USING CORPORATE GOVERNANCE TO PREDICT THE POSSIBILITY OF FINANCIAL DISTRESS OF LISTED COMPANIES IN VIETNAM'S MINING INDUSTRY

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Abstract: ***Corporations with weak management systems significantly increase risks, leading to inefficient operations and financial distress. The authors' research selects corporate governance characteristics such as corporate ownership, ownership concentration, gender issues, board size, board independence, and CEO duality as factors to forecast financial distress for Vietnamese listed enterprises in the mining industry. The research combines the corporate governance predictors with other variables such as financial ratios and macroeconomic factors in a panel data sample over a 10 - year period for predicting financial distress. The results show that corporate governance alone is not sufficient to forecast effectively financial difficulties for Vietnamese mining companies. The predictive power of the model appears to be performing much better in combination with financial ratios and macroeconomic factors.***

• Keywords: *corporate governance, financial distress, Vietnam mining industry.*

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1. Introduction

Financial distress (FD), also known as financial crisis, is commonly used to describe the financial condition of an individual or a company that is experiencing difficulty in meeting its obligations, particularly in making timely payments to its creditors. Prolonged and severe FD can ultimately lead to bankruptcy. Studies on predicting corporate FD were conducted very early, with the first study in 1930 by Fitzpatrick. The field gained significant momentum in subsequent years, with notable contributions from researchers such as Altman (1968). While there are varying perspectives on the selection of variables for predictive models, studies during this period generally focused on two groups of factors: financial ratios and external factors. Researchers generally agree on using financial ratios reflecting profitability, solvency, leverage, cash flow, and operational efficiency as crucial indicators of FD, as demonstrated in the works of Ohlson (1980). Additionally, external factors such as tight monetary policy, high-interest rates and high inflation (Liou and Smith, 2007) can contribute to FD situation and are often included as predictive variables.

However, in the 2000s and beyond, researchers began to focus on the impact of corporate governance on bankruptcy and financial distress. Corporate governance refers to a system of relationships between the management, board of directors, shareholders, and other stakeholders that provides the structure through which the company is directed and controlled. Effective corporate governance promotes increased company value, fosters investment growth, and contributes to long-term sustainability. In reality, companies with weak governance systems are more susceptible to loss, are at a higher risk of financial distress, and face increased overall risk. Numerous corporate governance characteristics are linked to these risks, including ownership structure, power dynamics, and gender diversity. Smaller board sizes, greater board independence, greater gender diversity on boards, and lower levels of management power concentration have been shown to reduce the risk of bankruptcy. Rajan and Zingales (1998) have pointed out that excessive ownership concentration is a common characteristic of many bankrupt Asian companies. Additionally, managerial abuse of power for private gain and short-term decision-making can lead to financial distress. Studies by Zhiyong Li et al. (2020) have demonstrated the predictive power of corporate governance characteristics in forecasting financial distress. Consequently, predictive models that combine corporate governance characteristics with other financial indicators have become increasingly popular among researchers.

2. Literature review

There is no consensus on the specific characteristics of corporate governance, such as ownership structure, power dynamics, gender diversity, board size,

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and board independence, and their impact on the probability of financial distress.

2.1. Board composition

The roles of the chairman of the board and the CEO differ significantly, as the former is responsible for major strategic decisions while the latter oversees day-to-day operations. In some companies, the same person holds both positions, and several studies have shown that dual leadership is positively correlated with the likelihood of financial distress, as demonstrated by Daily and Dalton (1994b). These authors argue that dual leadership can lead to more autocratic behavior and increased opportunities for CEOs/chairmen to pursue their own interests, while reducing the level of control. Conversely, De Maere et al. (2014) suggest that separating the roles of chairman and CEO can mitigate the risk of bankruptcy.

2.2. Proportion of independent directors

Based on agency theory, Jensen & Meckling (1976) argue that the presence of outside directors on a board is crucial for a company's survival. Daily & Dalton (1994a, 1994b) also support the view that the effectiveness of a board is highly dependent on the proportion of outsiders, especially during crises, as these members provide the company with access to valuable resources and information. However, there are some dissenting views, such as those of Chaganti et al. (1985), who argue that independent directors have a more superficial understanding of the company's specific characteristics and may therefore lead to less effective board functioning. Thus, previous studies have not reached a consensus on whether a higher proportion of independent directors has a positive or negative impact on the probability of financial distress.

2.3. Board size

The impact of board size on financial distress is a subject of debate, with research findings presenting conflicting conclusions. On the one hand, larger boards are less likely to experience financial distress. Researchers argue that larger boards offer a more diverse skill set, fostering a wider range of external relationships and generating a greater variety of viable solutions, thereby positively impacting organizational performance (Goodstein et al., 1994). An empirical study by Chaganti et al. (1985) also shows that companies experiencing financial distress tend to have smaller boards. On the other hand, proponents of agency theory argue that larger boards are more difficult to manage and coordinate, while smaller boards can make decisions more efficiently and effectively, thus better supporting the company's operations. Findings from research conducted by Yuli, A., & Choisi, E.A. (2021) using samples from Indonesian Coal Mining Companies support the agency theory.

2.4. Ownership concentration

Shleifer & Vishny (1997) argued that excessive ownership concentration often leads large shareholders to exploit their control to pursue private interests. In contrast, proponents of agency theory highlight the positive impact of ownership concentration on firm performance (Jensen & Meckling, 1976). This is because large shareholders are incentivized and have the expertise to effectively monitor the company's operations. Empirical studies also present conflicting findings on the relationship between ownership concentration and financial distress. While Deng and Wang (2006), in a study of 96 financially distressed and 96 non-distressed firms, found a negative correlation between ownership concentration and financial distress, Lee and Yeh (2004), in a study of Taiwanese listed companies, found that financial distress is more likely to occur in firms with high ownership concentration.

3. Research methods

3.1. Research data

Data on corporate governance factors such as ownership concentration, dual leadership (chairman and CEO), proportion of independent directors, board size, and average board age were collected from the annual reports of publicly listed mining companies on the Vietnamese stock market from 2012 to 2021. The sample includes 26 listed companies on both the HoSE and HNX exchanges. Additionally, secondary data on the financial ratios of these 26 companies were calculated by the authors based on financial statement data. To minimize errors due to the use of low-quality data, the authors collected annual reports and audited financial statements from reliable sources such as http://Vietstock.vn, http://s.caphe.vn. The listed mining companies included in the sample must have audited financial statements, ensuring reliability, and must have been listed for at least three years to meet the model's requirements. Macroeconomic data were collected from http://Vietstock.vn, http://s.caphe.vn and http://gso.gov.vn.

3.2. Research methods and model

3.2.1. Research methods

The methods used to forecast financial distress include univariate discriminant analysis (DA), multivariate discriminant analysis (MDA), and

logistic regression. Logistic regression is widely used in recent studies on financial distress forecasting. With logistic regression, the dependent variable is a binary variable that can take on one of two values: 0 (not distressed) and 1 (distressed). Therefore, the study requires a function that represents the probability of the estimated variable being equal to the actual values through the maximum log-likelihood function. The overall binary logistic regression function is constructed as follows:

$$Z = ln[Pi/(1-Pi)] = \beta 0 + \beta 1X1 + \beta 2X2 + ... + \beta kXk \quad (1)$$

Where: P (i=1): Probability of financial distress occurrence

P(i=0): Probability of no financial distress

3.2.2. Research model

Dependent variable:

Early identification of financial distress allows managers to take timely actions to mitigate risks, especially when a company is facing only minor difficulties. Therefore, this study adopts the criteria for identifying financial distress at the failure stage as proposed by Asquith, Gertner, and Scharfstein (1994). A company is considered to be financially distressed if it meets at least one of the following criteria: (1) The company has negative earnings before interest, taxes, depreciation, and amortization (EBITDA) for two consecutive years or (2) In any given year, the company's EBITDA is less than 80% of its interest expense.

Independent variables:

Based on previous theories and empirical studies, the authors selected the following corporate governance factors as predictors: board size, average board age, dual leadership (chairman and CEO), ownership concentration by large shareholders, and ownership of the board. Additionally, the authors selected five financial ratios and three macroeconomic factors, including inflation rate, economic growth rate, and interest rate, in combination with governance factors to examine their impact on the risk of financial distress among mining companies. The regression model is constructed as follows

Model 1: Utilizing corporate governance factors

$$Z = \ln\left[\frac{Pi}{1-Pi}\right] = \beta 0 + \beta 1 OWCN + \beta 2.BOARDSIZE + \beta 3.CEODL + \beta 4.BDINDE + \beta 5.BOARDAGE + \beta 6\ BDOW + \varepsilon \quad (2)$$

Model 2: Combining corporate governance factors and financial ratios

$$Z = \ln\left[\frac{Pi}{1-Pi}\right] = \beta 0 + \beta 1 OWCN + \beta 2.BOARDSIZE + \beta 3.CEODL + \beta 4.BDINDE + \beta 5.BOARDAGE + \beta 6\ BDOW + \beta 7 NSTA + \beta 8.MVETD + \beta 9.CFOTD + \beta 10.EBITTA + \beta 11\ WCTA + \varepsilon \quad (3)$$

Model 3: Combining corporate governance factors, financial ratios, and macroeconomic factors

$$Z = \ln\left[\frac{Pi}{1-Pi}\right] = \beta 0 + \beta 1 OWCN + \beta 2.BOARDSIZE + \beta 3.CEODL + \beta 4.BDINDE + \beta 5.BOARDAGE + \beta 6\ BDOW + 7NSTA + \beta 8.MVETD + \beta 9.CFOTD + \beta 10.EBITTA + \beta 11\ WCTA + \beta 7\ SIZE + \beta 8\ GDP + \beta 9.CPI + \beta 10.IR + \varepsilon \quad (4)$$

Table 1: Table of variable descriptions

Symbol	Variable	Measurement
1. Dependent Variable		
FD	Financial Distress	- EBITDA < interest expense for 2 consecutive year - EBITDA < 80% of interest expense in any given year
2. Explanatory Variables		
OWCN	Ownership Concentration	Percentage of shares held by entities or individuals holding 5% or more of the shares
BOARDSIZE	Board Size	Number of board members
CEODL	Chairman of the Board and the Chief Executive Officer (CEO) is the same person (CEO Duality)	A dummy variable equals 1 1 if the chairman is also the CEO, 0 otherwise
BDINDE	Board Independence	Proportion of independent directors on the board.
BOARDAGE	Board Age	Average age of board members
BDOW	Board Ownership	Percentage of shares owned by the board
EBITTA	Ratio of Profit before taxes and interest/ Total assets	(Total profit before tax + interest expense)/Total assets
CFOTD	Cash Flow to Total Debt Ratio	Net cash from operating activities (code 20 on cash flow statement /Total liabilities
MVETD	Market Value of Equity to Total Debt Ratio	(Closing stock price at the end of the year x number of shares outstanding) / Total liabilities
NSTA	Net Sales / Total Assets Ratio	Net Sales / Total Assets
WCTA	Working Capital/Total Assets Ratio	(Current Assets-Current Liabilities)/Total Assets
SIZE	Company size	Ln (total assets)
IR	Interest rate	Interbank interest rate for 6-month term
GDP	Economic growth rate	Economic growth rate (%)
CPI	Inflation rate	Consumer price index growth rate (%)

4. Regression results and discussion

4.1. Summary of sample characteristics

Table 2 presents the descriptive statistics of the variables, including the number of observations, mean, maximum, minimum, and standard deviation. Variable BDINDE has the highest mean and standard deviation, with values of 60.928 and 15.718, respectively. Moreover, the independent variables OWCN, BDOW, and MVETD exhibit large standard deviations, suggesting that the dependent variable FD might be influenced by these three independent variables.

Table 2: Table of descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FD	247	.101	.302	0	1
WCTA	247	.13	.261	-.325	.887
LNGLTS	247	.039	.118	-.439	.324
EBITTA	247	.085	.111	-.208	.519
MVETD	247	6.397	25.969	0	327.193
NSTA	247	1.14	1.216	0	10.911
IR	247	5.51	2.095	3.333	11.327
CFOTD	247	1.249	13.945	-45.058	196.822
OWCN	247	45.158	26.875	0	98.21
BOARDAGE	247	46.852	5.251	31.667	57.8
CEODL	247	.247	.432	0	1
BDINDE	247	60.928	15.718	20	100
BOARDSIZE	247	4.992	.675	3	7
BDOW	247	33.225	28.326	0	98.328
GDP	247	5.567	2.926	1	10
CPI	247	5.348	2.826	1	10

Source: Results from sample analysis

Table 3: Correlation Coefficient Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) FD	1.000														
(2) IR	-0.015	1.000													
(3) GDP	-0.033	-0.071	1.000												
(4) CPI	0.063	0.647	-0.022	1.000											
(5) WCTA	-0.074	0.020	-0.047	0.043	1.000										
(6) CFOTD	-0.025	0.061	-0.017	0.093	0.078	1.000									
(7) MVETD	0.071	0.071	-0.070	0.148	0.185	0.732	1.000								
(8) EBITTA	-0.467	0.160	-0.036	0.099	0.367	-0.057	-0.084	1.000							
(9) NSTA	-0.229	0.015	-0.031	0.017	-0.263	-0.060	-0.155	0.163	1.000						
(10) OWCN	-0.239	-0.081	0.010	-0.050	-0.417	-0.130	-0.237	0.247	0.347	1.000					
(11) BDINDE	0.199	-0.132	-0.001	-0.135	0.280	0.084	0.131	-0.127	-0.318	-0.275	1.000				
(12) CEODL	0.027	0.367	0.032	0.270	0.045	-0.037	-0.100	0.070	-0.017	-0.114	-0.273	1.000			
(13) BDOW	-0.206	-0.028	0.000	0.023	-0.270	-0.067	-0.049	0.167	0.350	0.588	-0.344	-0.140	1.000		
(14) BOARDSIZE	-0.116	0.010	0.046	0.025	0.101	0.025	0.002	0.223	-0.057	0.109	0.068	-0.035	-0.035	1.000	
(15) BOARDAGE	-0.119	-0.115	-0.009	-0.089	-0.239	0.014	-0.158	0.166	0.244	0.492	-0.202	0.028	0.303	-0.045	1.000

Source: Results from sample analysis

The correlation coefficients presented in Table 3 indicate the relationship between each pair of variables. A higher correlation coefficient suggests a stronger relationship between two variables, while a lower coefficient indicates a weaker relationship. The correlation matrix shows that the variables in the model have relatively low correlations (all below 0.8), indicating that the potential impact of multicollinearity is negligible. Additionally, Table 3 reveals that corporate governance factors such as ownership concentration and board ownership are negatively correlated with the probability of financial distress. Conversely, the level of board independence is positively correlated with the likelihood of financial distress. Furthermore, financial ratios such as EBIT/ Total Assets and Net Sales/Total Assets are negatively correlated with the dependent variable. However, to confirm whether these factors have a significant impact on the probability of financial distress, further regression analysis is needed.

4.2. Regression results

Table 4 presents the results of the binary logistic regression model predicting the probability of financial distress based on corporate governance factors, as well as a combination of financial and macroeconomic variables.

Table 4: Summary of regression results

VARIABLES	(1)	(2)	(3)
OWCN	-0.0184*	-0.0446	-0.128*
BOARDAGE	0.00478	0.0860	0.0710
CEODL	0.632	2.589	11.73*
BDINDE	0.0463**	0.0777*	0.323*
BOARDSIZE	-0.471	0.0367	-1.109
BDOW	-0.0164	-0.0108	-0.0364
WCTA		-3.109	-15.57*
CFOTD		-0.184***	-0.516**
MVETD		-0.0684**	-0.187**
NSTA		-1.334	-4.501
EBITTA		-86.36***	-234.6**
IR			-0.194
GDP			-0.936*
CPI			0.471
Size			12.76*
Constant	-2.258	-8.860	-158.6*

Source: Results from sample analysis

Model 1, which includes five corporate governance factors, reveals that ownership characteristics and the activity proportion of independent directors are statistically significant at the 10% and 5% levels, respectively, in relation to the dependent variable (Table 4). The greater the ownership concentration, the lower the probability of a mining company experiencing a financial crisis. Meanwhile, the proportion of independent directors on the board has a positive impact on the probability of financial distress in mining companies. When measuring the effects of variables related to corporate governance on dependent variable model 1 shows that the BDINDE variable has a larger impact. Model 2 includes five financial ratios, of which three - the Earnings before Interest and Taxes to Total Assets, the Cash Flow to Total Debt ratio, and the Capitalization to Total Debt ratio - are significant in predicting financial distress. In particular, the Earnings before Interest and Tax to Total Assets Ratios predictor (EBITTA), Cash Flow to Total Debt predictor (CFOTD) and Market Value of Equity to Total Liabilities Ratios predictor (MVETD) have an adverse effect on the probability of financial distress of Vietnamese listed companies at 1% significance level. Besides in Model 2, all significant corporate governance factors and financial ratios are combined, and the variable BDINDE exhibits the same significance as in Models 1. In Model 3, macroeconomic factors are added, and at the 10% significance level, the growth rate is found to have a negative impact on financial distress among mining companies. The effect of the predictors on distress among mining companies in model 3 is consistent with model 2. Four out of five financial ratios and three out of five explanation variables related to corporate governance have effects on the dependent variable (FD) with the corresponding significance levels of 5% and 10%.

Table 5: Summary of model fit tests

Models	AIC	Sig	-2 Log likelihood	McFadden's R2	Correctly classified
MH1	0,608	0,000	68.051	0.159	89.07%
MH2	0.249	0,000	18.666	0.769	96.75%
MH3	0.232	0,000	12.490	0.846	97.15%

Source: Results from sample analysis

To assess the goodness-of-fit of the constructed models, the authors employed the Chi-square test. The Chi-square significance value for all three models is 0.000, which is less than 0.05, indicating that all four regression models are well-fitted. Furthermore, Model 3 exhibits the highest pseudo R-squared (McFadden's R2) and the lowest -2 Log likelihood, suggesting that it is the best-fitting model.

4.3. Discussion on results of research

The output of the study revealed that Model 3 with the combination of different variables has predictive power. The WCTA Ratio, EBITTA ratio, CFOTD ratio and MVETD ratio are adverse determinants of financial distress. When WCTA Ratio, CFOTD Ratio, MVETD Ratio, EBITTA Ratio increases, the probability of financial distress tends to decrease and vice versa. This finding is consistent with the prior expectation and findings of Altman (1968).

On the other hand, the corporate governance coefficients in Model 3 have a relationship with the financial distress probability. The results indicate that when the chairman of the board also serves as the CEO, it increases the risk of financial distress for mining companies at the 10% significance level. When the chairman of the board also serves as the CEO, it leads to an excessive concentration of power in one individual, which can result in authoritarianism, abuse of power, bureaucratic decision-making, and decreased control and efficiency in business operations. This finding is consistent with the studies of Daily and Dalton (1994b) and De Maere et al. (2014)

There is a positive correlation between board independence and the probability of financial distress at the 10% significance level. Independent directors, characterized by a less in-depth understanding of the company's specific characteristics, can lead to decreased board effectiveness when their number increases, thus raising the risk of financial distress for mining companies. This finding is consistent with the studies of Chaganti et al. (1985).

Concentrated ownership by large shareholders is negatively correlated with financial distress in mining companies at the 10% significance level. Large shareholders with high ownership stakes are typically specialized investors who are better able to identify potential risks to the company, thereby reducing the likelihood of financial distress. This conclusion is consistent with the views of previous researchers such as Jensen & Meckling (1976) and Deng and Wang (2006).

5. Conclusion

This study empirically examines the impact of corporate governance factors on the likelihood of financial distress among Vietnamese listed mining companies from 2012 to 2021. The governance factors considered include board size, average board age, duality of CEO and chairman, board independence, ownership concentration, and ownership by directors. Logistic regression analysis on a dataset of 26 companies revealed a significant relationship between corporate governance factors and the probability of financial distress in the mining industry during this period. The results show a positive correlation between duality (combining the roles of CEO and chairman) and board independence, and a negative correlation between ownership concentration and the dependent variable. Therefore, mining companies should clearly separate the roles and responsibilities of the chairman and CEO to enhance oversight, improve operational efficiency, and reduce the risk of financial distress. Additionally, mining companies should consider regulations regarding the number of independent directors in proportion to the company size, as an excessive increase in this factor may heighten the risk of financial difficulties. Furthermore, considering the complexity and capital-intensive nature of the mining industry in Vietnam, along with high ownership concentration primarily by the state large shareholders with concentrated ownership in mining companies play a crucial role. These shareholders, with their experience and management knowledge, can establish modern corporate governance mechanisms, thereby improving operational efficiency and reducing the risk of financial distress. Moreover, the study's findings indicate that combining corporate governance factors with financial ratios and macroeconomic variables provides a better predictive model compared to using single factors alone.

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