

## Determinants of Corporate Bankruptcy in the Ecuadorian Oil Sector

*Determinantes de la quiebra empresarial  
en el sector petrolero ecuatoriano*

*Determinantes da falência corporativa no setor petrolífero equatoriano*

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## Abstract

In Ecuador, the “Oil and Mining” and “Oil Refining” activities averaged 6% of the GDP during the 2018-2020 period, and they also represented 9.06% of the total revenue in the General State Budget (GSB) during the same period. This underscores the significance of studying this sector. In line with the analysis of systemic risk in this research, the determinants of business failure are identified using data from 24 economic and financial indicators estimated between 2015 and 2020. Findings from a logistic regression model reveal that risk factors or variables increasing the probability of bankruptcy include “Long-Term Debt,” “Current Equity Indebtedness,” “Impact of Administrative and Sales Expenses,” and “Fixed Asset Leverage.” In contrast, “Asset Profitability,” “Financial Leverage: Greater than 29,” and “Industry: Wholesale and Retail Trade, Motor Vehicle Repair” were found to be protective factors, reducing the risk of business failure. The results highlight the key financial indicators that should be continuously monitored by the regulatory body in Ecuador and by companies themselves to prevent corporate bankruptcy, thus reducing systemic risk and the potential negative economic consequences it entails.

**Keywords:** Systemic Risk, Logistic Regression, Bankruptcy, Oil sector.

**JEL:** C58 Financial Econometrics; G33 Bankruptcy; Liquidation.

## Resumen

En Ecuador, las actividades de “petróleo y minería” y “refinación de petróleo” representaron en promedio el 6 % del PIB durante el período 2018-2020, y también el 9,06 % de los ingresos totales del Presupuesto General del Estado (PGE) durante el mismo período. Esto subraya la importancia de estudiar este sector. En consonancia con el análisis del riesgo sistémico de esta investigación, se identifican los determinantes del fracaso empresarial utilizando datos de 24 indicadores económicos y financieros estimados entre 2015 y 2020. Los resultados de un modelo de regresión logística revelan que los factores de riesgo o variables que aumentan la probabilidad de quiebra incluyen la “deuda a largo plazo”, el “endeudamiento actual del capital”, el “impacto de los gastos administrativos y de ventas” y el “apalancamiento de los activos fijos”. Por el contrario, se ha constatado que la “rentabilidad de los activos”, el “apalancamiento financiero: superior a 29” y el “sector: comercio mayorista y minorista, reparación de vehículos de motor” son factores protectores que reducen el riesgo de quiebra empresarial. Los resultados ponen de relieve los indicadores financieros clave que deben ser objeto de un seguimiento continuo por parte del organismo regulador de Ecuador y de las propias empresas para prevenir la quiebra empresarial, reduciendo así el riesgo sistémico y las posibles consecuencias económicas negativas que esta conlleva.

**Palabras clave:** riesgo sistémico, regresión logística, quiebra, sector petrolero.

**JEL:** C58 Econometría financiera, G33 Quiebra; Liquidación.

## Resumo

No Equador, as atividades de “Petróleo e Mineração” e “Refino de Petróleo” representaram, em média, 6% do PIB durante o período de 2018-2020, além de 9,06% da receita total do Orçamento Geral do Estado (OGE) durante o mesmo período. Isso ressalta a importância de estudar esse setor. Em linha com a análise do risco sistêmico nesta pesquisa, os determinantes do fracasso empresarial são identificados usando dados de 24 indicadores econômicos e financeiros estimados entre 2015 e 2020. As conclusões de um modelo de regressão logística revelam que os fatores de risco ou variáveis que aumentam a probabilidade de falência incluem “Dívida de longo prazo”, “Endividamento patrimonial atual”, “Impacto das despesas administrativas e de vendas” e “Alavancagem de ativos fixos”. Em contrapartida, “Rentabilidade dos ativos”, “Alavancagem financeira: superior a 29” e “Setor: comércio atacadista e varejista, reparo de veículos motorizados” foram considerados fatores de proteção, reduzindo o risco de falência empresarial. Os resultados destacam os principais indicadores financeiros que devem ser monitorados continuamente pelo órgão regulador do Equador e pelas próprias empresas para evitar a falência corporativa, reduzindo assim o risco sistêmico e as possíveis consequências econômicas negativas que ele acarreta.

**Palavras-chave:** Risco sistêmico, Regressão logística, Falência, Setor petrolífero.

**JEL:** C58 Econometria financeira, G33 Falência; Liquidação.

## Introduction

**B**usiness bankruptcy constitutes a phenomenon of critical importance at both the microeconomic and macroeconomic levels, as its consequences extend beyond direct financial losses borne by firm owners to encompass broader effects on production, employment, and public finances. Corporate failure disrupts productive capacity, reduces labor demand, weakens supply chains, and diminishes tax revenues, thereby generating negative spillovers that can affect overall economic growth and fiscal sustainability. In economies with limited macroeconomic adjustment mechanisms, such as Ecuador, these effects may be amplified, increasing the relevance of understanding the determinants of business bankruptcy.

Within this context, the oil sector represents a cornerstone of the Ecuadorian economy. According to data from the Central Bank of Ecuador (BCE), oil-related activities accounted for 6.5% of GDP and 13.08% of total State Budget revenues in 2019, rising to 6.3% and 18.46%, respectively, by 2022. Beyond its direct contribution to output and public revenues, the sector

plays a strategic role in generating export earnings and foreign exchange inflows, which are essential for sustaining liquidity and macroeconomic stability in a fully dollarized economy. Nevertheless, despite its importance, the number of active firms in the oil sector has declined in recent years, from 372 in 2018 to 358 in 2020. Given that operating companies, service providers, and suppliers maintain direct or indirect contractual linkages with the state-owned oil company, the bankruptcy of a single firm may propagate adverse effects throughout the production network, negatively impacting employment, investment, and economic growth.

The oil sector has historically sustained extensive production chains and significant levels of direct and indirect employment, making its financial stability a matter of national economic interest. In this setting, the increasing incidence of financial distress and bankruptcy among private oil companies has become a source of growing concern. Such failures may disrupt production processes, weaken public finances, deter private investment, and compromise energy security. Consequently, a systematic analysis of the causes and implications of corporate bankruptcy in Ecuador's private oil sector is essential for identifying structural vulnerabilities and for informing policy responses aimed at strengthening sectoral resilience and long-term sustainability.

The economic literature offers a wide range of methodological approaches for predicting business bankruptcy, including logistic regression models, Altman's Z-score, neural networks, and decision-tree techniques. These models rely on financial and economic indicators to estimate the probability of failure; however, empirical evidence suggests that the relevance and explanatory power of such indicators vary significantly across sectors. Sector-specific characteristics—such as capital intensity, exposure to external shocks, and regulatory frameworks—necessitate tailored analytical approaches when assessing bankruptcy risk.

Previous empirical studies for Ecuador highlight this heterogeneity. Girón Calva, Villanueva García, and Armas Herrera (2017) estimate bankruptcy models using five financial variables across eleven sectoral activity groups, while Rivadeneira et al. (2022) develop a prediction model for the agro-industrial sector based on six financial ratios. Despite these contributions, the oil sector—given its macroeconomic significance and structural particularities—has received limited attention in the context of firm-level bankruptcy analysis.

Considering the above, the primary objective of this study is to identify and quantify the financial and economic factors that determine the probability of bankruptcy of oil-sector firms in Ecuador during the period 2015–2020, using an econometric modeling approach. Specifically, the study aims to (i) estimate a firm-level bankruptcy prediction model tailored to the oil sector, (ii) identify sector-specific risk and protective financial indicators, and (iii) assess how firm-level financial distress may contribute to broader vulnerabilities within the sector. Furthermore, this research incorporates systemic risk as an analytical dimension, evaluating the extent to which corporate bankruptcies in the oil sector may generate contagion effects and amplify macroeconomic risks in the Ecuadorian economy.

## Literature review

Systemic risk refers to the risk or probability of failure in a complete system and is evidenced by correlation between most components or all its parts. (Renn et al. 2017)

Systemic financial risk is the risk that an event will trigger a loss of economic value or confidence in a substantial part of the financial system, and a resulting increase in uncertainty that is severe enough to have significant adverse effects on the economy. (Zopounidis and Galariotis 2015)

According to Cabrera Rodríguez, Melo Velandia, and Parra Amado (2014), systemic risk is defined as the conjunction of financial risks and risks in real activity. Considering that, financial control policies is recommended for this combination of risks, political interference and the determination of healthy.

Similarly, but naming the cause and again considering the major consequences, the European Central Bank 2004 defines systemic risk as follows: “The risk that the inability of an institution to meet its obligations as they fall due will affect compliance with obligations of other institutions. Such a default may cause significant liquidity or credit problems and, as a result, could threaten stability or confidence in the markets.” (Zopounidis and Galariotis 2015, 26).

The authors Zopounidis and Galariotis (2015) and Cabrera-Rodríguez, Melo-Velandia, and Parra-Amado (2014) agree in indicating that the effects

of sudden and unexpected systemic risk events are the deterioration of the value of assets and interruptions in the payment system with deterioration of the financial position of companies.

Systemic risk has four main properties (Renn 2020):

- They are risk events of a global nature.
- Events and entities are highly interconnected and intertwined, leading to complex causal structures.
- It is a non-linear risk in cause-effect relationships, often involving unknown inflection points or inflection areas.
- They are stochastic processes in their effect structure, so that more than one future is possible.

There are different ways to measure systemic risk, however, these involve the use of complex statistical, econometric and mathematical methodologies accompanied by computer tools that can process the information in an agile manner.

The procedure to determine systemic risk according to Cabrera-Rodríguez, Melo-Velandia, and Parra-Amado (2014) uses the CoVaR methodology to find the codependency between sectors. Using a sample of around 50 variables for the G7 economies, the authors find that exploring and exploiting information on many variables through a factor model produces an in-depth analysis of the interactions between financial frictions and the current macroeconomic condition of a country.

The study by Cabrera-Rodríguez, Melo-Velandia, and Parra-Amado (2014) shows that a shock in the real sector is immediately transmitted to the financial sector and then diluted over time. In contrast, a shock in the financial sector does not translate into an immediate effect on the real sector; in fact, the propagation of the shock is slower, although its effect increases over time.

In the work on Copula Theory by Latorre-Llorens (2017), he carries out a broad study of the way in which this methodology contributes to the determination of systemic risk, from which the following concept has been extracted. The copula is the dependency structure between the variables and the way of calculating them helps to determine the marginal distribution of the individual behavior of the variables isolated from the others.

It is important to analyze that systemic risk is correlated with the contagion of default. Once the network structure that links the balance sheets has been identified, it is interesting to examine the consequences of the failure of a node or set of nodes in the network.

Contagion and default are indicators that aim to quantify the impact of a given institution's default in terms of the (expected) loss it incurs for other institutions in the network, considering both balance sheet contagion and common shocks that affect the balance sheets (Cont, Moussa and Bastos 2013).

The main consequences of events of a systemic nature are inequity and injustice associated with the distribution of risks and benefits in time, space and social condition; psychological stress and distress associated with the risk or source of the risk (measured by psychometric scales); potential for conflict and social mobilization (degree of political or public pressure on risk regulatory agencies). It is likely to expect highly symbolic losses with repercussions in other fields, such as financial markets and the loss of credibility in management institutions. (Renn 2020).

According to Nucera et al. (2016) to analyze systemic risk it is necessary to combine the review of balance sheets with market data regarding returns and volatility. It also indicates that one of the main triggers of these systemic events is the lack of control and supervision in financial leverage ratios.

In the paper by Brownlees and Engle (2016) they state that a severe and prolonged decline in financial markets could trigger a systemic risk event which will have a high or low impact depending on the size and performance indicators of an entity. They show a simple approximation of bankruptcy indicators, using only information from the balance sheets regarding the value of assets and liabilities.

Financial ratios as early warning measures of corporate bankruptcy must be constantly monitored by companies and control agencies. With the joint analysis of systemic risk and financial ratios, weaknesses in certain components can be determined and magnitudes of impact on the real economy and the financial system can be defined.

Bohórquez Alfonso (2019) develop a bankruptcy prediction model based on financial ratios and uses LOGIT logistic distribution functions.

Below is a comparison of similar studies to show the level of prediction when using a LOGIT (Table 1) model as a predictor of business bankruptcy.

Table 1  
**Comparison of Logit model studies**

Author/s	Model	Country	Prediction
(Caro, Díaz, and Porporato 2016)	Mixed logistic	Argentina	91%
(Pérez, González and Lopera 2013)	Logit	Colombia	83,20%
(Chocce et al. 2002)	Logit	Chile	85,71%

Source: Caro, Díaz and Porporato (2016); Pérez, Gonzalez and Lopera (2013); Chocce et al. (2002).  
 Preparation: the authors.

## Methodology

To identify the determinants of bankruptcy of companies in the oil sector, information was collected from companies with the following four-digit International Standard Industrial Classification of All Economic Activities (ISIC) codes (Table 2):

Table 2  
**ISIC of the oil sector**

Code	Description
B0610.00	Extraction of crude oils from petroleum, shale and tar sands, production of crude oil from shale and tar sands, crude oil production processes
B0620.01	Production of crude hydrocarbons in gaseous state (natural gas), condensate extraction, drainage and separation of liquid fractions, gas desulfurization.
B0620.02	Extraction of liquid hydrocarbons, obtained through liquefaction or pyrolysis.
B0910.01	Petroleum and gas extraction services activities carried out in exchange for remuneration or by contract; directional drilling and re-drilling; initial drilling; erection, repair and dismantling of drilling rigs, cementing of casing tubes for petroleum and gas wells, pumping, plugging and abandonment of wells, etc.
B0910.02	Fire prevention and extinguishing services in oil and gas fields.
C1920.01	Production of motor fuels: gasoline, kerosene, etc.; light, medium and heavy fuel oil, refinery gases such as ethane, butane or propane, etc.

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Code	Description
C1920.02	Manufacture of petroleum-based lubricating oils or greases, including those manufactured from petroleum waste.
C1920.03	Manufacture of products for the petrochemical industry and for the manufacture of road pavements.
C1920.05	Manufacture of biofuels, that is, the mixture of alcohol with petroleum, for example: Gasohol.
C1920.06	Support services for the manufacture of petroleum refining products on a fee or contract basis.
C1920.09	Manufacture of other petroleum refining products: mineral benzine (turpentine), petroleum jelly, paraffin wax, petroleum jelly (petrolate), petroleum briquettes, etc.
C2011.23	Manufacture of cyclic and acyclic hydrocarbons, saturated and unsaturated, benzene, toluene, xylene and other products of the distillation of tar, coal or mineral oil, production of pitch and pitch coke.
C2819.24	Manufacture of distillation and rectification of plants for oil refineries, the chemical industry, the beverage manufacturing industry, etc.
C3011.01	Construction of commercial vessels: passenger ships, ferries, merchant ships, oil tankers, tugboats, etc.
C3312.12	Repair and maintenance services for mining, construction and petroleum and gas extraction machinery on a fee or contract basis.
E3900.02	Decontamination activities of industrial facilities or lands, including nuclear ones; Decontamination and cleaning of surface waters after accidental contamination; Removal of asbestos, lead paint and other toxic materials.
G4661.01	Wholesale of crude oil.
G4661.03	Wholesale of liquid fuels naphtha, gasoline, biofuel includes greases, lubricants and oils, liquefied petroleum gases, butane and propane.
H5012.02	Transportation of barges, oil platforms, etc., towed or pushed by tugboats.
N7730.11	Rental for operational purposes, without operators, of other types of machinery and operational equipment that are usually used as capital goods by industries
N8129.93	Cleaning the interior of tanker trucks and oil tankers.

Source: [United Nations 2024](#) (ISIC Rev. 5).

Preparation: the authors.

Public information was collected from the Superintendency of Companies, Securities and Insurance of Ecuador (**SuperCias**) for the period 2015–2020, resulting in a total of 1,774 records.

To determine business failure or bankruptcy, companies that presented financial economic information in at least two consecutive years were considered, that is, companies with two years of experience were included, this reduces the bias of new companies in the market (1 year old) that would appear to be successful. Under this criterion, the data sample was reduced to 441 observations.

Subsequently, for each company, the last year that presented information was observed and in this way the bankruptcy variable was defined, which takes the value of 1 when the last report presented to the SuperCias is prior to the year 2020, this indicates that the company has disappeared or bankrupt in a previous period.

$$\text{Formally} \quad Y_i = \begin{cases} 1 & \text{if } x_{i,t} < 2020 \\ 0 & \text{if } x_{i,t} = 2020 \end{cases} \quad (1)$$

Where,  $x_{i,t}$  is the vector of financial economic variables presented for the last time to the SuperCias by company  $i$  at time  $t$ ,  $Y_i$  is a variable that identifies whether the company was active or bankrupt, which takes 0 and 1, respectively.

Subsequently, the determinants of bankruptcy of companies in the oil sector, based on the work of Rivadeneira et al. (2022) were estimated through a logistic regression model.

Logistic Regression is a regression analysis technique used to model the probability of an event occurring. In the context of business and financial econometrics, it is used to model the probability of a company going bankrupt, of a financial asset suffering a loss, or of a consumer making a certain investment decision. Formally the model can be presented as follows:

$$\text{logit}(p) = X\beta$$

Where,  $\text{logit}(Y)$  is the logistic function, which converts the probability  $Y$  into a value between 0 and 1,  $X$  is the matrix of independent variables and  $\beta$  is the vector of model parameters.

The vector of independent variables (Table 3) is composed of the following indicators:

**Table 3**  
**Financial economic variables of companies in the oilfield sector**

Ratio	Variable	Formula
Liquidity	Current liquidity Acid test	Current Assets/Current Liabilities $\text{Current Assets} - \text{Inventories} / \text{Current Liabilities}$
Solvency	Asset debt Equity debt Fixed Asset Debt Short-term debt Long-term debt Leverage Financial leverage Heritage Strength Current Equity Debt Non-current Equity Debt Short- and long-term leverage	Total Liabilities / Total Assets Total Liabilities / Equity Equity / Fixed Assets Current Liabilities / Total Liabilities Non-Current Liabilities / Total Liabilities Total Assets / Equity $(\text{Profit before taxes} / \text{Equity}) / (\text{Profit before taxes and interest} / \text{Total Assets})$ Share Capital/Equity Short-term accounts and documents to pay / Equity Long-term accounts and documents to pay / Equity Short and long-term accounts and documents to pay / Equity
Management	Portfolio rotation Sales turnover Impact Expenses, Management and Sales Impact of Financial Burden	Sales / Accounts and Receivables Sales / Total Assets Management and Sales Expenses / Sales Financial Expenses / Sales
IProfitability	Gross Margin Operating Margin Net Sales Profitability Operational Return on Equity Financial Profitability Asset Operational Profitability ROA	$(\text{Sales} - \text{Cost of Sales}) / \text{Sales}$ Operational Profit/Sales Net Profit/Sales Operating Profit / Equity $(\text{Sales} / \text{Assets}) * (\text{Profit before taxes and interests} / \text{Sales}) * (\text{Assets} / \text{Equity}) * (\text{Profit before taxes} / \text{Profit before taxes and interests}) * (\text{Net Income} / \text{Profit before taxes})$ Operating Profit / Total Assets Net Profit / Total Assets

Source: SuperCias (2025).

Preparation: the authors.

## Results

In this way, it was determined that a total of 441 companies, 24.1% (110) went bankrupt and 75.1% (331) were still active. Next, the descriptive statistics of each group of companies are presented, and a mean difference test (t test) (Table 4). The results indicate that except for the variables “Long-term Debt”, “Non-Current Equity Indebtedness”, “Impact of Administrative Expenses and Sales” and “Impact of the Financial Burden” (where the p value is statistically significant at 99% of credibility), the average values between active and bankrupt companies are the same.

Table 4  
Descriptive statistics economic and financial information of the oil sector

Variable	Bankrupt=0		Bankrupt=1		Diff	p-value
	Average	Standard Deviation	Average	Standard Deviation		
Long-term debt	0.525	-0.353	0.72	-0.336	0.195***	[0.000]
Current Liquidity	226.494	-3570.009	13.323	-72.97	-213.171	[0.279]
Acid Test	2.317	-3.181	3.303	-4.599	0.986	[0.037]
Asset Debt	0.619	-0.285	0.651	-0.354	0.032	[0.394]
Equity Debt	5.08	-7.524	6.214	-8.886	1.134	[0.229]
Short-term debt	0.695	-0.311	0.741	-0.351	0.046	[0.218]
Fixed Asset Debt	12.905	-31.666	20.92	-45.052	8.015	[0.084]
Leverage	5.972	-7.406	6.848	-8.755	0.876	[0.345]
Financial Leverage	3.724	-13.097	1.412	-22.697	-2.312	[0.310]
Equity Strength	0.275	-0.394	0.41	-0.548	0.136	[0.017]
Current Equity Debt	3.137	-5.211	5.512	-7.019	2.375	[0.001]
Non-current Equity Debt	16.677	-13.33	22.078	-11.158	5.402***	[0.000]
Short and Long Term Leverage	4.825	-7.759	7.479	-9.945	2.654	[0.011]
Portfolio rotation	14.95	-22.706	19.541	-28.88	4.592	[0.129]
Sales Rotation	1.817	-2.176	1.42	-1.736	-0.397	[0.052]

Variable	Bankrupt=0		Bankrupt=1		Diff	p-value
	Average	Standard Deviation	Average	Standard Deviation		
Impact of Management Expenses and Sales	0.479	-0.531	0.792	-0.63	0.314***	[0.000]
Impact of financial burden	0.023	-0.033	0.039	-0.041	0.016**	[0.000]
Gross Margin	0.456	-2.183	0.705	-0.508	0.248	[0.056]
Operating Margin	-0.616	-6.943	-4.606	-39.194	-3.99	[0.288]
Net sales profitability	-0.999	-9.09	-5.026	-39.396	-4.027	[0.287]
Operational profitability of equity	0.251	-2.126	0.092	-1.834	-0.159	[0.451]
Financial profitability	-0.526	-3.52	-0.585	-2.448	-0.059	[0.846]
Operational profitability of the asset	0.103	-0.237	-0.028	-0.504	-0.131	[0.009]
Asset profitability	-0.011	-0.122	-0.115	-0.392	-0.105	[0.006]
N	331		110			

Source: SuperCias (2025).

Preparation: the authors.

As described in the previous section, a logistic regression model was estimated with economic and financial information, obtaining the following results (Table 5).

Table 5  
Model of determinants of bankruptcy of companies in the oil sector

Variables	Odds ratio	dy/dx
Long-term debt	4.223***	0.2415***
	(1.560)	(0.0601)
Current Equity Debt	1.079***	0.0127***
	(0.023)	(0.0036)
Fixed Asset Debt	1.009***	0.0015***
	(0.003)	(0.0005)
Asset profitability	0.223***	-0.252***

Variables	Odds ratio	dy/dx
	(0.110)	(0.0832)
Impact of Administrative Expenses and Sales	1.654**	0.0843**
	(0.342)	(0.0349)
Financial Leverage: Greater than 29	0.340*	-0.134*
	(0.202)	(0.052)
Branch: Wholesale and retail trade, vehicle repair	0.568**	-0.0916**
	(0.156)	(0.0421)
N	441	
ROC area	0.7551	
Model global adjustment	79.59%	
p value Hosmer Lemshow adjustment test	0.292	

Notes:

Robust errors in parentheses.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Preparation: the authors.

Of a total of 24 independent variables, 13 results are statistically significant at 99% confidence, except for the variable “Financial Leverage: Greater than 29” which turned out to be significant at 90% confidence. The ODDs ratio indicates that the variables “Return on asset” (ROA) and “Branch: Wholesale and retail trade, vehicle repair” are protective factors of business bankruptcy, that is, as the ROA increases, the probability of bankruptcy decreases. Likewise, the activities of “Wholesale and retail trade, vehicle repair” have a lower risk of bankruptcy in relation to the rest of the ISIC activities at double digits; The rest of the variables are risk factors, since the ODDs ratio is greater than 1 and their marginals indicate that increasing the value of the variables increases the probability of bankruptcy.

Despite being an explanatory regression model, where the objective is to identify the variables that influence (statistically significant) bankruptcy, and not a predictive model, the area under the ROC curve was estimated, obtaining a value of 0.75, which indicates a good model fit; Thus, it can also be verified that the global fit of the model obtained from the confusion matrix

yielded a value of 79.59%. Finally, the p value of the Hosmer Lemeshow test allows not to reject the  $H_0$ , at 99% confidence, which shows that the estimated values are equal to the observed data.

## Discussion of results

The empirical results indicate that a limited set of financial indicators plays a statistically significant and economically meaningful role in explaining the probability of bankruptcy among firms operating in Ecuador's oil sector. Specifically, long-term debt, current equity indebtedness, fixed asset indebtedness, net asset profitability, the impact of administrative and sales expenses, financial leverage, and participation in wholesale and retail trade activities emerge as the most relevant explanatory variables. Together, these indicators capture key dimensions of firms' financial structure, profitability, and cost management, which are particularly critical in a capital-intensive and highly volatile sector such as oil.

Long-term debt reflects the composition and maturity structure of corporate liabilities. While higher long-term debt may reduce short-term liquidity pressures, excessive reliance on this form of financing can increase financial vulnerability over time. The estimated coefficient indicates that a one-percentage-point increase in long-term debt raises the probability of bankruptcy by 24.15%, highlighting the risks associated with prolonged leverage accumulation. This finding is consistent with De Llano Monelos, Piñeiro and Rodríguez (2016), who identify long-term debt as a significant determinant of corporate failure and report that its inclusion contributes to a predictive accuracy of 83% in their bankruptcy model.

Current equity of indebtedness measures a firm's dependence on short-term external financing relative to its own resources, thereby providing insight into its short-term financial stability. The results show that a one-percentage-point increase in this indicator increases the probability of bankruptcy by 12.72%, suggesting that excessive reliance on short-term liabilities substantially heightens default risk. This result aligns with prior empirical evidence. Caro, Díaz, and Porporato (2016) report this variable as statistically significant, with a coefficient of 1.37% and a model accuracy of

91%, while Chocce et al. (2002) also include this indicator in their analysis, achieving a prediction precision of 85.71%.

Fixed asset indebtedness captures the extent to which long-term assets are financed through debt rather than equity. Although the estimated marginal effect is comparatively small, the model shows that a one–percentage-point increase in this indicator raises the probability of bankruptcy by 0.14%. This finding supports the notion that greater leverage in fixed assets, even at moderate levels, can increase financial fragility in capital-intensive industries. Consistent with this result, Sponerova, Sponer, and Svoboda (2021) identify fixed asset indebtedness as a significant predictor of bankruptcy, reporting a coefficient of 0.90% and an overall model accuracy of 77.20%.

Net asset profitability, commonly analyzed through the DuPont framework, emerges as one of the most robust protective factors against bankruptcy. This indicator reflects a firm's capacity to generate profits from its asset base. The results show that a one–percentage-point increase in net asset profitability reduces the probability of bankruptcy by 25.19%, underscoring the central role of operational efficiency and profitability in sustaining financial viability. This finding is strongly supported by the literature: Bohórquez Alfonso (2019) reports a coefficient of –8.65%, while Caro, Díaz, and Porporato (2016) obtain a coefficient of –9.98%, with prediction accuracies of 90.05% and 91%, respectively. The magnitude of the effect observed in the present study further reinforces the relevance of profitability-based indicators in bankruptcy prediction models.

Administrative and sales expenses constitute a critical component of cost structure and managerial efficiency. When these expenses exceed the gross margin, they can severely erode profitability and compromise financial sustainability. The estimated coefficient indicates that a one–percentage-point increase in the ratio of administrative and sales expenses increases the probability of bankruptcy by 8.43%. Although this indicator has received limited attention in previous studies, its significance in this model suggests that cost management inefficiencies play a decisive role in explaining firm failure in the oil sector, where operating margins are highly sensitive to price fluctuations and contractual rigidities.

Finally, financial leverage reflects the interaction between debt financing and profitability. Values greater than one indicate that the use of debt

enhances returns on equity, while values below one implies that financing costs outweigh the benefits of leverage. The model shows that a one–percentage-point increase in financial leverage reduces the probability of bankruptcy by 13.40%, indicating that, under certain conditions, leverage can act as a protective factor. This result suggests that firms capable of using debt efficiently—particularly in a dollarized economy with constrained access to countercyclical financing—may strengthen their financial resilience rather than increase their risk of failure.

Overall, the discussion highlights that bankruptcy risk in Ecuador’s oil sector is shaped by a complex interaction between debt structure, profitability, and cost management. The consistency of most results with prior empirical studies reinforces the robustness of the model, while the significance of less traditional indicators underscores the importance of adopting sector-specific approaches when analyzing corporate failure in strategic industries.

## Conclusions

Ecuador’s oil companies play a pivotal role in the national economy, accounting for 6.5% of GDP and 13.08% of total State Budget revenues in 2019, thereby underscoring the sector’s strategic importance for fiscal sustainability and macroeconomic stability within a fully dollarized monetary regime. In the absence of an independent monetary policy, Ecuador’s dollarization framework heightens the economy’s dependence on external sources of foreign exchange—particularly oil exports—to sustain liquidity, public spending, and balance-of-payments equilibrium. Using economic and financial information reported to the Superintendency of Companies, Securities and Insurance ([SuperCias](#)) for the period 2015–2020, this study constructed a sample of 441 oil-sector firms with at least two years of operation, of which 24.94% (110 firms) experienced bankruptcy during the analysis period. This relatively high incidence of corporate failure reflects not only firm-level weaknesses but also the amplification of external shocks—such as international oil price volatility—under dollarization, where adjustment mechanisms operate primarily through real activity, fiscal accounts, and corporate balance sheets.

Based on this sample, 24 financial and economic indicators were estimated to evaluate firms' liquidity, solvency, managerial efficiency, and profitability. A logistic regression model estimated at a 90% confidence level identified the main factors associated with business bankruptcy. The indicators "Long-term Debt," "Current Equity Indebtedness," "Impact of Administrative Expenses and Sales," and "Fixed Asset Indebtedness" display odds ratios that confirm their role as risk factors, significantly increasing the probability of bankruptcy. Conversely, "Asset Profitability," "Financial Leverage (>29)," and the activity classification "Wholesale and Retail Trade, Vehicle Repair" emerged as protective factors. Within a dollarized economy, these results are particularly relevant, as firms face rigid financing conditions, limited access to countercyclical credit, and heightened exposure to liquidity constraints during downturns.

Most of the results are consistent with the findings of De Llano Monelos, Piñeiro and Rodríguez (2016), Caro, Díaz, and Porporato (2016), Chocce et al. (2002), Sponerova, Sponer, and Svoboda (2021), and Bohórquez Alfonso (2019). However, the results concerning the "Impact of Administrative Expenses and Sales" and "Financial Leverage" diverge from prior empirical evidence. These differences may be attributed to the structural features of Ecuador's oil sector operating under dollarization, where cost rigidities, foreign-currency denominated liabilities, and the procyclical nature of fiscal and financial conditions intensify firms' vulnerability to adverse shocks.

Overall, the findings highlight the need to monitor financial indicators that are not necessarily standard across sectors but are critical for the oil industry in a dollarized context. These indicators should be systematically incorporated into the supervisory and early-warning frameworks of SuperCias, as well as into firms' internal risk management systems. Strengthening such mechanisms could support the design of regulatory measures and public policies aimed at preventing and mitigating systemic bankruptcy risk, thereby limiting adverse spillovers on economic growth, employment, fiscal revenues, and the availability of foreign exchange.

Finally, assessing systemic risk in Ecuador's oil sector requires future research that integrates firm-level bankruptcy prediction models with analyses of financial contagion under dollarization. This entails reliably identifying inter-firm linkages through debt, equity participation, and investment networks,

in order to evaluate how financial distress may propagate across the sector and compromise macroeconomic stability in an economy where adjustment relies predominantly on real and fiscal channels rather than monetary instruments.

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#### **DECLARACIÓN DE CONFLICTO DE INTERESES**

Los autores declaran no tener ningún conflicto de interés financiero, académico ni personal que pueda haber influido en la realización del estudio.

#### **DECLARACIÓN DE ÉTICA**

Los autores declaran haber cumplido con los principios éticos durante el proceso de investigación.

#### **DECLARACIÓN DE CONTRIBUCIÓN DE LA AUTORÍA**

Leonardo Saraguro participó en la conceptualización, curación de datos, análisis formal, investigación, investigación y edición del artículo final. Alexander Andrade Condor participó en la conceptualización, la curación de datos, análisis formal, investigación y revisión. Diego Raza-Carrillo participó en la investigación, metodología, administración del proyecto, validación, redacción del borrador, redacción, revisión y edición del artículo final. Carlos de la Torre participó en investigación, validación, redacción del borrador y edición del artículo final.