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Determinants of Financial Distress in Firms: An Empirical Study in the Cameroonian Context

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Abstract

The aim of this article is to identify the determinants of financial distress among firms in the Cameroonian context. To achieve this objective, the study employs an econometric approach based on logistic regression and Altman's Z-score adapted for small and medium-sized enterprises (SMEs). The analysis is based on a sample of 470 firms observed over the period 2020–2023 and incorporates eleven explanatory variables drawn from the corporate finance literature. The empirical results show that profitability, liquidity, asset turnover, firm size, and asset tangibility significantly influence the probability of financial distress. The study also reveals heterogeneity according to firm size, with SMEs appearing more vulnerable to financial constraints than large firms. These findings confirm the relevance of classical failure prediction models in emerging economies.

Keywords: *Altman Z-score, cameroon, corporate failure, financial distress, logistic regression, SMEs*

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1. Introduction

Financial distress is a central topic in corporate finance research, given its implications for economic stability, organizational performance, and firm survival. It manifests when a firm faces persistent difficulties in meeting its financial obligations, a situation that may lead to failure or cessation of operations. Given the economic and social costs associated with corporate bankruptcies (job losses, value destruction, and disruption of productive networks), understanding and anticipating financial distress has attracted growing interest in the academic literature.

The pioneering work of Beaver (1966) and Altman (1968) paved the way for identifying financial indicators capable of predicting corporate failure. Altman's Z-score model, based on multiple discriminant analysis, remains one of the most widely used tools for assessing bankruptcy risk. Subsequent research enriched these approaches by employing more sophisticated econometric methods, notably logit and probit probabilistic models (Ohlson, 1980) and hazard models (Shumway, 2001). These contributions improved the understanding of the mechanisms leading to financial distress and enabled the development of increasingly powerful prediction tools.

However, most of these models were developed and validated in developed economies characterized by relatively structured financial markets and greater availability of financial information. In emerging economies, firms often operate in more uncertain economic and institutional environments, marked by constraints on access to financing, significant information asymmetries, and sometimes fragile governance structures. These specificities may influence the dynamics of financial distress and limit the transferability of models developed in industrialized economies.

In sub-Saharan African countries, empirical research on corporate financial distress remains relatively limited, despite the importance of this issue for the stability of the productive sector. In Cameroon, firms — particularly small and medium-sized enterprises (SMEs) — face numerous structural constraints that may increase their financial vulnerability, including restricted access to credit, undercapitalization, and economic environment instability (Taguem Fah, 2017; Fombang & Nzongang, 2020). Furthermore, institutional mechanisms for preventing and addressing corporate difficulties remain underdeveloped, which reinforces the need for early warning tools adapted to the local context.

Despite the abundance of research on failure prediction in developed economies, empirical evidence on the determinants of financial distress in the Cameroonian context remains limited. This gap raises the question of the relevance of classical failure prediction models when applied to different institutional and economic environments.

In this context, the objective of this article is to identify the determinants of financial distress among firms in Cameroon. The analysis is based on an econometric approach using logistic regression, with financial distress measured using Altman's Z-score adapted for small and medium-sized enterprises. The study draws on a sample of 470 firms observed over the period 2020–2023, using data from the National Institute of Statistics. The explanatory variables are drawn from the main determinants identified in the corporate finance literature, namely profitability, liquidity, indebtedness, asset tangibility, firm size, and asset turnover.

This research contributes to the literature in several ways. First, it provides new empirical evidence on the determinants of financial distress in an emerging economy context that has received limited scholarly attention. Second, it enables an assessment of the relevance

of traditional failure prediction models in the African context. Finally, the findings offer useful insights for improving early detection mechanisms for corporate financial difficulties.

The remainder of the article is organized as follows. The following section presents the literature review on the determinants of financial distress. Section 3 describes the research methodology and data used. Section 4 presents the empirical results, while Section 5 discusses their implications. Finally, the last section concludes the study and proposes avenues for future research.

2. Determinants of Financial Distress: a Literature review

Research on financial distress aims, on one hand, to understand the mechanisms leading to corporate failure (Beaver, 1966; Altman, 1968) and, on the other hand, to identify indicators that allow anticipating its occurrence (Ohlson, 1980; Shumway, 2001). We also note studies focused on prediction models (Altman, 1968). Moreover, numerous works have identified determinants of financial distress (Platt & Platt, 2002; Li & Sun, 2009; Tinoco & Wilson, 2013), highlighting the role of financial factors (Altman, 2000; Bhandari, 1988; Opler & Titman, 1994). In this context, this section first presents the theoretical foundations of financial distress analysis before examining the main empirical results concerning its determinants.

2.1. Theoretical Foundations of Financial Distress

The analysis of corporate financial distress draws on several theoretical frameworks from corporate finance. These approaches help understand the mechanisms that may lead a firm to financial vulnerability and identify the factors that may explain the emergence of financial difficulties.

The first approach mobilized in the literature is the capital structure trade-off theory (Trade-off Theory), developed in particular by Kraus and Litzenberger (1973). According to this theory, firms determine their optimal debt level by trading off the tax benefits associated with debt against the potential costs related to financial distress. While debt allows firms to benefit from a tax advantage through the deductibility of interest payments, excessive reliance on debt may nonetheless increase the probability of financial distress due to the burden of financial charges and the heightened risk of default.

Another important approach is agency theory, introduced by Jensen and Meckling (1976). This theory highlights the conflicts of interest that may exist between managers and shareholders, as well as between shareholders and creditors. These divergences of interest may lead to inefficient or opportunistic management decisions, which may increase the risk of financial difficulties for the firm.

The literature also draws on the Pecking Order Theory proposed by Myers and Majluf (1984). According to this approach, firms follow a hierarchy in their financing sources: they use internal resources first, then resort to debt, and finally to equity issuance. This hierarchy is driven in particular by information asymmetries between managers and investors. When internal resources become insufficient and debt levels rise, the risk of financial distress may increase.

Finally, the pioneering work dedicated to corporate failure prediction also contributed to structuring the analysis of financial distress. In this regard, Beaver (1966) shows that certain financial ratios can distinguish failing firms from healthy ones several years in advance. In the same vein, Altman (1968) develops the Z-score, based on a combination of financial ratios that allows assessing the probability of corporate bankruptcy.

Taken together, these theoretical approaches suggest that financial distress results from the interaction of multiple factors related to financial structure, economic performance, and the firm's management mechanisms. These theoretical foundations thus constitute the analytical framework used to examine the determinants of financial distress among SMEs operating in Cameroon.

2.2. Determinants of Financial Distress

Corporate financial distress has been the subject of numerous empirical studies aimed at identifying the factors that can anticipate financial difficulties. The first empirical research in this field dates back to the pioneering study of William Beaver (1966), which demonstrates, through an analysis of financial ratios of American firms, that certain accounting indicators can distinguish failing firms from healthy ones several years in advance. This contribution paved the way for a large body of research seeking to improve the predictive power of financial indicators.

In this perspective, Edward Altman (1968) developed a failure prediction model based on multiple discriminant analysis. Drawing on a sample of 66 American industrial firms, he demonstrated that a combination of financial ratios related to profitability, liquidity, and solvency can predict the probability of corporate bankruptcy with high accuracy. This model, known as the Z-score, remains one of the most widely used instruments in the empirical literature on financial distress. Subsequent research sought to improve the predictive performance of these models by employing more advanced econometric techniques. In this regard, James Ohlson (1980) proposed a model based on logistic regression applied to a large sample of American firms. The results of this study show that several financial variables, notably profitability, liquidity, and indebtedness, significantly influence the probability of corporate failure.

From the 2000s onward, the empirical literature was enriched by analyses based on large longitudinal datasets. For instance, Campbell, Hilscher, and Szilagyi (2008) analyzed a sample of more than 9,000 American firms over the period 1963–2003 and showed that profitability, performance volatility, and financial structure are significant determinants of the probability of financial distress. Similarly, Tinoco and Wilson (2013), in a study of British firms, confirmed that financial performance indicators and capital structure measures possess significant predictive power in explaining corporate financial difficulties.

In the context of African economies, several empirical studies also highlight the importance of financial factors in explaining corporate distress. For instance, Abel Ezeoha (2008) analyzed a sample of listed Nigerian firms over the period 1990–2005 and showed that profitability, liquidity, and capital structure significantly influence the probability of financial distress. More recently, Samuel Muriithi (2017), in a study of African SMEs, emphasized that financial constraints and weak economic performance are key determinants in the occurrence of corporate financial difficulties.

In line with these empirical studies, several recent works on SMEs in developing economies confirm that financial performance is a major determinant of financial distress. Firms with low profitability have limited internal resources to finance their activities and meet their financial commitments, which increases their probability of experiencing financial difficulties.

The preceding empirical studies highlight the central role of financial performance in explaining corporate financial difficulties. Firms with low profitability have limited internal resources to finance their activities and meet their financial obligations. However, the financial vulnerability of firms does not depend solely on their

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ability to generate profits. It is also linked to how firms structure their financing and allocate their capital sources between equity and debt.

In this perspective, the empirical literature has examined the role of capital structure in explaining corporate financial distress. For instance, Robert Shumway (2001), drawing on a large sample of American firms, shows that financial leverage is a significant determinant of the probability of bankruptcy. The author demonstrates that highly indebted firms face a higher probability of financial difficulties due to the pressure exerted by interest charges on their cash flows. Building on this work, Andreas Charitou, Neophytos Lambertides, and Lefteris Trigeorgis (2004) analyze a sample of British firms and show that capital structure variables, notably the debt ratio and interest coverage, contribute significantly to explaining situations of financial distress. The authors emphasize that firms with high financial leverage are more exposed to economic fluctuations and liquidity constraints.

Similar results are found in more recent studies, such as those of Abe de Jong, Rezaul Kabir, and Thuy Thu Nguyen (2008), who, drawing on data from firms in several developed and emerging countries, demonstrate that capital structure is a key factor in explaining the financial fragility of firms. With specific regard to the African context, Joseph Abor (2005), in a study of listed firms on the Ghana Stock Exchange, shows that firms with higher debt levels are more exposed to financial instability risks. More recently, Augustine Fosu (2013), using data from listed African firms, highlights that an increase in financial leverage raises the financial vulnerability of firms, particularly in economic environments characterized by limited access to financial markets.

Overall, these empirical works suggest that capital structure is a key determinant of corporate financial stability. Excessive reliance on debt can increase pressure on a firm's cash flows and reduce its ability to meet its financial commitments, thereby raising the probability of financial distress.

However, it is important to note that the financial vulnerability of firms does not depend solely on financial variables. Several empirical studies show that managerial characteristics and executive competencies also play a determinant role in firms' ability to prevent or overcome financial difficulties. In this perspective, the empirical literature has progressively examined the influence of management quality on firm performance and survival. One of the most influential empirical studies in this field is that of Nicholas Bloom and John Van Reenen (2007), who analyzed management practices in several hundred industrial firms from different countries. The results show that firms characterized by higher-quality management practices exhibit superior economic performance and a greater capacity to withstand economic difficulties.

These findings have been confirmed by subsequent empirical work. For example, Nicholas Bloom, Raffaella Sadun, and John Van Reenen (2012) show, using data collected from several thousand firms across different countries, that the quality of management practices significantly influences firm productivity, profitability, and sustainability. The authors notably demonstrate that firms with more structured management systems are better equipped to anticipate risks and adapt to economic constraints.

In the context of small and medium-sized enterprises, several empirical studies also highlight the importance of managerial competencies in firm survival. For example, Colin Gray (2006) demonstrates, drawing on an analysis of British SMEs, that executive experience and competencies are key determinants of firm performance and sustainability. Similarly, Kevin Mole, Mark Hart, Stephen Roper, and David Saal (2009) show that management practices and entrepreneurial competencies significantly influence SME growth and survival.

In the African context, several empirical studies also highlight the determinant role of management in firm performance and survival. For instance, Samuel Muriithi (2017) emphasizes that managerial competencies and executives' ability to manage firm resources effectively are essential factors in explaining SME survival in African economies characterized by significant institutional and financial constraints.

Overall, these empirical works suggest that management quality is a key determinant of firms' ability to anticipate financial risks, manage their resources effectively, and maintain their financial stability.

The literature also emphasizes that firms' financial vulnerability depends on certain firm-specific characteristics, notably size, age, and growth rate. These structural characteristics can indeed influence firms' ability to access financial resources, withstand economic shocks, and ensure the sustainability of their activities. In this perspective, several empirical studies have examined the role of structural characteristics in the probability of corporate failure. For example, David Evans (1987), based on an analysis of a large sample of American firms, shows that firm size and age significantly influence survival probability. The results of this study indicate that larger and older firms generally exhibit a lower risk of failure than small or recently created firms.

These results were confirmed by subsequent empirical work. Thus, Paul Dunne, Mark Roberts, and Larry Samuelson (1989), studying the dynamics of American manufacturing firms, demonstrate that firm size is a key factor in explaining entry, growth, and exit rates. Larger firms generally possess greater financial and organizational resources, reinforcing their capacity to cope with economic difficulties. More recently, Luc Laeven and Fabian Valencia (2013), in an analysis of the determinants of financial crises and corporate vulnerability, demonstrate that certain structural characteristics, notably firm size and organizational structure, influence firms' ability to absorb economic shocks.

In the context of African economies, several empirical works also highlight the importance of structural characteristics in explaining firm survival. For example, Abel Ezeoha and Chinwe Okafor (2010), based on a study of Nigerian firms, show that firm size and age significantly influence financial stability and survival probability. The authors emphasize that smaller and younger firms generally appear more vulnerable to financial constraints and economic fluctuations. Overall, these empirical works suggest that the structural characteristics of firms are important determinants of their financial stability and ability to cope with economic difficulties.

3. Data and model Specification

3.1. Data

The data used in this study come from the National Institute of Statistics (NIS) of Cameroon. They allow assessing corporate financial distress and identifying the factors likely to influence it, based on financial indicators commonly used in the empirical literature. The data cover the balance sheets and income statements of 700 firms operating in Cameroon, belonging to different sectors of activity, over the period 2013–2020. After treating missing values and verifying the consistency of accounting information, the final sample retained for empirical analysis comprises 470 firms.

The dependent variable of the study, representing financial distress, is measured using the Z-score proposed by Altman (2000) in its version adapted for non-listed firms and emerging economies.

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Table 1. Definition of Variables Used in the Study

Variables	Code	Measure	References
Financial Distress	*Z*-score	Altman Z-score index (2000)	Altman (2000)
Profitability	*ROA*	Net Income / Total Assets	Altman et al. (2010); Sari et al. (2023)
Liquidity	*LIQ*	Current Assets / Current Liabilities	Chen & Lee (1993); Mba et al. (2023)
Indebtedness	*DEBT*	Total Debt / Total Assets	Rossi & Bianchi (2021)
Solvency	*SOLGENE*	Equity / Total Debt	Deakin (1972); Kaya & Alpkan (2021)
Firm Size	*TAILLE*	Natural Logarithm of Total Assets	Chancharat (2008)
Asset Tangibility	*TANG*	Property, Plant & Equipment / Total Assets	Frank & Goyal (2009)
Asset Turnover	*ROTAACTIF*	Revenue / Total Assets	Altman (1968); Tascón et al. (2022)
Trade Receivables	*CRECOM*	Trade Receivables / Total Assets	García-Teruel & Martínez-Solano (2007)
Revenue Growth	*CROISCA*	(Revt – Revt–1) / Revt–1	Zhang et al. (2010)
Capital Structure	*STRUCAP*	Total Debt / Equity	Stewart Myers (1984)
Management Quality	*QUALMAG*	Management performance or efficiency indicator	Carlos Pindado et al. (2008)

This composite indicator is widely used in the empirical literature to assess corporate bankruptcy risk. The model is written as follows:

$$Z' = 0.717X_1 + 0.847X_2 + 3.107X_3 + 0.420X_4 + 0.998X_5$$

Where:
- X_1: Working Capital / Total Assets
- X_2: Retained Earnings / Total Assets
- X_3: Earnings Before Interest and Taxes / Total Assets
- X_4: Book Value of Equity / Total Liabilities
- X_5: Net Sales / Total Assets

The Z-score is a composite indicator recognized for its robustness in predicting corporate failure. It classifies firms according to their level of financial risk, distinguishing three zones:

- A safe zone when $Z > 2.9$;
- An uncertainty zone when $1.23 < Z < 2.9$;
- A distress zone when $Z < 1.23$.

Regarding the explanatory variables, they cover different dimensions of the economic and financial situation of firms, notably their financial performance, financing structure, structural characteristics, and certain management-related aspects.

More specifically, the analysis uses indicators such as profitability (Altman et al., 2010; Sari et al., 2023), liquidity (Chen & Lee, 1993; Mba et al., 2023), level of indebtedness (Rossi & Bianchi, 2021), solvency (Deakin, 1972; Kaya & Alpkan, 2021), firm size (Chancharat, 2008), asset tangibility (Frank & Goyal, 2009), asset turnover (Altman, 1968; Tascón et al., 2022), trade credit (García-Teruel & Martínez-Solano, 2007), revenue growth (Zhang et al., 2010), capital structure (Myers, 1984), as well as certain indicators related to management quality (Pindado et al., 2008). The variables retained are presented and defined in the following table.

Regarding financial performance, economic profitability as measured by *ROA* shows a mean of 0.095 with a standard deviation of 0.127, reflecting relatively wide dispersion in performance across firms in the sample. Return on equity (*ROE*) displays a slightly negative mean (−0.003), suggesting that some firms experience weak or unstable financial performance. With respect to liquidity and solvency, the results show that the general liquidity ratio (*LIQGENE*) has a mean of 4.34 but with significant dispersion (standard deviation of 19.01), indicating that some firms have very high liquidity levels while others face more significant cash flow constraints. The solvency ratio (*SOLGENE*) shows a mean of 0.81, suggesting that, on average, firms have a moderate level of equity coverage of their debt.

Regarding structural variables, average firm size, measured by the logarithm of total assets, stands at 8.28, indicating a predominance of SMEs in the sample. Asset tangibility (*TANG*) shows a mean of 62.60 but with a very high standard deviation (837.28), revealing strong heterogeneity in firms' asset composition. Asset turnover (*ROTAACTIF*), which measures efficiency in resource utilization, shows a mean of 1.27, suggesting that on average firms generate a level of activity slightly above the value of their assets. Regarding financial structure, the debt ratio (*DEBT*) shows a relatively high mean (73.97), accompanied by significant dispersion (standard deviation of 1522.97), reflecting highly contrasting financial situations across firms. Similarly, the capital structure ratio (*STRUCAP*) shows a mean of 0.72, indicating relatively significant reliance on debt in some firms.

Variables related to commercial dynamics and management also show significant variation. Revenue growth (*CROISCA*) shows a mean of 0.108, suggesting moderate activity growth. Trade credit (*CRECOM*) has a mean of 0.43, indicating that firms make significant use of inter-firm financing. Finally, the management quality variable (*QUALMAG*) shows a mean of −0.35, which may reflect disparities in management and organizational practices across firms.

A Pearson correlation matrix and a multicollinearity test based on the Variance Inflation Factor (*VIF*) were carried out. The results of the correlation matrix indicate that the coefficients between the explanatory variables remain generally low to moderate, suggesting the absence of excessively strong linear relationships between the independent variables. Some significant correlations nonetheless appear between certain financial variables. Economic profitability (*ROA*) shows a positive and significant correlation with asset turnover (*ROTAACTIF*), suggesting that more efficient use of assets is associated with better economic performance. Similarly, financial profitability (*ROE*) is positively correlated with management quality (*QUALMAG*), which may reflect the importance of management practices in improving financial performance. Furthermore, a relatively high correlation is observed between indebtedness (*DEBT*) and asset tangibility (*TANG*).

This relationship can be explained by the fact that firms with significant tangible assets can offer more collateral to creditors, which facilitates their access to debt financing. However, despite this relatively strong correlation, the values remain compatible with the thresholds generally accepted in the empirical literature.

To complement this analysis, a multicollinearity test based on the Variance Inflation Factor (*VIF*) was conducted. The results show that *VIF* values range between 1.01 and 9.87, with a mean of 2.75. According to the recommendations of the econometric literature, a serious multicollinearity problem is generally suspected when *VIF*

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Table 2. Descriptive Statistics of Study Variables

Variables	Mean	Std. Dev.	Min	Max
ROA	0.096	0.127	0.000	1.890
LAGROA	0.066	0.187	-1.168	1.391
ROE	-0.003	0.055	-0.358	0.349
LAGROE	-0.003	0.070	-0.449	0.880
LIQGENE	4.342	19.012	0.000	292.496
LAGLIQGENE	3.439	12.673	0.000	168.338
SOLGENE	0.811	0.785	-0.060	9.821
LAGSOLGENE	0.845	0.769	-0.939	8.570
CROISCA	0.109	0.570	-1.000	5.213
LAGCROISCA	0.152	0.632	-0.998	8.606
QUALMAG	-0.353	1.811	-14.802	13.161
LAGQUALMAG	-0.170	3.442	-15.416	47.850
CRECOM	0.434	0.379	-0.130	5.791
LAGCRECOM	0.425	0.292	-0.320	1.887
STRUCAP	0.729	0.815	-9.576	7.327
LAGSTRUCAP	0.773	0.698	-4.906	5.719
ROTAACTIF	1.275	1.551	0.000	14.887
LAGROTAACTIF	1.518	3.188	0.002	45.671
DEBT	73.978	1522.975	-167.268	33017.860
LAGDEBT	3.900	33.296	-91.569	626.696
TANG	62.606	837.285	-0.013	17185.310
LAGTANG	13.871	209.096	-693.522	4367.928
TAILLE	8.282	0.971	4.492	13.504

Table 3. Pearson Correlation Matrix

Variables	ROA	ROE	LIQGENE	SOLGENE	CROISCA	QUALMAG	CRECOM	STRUCAP	ROTAACTIF	DEBT	TANG	TAILLE
ROA	1.000											
ROE	0.059											
LIQGENE	0.072	0.070	1.000									
SOLGENE	-0.006	0.217*	-0.139*	1.000								
CROISCA	-0.013	0.002	-0.019	0.048	1.000							
QUALMAG	0.020	0.663*	0.075	0.129*	-0.036	1.000						
CRECOM	0.006	0.014	0.020	0.057	0.063	-0.020	1.000					
STRUCAP	0.038	-0.028	0.031	-0.036	0.008	0.010	0.046	1.000				
ROTAACTIF	0.416*	-0.249*	0.018	0.163*	0.027	0.013	-0.049	0.087	1.000			
DEBT	-0.036	0.051	0.012	-0.011	0.006	0.075	0.020	-0.003	0.053	1.000		
TANG	-0.054	0.049	0.061	-0.030	0.006	0.075	-0.007	-0.004	0.030	0.946*	1.000	
TAILLE	0.194*	-0.184*	-0.138*	-0.192*	0.030	-0.067	-0.066	-0.071	-0.078	-0.182*	-0.201*	1.000

Note: This table presents the Pearson correlation matrix of the explanatory variables in the model. The coefficients indicate the strength and direction of the linear relationship between variables.

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values exceed the critical threshold of 10. In our case, all variables show values below this threshold, indicating that multicollinearity is not a major concern in the estimated model.

Overall, these results confirm that the explanatory variables retained in this study can be simultaneously introduced into the econometric model without significant risk of excessive collinearity. This preliminary step ensures the reliability of the logit model estimates aimed at identifying the determinants of financial distress among SMEs operating in Cameroon.

3.2. Econometric model Specification

The main objective of this study is to identify the factors likely to explain the probability of financial distress among SMEs operating in Cameroon. Given the binary nature of the dependent variable (indicating whether a firm is in financial distress or not), the estimation is carried out using a logit model, widely used in the empirical literature on bankruptcy prediction and corporate financial vulnerability analysis.

The dependent variable is constructed from Altman's Z-score, transformed into a dichotomous variable. It takes the value **1** when the firm is classified as being in financial distress, and **0** otherwise. In this framework, the probability that firm i is in financial distress at period t is modeled as follows:

$$P\left(DISTRESS_{it}=1\right)=\frac{1}{1+\ e^{-Z_{it}}}$$

where:

$$Z_{it}=\beta_1 ROA_{it}+\beta_2 ROE_{it}+\beta_3 LIQGENE_{it}+\beta_4 SOLGENE_{it}$$
$$+\beta_5 CROISCA_{it}+\beta_6 QUALMAG_{it}+\beta_7 CRECOM_{it}+\beta_8 STRUCAP_{it}$$
$$+\beta_9 ROTACTIF_{it}+\beta_{10} DEBT_{it}+\beta_{11} TANG_{it}+\beta_{12} TAILLE_{it}+\varepsilon_{it}$$

- $DISTRESS_{it}$: binary variable indicating the financial situation of firm i at period t
- β_0: model intercept
- β_k: coefficients associated with the explanatory variables
- ε_{it}: random error term

The model is estimated using the Maximum Likelihood Estimation (MLE) method. This approach yields efficient coefficient

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. estat classification

Logistic model for z

              ------- True -------
Classified |         D            ~D          Total
-----------+--------------------------------------
     +     |       137             2            139
     -     |         3            96             99
-----------+--------------------------------------
   Total   |       140            98            238

Classified + if predicted Pr(D) >= .5
True D defined as z != 0
--------------------------------------------------
Sensitivity                     Pr( +| D)   97.86%
Specificity                     Pr( -|~D)   97.96%
Positive predictive value       Pr( D| +)   98.56%
Negative predictive value       Pr(~D| -)   96.97%
--------------------------------------------------
False + rate for true ~D        Pr( +|~D)    2.04%
False - rate for true D         Pr( -| D)    2.14%
False + rate for classified +   Pr(~D| +)    1.44%
False - rate for classified -   Pr( D| -)    3.03%
--------------------------------------------------
Correctly classified                         97.90%
--------------------------------------------------
```

Figure 1. Classification Analysis

Table 4. Multicollinearity Test (Variance Inflation Factor)

Code	VIF	1/VIF
TANG	9.87	0.101
DEBT	9.78	0.102
ROE	2.11	0.474
QUALMAG	1.92	0.520
ROTAACTIF	1.43	0.700
ROA	1.32	0.760
TAILLE	1.23	0.814
SOLGENE	1.15	0.873
LIQGENE	1.09	0.915
CRECOM	1.03	0.970
STRUCAP	1.03	0.973
CROISCA	1.01	0.988

Note: This table presents the results of the multicollinearity test based on the Variance Inflation Factor (VIF). According to the econometric literature, a serious multicollinearity problem is generally suspected when $VIF > 10$ (Gujarati, 2004; Wooldridge, 2013). The results indicate that all variables present values below the critical threshold, with a mean VIF of 2.75, suggesting the absence of problematic multicollinearity among the explanatory variables in the model.

estimates when the dependent variable is dichotomous. The results obtained will allow identifying the significant factors explaining the probability of financial distress among Cameroonian SMEs, while assessing the relative importance of financial, structural, and managerial dimensions in corporate vulnerability. The estimation of the proposed model relies on an econometric approach adapted to the binary nature of the dependent variable. Indeed, the variable Z-score, which indicates the financial situation of the firm, takes the value 1 when the firm is in financial distress and 0 when it is considered financially healthy.

In this context, the use of a classical linear regression model would be inappropriate, as it could yield estimated probabilities outside the $[0, 1]$ interval and violate certain fundamental model assumptions. To overcome these limitations, this study employs a logit model, which allows modelling the probability that a firm is in financial distress as a function of a set of explanatory variables. The logit model is based on the logistic distribution function, which ensures that estimated probabilities remain within 0 and 1.

4. Empirical Results and Discussion

Prior to estimating the logistic model, a classification analysis was carried out to evaluate the predictive capacity of the model. The results indicate an overall correct classification rate of 97.90%, with a sensitivity of 97.86% and a specificity of 97.96%. The positive predictive value (98.56%) and negative predictive value (96.97%) confirm the strong discriminating capacity of the model. This low error rate, below 3%, attests to the empirical robustness of the model and its ability to correctly identify firms in financial distress.

The estimation of the logistic model, based on 470 Cameroonian firms observed between 2020 and 2023, highlights the statistical relevance of the retained determinants. The overall model is significant (Wald $\chi^2(11) = 82.97$; $p < 0.0000$) and presents a pseudo-R^2 de 0.8247, indicating high explanatory capacity.

The econometric analysis highlights the central role of financial performance variables in explaining financial distress among Cameroonian SMEs. The results indicate that Economic profitability (*ROA*) exerts a negative and highly significant effect on the probability of financial distress ($\beta = -11.0047$; $p = 0.004$). In other words, the more profitable a firm is, the lower the probability of failure. This result is explained by the fact that profitable firms have greater internal cash flows, enabling them to finance their activities, reduce their dependence on external financing, and more easily meet their financial commitments. This finding confirms the conclusions of Altman (1968) and Ohlson (1980), who identify profitability as one of the most discriminating indicators in bankruptcy prediction models. Similar empirical results are also reported in related studies in the empirical literature.

Along the same lines, general liquidity (*LIQGENE*) also shows a negative and statistically significant effect ($\beta = -0.0402$; $p = 0.042$). This result suggests that a better capacity to cover short-term obligations reduces the probability of financial distress. A firm with a sufficient level of liquidity is indeed better equipped to absorb cyclical shocks and maintain the continuity of its operations. This relationship is consistent with the pioneering analyses of Beaver (1966) and Deakin (1972), who show that liquidity ratios are particularly relevant indicators for the early detection of corporate financial difficulties.

By contrast, general solvency (*SOLGENE*) shows a positive and highly significant coefficient ($\beta = 13.1905$; $p = 0.000$), which may appear paradoxical at first glance. Theoretically, a high level of equity is expected to strengthen financial soundness and reduce the risk of failure.

However, this result can be interpreted as reflecting apparent solvency — a situation in which certain firms present a relatively solid financial structure from an accounting standpoint but do not generate sufficient operational performance to sustain their activities over time. Such a configuration can lead to a progressive deterioration of the financial situation despite an initially high level of equity. This interpretation aligns with analyses from the financial distress literature (Platt and Platt, 1990), who emphasize that the assessment of a firm's financial health cannot be limited to a single solvency indicator but must be understood in a multidimensional manner.

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Finally, revenue growth (*CROISCA*) does not appear statistically significant in the estimated model. This result suggests that business expansion does not necessarily constitute a determinant factor of corporate financial stability. Indeed, rapid growth can be accompanied by increased financing needs, greater pressure on cash flows, and an imbalance between sales growth and the firm's internal financial capacities.

Taken together, these results highlight the determinant role of certain dimensions of financial performance (particularly profitability and liquidity) in reducing the risk of financial distress. They thus confirm that economic soundness and the capacity to generate cash flows constitute essential resilience factors for SMEs. Accordingly, Hypothesis H_1, which posits that financial performance significantly influences the probability of financial distress among Cameroonian SMEs, is broadly validated.

The results indicate that total indebtedness (*DEBT*) exerts a negative and significant effect in the overall model ($coef. = -0.0498$; $p = 0.029$). This result may seem counterintuitive in light of the trade-off theory developed by Kraus and Litzenberger (1973), according to which a high level of indebtedness increases the risk of bankruptcy. However, in the context of emerging economies, this result may reflect a selection effect: only firms considered solvent by financial institutions have access to credit. This interpretation aligns with Ross's (1977) signaling theory, according to which the use of debt can constitute a positive signal sent to the market regarding the financial quality of the firm. Similar conclusions are reported by Fama and French (2002), who show that certain financially sound firms use debt as an instrument of financial discipline. In contrast, capital structure (*STRUCAP*) shows no significant effect in the estimated model. This result suggests that the overall composition of financing between debt and equity does not constitute a direct determinant of financial distress in the sample studied.

This observation aligns with the conclusions of Rajan and Zingales (1995), who show that financial structure may be poorly discriminating in certain institutional environments. Thus, the influence of capital structure appears limited and essentially linked to the level of indebtedness. Hypothesis H_2 is therefore partially validated.

The results show that management quality (*QUALMAG*) does not present a statistically significant effect in the estimated model ($coef. = 0.2542$; $p = 0.448$). This lack of significance may be explained by the difficulty of empirically measuring management quality using quantitative indicators. Executives' competencies, experience, or strategic capacity are often difficult to capture through statistical variables. The literature nonetheless highlights the importance of management in organizational performance. The work of Jensen and Meckling (1976) highlights the role of managers in financial decisions and value creation, while Hambrick and Mason (1984) show that executive characteristics influence firms' strategic orientations. In the context of this study, it is possible that the influence of management is indirect and manifests through other financial variables such as profitability or financing choices. Hypothesis H_3 is therefore not empirically confirmed.

The results show that asset turnover (*ROTAACTIF*) exerts a negative and highly significant effect on the probability of financial distress ($coef. = -8.7467$; $p = 0.000$). This indicates that more efficient use of assets contributes to strengthening firms' financial resilience. Indeed, high asset turnover reflects better operational performance and a greater capacity to generate revenue from available resources. This result aligns with the analyses of Luoma and Laitinen (1991) and Tascón and Castaño (2012).

Firm size (TAILLE) also shows a negative and significant effect ($coef. = -0.6158$; $p = 0.036$). This result suggests that larger firms benefit from a structural advantage that enables them to better withstand financial difficulties. Large firms generally benefit from better access to financing, economies of scale, and greater diversification of activities. This observation is consistent with the analyses of Penrose (1959) and Williamson (1975). Finally, asset tangibility (*TANG*) exerts a positive and significant effect ($coef. = 0.0963$; $p = 0.029$), indicating that a high proportion of tangible assets can increase the probability of financial distress. A highly fixed asset structure can limit a firm's financial flexibility and reduce its adaptability in times of crisis. This result is consistent with the analyses of Balcaen and Ooghe (2006), who highlight the risks associated with an excessive accumulation of physical assets. Overall, these results show that several structural characteristics significantly influence the probability of financial distress. Hypothesis H_4 is therefore validated.

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Table 5. Results of the Logistic Regression Explaining Financial Distress

Variables	Combined Model (470)	SMEs (232)	Large Firms (238)
ROA	-0.0110***	0.0088*	-0.0345***
	(0.0039)	(0.0049)	(0.0127)
DEBT	2.1756***	-0.0366	3.2985***
	(0.5891)	(0.0542)	(0.9875)
LIQGENE	-0.2696***	0.1495***	-0.4965***
	(0.0972)	(0.0196)	(0.1750)
TAILLE	-0.2926***	0.1634***	-0.3981***
	(0.1048)	(0.0247)	(0.1529)
SOLGENE	-0.0090	2.0900	-0.0188
	(0.0219)	(1.8740)	(0.0294)
CROISCA	0.0126	-0.0032	0.0119
	(0.0123)	(0.0038)	(0.0178)
QUALMAG	-0.9650***	-0.2542	-0.9547***
	(0.0151)	(0.3360)	(0.0206)
Trade Receivables (CRECOM)	-0.0341	0.0502***	-0.0658
	(0.0215)	(0.0072)	(0.0349)
STRUCAP	-0.0706***	-0.0026	-0.1238***
	(0.0261)	(0.5320)	(0.0454)
ROTAACTIF	-0.0146	-0.0256*	-0.0040
	(0.0242)	(0.0131)	(0.0322)
TANG	-0.0162	0.0093	-0.0291
	(0.0544)	(0.0067)	(0.0796)
_cons	0.1892***	0.0377**	0.1739**
	(0.0606)	(0.0179)	(0.0800)
Wald χ^2 (11)	82.97	64.21	71.45
Prob > χ^2	0.0000	0.0000	0.0000
Pseudo R^2	0.8247	0.8206	0.8814

Note: Robust standard errors are in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

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5. Conclusion

This research aimed to identify the determinants of financial distress among SMEs operating in Cameroon, employing an econometric approach based on a logit model applied to a sample of 470 firms observed over the period 2020–2023. In an economic context marked by high vulnerability among small and medium-sized enterprises, the study sought to analyze the extent to which financial, structural, and managerial factors influence the probability of financial distress. The empirical results highlight the determinant role of several financial variables in explaining corporate fragility. In particular, economic profitability and liquidity emerge as protective factors against financial distress, confirming that firms' capacity to generate profits and maintain a healthy cash position is central to their resilience. These results are in line with the work of Edward I. Altman (1968) and James A. Ohlson (1980), who emphasize the importance of performance indicators in predicting corporate failure.

The analysis also shows that certain variables related to financial structure and organizational characteristics significantly influence the probability of distress. Indebtedness, asset turnover, firm size, and asset tangibility emerge as important explanatory factors of corporate vulnerability. In contrast, management quality and revenue growth do not show statistically significant effects in the estimated model. Overall, these results confirm that SME financial distress results from a combination of financial and structural factors, which leads to validation of the general hypothesis that the probability of financial distress is influenced by multidimensional determinants.

Beyond their empirical scope, these results also have several managerial and institutional implications. For SME managers, they underscore the importance of rigorous management of profitability, liquidity, and asset utilization in order to strengthen the firm's financial soundness. For financial institutions and public authorities, they highlight the need to develop early diagnostic tools to identify at-risk firms and establish appropriate support mechanisms.

However, this study has certain limitations that open avenues for future research. On one hand, the analysis relies on a limited number of financial and organizational indicators; integrating macroeconomic or institutional variables could enrich the explanation of the financial distress phenomenon. On the other hand, the use of complementary econometric approaches, such as survival models or machine learning techniques, could improve the predictive capacity of failure models applied to SMEs in developing economies.

Thus, this research contributes to a better understanding of the financial vulnerability factors of SMEs in the Cameroonian context and highlights the importance of an integrated approach combining economic performance, financial structure, and organizational characteristics to analyze the dynamics of corporate financial distress.

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