DETERMINANTS OF FINANCIAL DISTRESS IN LISTED FOOD FIRMS IN VIETNAM: MODERATING EFFECTS OF ECONOMIC GROWTH AND QUALITY MANAGEMENT

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Abstract: ***This study examines factors affecting financial distress in food processing firms listed on the Vietnamese stock market from 2018-2023, using OLS and HDFE regressions. Results show that profitability and short-term liquidity positively influence the Z-score, reducing financial vulnerability, while firm size and leverage negatively impact it, increasing risks. Economic growth and quality management moderate these effects: high liquidity aids resilience in favorable conditions, and ISO 22000 certification, combined with profitability, offsets leverage and exchange rate risks. These insights highlight the role of macroeconomic and governance factors in shaping financial distress in Vietnam's food industry.***

• Keywords: *food manufacturing companies, financial distress, economic growth, quality management.*

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1. Introduction

Financial distress remains a critical concern for firms, especially in emerging markets where economic volatility and structural challenges heighten vulnerabilities. In Vietnam, the food processing sector a key driver of growth and exports faced mounting pressures from 2018 to 2023 due to global supply chain disruptions, exchange rate fluctuations, and the lingering impact of COVID-19. Despite its significance, little research has examined the determinants of financial distress in this sector, particularly under moderating influences. Understanding these dynamics is essential for firms to build resilience and for policymakers to craft targeted interventions.

This study addresses this gap by analyzing factors influencing financial distress in 40 food processing firms listed on HOSE and HNX during 2018-2023, using 240 firm-year observations. Based on models like Altman's Z-score, the research applies Ordinary Least Squares (OLS) and High-Dimensional Fixed Effects (HDFE) regressions to assess the roles of profitability, liquidity, leverage, firm size, and exchange rate volatility. It also examines how economic growth and ISO 22000 certification moderate these relationships. The findings aim to offer insights into how macroeconomic conditions and internal governance practices affect financial stability in Vietnam's trade-exposed food industry.

2. Literature review

Extensive global research has examined the determinants of financial distress, contributing to a deeper understanding of corporate financial stability. Prior studies can be grouped into three main areas: (i) firm-level fundamentals, (ii) macroeconomic factors, and (iii) corporate governance each offering complementary insights into financial risk, especially in sectors like food processing that are shaped by both internal and external forces.

Firm-Level Fundamentals: Internal financial health and strategic choices play a crucial role in distress prediction. For instance, large book-tax differences often signal weak financials or aggressive accounting (Noga & Schnader, 2013), though the role of profit quality remains underexplored. Zhang (2015) found that R&D investments increase risk due to uncertainty, especially during downturns. Other stabilizing factors include foreign currency hedging (Magee, 2013), strong employee relations (Kane et al., 2005), transparent disclosures, and effective CSR (Al-Hadi et al., 2017).

Corporate Governance: Governance mechanisms help reduce financial risk by limiting managerial opportunism (Shleifer & Vishny, 1997). While the effects of board size and CEO duality remain debated, independent directors may reduce risk, though their effectiveness varies by firm size (Hsu & Wu, 2014). CEO traits and ownership structure also matter, as leadership experience, overconfidence, and political ties can either mitigate or heighten risk.

Macroeconomic Factors: External economic conditions significantly influence financial risk. Recessions typically

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reduce revenues and liquidity (Liou & Smith, 2007), as seen in Vietnam's food industry during COVID-19. Inflation, interest rates, and monetary policy also affect firm solvency (Tinoco & Wilson, 2013). Firm responses to economic cycles vary, with governance potentially moderating these effects (Aldamen et al., 2012).

Despite a rich global literature, findings remain inconsistent due to context-specific variables and risk measures. In Vietnam, sectoral research particularly on food firms remains limited, despite their exposure to global supply chains and macroeconomic volatility. Moreover, few studies examine moderating effects. This study addresses these gaps by analyzing the impact of key factors on Z-score among listed food firms, while investigating the moderating roles of GDP growth and ISO 22000 certification.

3. Theoretical basis and model variables

Financial distress (FD) in firms stems from financial and macroeconomic factors. This study examines five key variables Return on Assets (ROA), Liquidity, Financial Leverage (Leverage), Exchange Rate Volatility (ERV), and Firm Size (FirmSize) selected for their relevance to Vietnam's food processing industry (2018-2023). ROA gauges operational efficiency, Leverage reflects debt risk, Liquidity measures short-term solvency, FirmSize indicates financial capacity, and ERV captures exchange rate shocks (Opler & Titman, 1994). Unlike broader models, this focus reduces multicollinearity and aligns with the sector's operational and capital challenges (Beaver, 1966), with ERV added to address import-export dependencies (Nguyen & Doan, 2020).

ROA: As net income over assets, ROA predicts FD inversely due to its shock-absorbing role, critical amid Vietnam's fluctuating input costs (Beaver, 1966; Altman, 1968).

Liquidity: Measured by the current ratio, low liquidity signals FD risk, especially under supply chain pressures (Beaver, 1966).

Leverage: Debt-to-assets ratio heightens FD risk via fixed obligations, relevant given 2018-2023 debt reliance (Merton, 1974).

Firm Size: Larger firms show lower FD risk due to resources, while smaller ones are vulnerable in Vietnam's competitive market (Denis & Mihov, 2003).

ERV: VND fluctuations impact financial distress due to import-export exposure, a unique sector challenge (Nguyen & Doan, 2020).

Additionally, this study also explores moderating effects: Economic Growth (GDP growth) eases Leverage's negative impact and boosts Liquidity's effect on Z-score (Levine, 2005; Le & Tran, 2021), while ISO 22000 enhances ROA's positive link, mitigates Leverage risk, and stabilizes supply chains against ERV (Trienekens & Zuurbier, 2008; Mensah & Adams, 2020), aligning with Vietnam's global trade context (2018-2023).

4. Methodology

4.1. Research model

** Research hypothesis*

Based on the theoretical framework regarding the factors affecting corporate financial distress presented in the previous section, the following hypotheses are proposed:

Hypothesis 1: Return on Assets (ROA) affects the financial distress of food processing firms.

Hypothesis 2: Financial leverage affects the financial distress of food processing firms.

Hypothesis 3: Liquidity affects the financial distress of food processing firms.

Hypothesis 4: Firm size affects the financial distress of food processing firms.

Hypothesis 5: Exchange rate volatility affects the financial distress of food processing firms.

Hypothesis 6: Food safety regulations moderate the relationship between ROA and financial distress of food processing firms.

Hypothesis 7: Food safety regulations moderate the relationship between financial leverage and financial distress of food processing firms.

Hypothesis 8: Food safety regulations moderate the relationship between liquidity and financial distress of food processing firms.

Hypothesis 9: Food safety regulations moderate the relationship between firm size and financial distress of food processing firms.

Hypothesis 10: Food safety regulations moderate the relationship between exchange rate volatility and financial distress of food processing firms.

Hypothesis 11: Economic growth moderates the relationship between ROA and financial distress of food processing firms.

Hypothesis 12: Economic growth moderates the relationship between financial leverage and financial distress of food processing firms.

Hypothesis 13: Economic growth moderates the relationship between liquidity and financial distress of food processing firms.

Hypothesis 14: Economic growth moderates the relationship between firm size and financial distress of food processing firms.

Hypothesis 15: Economic growth moderates the relationship between exchange rate volatility and financial distress of food processing firms.

** Research models*

Based on the research hypotheses, the models proposed in the study are as follows:

$$Zscore_{i,t} = \beta_0 + \beta_1 ROA_{i,t} + \beta_2 LEV_{i,t} + \beta_3 LIQ_{i,t} + \beta_4 Firmsize_{i,t} + \beta_5 ERV_{i,t} + \beta_6 (GDPGrowth_{i,t} \times ROA_{i,t}) + \beta_7 (GDPGrowth_{i,t} \times LEV_{i,t}) + \beta_8 (GDPGrowth_{i,t} \times LIQ_{i,t}) + \beta_9 (GDPGrowth_{i,t} \times Firmsize_{i,t}) + \beta_{10} (GDPGrowth_{i,t} \times ERV_{i,t}) + \beta_{11} (ISO_{i,t} \times ROA_{i,t}) + \beta_{12} (ISO_{i,t} \times LEV_{i,t}) + \beta_{13} (ISO_{i,t} \times LIQ_{i,t}) + \beta_{14} (ISO_{i,t} \times Firmsize_{i,t}) + \beta_{15} (ISO_{i,t} \times ERV_{i,t}) + \epsilon_{i,t}$$

Where:

ROA: Return on Assets - reflects the financial performance of the firm.

LEV: Financial leverage.

LIQ: Short-term liquidity.

Firmsize: Firm size

ERV: Exchange rate volatility

GDP Growth: Economic growth

ISO: ISO 22000 quality management certification

β_0 (Intercept): The intercept - the value of the Z-score when all independent variables are equal to zero.

β_t where t = 1, 2, ..., 15 corresponds to each independent variable or interaction term

ε (Error term): The random error

The variables in the research model are described specifically in the following table:

Table 1: Variables measurement

Variables	Measurement
Dependent variable	
Z score	$Z=1.2X_1+1.4X_2+3.3X_3+0.6X_4+1.0X_5$ Where: - X_1: Working Capital / Total Assets - X_2: Retained Earnings / Total Assets - X_3: EBIT / Total Assets - X_4: Market Value of Equity / Total Liabilities Market Value of Equity (MVE) = Book Value of Equity × Market Adjustment Factor (P/B ratio), with data collected as of December 31 each year, consistent with the balance sheet date. X_5: Sales / Total Assets
Independent variables	
ROA	Return on assets= Net profit after tax / Total assets
LEV	Leverage= Total liabilities / Total assets
LIQ	Short-term liquidity = Current assets / Current liabilities
Firm Size	Logarithm of total assets
ERV	$= \frac{NEER_t - NEER_{t-1}}{NEER_{t-1}} \times 100\%$ **ER_t**: Annual fluctuation in NEER (Nominal Effective Exchange Rate)
Moderator variables	
ISO	Dummy variable (takes the value 1 if the firm holds an ISO 22000 certification, and 0 otherwise).
GDP Growth	$= \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}}$

4.2. Data and summary statistics

Financial data for the sample firms were sourced from 2018-2023 financial statements of food processing companies listed on HOSE and HNX. Quality management data, focusing on ISO 22000 certification, were collected from management reports and company websites for the same period. Economic growth data were obtained from the World Bank, while real effective exchange rate data were sourced from TradingEconomics.com.

Table 2 summarizes the descriptive statistics for the variables used in the study, based on 240 firm-year observations from 40 food processing firms listed on HOSE and HNX during 2018-2023. The variables include the Z-score (financial distress), ISO 22000 certification (ISO), GDP Growth, ROA, financial leverage (LEV), liquidity (LIQ), firm size (log of total assets), and exchange rate volatility (ERV).

Table 2: Summary of descriptive statistics

Variables	Observation	Mean	Std	Min	Max
Zscore	240	2.328	4.982	-29.293	18.833
ISO	240	0.55	0.499	0	1
GDPgrowth	240	5.583	2.231	2.6	8.1
ROA	240	0.026	0.149	-1.627	0.315
LEV	240	0.942	2.620	0.034	23.179
LIQ	240	2.140	3.250	0.001	29.407
Firmsize	240	27.516	1.598	23.559	32.468
ERV	240	1.106	2.273	-2.067	3.809

Data source: Stata output

The Z-score averages 2.328 (SD = 4.982), ranging from -29.293 to 18.833, indicating wide variation in financial health. ISO certification is present in 55% of firms (mean = 0.55), while GDP Growth averages 5.583%, suggesting a relatively stable macroeconomic environment. ROA has a mean of 2.6%, with large variation (SD = 0.149), highlighting diverse profitability levels. LEV shows high dispersion (mean = 0.942; max = 23.179), pointing to differing debt reliance. LIQ varies considerably (mean = 2.140; SD = 3.250), with some firms showing very low or high short-term liquidity. Firm size ranges from 23.559 to 32.468 (mean = 27.516), and ERV averages 1.106, reflecting notable exchange rate fluctuations during a period marked by global shocks, including the COVID-19 pandemic.

5. Empirical results and discussion

5.1. Panel unit root test

Gujarati (2003) notes that non-stationary data can lead to inaccurate regression results, necessitating panel unit root tests. Given the strongly balanced data in this study, the Levin, Lin & Chu (2002) test is applied, confirming that all five variables are stationary, making them suitable for subsequent analysis.

5.2. Correlation analysis

Table 3: Correlation matrix between variables

	Zscore	ROA	LEV	LIQ	Firmsize	ERV
Zscore	1.0000					
ROA	0.5719*	1.0000				
LEV	-0.8448*	-0.4209*	1.0000			
LIQ	0.5388*	0.0864	-0.1495*	1.0000		
Firmsize	0.0501	0.3290*	-0.3199*	-0.1628*	1.0000	
ERV	-0.0057	-0.0450	0.0028	-0.0048	-0.0168	1.0000

Data source: Stata output

Correlation coefficients marked with an asterisk (*) are significant at the 5% level or lower, reflecting reliable variable relationships. The Z-score is strongly positively correlated with ROA and LIQ, indicating that higher profitability and liquidity reduce financial distress, consistent with Beaver (1966). Conversely, it shows a strong negative correlation with LEV, suggesting that high leverage increases distress risk due to repayment pressures (Andrade & Kaplan, 1998). Correlations with Size and ERV are not significant, implying minimal direct impact on the Z-score in this sample.

5.3. Discussion of regression results

Multicollinearity was evaluated using the Variance Inflation Factor (VIF), with some interaction terms exceeding the threshold of 10. Mean-centering was applied to reduce correlations, lowering all VIF values below 10. Subsequent High-Dimensional Fixed Effects (HDFE) and HDFE with entropy balancing on the adjusted dataset ensured reliable coefficient estimates for 2018-2023.

To assess the impact of independent variables on the dependent variable, the author used OLS, HDFE, and HDFE with Entropy Balancing for robustness. As GDP growth and exchange rate volatility are time-invariant, they were omitted in HDFE with year fixed effects; models were run with and without year effects for a comprehensive 2018-2023 analysis.

The hypothesis that ROA, Leverage, and Liquidity differ between large firms and SMEs (by total assets) was confirmed by a t-test ($p < 0.05$). Entropy balancing adjusted weights to minimize selection bias, enhancing the accuracy of HDFE estimates of financial factors' impact on the Z-score.

Table 4: Regression results on the factors affecting financial distress under the moderating effects of economic growth and quality management certification in listed joint-stock food processing companies

VARIABLES	OLS	HDFE (Year FE)	HDFE (No Year FE)	HDFE with Entropy Balancing Weights (Year FE)	HDFE with Entropy Balancing Weights (No Year FE)
ROA	8.992***	8.977***	8.992***	9.233***	9.239***
	(0.701)	(1.065)	(0.977)	(0.570)	(0.573)
LEV	-1.349***	-1.335***	-1.349***	-1.335***	-1.335***
	(0.0782)	(0.0882)	(0.0602)	(0.033)	(0.033)
LIQ	0.581***	0.589***	0.581***	1.326*	0.587***
	(0.0644)	(0.0290)	(0.0182)	(0.708)	(0.064)
Firmsize	-0.410***	-0.336	-0.410	-0.0190	-0.296**
	(0.104)	(0.417)	(0.263)	(0.175)	(0.112)
ERV	0.0563	-	0.0563	-	0.0374
	(0.109)	-	(0.0527)	-	(0.0437)
GDPgrowth*ROA	-0.320	-0.264	-0.320	-0.612	-0.578
	(0.312)	(0.440)	(0.321)	(0.419)	(0.475)
GDPgrowth*LEV	-0.000262	-0.00285	-0.000262	-0.236	-0.130
	(0.0136)	(0.00907)	(0.00517)	(0.391)	(0.121)
GDPgrowth*LIQ	0.00382	0.00237	0.00382	0.102***	0.1059***
	(0.0111)	(0.0147)	(0.0129)	(0.008)	(0.008)
GDPgrowth*Firmsize	-0.000324	-0.0142	-0.000324	-0.0003	0.004
	(0.00165)	(0.0314)	(0.00176)	(0.002)	(0.006)
GDPgrowth*ERV	-0.00421	-	-0.00421	-	-0.016
	(0.0169)	-	(0.00884)	-	(0.137)
ISO*ROA	1.908	1.976	1.908	9.735**	9.868**
	(1.534)	(2.986)	(2.926)	(4.018)	(4.145)
ISO*LEV	0.248	0.252	0.248	0.772*	0.865**
	(0.233)	(0.254)	(0.254)	(0.406)	(0.420)
ISO*LIQ	0.101	0.101	0.101	-0.322	-0.346
	(0.0939)	(0.155)	(0.155)	(0.251)	(0.254)
ISO*ERV	-0.0133	-0.0105	-0.0133	0.0687**	0.0512*
	(0.0763)	(0.0281)	(0.0270)	(0.0268)	(0.0254)
ISO*Firmsize	0.0732	0.0744	0.0732	-0.133	-0.112
	(0.124)	(0.294)	(0.286)	(0.147)	(0.142)
Constant	13.15***	13.30*	13.15*	8.781***	9.425***
	(2.830)	(7.620)	(7.489)	(3.105)	(2.904)
Observations	240	240	240	240	240
R-squared	0.950	0.950	0.950	0.786	0.778
Year FE	No	Yes	No	Yes	No
Firm FE	No	Yes	Yes	Yes	Yes

Data source: Stata output

The results show that Return on Assets (ROA) positively and significantly ($p < 0.01$) reduces financial distress (Z-score) across OLS, HDFE with and without year-fixed effects, with coefficients ranging from 8.977 to 9.239, highlighting profitability's role in enhancing financial health among 40 listed food firms on HOSE and HNX (2018-2023). This aligns with Altman and Hotchkiss (2006) and Ohlson (1980), emphasizing ROA's importance in liquidity and debt capacity, especially during shocks like COVID-19.

Financial Leverage (LEV) negatively and significantly impacts the Z-score, with higher debt increasing risk, consistent with Merton (1974) and Zmijewski (1984), particularly evident in the food sector's cash flow volatility during 2020-2021.

Short-term Liquidity (LIQ), measured by the current ratio, positively and significantly boosts the Z-score, supporting Beaver (1966) and Altman (1968) on its role in resilience, crucial amid 2020-2021 supply chain disruptions.

Firm Size unexpectedly shows a negative Z-score relationship, possibly due to managerial inefficiencies in large firms (Berger et al., 1993), exacerbated by 2020-2021 exchange rate and demand challenges in Vietnam (World Bank, 2022).

Exchange Rate Volatility (ERV) exhibits no significant effect on financial distress.

Moderating effects reveal that GDP growth × LIQ positively and significantly ($p < 0.01$) enhances Z-scores, suggesting liquidity leverages economic recovery post-2021 (Chordia & Shivakumar, 2005). ISO 22000 × ROA positively and significantly ($p < 0.05$) amplifies profitability's effect, reflecting improved efficiency and credibility (Hasan & Habib, 2017). ISO 22000 × LEV shows a positive effect ($p < 0.10$-0.05), indicating quality management mitigates leverage risks, especially during 2020-2021 disruptions. ISO 22000 × ERV positively and significantly ($p < 0.05$-0.10) reduces ERV's adverse impact, aligning with Magee (2013) on risk management benefits.

6. Conclusions

This study examines financial distress determinants in Vietnamese food processing firms (2018-2023) using OLS and HDFE regressions, finding that profitability and liquidity boost the Z-score, while firm size and leverage heighten risk. Economic growth and ISO 22000 certification moderate these effects, enhancing resilience and mitigating leverage and exchange rate risks.

Recommendations include boosting profitability and liquidity, reducing debt in large firms via refinancing or equity, leveraging economic growth for cash flow, pursuing ISO 22000 for reputation, and encouraging regulatory incentives like tax breaks to strengthen the sector post-2023.

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