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Financial Ratios on Reducing Financial Distress Moderated by ESG

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ABSTRACT

This study investigates the influence of financial ratios, including leverage, liquidity, operating capacity, and operating cash flow, on financial distress among NASDAQ-100 companies from 2013 to 2023. Using panel data regression on 700 firm-year observations, the results reveal that leverage increases financial distress, while liquidity, operating capacity, and operating cash flow help reduce it. Moreover, ESG disclosure plays a dual role: it directly contributes to reducing financial distress and significantly moderates the relationship between liquidity and distress. These findings support stakeholder theory and underscore the importance of integrating financial fundamentals with transparent ESG reporting to enhance corporate financial resilience.

Keywords: Financial Distress, ESG, Financial Ratios, NASDAQ-100, Stakeholder Theory

INTRODUCTION

Financial distress has become a central theme in corporate finance research, especially in the wake of global financial crises and rising market volatility (Outecheva, 2007; Dirman, 2020; Belkhir, 2025). For NASDAQ-100 companies, which include some of the largest U.S. firms by market capitalization, financial health is vital for investor confidence and operational continuity. Financial distress occurs when a company cannot meet its financial obligations, often leading to loss of reputation, restructuring, or bankruptcy (Beaver, 1966; Platt & Platt, 2002).

Prior studies have explored the predictive power of financial ratios on distress (Achim et al., 2021; Grice & Dugan, 2001), but limited research addresses how non-financial indicators, such as ESG disclosure, influence or interact with these ratios. ESG (Environmental, Social, and Governance) reporting has become increasingly relevant in assessing long-term sustainability and risk exposure (Clarkson et al., 2008; Eccles & Krzus, 2018; Yadav, 2025; Zhou et al., 2025;

Yavuz et al., 2025). Financial ratios have consistently been regarded as essential tools for predicting corporate financial distress, with variables such as leverage, liquidity, operating capacity, and operating cash flow serving as the most widely applied indicators. While the predictive power of these ratios has been extensively documented, recent scholarship has emphasized the growing importance of incorporating non-financial dimensions into traditional distress models. In particular, Environmental, Social, and Governance (ESG) disclosure has emerged as a critical factor influencing firm performance, investor confidence, and long-term sustainability. Nevertheless, despite the increasing attention to ESG in corporate finance and investment literature, very few studies have considered its potential moderating role in the relationship between financial ratios and financial distress. This omission is especially evident in the context of large U.S. corporations, where ESG disclosure has become an integral component of reporting standards and stakeholder engagement. To address this gap, the present study examines NASDAQ-100 firms, focusing on the effect of financial ratios on distress likelihood and the moderating

role of ESG disclosure. By integrating financial and sustainability-related measures, the study contributes to a more holistic understanding of corporate resilience and provides novel insights for academics, practitioners, and policymakers.

LITERATURE REVIEW

Stakeholder Theory

According to Freeman (1984), firms should consider the interests of all stakeholders,not just shareholders. Donaldson and Preston (1995) argue that stakeholder-focused strategies create long-term value. ESG disclosure supports this by increasing transparency toward investors, employees, regulators, and society (Clarkson et al., 2008; Eccles & Krzus, 2018). Prior research shows ESG practices reduce information asymmetry and improve stakeholder trust (Fatemi et al., 2018; Dhaliwal et al., 2011).

Leverage and Financial Distress

Leverage measures a firm's reliance on debt. High leverage increases fixed obligations and reduces financial flexibility, making firms more vulnerable during economic downturns (Altman, 1968; Outecheva, 2007). Several studies (Achim et al., 2021; Harymawan et al., 2021) show that high debt ratios are positively associated with financial distress.

H1: Leverage exerts a positive impact on financial distress.

Firms with higher leverage are more likely to experience financial distress due to increased financial burden.

Liquidity and Financial Distress

Liquidity reflects the firm's ability to meet short-term obligations. A strong liquidity position reduces the likelihood of technical insolvency and improves resilience (Beaver, 1966; Ross et al., 2022). Studies by Grice and Dugan (2001) and Almamy et al. (2016) show that low liquidity is an early warning signal for financial distress.

H2: Liquidity has a positive effect on reducing financial distress.

Firms with higher liquidity are better equipped to manage unexpected shocks and sustain operations.

Operating Capacity and Financial Distress

Operating capacity, often measured by asset turnover, indicates how efficiently a firm uses its resources to generate revenue. Higher turnover ratios suggest better asset utilization and reduced risk of distress (Altman, 1983; Grice & Dugan, 2001). Recent evidence (Achim et al., 2021; Binh et al., 2023) supports this relationship.

H3: Operating capacity has a positive effect on reducing financial distress.

Efficient asset utilization enhances performance and lowers insolvency risk.

Operating Cash Flow and Financial Distress

Operating cash flow shows how much cash a firm generates from its core activities. Positive cash flow reduces reliance on external financing and supports long-term stability (Platt & Platt, 2002; DeFond & Hung, 2003). Several studies (Beaver, 1966; Outecheva, 2007) find negative cash flow to be a predictor of distress.

H4: Operating cash flow has a positive effect on reducing financial distress.

Firms with stronger internal cash flow are more financially stable and less prone to default.

ESG Disclosure and Financial Distress

ESG disclosure enhances transparency and signals responsible management practices. Firms with high ESG ratings are often rewarded with lower capital costs and reduced distress risk (Clarkson et al., 2008; Fatemi et al., 2018). ESG performance is linked to improved stakeholder trust and long-term resilience (Jin & Sandwidi, 2023; Chebbi & Ammer, 2023).

H5: ESG disclosure has a positive effect on reducing financial distress.

Transparent ESG practices improve reputation, stakeholder confidence, and access to financing.

Hypotheses on ESG as a Moderator

Prior literature suggests that ESG disclosure may influence the effectiveness of financial ratios in predicting distress. However, this interaction remains underexplored, especially among large-cap firms.

H6: ESG disclosure moderates the relationship between leverage and financial distress.

Firms with high leverage but strong ESG disclosure may mitigate risk perception and distress probability.

H7: ESG disclosure moderates the relationship between liquidity and financial distress.

ESG transparency could strengthen the positive impact of liquidity on reducing distress.

H8: ESG disclosure moderates the relationship between operating capacity and financial distress.
Efficient firms that also disclose ESG data may experience even greater resilience.
H9: ESG disclosure moderates the relationship between operating cash flow and financial distress.
Firms with high cash flow and strong ESG practices may further reduce their likelihood of distress.

RESEARCH METHOD

This study applies a quantitative approach using secondary panel data from annual and sustainability reports of NASDAQ-100 companies covering 2013–2023. The sampling criteria ensured that only firms with complete financial and ESG data across all 10 years were included.

Table 1: Sample Selection Process

Criteria	Number
Total companies in NASDAQ-100	100
Excluded due to missing data	30
Final sample	**70**
Observation period (years)	10
Total firm-year observations	**700**

Table 2: Variable Definitions and Measurements

Variable	Definition	Measurement
Financial Distress (FD)	Proxy for financial vulnerability	Zmijewski Score: $X = -4.3 - 4.5\times X_1 + 5.7\times X_2 - 0.004\times X_3$
Leverage (LEV)	Capital structure risk	Total Liabilities / Total Assets
Liquidity (LIQ)	Short-term solvency	Current Assets / Current Liabilities
Operating Capacity (OC)	Revenue-generating efficiency	Net Sales / Total Assets
Operating Cash Flow	Operational cash strength	Net Operating Cash Flow / Current Liabilities
ESG Disclosure (ESGD)	ESG transparency	ESG Index = $\Sigma X_i / N_i$ (sum of ESG item scores over total items)

RESULTS AND ANALYSIS

Descriptive Statistics

Table 3: Descriptive Statistics

Variable	Min	Max	Mean	Std. Dev	Skewness	Kurtosis
LEV	0.05	0.91	0.42	0.15	0.41	2.78
LIQ	0.61	3.24	1.85	0.54	0.12	2.32
OC	0.35	2.78	1.09	0.49	0.19	2.46
OCF	-0.15	0.92	0.33	0.21	-0.05	2.15
FD	-2.48	2.31	-0.17	1.07	0.23	2.63
ESGD	0.10	0.85	0.39	0.18	0.09	2.87

The descriptive statistics in Table 3 reveal that NASDAQ-100 firms maintain an average leverage ratio of 42%, indicating moderate reliance on debt financing. This is consistent with Achim et al. (2021) and Binh et al. (2023), who observed similar leverage levels in large-cap firms across Europe and Asia, respectively. While moderate leverage can enhance returns through the tax shield effect, excessive reliance on debt increases fixed obligations and vulnerability to macroeconomic shocks (Altman, 1968; Outecheva, 2007).

Liquidity averages 1.85, implying that firms possess nearly twice as many current assets as current liabilities. This reflects robust short-term solvency and aligns with findings by Almamy et al. (2016) and Ross et al. (2022), who reported that high liquidity is a strong defensive mechanism against distress, particularly during downturns.

Operating capacity (mean = 1.09) and operating cash flow (mean = 0.33) suggest efficient asset utilization and healthy internal cash generation. Similar efficiency levels have been linked to lower distress risk by Grice and Dugan (2001) and Platt and Platt (2002). The skewness and kurtosis values for all variables remain within acceptable ranges, indicating approximately normal distributions suitable for regression analysis.

5.2 Correlation Matrix

Table 4: Correlation Matrix

	LEV	LIQ	OC	OCF	ESGD	FD
LEV	1					
LIQ	-0.33	1				
OC	-0.12	0.24	1			
OCF	-0.28	0.45	0.31	1		
ESGD	-0.06	0.18	0.09	0.11	1	
FD	-0.47	0.36	0.29	0.22	0.16	1

The correlation matrix (Table 4) confirms expected relationships between variables. Leverage shows a strong negative correlation with financial distress (r = -0.47), reinforcing prior evidence that higher debt burdens increase distress likelihood (Harymawan et al., 2021; Reid et al., 2024). In contrast, liquidity, operating capacity, and operating cash flow exhibit positive correlations with financial health, consistent with earlier research by Beaver (1966) and Binh et al. (2023), which emphasized the protective role of operational and cash-flow efficiency.

All correlation coefficients are below 0.70, eliminating multicollinearity concerns and confirming that each variable contributes uniquely to the analysis.

Regression Assumptions Testing

Normality of residuals: Passed (Shapiro-Wilk, $p > 0.05$)
Homoscedasticity: Passed (Breusch-Pagan, $p = 0.213$)
Multicollinearity: VIFs < 5

Multiple Regression (Model 1)

Table 5: Multiple Regression (Model 1)

Variable	Std. Error	t	p-value	Decision
LEV	1.079	-7.61	0.000	H1 Supported
LIQ	0.183	5.02	0.000	H2 Supported
OC	0.366	4.27	0.000	H3 Supported
OCF	1.651	2.11	0.035	H4 Supported
ESGD	1.036	2.03	0.043	H5 Supported

$R^2 = 0.386$; Adjusted $R^2 = 0.379$

Moderated Regression (Model 2)

Table 6: Moderated Regression (Model 2)

Interaction	B	Std. Error	t	p-value	Decision
ESG.LEV	-1.005	1.276	-0.79	0.430	H6 Rejected
ESG.LIQ	-1.834	0.748	-2.45	0.015	H7 Supported
ESG.OC	-0.544	0.889	-0.61	0.541	H8 Rejected
ESG.OCF	-0.891	1.893	-0.47	0.636	H9 Rejected

$R^2 = 0.402$; Adjusted $R^2 = 0.390$

Regression Results Interpretation (Model 1):

The multiple regression results (Table 5) show that leverage exerts a significant and negative impact on financial stability ($\beta = -8.214$, $p < 0.001$), aligning with Altman's (1968) bankruptcy prediction model and the more recent findings of Achim et al. (2021), who demonstrated that over-leveraged firms face heightened default risk.

Liquidity ($\beta = 0.917$, $p < 0.001$) significantly reduces distress probability, corroborating Beaver (1966) and Almamy et al. (2016), who identified liquidity as a leading early-warning signal. Operating capacity ($\beta = 1.563$, $p < 0.001$) confirms that efficient use of assets enhances resilience (Grice & Dugan, 2001; Binh et al., 2023), while operating cash flow ($\beta = 3.487$, $p = 0.035$) supports the view of DeFond and Hung (2003) that strong internal cash generation lowers dependence on external financing.

ESG disclosure ($\beta = 2.102$, $p = 0.043$) emerges as a significant predictor of reduced financial distress, consistent with Clarkson et al. (2008) and Fatemi et al. (2018), who showed that transparency in ESG practices fosters investor trust and reduces perceived risk.

Regression Results Interpretation (Model 2):

When ESG disclosure is introduced as a moderator, a significant interaction appears only in the liquidity–financial distress relationship ($\beta = -1.834$, $p = 0.015$). This suggests that ESG transparency amplifies the protective effect of liquidity, perhaps by signaling prudent resource management and social responsibility, thereby improving stakeholder confidence. This finding parallels the conclusions of Jin and Sandwidi (2023) and Singh (2024), who observed that ESG commitments enhance the credibility of firms' financial strengths, particularly their solvency.

However, no significant moderation is observed for leverage, operating capacity, or operating cash flow. This result aligns with Liwa et al. (2024), who found that ESG benefits may be context-specific and more impactful when tied to short-term solvency measures than to structural or operational efficiency metrics.

Overall, the results validate stakeholder theory by showing that a combination of sound financial fundamentals and ESG transparency strengthens corporate resilience, while also revealing that ESG's moderating role is selective rather than universal.

DISCUSSION

This study confirms that traditional financial ratios remain powerful predictors of financial distress among large-cap firms, while also shedding light on the selective moderating role of ESG disclosure. The findings extend prior literature by showing that, for NASDAQ-100 companies, liquidity, operational efficiency, and cash-flow strength act as financial "shock absorbers," whereas leverage amplifies vulnerability to distress.

The negative and significant effect of leverage aligns with the early bankruptcy prediction work of Altman (1968) and the more recent findings of Achim et al. (2021) and Reid et al. (2024), which consistently report that high debt levels reduce financial flexibility and increase sensitivity to market downturns. Conversely, liquidity emerged as a strong protective factor, consistent with Beaver (1966), Almamy et al. (2016), and Ross et al. (2022), who emphasized that firms with healthy current ratios are better equipped to meet short-term obligations, thereby avoiding technical insolvency.

Similarly, the positive role of operating capacity reinforces the evidence from Grice and Dugan (2001) and Binh et al. (2023), highlighting that efficient asset utilization reduces the likelihood of financial deterioration. The protective effect of operating cash flow corroborates the arguments of DeFond and Hung (2003) and Platt and Platt (2002) that internally generated funds diminish reliance on costly external financing, reducing default risk.

One of the most notable results is the direct and positive influence of ESG disclosure on reducing financial distress. This supports the stakeholder theory perspective (Freeman, 1984; Donaldson & Preston, 1995) and is in line with empirical evidence from Clarkson et al. (2008), Fatemi et al. (2018), and Jin and Sandwidi (2023), who found that transparent ESG practices enhance firm reputation, lower capital costs, and improve stakeholder trust. In this way, ESG acts not merely as a "soft" reputational asset but as a tangible contributor to financial resilience.

The moderation analysis reveals that ESG disclosure significantly strengthens the relationship between liquidity and reduced financial distress. This finding parallels the work of Singh (2024) and Liwa et al. (2024), who observed that ESG commitments enhance the credibility of firms' solvency signals, particularly in industries where liquidity is a critical measure of operational stability. The absence of significant moderation for leverage, operating capacity, and operating cash flow suggests that ESG's amplifying effect may be contingent upon the nature of the financial metric. Liquidity — a short-term and easily observable indicator — may provide a clearer and more immediate channel for ESG-driven trust than structural or long-term operational measures.

Overall, these results provide a nuanced contribution to both theory and practice. From a theoretical standpoint, they reinforce stakeholder theory while also refining risk theory by showing that ESG's mitigating effect is not uniform but targeted. From a managerial perspective, they highlight that ESG reporting should be strategically aligned with liquidity management to maximize resilience benefits.

CONCLUSION AND RECOMMENDATIONS

This study provides robust empirical evidence that traditional financial ratios, specifically leverage, liquidity, operating capacity, and operating cash flow, remain fundamental predictors of financial distress among large U.S. firms. Using data from NASDAQ-100 companies from 2013 to 2023, the analysis confirms that high leverage significantly increases the likelihood of distress. In contrast, strong liquidity, efficient asset utilization, and healthy cash generation substantially reduce it. These findings echo earlier works by Altman (1968), Beaver (1966), and Grice and Dugan (2001), while extending them to the contemporary context of ESG integration.

A key contribution of this research is the identification of ESG disclosure as both a direct protective factor and a selective moderator. Consistent with stakeholder theory (Freeman, 1984; Donaldson & Preston, 1995) and

studies by Clarkson et al. (2008) and Fatemi et al. (2018), transparent ESG reporting appears to enhance stakeholder trust and improve financial stability. Notably, ESG disclosure strengthens the positive impact of liquidity on distress reduction, a result that aligns with Singh (2024) and Liwa et al. (2024) but shows no significant moderation for leverage, operating capacity, or operating cash flow. This suggests that ESG's risk-mitigating effects may be most potent when linked to short-term solvency signals rather than structural or efficiency-based metrics.

Overall, these findings emphasize that combining sound financial fundamentals with credible ESG transparency can significantly bolster corporate resilience in the face of economic uncertainty.

The results confirm that ESG transparency can yield tangible financial benefits by strengthening legitimacy and stakeholder confidence. However, the moderating role of ESG is not uniform, as its greatest value appears when it complements liquidity, underscoring the need for context-specific integration. This study adds to the growing body of research (e.g., Binh et al., 2023; Jin & Sandwidi, 2023) that combines financial ratios with ESG indicators in predicting financial distress. From a managerial perspective, firms should actively monitor leverage, liquidity, operational efficiency, and cash flow as core measures of financial health, while positioning ESG reporting as a strategic tool to reinforce liquidity signals rather than a simple compliance requirement. For investors and creditors, evaluation should adopt a hybrid approach that incorporates both financial ratios and the quality of ESG disclosure, as firms with robust liquidity and credible ESG practices are more likely to withstand adverse conditions. At the governance level, boards are encouraged to align ESG strategies with working capital management policies to maximize their combined protective effect.

The findings also carry important regulatory implications. Regulators should prioritize the standardization of ESG reporting by promoting mandatory and comparable disclosure frameworks (e.g., CSRD, ISSB) to enhance transparency and mitigate information asymmetry. In parallel, stronger enforcement mechanisms are needed to curb greenwashing practices, thereby ensuring the credibility of ESG claims and reducing associated reputational and financial risks. Furthermore, policy guidance should emphasize the integration of ESG transparency with key solvency indicators, particularly liquidity, as a means of reinforcing systemic resilience

The study is subject to several limitations. First, the results are derived from large-cap U.S. firms, which may restrict their generalizability to mid-cap companies or firms in emerging markets. Second, the reliance on composite ESG indices could mask sector-specific dynamics or potential greenwashing practices. Third, the correlational design employed constrains causal inference, suggesting that future research should adopt quasi-experimental or longitudinal methodologies to strengthen causal claims. Building on these limitations, future studies may investigate non-linear or threshold effects of ESG disclosure, assess sectoral heterogeneity, and examine whether ESG–liquidity synergies persist across varying market environments. Moreover, cross-country analyses could provide further insights into the role of regulatory frameworks in shaping the relationship between ESG practices and financial distress.

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Conflict of Interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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