and ethical reporting practices. The convergence of these elements determines the extent to which auditors perceive engagement risk and design appropriate audit procedures. Studies across different jurisdictions consistently show that governance mechanisms influence audit risk both directly and indirectly through improvements in transparency, internal control effectiveness, and stakeholder monitoring [4, 6, 8]. However, despite substantial international evidence, inconsistencies remain regarding the relative influence of specific governance components, particularly within emerging markets characterized by unique institutional and ownership structures.

In the context of the Tehran Stock Exchange, rapid market development, regulatory reforms, and increasing participation of institutional investors have intensified the need for reliable audit risk assessment frameworks. Iranian capital markets present distinctive governance characteristics, including concentrated ownership, evolving audit regulation, and varying levels of board independence, making them an appropriate setting for investigating governance determinants of audit risk. Although previous studies have explored individual governance factors, comprehensive empirical analyses integrating multiple governance mechanisms remain limited. Addressing this gap is essential for improving auditors' risk assessment processes, enhancing investor confidence, and strengthening financial reporting credibility.

Therefore, the aim of this study is to examine the effect of corporate governance elements—including board independence, audit committee independence, CEO duality, institutional ownership, and audit quality—on audit risk among companies listed on the Tehran Stock Exchange.

2. Methodology

This study is applied in nature because its results are useful for a wide range of capital market participants, including analysts, investors, government authorities, the Tehran Stock Exchange Organization, creditors, and auditors. The required information was collected from the Comprehensive Database of All Listed Companies (CODAL) of the Tehran Stock Exchange; therefore, in terms of research design, the study is documentary, ex post facto, and quantitative. The statistical population consists of companies listed on the Tehran Stock Exchange, and

the study period covers the years 2015 to 2021 (seven years). Sampling was conducted using a screening method, and firms meeting the following criteria were selected as the sample: first, to enhance comparability, companies whose fiscal year-end was not at the end of March or that changed their fiscal year during the study period were excluded; second, companies whose trading activities were suspended for more than six months within the research period were removed; third, investment companies, financial intermediaries, banks, insurance companies, and financing institutions were excluded due to the different nature of their operations; fourth, companies with incomplete or unavailable information were excluded. Ultimately, after applying these conditions, 105 companies were selected as the final sample. Following data collection and classification, descriptive statistics, regression model assumption tests, stationarity tests, and finally the statistical models of the study were examined.

Research Variables

Audit Risk (AR): This is the dependent variable and is measured as the natural logarithm of audit fees [20].

Board Independence (BInd): Measured as the proportion of non-executive board members to the total number of board members [6].

Audit Committee Independence (ACInd): Measured as the proportion of non-executive members to the total number of audit committee members [6].

CEO Duality (CEODual): This variable takes the value of one if the CEO simultaneously serves as chairperson or vice-chairperson of the board of directors, and zero otherwise [6].

Institutional Ownership (Inves): Measured as the percentage of shares held by banks, holding companies, financial institutions, and generally shareholders owning more than 5 percent of the company's shares [6].

Audit Quality (AQ): This variable equals one if the company's auditor is Mofid Rahbar Audit Firm or the Audit Organization, and zero otherwise [13, 20].

The following control variables were measured following Fakhfakh et al. (2022) and Dehmardeh et al. (2020):

Modified Audit Opinion (MAO): Takes the value of one if the auditor issues a modified opinion and zero otherwise [6].

Audit Report Lag (AL): Measured as the logarithm of the time interval between the fiscal year-end and the issuance of the audit report [6].

Financial Leverage (Lev): Measured as the ratio of total liabilities to total assets.

Firm Size (Size): Measured as the natural logarithm of total company assets.

Return on Assets (ROA): Measured as the ratio of net income to total assets [20].

To test the research hypotheses, Models (1) through (5) were specified as follows:

Model (1)

$$AR_{it} = \beta_0 + \beta_1 BInd_{it} + \beta_2 MAO_{it} + \beta_3 AL_{it} + \beta_4 Lev_{it} + \beta_5 Size_{it} + \beta_6 ROA_{it} + \varepsilon_{it}$$

Model (2)

$$AR_{it} = \beta_0 + \beta_1 ACInd_{it} + \beta_2 MAO_{it} + \beta_3 AL_{it} + \beta_4 Lev_{it} + \beta_5 Size_{it} + \beta_6 ROA_{it} + \varepsilon_{it}$$

Model (3)

$$AR_{it} = \beta_0 + \beta_1 CEODual_{it} + \beta_2 MAO_{it} + \beta_3 AL_{it} + \beta_4 Lev_{it} + \beta_5 Size_{it} + \beta_6 ROA_{it} + \varepsilon_{it}$$

Model (4)

$$AR_{it} = \beta_0 + \beta_1 Inves_{it} + \beta_2 MAO_{it} + \beta_3 AL_{it} + \beta_4 Lev_{it} + \beta_5 Size_{it} + \beta_6 ROA_{it} + \varepsilon_{it}$$

Model (5)

$$AR_{it} = \beta_0 + \beta_1 AQ_{it} + \beta_2 MAO_{it} + \beta_3 AL_{it} + \beta_4 Lev_{it} + \beta_5 Size_{it} + \beta_6 ROA_{it} + \varepsilon_{it}$$

3. Findings and Results

Table 1 presents the descriptive statistics of the research variables for 105 companies (735 observations). As shown in Table 1, the mean value of audit risk is 7.32, indicating that higher values correspond to higher assessed levels of audit risk. The mean value of audit committee independence is 0.72, implying that approximately 72% of audit committee members are independent. The mean board independence is 0.66, indicating that about 66% of board members are non-executive directors. The mean logarithm of financial reporting delay is 4.27; higher values represent longer delays in issuing financial statements. The mean percentage of institutional ownership is 68%, meaning that approximately 68% of the shares of the sample companies during the study period were held by institutional investors. The mean financial leverage ratio is 55%, suggesting that sample firms tend to rely more heavily on debt financing, with liabilities accounting for 55% of total assets. The mean return on assets equals 0.14, indicating that the sample firms generated approximately 14% profit for each unit of assets employed; higher values reflect greater managerial efficiency in asset utilization. The mean firm size is reported as 14.74.

Table 1. Descriptive Statistics of Variables

Variable	Symbol	Mean	Median	Maximum	Minimum	Standard Deviation
Audit Risk	AR	7.323	7.252	8.801	5.961	0.767
Audit Committee Independence	ACInd	0.723	0.667	1.000	0.333	0.184
Board Independence	BInd	0.669	0.600	1.000	0.400	0.173
Financial Reporting Delay	AL	4.278	4.317	4.771	3.638	0.358
Institutional Ownership	Inves	0.683	0.717	0.920	0.240	0.183
Financial Leverage	Lev	0.556	0.558	0.869	0.210	0.183
Return on Assets	ROA	0.147	0.119	0.447	−0.030	0.127
Firm Size	Size	14.743	14.565	18.105	12.640	1.352

Frequency Distribution of Dummy Variables

Variable	Value	Frequency	Percentage
CEO Duality	0	461	62%
	1	275	38%
Audit Quality	0	572	77%
	1	164	23%
Modified Audit Opinion	0	430	58%
	1	306	42%

The frequency distribution of dummy variables (zero and one) is also presented in Table 1. Based on these results, CEO duality exists in 38% of the observations, meaning that in these cases the CEO simultaneously serves as vice-chairperson of the board of directors. In 23% of the observations, the company's independent auditor is either the Audit Organization or Mofid Rahbar Audit Firm. Furthermore, in 42% of the observations, the auditor issued a modified (non-unqualified) audit opinion.

Table 2. Selection of the Appropriate Model Estimation Method

Models	Test	Statistic	Significance Level	Approved Method
Model (1)	Chow Test	8.54	0.00	Panel Data
	Hausman Test	100.99	0.00	Fixed Effects
Model (2)	Chow Test	8.38	0.00	Panel Data
	Hausman Test	16.56	0.01	Fixed Effects
Model (3)	Chow Test	8.50	0.00	Panel Data
	Hausman Test	103.88	0.00	Fixed Effects
Model (4)	Chow Test	8.94	0.00	Panel Data
	Hausman Test	102.95	0.00	Fixed Effects

Model (5)	Chow Test	7.25	0.00	Panel Data
	Hausman Test	10.86	0.00	Fixed Effects

According to the results presented in Table 2, the appropriate estimation method for the research models is panel data regression using the fixed-effects approach.

Table 3 reports the results of hypothesis testing. In all five estimated models, the F-statistic is statistically significant at the 99% confidence level. The Durbin–Watson statistic ranges between 1.5 and 2.5, indicating that there is no serial autocorrelation problem among the research variables.

Based on the results of the first hypothesis shown in Table 3, there is a negative (−0.223) and statistically significant relationship at the 99% confidence level between board independence and audit risk. In other words, increasing board independence leads to a reduction in audit risk. Therefore, the first research hypothesis is supported.

Table 3. Results of Research Model Testing

Hypothesis		First			Second			Third			Fourth			Fifth		
Variable	Symbol	Coefficient	t-Statistic	Sig.	Coefficient	t-Statistic	Sig.	Coefficient	t-Statistic	Sig.	Coefficient	t-Statistic	Sig.	Coefficient	t-Statistic	Sig.
Board Independence	BInd	−0.223*	−2.981	0.004												
Audit Committee Independence	ACInd				−0.107	−2.022	0.044									
CEO Duality	CEODual							0.022	2.117	0.035						
Institutional Ownership	Inves										−0.921	−3.320	0.001			
Audit Quality	AQ													0.595	12.506	0.000
Modified Audit Opinion	MAO	−0.119*	−3.011	0.001	−0.065	−3.032	0.003	−0.099	−5.422	0.000	−0.140	−2.205	0.028	−0.143	−3.526	0.001
Audit Report Lag	AL	0.207	1.981	0.042	0.045	1.484	0.139	0.070	1.939	0.053	0.164	1.597	0.111	0.071	1.315	0.189
Financial Leverage	Lev	0.360	1.663	0.097	0.340	4.202	0.000	0.263	3.334	0.001	0.427	2.027	0.043	0.600	4.342	0.000
Firm Size	Size	0.059	1.981	0.002	0.036	2.106	0.036	0.031	1.996	0.047	0.053	1.507	0.132	0.170	10.131	0.000
Return on Assets	ROA	0.364	1.412	0.159	0.401	4.083	0.000	0.394	4.448	0.000	0.230	0.894	0.372	0.279	1.406	0.160
Constant	C	5.219	8.646	0.000	6.307	20.405	0.000	6.400	24.904	0.000	6.251	9.365	0.000	4.040	12.431	0.000
R^2		0.6834			0.6765			0.6831			0.6923			0.4047		
Adjusted R^2		0.6179			0.6716			0.6797			0.6286			0.3991		
F-Statistic		10.44			197.50			282.31			10.87			72.08		
Durbin–Watson		1.61			1.52			1.55			1.55			1.74		

Table 3 reports the results of testing the second hypothesis, indicating a negative (−0.107) and statistically significant relationship at the 95% confidence level between audit committee independence and audit risk. This finding implies that increasing audit committee independence leads to a reduction in audit risk. Therefore, the second research hypothesis is accepted at the 95% confidence level.

Table 3 also presents the results of testing the third hypothesis, which show a positive (0.022) and statistically significant relationship at the 95% confidence level between CEO duality and audit risk. Accordingly, the third research hypothesis is supported.

Furthermore, the results related to the fourth hypothesis demonstrate a negative (−0.921) and statistically significant relationship between institutional ownership and audit risk. In other words, higher institutional

ownership is associated with lower audit risk. Consequently, the fourth research hypothesis is accepted at the 99% confidence level.

Finally, Table 3 shows that there is a positive (0.595) and statistically significant relationship between audit quality and audit risk. Therefore, based on the theoretical foundations of the study, the fifth research hypothesis is not supported.

4. Discussion and Conclusion

The findings of this study provide important empirical evidence regarding the relationship between corporate governance mechanisms and audit risk in companies listed on the Tehran Stock Exchange. Overall, the results confirm that governance structures play a decisive role in shaping auditors' risk assessments, supporting the theoretical argument that effective monitoring mechanisms reduce information asymmetry, enhance transparency, and ultimately lower perceived audit risk. The empirical models demonstrate that board independence, audit committee independence, and institutional ownership are negatively associated with audit risk, whereas CEO duality increases audit risk. However, contrary to theoretical expectations, audit quality exhibits a positive relationship with audit risk. These results contribute to the growing body of literature emphasizing the governance–audit risk nexus and highlight the contextual importance of institutional characteristics in emerging capital markets.

The negative and significant relationship between board independence and audit risk indicates that firms with a higher proportion of non-executive directors benefit from stronger monitoring functions and improved oversight of financial reporting processes. Independent board members reduce managerial opportunism, strengthen internal control systems, and enhance communication between management and auditors, thereby lowering uncertainty surrounding financial statements. This finding aligns with evidence demonstrating that effective boards reduce audit engagement risk by improving governance effectiveness and enhancing auditor confidence in internal monitoring mechanisms [6]. Prior research similarly shows that governance quality influences auditors' reliance on internal controls and reduces the likelihood of material misstatements [3]. The result is also consistent with theoretical frameworks linking governance effectiveness to audit quality and risk mitigation [2]. From an agency theory perspective, independent boards act as a control mechanism that constrains managerial discretion, which ultimately reduces auditors' perceived risk exposure.

The results further reveal a significant negative association between audit committee independence and audit risk. Independent audit committees enhance the credibility of financial reporting by supervising accounting policies, internal control effectiveness, and external audit processes. These committees function as specialized governance bodies that bridge communication between auditors and management, thereby reducing uncertainty and audit complexity. Empirical evidence from international markets demonstrates that strong audit committee independence improves audit quality outcomes and reduces governance-related risks [8]. The findings also align with studies emphasizing that audit committees contribute to improved monitoring efficiency and risk reduction in financial reporting environments [6]. By reinforcing internal governance structures, audit committees reduce the probability of misstatements and strengthen auditors' confidence during engagement planning, which translates into lower assessed audit risk.

The third hypothesis examined the effect of CEO duality on audit risk, and the results show a positive and statistically significant relationship. When the CEO simultaneously holds leadership positions within the board of directors, monitoring effectiveness weakens due to concentration of power, potentially increasing agency conflicts

and reducing board independence. This outcome supports governance theories suggesting that role duality undermines oversight functions and increases information asymmetry between management and stakeholders. Previous studies indicate that weaker governance structures increase auditors' perceived risk because managerial dominance reduces transparency and accountability [4]. Similarly, research examining governance effectiveness demonstrates that separation of leadership roles enhances monitoring quality and improves audit outcomes [2]. The findings therefore suggest that CEO duality signals elevated engagement risk to auditors, leading to higher audit risk assessments.

Institutional ownership was also found to have a significant negative effect on audit risk, indicating that higher participation by institutional investors enhances monitoring quality and improves corporate governance effectiveness. Institutional shareholders possess both incentives and resources to monitor managerial behavior, demand high-quality financial reporting, and reduce opportunistic accounting practices. Evidence shows that institutional ownership strengthens audit quality by increasing external monitoring pressure and encouraging transparency [9]. Prior research also demonstrates that institutional investors discourage earnings management and promote conservative reporting practices, thereby reducing audit risk exposure [10]. The present findings are consistent with governance research highlighting the role of ownership concentration in improving financial reporting reliability and lowering auditors' uncertainty during risk assessment procedures.

One of the most notable results of this study concerns the positive relationship observed between audit quality and audit risk, which contradicts conventional theoretical expectations. While high-quality auditors are generally expected to reduce audit risk, the findings suggest that reputable audit firms may be more frequently engaged by high-risk clients requiring stronger monitoring and more rigorous auditing procedures. This interpretation is consistent with the argument that audit quality can be endogenous to risk conditions, where firms facing higher inherent or control risk deliberately select higher-quality auditors to enhance credibility [11]. Litigation risk environments also demonstrate that large or reputable auditors tend to accept complex engagements characterized by higher inherent risk while compensating through increased audit effort [7]. Therefore, the positive association identified in this study may reflect risk-based auditor selection rather than reduced audit effectiveness. Similar conclusions have been reported in studies examining audit fees and auditor specialization in high-risk engagements [13].

The control variables further reinforce the multidimensional nature of audit risk assessment. The negative association between modified audit opinions and audit risk suggests that auditors adopt more conservative reporting behavior when governance risks are identified, which may reduce uncertainty in subsequent audit engagements. This finding corresponds with research demonstrating that disclosure practices and accountability mechanisms influence auditors' risk evaluations [20]. Financial leverage shows a positive relationship with audit risk, confirming that highly leveraged firms expose auditors to greater financial reporting uncertainty and potential litigation risk [28]. Similarly, firm size exhibits mixed effects across models, reflecting the dual nature of large firms that benefit from stronger internal controls while simultaneously facing greater operational complexity.

The findings also align with emerging technological and behavioral perspectives on audit risk. Recent studies emphasize that audit risk assessment increasingly incorporates technological factors, including digital transformation and data analytics capabilities, which reshape auditors' evaluation processes [15]. The integration of information technology governance and e-auditing practices has been shown to reduce audit risk through enhanced monitoring efficiency and automated verification mechanisms [16]. Moreover, auditors' cognitive abilities and professional judgment significantly influence risk acceptance decisions, reinforcing the behavioral

dimension of audit risk assessment [14]. These perspectives suggest that governance mechanisms operate alongside technological and human factors in determining audit risk outcomes.

The results also resonate with contemporary research emphasizing advanced analytical techniques in audit risk prediction. Neural network models and machine-learning approaches demonstrate that governance variables play a critical role in predicting engagement risk within complex financial environments [17, 18]. Data mining applications further confirm that governance characteristics and financial indicators jointly enhance risk prediction accuracy [19]. These developments highlight the importance of integrating traditional governance analysis with modern analytical tools when evaluating audit risk.

In addition, the role of corporate social responsibility disclosures and ethical governance practices must be considered when interpreting the findings. Research indicates that CSR transparency improves stakeholder trust and reduces uncertainty in financial reporting environments, thereby influencing auditors' risk judgments [21, 22]. Studies also demonstrate that audit risk plays a mediating role in improving audit quality and investment efficiency, reinforcing the broader economic implications of effective governance structures [5, 27]. The present results therefore contribute to a holistic understanding of audit risk as a governance-driven construct influenced by organizational, institutional, and technological factors.

From a planning perspective, audit risk assessment frameworks increasingly incorporate structured judgment models and fuzzy decision-making techniques to improve audit planning accuracy [23]. Research on audit budgeting behavior further shows that auditors sometimes substitute budget constraints for formal risk evaluation, which may affect audit effectiveness [24]. Additionally, specialist auditors have been shown to reduce engagement risk in complex regulatory environments, emphasizing the importance of expertise in managing audit risk exposure [25]. These insights help contextualize the findings by demonstrating that governance mechanisms interact with professional audit practices in shaping risk outcomes.

Evidence from tax auditing and regulatory oversight studies also supports the importance of structured risk models in improving monitoring effectiveness and compliance outcomes [26]. Collectively, the findings confirm that audit risk is not solely a function of financial variables but rather a multidimensional construct shaped by governance quality, institutional monitoring, technological transformation, and auditor expertise. The study therefore extends prior literature by providing integrated empirical evidence from an emerging market context and reinforcing the central role of corporate governance in audit risk management.

The results contribute to auditing and corporate governance literature by demonstrating that governance mechanisms influence audit risk in heterogeneous ways. Independent monitoring structures and institutional ownership reduce risk perceptions, while managerial power concentration increases engagement risk. At the same time, the unexpected positive relationship between audit quality and audit risk highlights the complexity of auditor selection dynamics and the importance of considering contextual institutional factors. These findings underscore the need for regulators, auditors, and investors to evaluate governance effectiveness holistically rather than relying on isolated indicators.

One limitation of this study relates to the use of secondary archival data derived from publicly available financial statements, which may not fully capture qualitative governance characteristics such as board expertise, managerial competence, or internal control culture. In addition, the measurement of audit risk using audit fees may not completely reflect all dimensions of engagement risk perceived by auditors. The focus on firms listed on a single stock exchange may also limit the generalizability of the findings to other institutional environments or regulatory systems.

Future research could expand the scope of analysis by incorporating cross-country comparisons to evaluate how institutional differences influence the governance–audit risk relationship. Researchers may also investigate moderating variables such as industry specialization, digital audit adoption, ESG disclosure practices, or regulatory reforms. Employing longitudinal or mixed-method approaches could provide deeper insight into causal mechanisms linking governance effectiveness and audit risk assessment. Furthermore, integrating machine-learning techniques with governance indicators may enhance predictive accuracy and offer new directions for audit risk modeling.

From a practical perspective, the findings suggest that policymakers should strengthen governance regulations aimed at enhancing board independence and audit committee effectiveness. Audit firms may benefit from incorporating governance indicators more systematically into risk assessment procedures, while investors should consider governance structures as signals of financial reporting reliability. Corporate managers are encouraged to avoid excessive concentration of authority through CEO duality and to promote transparent governance practices that improve audit outcomes and reduce perceived engagement risk.

Authors' Contributions

Authors equally contributed to this article.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

The authors report no conflict of interest.

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