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Abstract

Companies confront crises at different moments. These need to be anticipated and the prediction of occurrences by using multivariate data. The purpose of the study was to determine the amount of financial insolvency risk of enterprises in the tourism sector in the light of the worldwide crisis. The study is quantitative in nature, and the analysis is based on 208 enterprises of the tourism sector, which provide systematic and consistent financial information. The data were acquired from the Superintendence of Companies of Ecuador, for the years 2018-2022. The report gives information on the extent of danger of financial insolvency in the tourism industry. The analysis used the Altman Z-score model, which revealed that the hotel, travel agency, and food and beverage subsectors increased their financial risks during the crisis and have not yet returned to pre-crisis levels.

Keywords

Tourism sector, Altman Z-score, financial risk, bankruptcy, crisis

Resumen

Las empresas afrontan crisis en diferentes momentos. Estos deben anticiparse y predecir las ocurrencias utilizando datos multivariantes. El objetivo del estudio fue determinar el nivel de riesgo de insolvencia financiera de las empresas del sector turístico a la luz de la crisis mundial. El estudio es de carácter cuantitativo y se basa en 208 empresas del sector turístico, que proporcionan información financiera sistemática y consistente. Los datos fueron obtenidos de la Superintendencia de Empresas de Ecuador, correspondientes a los años 2018-2022. El informe ofrece información sobre el alcance del riesgo de insolvencia financiera en la industria turística. El análisis utilizó el modelo Altman Z-score, que reveló que los subsectores hoteleros, de agencias de viajes y de alimentación aumentaron sus riesgos financieros durante la crisis y aún no han vuelto a los niveles previos a la crisis.

Palabras clave

Sector turístico, Altman Z"-Score, riesgo financiero, quiebra, crisis

Introduction

The tourism sector is important globally, both for its contribution to the economy (A. Khan et al., 2023) and for its linkages with other sectors in the supply chain (Wen et al., 2023). The World Travel & Tourism Council emphasizes that the industry plays an important role in socio-economic development (WTTC & Economics Oxford, 2024). Moreover, it is relevant for job creation, the promotion of prosperity, and inclusion (Agarwal & Gopinath, 2022; Haryanto, 2020). In 2019, the tourism sector generated 10.4% of global GDP (US\$9,2 trillion), 10.6% of all jobs (334 million), and was responsible for creating one in four new jobs worldwide (WTTC, 2023a). In Latin America, in 2022, it contributed US\$302.6 billion to the regional economy and employed nearly 16.4 million people (WTTC, 2023b). According to the UNWTO (2020), Latin America and the Caribbean represented 10.3% of global GDP in 2019. In Ecuador, it will represent 4.4% of the national economy by the end of (WTTC, 2023b).

Despite its predominant role, it has become the most vulnerable sector of the industry (Meng, 2022), being a hyper-mobile sector subject to an increasingly interconnected world economy facing major global crises (Ma et al., 2020), and adverse consequences such as "black swans" (Lee & Chen, 2021), which have caused changes in the behavior of tourists and customers (Abbas et al., 2021), reduction in tourism demand and devastation of the tourism economy (Xie et al., 2022), loss of revenue for hotels, restaurants, airlines, and other businesses related to the tourism industry (Hendhana et al., 2024). Hendhana et al.(2024, p. 1) point out that "crises and disruptions are the main challenges for the tourism industry", causing significant changes and threatening the survival of organizations (Smolčić & Dora, 2024). These include natural or man-made disasters that cause loss of life, damage to infrastructure, destruction of businesses, reduction in income, and increase in poverty. In the first three years of the 2020s, they caused losses of approximately USD 232 billion (World Bank, 2022).

Against this background, the following research question was formulated: What is the risk of financial insolvency of companies in the tourist sector? The vulnerability of the tourism sector to economic, political, social, and ecological crises, as well as epidemics or pandemics such as COVID-19 (Nagendrakumar et al., 2023), indicates the need to evaluate the risk of financial bankruptcy due to loss of revenues, often caused by the fall in tourism flows. and decreased activity (Haryanto, 2020; Kalogiannidis, 2020). It is important to understand the levels of financial bankruptcy risk to establish measures for business continuity and avoid business failure (Nagendrakumar et al., 2023). It provides a decision on the financial capacity of the companies (Mahbuba & Dhaka, 2015). Expectations of the stakeholders (Sutra, 2020). The in-depth study makes an important contribution to the scientific literature by adapting and confirming the Altman Z-score model for the tourist sector, considering its peculiarities and unique challenges. The split per subsector (lodging, travel agencies and food and beverages) allows a more in-depth knowledge of the specific vulnerabilities of each subsector. This is

vital for designing more effective mitigation measures and policies to accelerate the recovery and sustainability of the sector. The study intends to provide a strategic decision-making framework on the continuous monitoring and prevention tactics that the business might adopt to strengthen its financial resilience.

Various strategies are used to evaluate the risk of financial failure of firms. In this study, the Altman Z-score model was used (Altman, 1968, 2002; Altman et al., 2017). It is a multivariate statistical model that predicts the financial risk and the chance of bankruptcy based on financial variables such as liquidity, operability, debt, and profitability, and offers information on the financial health of the companies (Agustian & Syofyan, 2022; Álvarez-Ferrer & Campa-Planas, 2020; Isaac-Roque & Caicedo-Carrero, 2023; Karim et al., 2021; Zainudin et al., 2023). The modified Altman Z'-score model was chosen due to its high predictive power of financial failure. Reported accuracy has been between 70% and 90% in predicting financial failure up to 2 years ahead in several studies (Agustian & Syofyan, 2022; Akbulayev et al., 2020; Del Castillo & Fernández, 2021; Kaura, 2023).

This research is structured as follows: a theoretical framework section covering issues related to the Altman Z-score model. The methodology and data analysis techniques are described in the next section, followed by presentation of findings and discussion and finally conclusions and potential ideas for future study.

Literature review

Financial uncertainties have been caused to companies by eventualities such as disease outbreaks, security challenges, financial crises, government measures, the COVID-19 pandemic, and wars, which have also increased the probability of financial difficulties (Goh et al., 2022; Z. Li et al., 2020). These crises paralyzed the world through regulatory measures that forced companies to close their doors, implement social distancing, and enforce quarantines (Morán et al., 2021). It brought consequences for all economic sectors (Andhiny et al., 2022; Kalogiannidis, 2020), dealt a severe blow to the global economy, and posed a threat due to potential financial risks or difficulties (Kıraci, 2021; Morán et al., 2021). Some sectors were more affected than others, straining operational capacity and sustainability and predisposing them to insolvency due to limited flows (Haro, 2021). One of the sectors most severely affected is tourism (Bakar & Rosbi, 2020; Chang & Mcaleer, 2020; Maharani & Sari, 2021; Souza & Chandrashekhara, 2023), which experienced a worldwide revenue decline of more than 50% (Wieprow & Gawlik, 2021), leading to financial problems. Additionally, this sector has a greater susceptibility to failure (H. Li et al., 2017) because management fundamentals cannot be strengthened (N. Khan et al., 2020; Muhammad et al., 2023; Situm, 2023), and a deficiency in innovation processes and new ideas (N. Khan et al., 2020). Almost 50% of establishments in the hotel sector do not survive beyond 5 years of operation (Abidin et al., 2021).

Tourism is considered as a multidimensional phenomena with wide variety of consequences on regional development(Shakya, 2009). It is an engine of economic growth and a source of foreign exchange from tourist enterprises (Endah et al., 2021). It is a booming sector (Akbulayev et al., 2020), but low financial performance and even economic losses, meaning decrease in purchasing power, leading to financial difficulties (Andhiny et al., 2022; Purwanto et al., 2023), it is a high-risk industry (Situm, 2023), which has encountered significant challenges (Abidin et al., 2021). Tourism companies are industries that promote cultural reciprocity (Gil et al., 2020), providing services and intangible goods such as hotels, restaurants, travel agencies, and transportation (Belda & Cabrer-Borrás, 2021; Del Castillo & Fernández, 2021). These involve financial difficulties and entail reductions in income and working capital, as well as consecutive periods of negative results (Abidin et al., 2021; Endah et al., 2021; Situm, 2023). These issues arise from weak management, regulatory measures involving social restrictions (Andhiny et al., 2022), and changes in tourist behavior and competitiveness (Gemar et al., 2019), which negatively affect all stakeholders in the company (Ashraf et al., 2019; Muñoz-Izquierdo et al., 2020). Table 1 outlines the effects that financial difficulties generate:

Table 1.
Effect of financial difficulties.

Early Stage			Late Stage		Final Stage	
Effect of Financial Difficulties:	•	Decrease in profitability	•	Fall in profitability	•	Fall in profitability
			•	Increase in leverage	•	Increase in leverage
					•	Decrease in liquidity
					•	Legal proceedings
		Economic Failure		Economic Failure		Legal Failure
		Low-Risk Zone		Medium-Risk Zone		High -Risk Zone

Source: (Álvarez-Ferrer & Campa-Planas, 2020; Ashraf et al., 2019; Muñoz-Izquierdo et al., 2020; Sormunen & Laitinen, 2012)

Predictive models serve as an alternative for monitoring and predicting financial bankruptcies, ensuring the continuity and proper functioning of the company (Correia et al., 2022; Gémar et al., 2016). These models require financial data to help anticipate financial risk and bankruptcy. Data is obtained from financial statements (Metaxas & Romanopoulos, 2023) and the application of indicators (Muñoz-Izquierdo et al., 2020).

Financial statements are reports that allow understanding the economic condition of the company; they provide information about assets, liabilities, equity, expenses, and income, to offer useful information for a wide range of users (Atang et al., 2022; Maharani & Sari, 2021), additionally, they serve as the foundational tool for the application of financial indicators (Rahmah & Novianty, 2021).

Financial indicators were tools used in the analysis of past business situations, but given the importance of stakeholders having useful information for decision-making and financial difficulties analysis (Çolak, 2021; Endah et al., 2021; Prabowo, 2019), a few decades ago, they began to be applied as projection instruments (Haro, 2021; Ibarra, 2006), to predict the success or failure of companies and measure the financial health of the companies (Atang et al., 2022; Kıraci, 2021).

These measures, by themselves, are not representative; it is necessary to establish a pattern (Çolak, 2021; Correia et al., 2022), analyzing different criteria, considering objectives, applying multivariable analysis, and, above all, having accounting information that meets two conditions: utility and reliability (Ibarra, 2006). The selection of indicators should be able to financially explain strategic factors, for which Altman chooses variables such as liquidity, profitability, operability, and leverage, to predict risk and bankruptcy (Altman, 1968; Altman et al., 2017; Lizarzaburu et al., 2021). The forecast of financial bankruptcy stems from the pioneering work of Fitzpatrick in 1932 which was descriptive in character. Later, important contributions were made by Arthur Winakor and Raymond Smith (1935) and Charles Merwim was prominent throughout the period 1926-1936 (Correia et al., 2022; Ibarra, 2006; Valaskova et al., 2018). Beaver (1966) was a pioneer in advocating the use of accounting information and indicators as informal predictors of bankruptcy (Álvarez-Ferrer & Campa-Planas, 2020; Ashraf et al., 2019).

Since then, several researchers have conducted financial investigations using indicators and multivariable models, among which Altman stands out with the Z-Score model (Çolak, 2021), which was designed to integrate various financial ratios into a single indicator capable of measuring the solvency and susceptibility of a company to financial bankruptcy (Akbulayev et al., 2020; Lestari et al., 2021; Souza & Chandrashekhar, 2023). Meanwhile, the first studies on the failure of tourism companies date back to the 1990s (Metaxas & Romanopoulos, 2023). Financial bankruptcy occurs when the firm does not have enough liquidity to pay its obligations to creditors. (Gemar et al., 2019). To make profits is considered a management failure (Lestari et al., 2021; Prabowo, 2019; Pratama et al., 2020), which could result in dissolution and illiquidity that affect the economy of stakeholders (Agustian & Syofyan, 2022; Akbulayev et al., 2020; Goh et al., 2022; Karim et al., 2021). Therefore, the early warning model needs to estimate the probability of hazards and financial insolvency (Ashraf et al., 2019; Gemar et al., 2019).

Edward Altman proposes the Z-Score model, a multidisciplinary predictive tool (Altman, 1968) that employs multiple discriminant analysis (MDA) (Endah et al., 2021; Lestari et al., 2021). It applies multivariable statistical analysis of indicators to identify healthy companies from those in the process of bankruptcy (Ibarra, 2006) and, in the near future, to anticipate bankruptcy (Manaseer & Al-Oshaibat, 2018). The Altman technique classifies indicators into defined groups (Álvarez-Ferrer & Campa-Planas, 2020) and assigns different weights to each (Lestari et al., 2021), based on which the risk is categorized into three levels: low, medium, and high.

The Altman Z-Score models have evolved over time to be applicable to a diversity of companies with different characteristics, whether in manufacturing, commerce, or services, and whether or not they are listed on the stock market (Akbulayev et al., 2020). The original model was applied to publicly traded manufacturing companies (Agustian & Syofyan, 2022; Isaac-Roque & Caicedo-Carrero, 2023). Subsequently, a new model was developed to broaden the scope to encompass a wider range of companies (Altman, 1983). This model applies to privately held manufacturing companies in emerging markets and allows for data extraction directly from financial statements (Lizarzaburu et al., 2021). Finally, a third version was introduced for non-manufacturing companies, specifically applicable to service-oriented businesses operating in emerging markets (Álvarez-Ferrer & Campa-Planas, 2020). Table 2 describes the different versions of the Altman Z-Score.

Table 2.

Altman Z-Score models.

Z	Company	Formula	Detail	Range
Z-Score (Original)	Manufacturing companies listed on the stock exchange	$Z=0,012X1+0,014X2+0,033X3+0,006X4+0,999X5$	X1=WC/TA	Z > 2,99 Low-risk zone
			X2=RE/TA	
			X3=EBITDA/TA	Z = 2,99 and 1,81 Medium-risk zone
			X4=MVE/TL	
			X5=S/TA	Z < 1,81 High-risk zone
Z'-Score	Private companies	$Z'=0,717X1+0,847X2+3,107X3+0,420X4+0,998X5$	X1=WC/TA	Z > 2,90 Low-risk zone
			X2=RE/TA	
			X3= EBITDA-TA/TA	Z = 2,90 y 1,23 Medium-risk zone
			X4=EQ/TL	
			X5=S/TA	Z < 1,23 High-risk zone
Z''-Score	Service-based companies, non-manufacturers, and emerging markets.	$Z''=6,567X1+3,26X2+6,727X3+1,05X4$	X1=WC/TA	Z > 2,60 Low-risk zone
			X2=RE/TA	
			X3=EBITDA/TA	Z = 2,60 y 1,10 Medium-risk zone
			X4=S/TL	Z < 1,10 High-risk zone

Note: WC = Working capital (current assets - current liabilities); TA = Total assets; RE = Retained earnings; EBITDA = Earnings before interest and taxes; MVE = Market value of equity; TL = Total liabilities; S = Sales; EQ = Equity (Book value).

Source: (Altman, 2002; Álvarez-Ferrer & Campa-Planas, 2020; Kıraci, 2021; Lizarzaburu, 2014; Prabowo, 2019)

The Altman model, in addition to its "relevance, high recurrence, and popularity" (Muñoz-Izquierdo et al., 2020, p. 3), operates reasonably well, with an accuracy ranging from 70% to 90% approximately (Agustian & Syofyan, 2022; Akbulayev et al., 2020; Altman et al., 2017; Ashraf et al., 2019; Del Castillo & Fernández, 2021; Kaura, 2023; Souza & Chandrashekhar, 2023). It measures the prediction of bankruptcy up to 2 years prior to it, with financial difficulties intensifying 1 year before bankruptcy

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(Álvarez-Ferrer & Campa-Planas, 2020). Table 3 presents the liquidity, profitability, operability, and leverage variables applicable in the Altman Z"-Score model.

Table 3.

Description of Altman Z"-Score model variables.

Variable	Formula	Definition
Liquidity (Working Capital) X1	$X1 = \frac{\text{Working Capital}}{\text{Total Assets}}$	Capacity to generate resources for daily operations from assets.
Profitability (Retained Earnings) X2	$X2 = \frac{\text{Undistributed Profits}}{\text{Total Assets}}$	Capacity to create earnings cumulatively. Undistributed profits are the entity's earnings (dividends) that are not distributed to the owners of the entity.
Operability (EBITDA) X3	$X3 = \frac{\text{EBITDA}}{\text{Total Assests}}$	Ability to generate operating profits (before interest and taxes), i.e., management efficiency.
Leverage (Solvency) X4	$X4 = \frac{\text{Value of Equity}}{\text{Total Liabilities}}$	Ability to pay bills, particularly long-term bills, with equity. The lesser the value, the higher the likelihood of financial troubles

Source:(Atang et al., 2022; Isaac-Roque & Caicedo-Carrero, 2023; Lestari et al., 2021; Manaseer & Al-Oshaibat, 2018; Muhammad et al., 2023; Pratama et al., 2020)

Note: A higher value indicates no difficulties in meeting obligations.

For the case of the tourism sector, comprised of service-oriented companies operating in an emerging market, the Altman Z"-Score model is selected. This model utilizes four variables: liquidity, profitability, operability, and leverage, as detailed in Table 2.

Materials and methods

The research employed a descriptive quantitative approach that facilitated the comparison of financial data to assess financial bankruptcy risk levels during the crisis periods between 2018 and 2022 (Siyoto & Sodik, 2015; Sugiarto, 2022). Financial information was extracted from the Superintendence of Companies and Insurance of Ecuador, covering tourism-sector companies and providing a financial time-series database. The selected period was motivated by economic, political, and social crises (Barreira & Cesário, 2024) that posed challenges to the financial performance of companies worldwide. The study population comprised 4,054 companies classified as SMEs in the Ecuadorian tourism sector. According to the International Standard Industrial Classification (ISIC), this sector is divided into the following subsectors: accommodation (I55), food and beverages (I56), and travel agencies (N79) (INEC 2020). Firms without complete data on financial variables required by the Altman Z-Score model were excluded, resulting in a final sample of 208 firms per year, with an average of 12.480 observations.

The data analysis was performed by calculating financial indicators using the Altman Z-score model, which considers liquidity, profitability, operability, and leverage, as described in Tables 2 and 3 for service firms. Tools for statistical analysis were employed, for example Excel and JAMOV version 2.3.21. A chi-square test was undertaken to evaluate the relationship between firms located in low risk zones and the probability not to experience financial trouble. Additionally, ANOVA was used to test variance on Z-Score model scores. The correlation analysis was used to examine the effects of different financial variables on the overall financial health of firms in each subsector (liquidity, profitability, operability and leverage).

Results and discusión

a. Descriptive statistics

In 2020, the highest average Z score was in the accommodation subsector, at 1.64. The lowest Z-score average was for the food and beverage subsector at -0.532. These values indicate that both subsectors, along with travel agencies, were affected in the Z model variable scores in 2020.

By the end of 2022, the average Z score for the food and beverage subsector had improved relative to pre-pandemic levels, at 0.922 versus 0.588. However, the average Z scores for the accommodation and travel agency subsectors at the end of 2022 have not surpassed pre-pandemic levels. See Table 4.

Table 4. Z"-Score descriptive by tourism subsectors for the year 2018-2022.

	Subsector	Z 2018	Z 2019	Z 2020	Z 2021	Z 2022
N	1 Travel Agencies	88	88	88	88	88
	2 Food and Beverage	91	91	91	91	91
	3 Accommodation	29	29	29	29	29
Mean	1 Travel Agencies	1.77	1.84	0.0388	0.884	1.38
	2 Food and Beverage	1.09	0.588	-0.532	0.883	0.922
	3 Accommodation	2.24	2.51	1.64	1.64	1.85
Standard Deviation	1 Travel Agencies	3.36	3.11	3.47	3.50	3.44
	2 Food and Beverage	3.38	3.07	3.36	3.64	3.62
	3 Accommodation	2.68	2.40	2.43	2.74	2.21
Minimum	1 Travel Agencies	-7.50	-7.67	-8.62	-9.97	-7.42
	2 Food and Beverage	-6.78	-6.80	-8.80	-8.47	-7.61

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	3 Accommodation	-3.20	-1.68	-3.74	-2.91	-4.14
Maximum	1 Travel Agencies	8.00	9.33	7.99	8.35	9.77
	2 Food and Beverage	9.13	8.77	7.23	8.33	9.75
	3 Accommodation	7.90	8.51	7.61	9.45	5.73

Before the pandemic, in 2019, tourism sector companies were in the high-risk zone in 60,10% of cases. During the 2020 pandemic, this percentage rose to 73,08%. Meanwhile, at the end of 2022, the high-risk level of 61,06% remained above the pre-pandemic value of 60,10%. See Table 5.

Table 5.

Relative frequencies of risk zones in tourism-sector companies in Ecuador, 2018-2022.

Risk	2018	rf	2019	rf	2020	rf	2021	rf	2022	Rf
High	114	54,81%	125	60,10%	152	73,08%	124	59,62%	127	61,06%
Medium	33	15,87%	32	15,38%	24	11,54%	36	17,31%	29	13,94%
Low	61	29,33%	51	24,52%	32	15,38%	48	23,08%	52	25,00%
Total	208	100,00%	208	100,00%	208	100,00%	208	100,00%	208	100,00%

In 2019, the subsector in the high-risk zone was food and beverages, accounting for 30,3%, and the same occurred in 2020. For 2021, the subsector with the highest percentage of high risk was travel agencies, with 27,4%. At the end of 2022, the food and beverage subsector represented the highest share of companies in high-risk zones, at 28,40%. See Table 6.

Table 6.

Frequencies according to Z categories of tourism subsectors for the years 2018-2022.

Risk Category	Subsector	2018		2019		2020		2021		2022	
		fa	% of Total	fa	% of Total	fa	% of Total	fa	% of Total	fa	% of Total
1 HIGH	1 Travel Agencies	44	21.2 %	50	24.0 %	62	29.8 %	57	27.4 %	54	26.0 %
	2 Food and beverages	57	27.4 %	63	30.3 %	72	34.6 %	53	25.5 %	59	28.4 %
	3 Accommodation	13	6.3 %	12	5.8 %	18	8.7 %	14	6.7 %	14	6.7 %
2 MEDIUM	1 Travel Agencies	14	6.7 %	13	6.3 %	12	5.8 %	11	5.3 %	13	6.3 %
	2 Food and beverages	12	5.8 %	12	5.8 %	6	2.9 %	16	7.7 %	12	5.8 %
	3 Accommodation	7	3.4 %	7	3.4 %	6	2.9 %	9	4.3 %	4	1.9 %

3 LOW	1 Travel Agencies	30	14.4 %	25	12.0 %	14	6.7 %	20	9.6 %	21	10.1 %
	2 Food and beverages	22	10.6 %	16	7.7 %	13	6.3 %	22	10.6 %	20	9.6 %
	3 Accommodation	9	4.3 %	10	4.8 %	5	2.4 %	6	2.9 %	11	5.3 %

This sector is vulnerable to crises because its operations, directly reflected in profitability, are affected, and it resorts to leverage, an element that impacts liquidity. All these multifactorial effects place companies in a high-risk zone, making it essential to evaluate the indicators continuously. Before the pandemic, 50 out of 88 companies in the travel agency subsector were in a high-risk zone. This number increased to 62 in 2020, and in subsequent years it has decreased slightly. However, as depicted in Figure 1, the high-risk zone has not reached 2019 levels or lower, as would be expected.

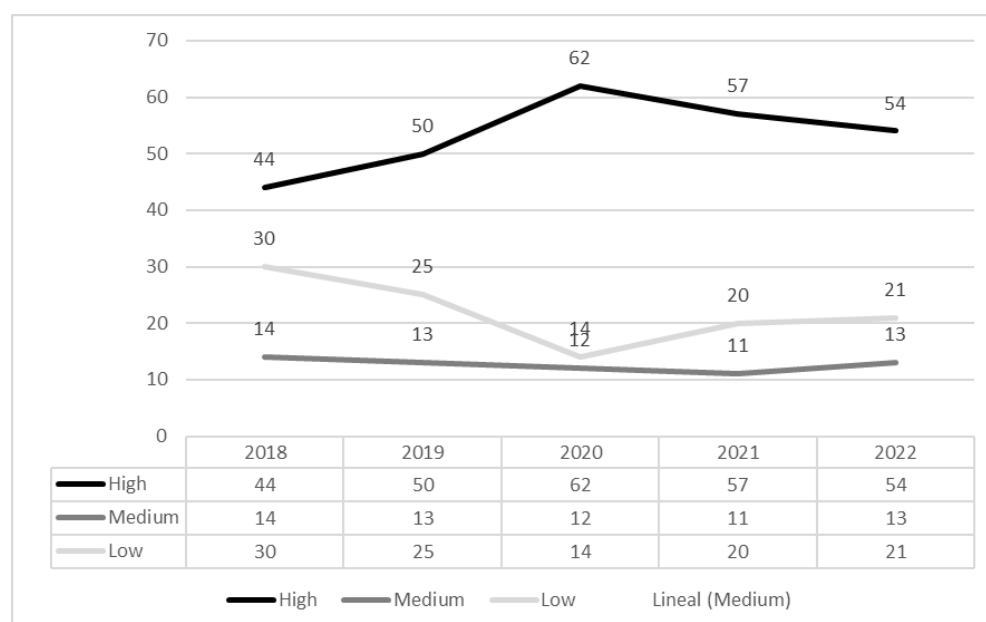


Figure 1. Risk Zones in the Travel Agencies Subsector 2018-2022.

The food and beverage subsector is the most volatile of the three analyzed; that is, the number of companies in risk zones from 2018 to 2022 is the most variable across the subsector. This number increased in 2020 (from 72 to 91). In 2021, the number of companies in the high-risk zone decreased, showing a slight improvement. By 2022, companies in the high-risk zone still predominate (59 out of 91); however, the number of companies is lower and appears more favorable than in 2019. See figure 2.

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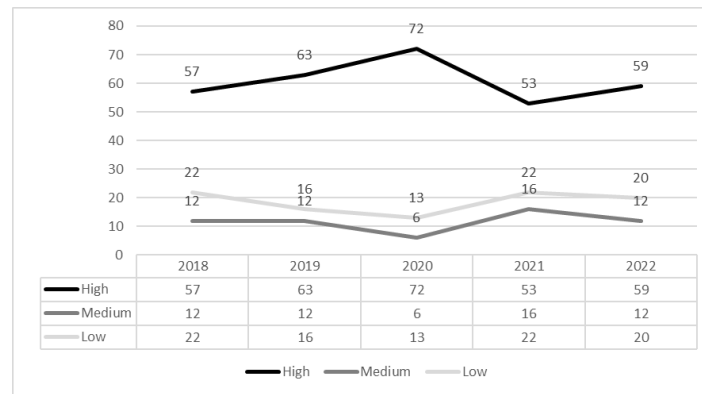


Figure 2. Risk Zones in the Food and Beverage Subsector 2018-2022.

In the accommodation subsector, 12 of 29 companies were in the high-risk zone in 2019. In 2020, more companies entered this category, specifically 18. By the end of 2022, half of the companies were in the high-risk zone, a higher and less favorable figure than in 2019. See figure 3.

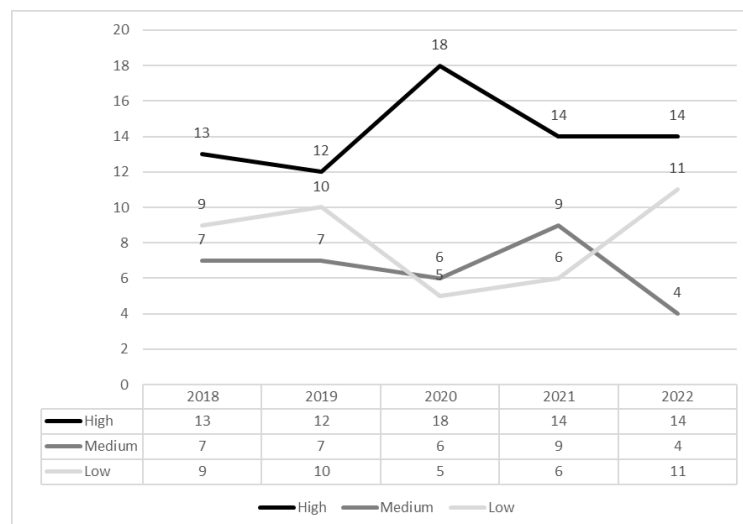


Figure 3. Risk zones in the accommodation subsector 2018-2022.

b. One-way ANOVA in the tourism sector for the years 2018-2022

To verify if the mean of Z scores in the tourism subsectors differs across the different years of study, the following hypotheses were formulated:

H1 = The mean of the Z scores in the subsectors of the tourism sector is different.

Significance level: 0.05.

In the years 2019 and 2020, the p-value is less than 0.05. In conclusion, the mean of the Z scores for 2019 and 2020 differs. In the remaining years, the Z-score means are equal. This could be explained by the turbulence and crisis, a factor that caused the variables of the Z"-Score model to be volatile, thereby reducing the mean, as explained earlier, see table 7.

Table 7.

One-way ANOVA (Welch) of tourism subsectors for the year 2018-2022.

	F	gl1	gl2	p
Z 2017	1.302	2	88.9	0.277
Z 2018	1.979	2	86.5	0.144
Z 2019	7.029	2	87.5	0.001
Z 2020	7.322	2	91.2	0.001
Z 2021	0.861	2	88.0	0.426
Z 2022	1.357	2	97.5	0.262

Once the risk levels of companies in the tourism sector were determined, it was necessary to examine how the groups classified by the Altman Z"-Score model (high, medium, low) were related to the probability of closure of companies in the tourism sector. As expected, companies in the high- and medium-risk zones are more likely to experience financial distress than those in the low-risk zone. To test this assumption, contingency tables were used, as shown below:

H1: There is a relationship between high-medium risk zones and the probability of short-term financial distress.

H2: There is a relationship between low-risk zones and the probability of no financial distress in the medium term.

Significance level 0.05%.

The Chi-square value for all years is less than 0.05 (See table 8); therefore, the hypothesis of a relationship between companies in the high- to medium-risk zones and the probability of short-term financial distress is accepted. On the other hand, empirical evidence suggests a relationship between companies in low-risk zones and the probability of not experiencing financial distress in the medium term.

Table 8.

Chi-square Tests in the Tourism Sector for the Years 2018-2022

Chi-square Tests a	df	Value	Asymptotic significance (two-sided)	Value	Asymptotic significance (two-sided)	Value	Asymptotic significance (two-sided)	Value	Asymptotic significance (two-sided)	Value	Asymptotic significance (two-sided)
Pearson Chi-square	2	208,000 ^b	0	208,000 ^b	0	208,000 ^b	0	208,000 ^b	0	208,000 ^b	0
Likelihood Ratio	2	255,128	0	238,224	0	197,788	0	233,931	0	253,438	0
Linear-by-Linear Association	1	174,72	0	172,016	0	173,647	0	169,564	0	178,596	0
Valid Cases		208		208		208		208		208	

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a. Year = 2018	a. Year = 2019	a. Year = 2020	a. Year = 2021	a. Year = 2022
b. 0 cells (0.0%) had expected count less than 5. The minimum expected count is 10,00.	b. 0 cells (0.0%) had expected count less than 5. The minimum expected count is 8,57.	b. 1 cell (16.7%) had an expected count less than 5. The minimum expected count is 4,38.	b. 0 boxes (0,0%) have expected a lower count than 5. The minimum expected count is 8,75.	b. 0 cells (0.0%) had expected count less than 5. The minimum expected count is 8,35

Table 9 shows that companies in the Travel Agencies and Food and Beverage subsectors are at high risk due to low liquidity, low profitability, and high leverage. In addition, the Food and Beverage subsector is also affected by low operability.

Table 9.

Correlation of the financial ratios of the sub-sectors with the Z"-Score.

Subsector	Z-score	Coefficients	X1	X2	X3	X4
Travel Agencies	High -Risk Zone	Correlation coefficient	,743**	,443**	0,248	,353*
		Sig. (bilateral)	0,000	0,002	0,089	0,014
		N	48	48	48	48
	Low-Risk Zone	Correlation coefficient	,765**	0,151	0,241	0,292
		Sig. (bilateral)	0,000	0,463	0,236	0,148
		N	26	26	26	26
Food and Beverage	High -Risk Zone	Correlation coefficient	,752**	,534**	,290*	,431**
		Sig. (bilateral)	0,000	0,000	0,029	0,001
		N	57	57	57	57
	Low-Risk Zone	Correlation coefficient	,477*	,635**	0,335	,502*
		Sig. (bilateral)	0,018	0,001	0,109	0,012
		N	24	24	24	24

Discussion

The global crisis's impact on the tourism sector from 2018 to 2022 underscores how these events drastically reduced revenues, with estimates suggesting declines ranging from 50% to 90% due to the economic recession impacting industry cash flows (Deyshappriya et al., 2021; Kıraci, 2021). These consequences are confirmed by studies in Kosovo and Vietnam, showing substantial losses due to reductions in both domestic and international visitor arrivals (Huynh et al., 2021; Kuqi et al., 2023; Terziyska & Dogramadjieva, 2021). They impact family earnings and demand for tourism services and so affect the economic contribution of the industry (Meng, 2022).

In Ecuador, a major shift was noticed as enterprises shifted from a safe range to uncertainty, potentially resulting in insolvency, notwithstanding the strength of larger asset accumulation relative to the requirement for external resources (Haro, 2021).

Such measures as border closures and restrictions on tourist visits had significant repercussions on operations and consequently on the financial situation of tourism businesses (Bakar & Rosbi, 2020; Bartik et al., 2020; Hayakawa & Mukunoki, 2021; Kalogiannidis, 2020). The impacts show the tourism sector's vulnerability to crises, with sub-sectors such as transportation, hotels, restaurants, and entertainment being most affected, which leads to a direct loss of income (Hendhana et al., 2024; Rahmah & Novianty, 2021; Vavrek et al., 2021; Wieprow & Gawlik, 2021).

The variability in the financial stability of Ecuadorian tourism companies reflects heterogeneity, which differs from the research companies in Indonesia were in a low-risk zone with healthier conditions and a lower probability of bankruptcy (Rahmah & Novianty, 2021). This underscores that success is attributed to governmental efforts and foreign exchange earnings from tourist activities.

For the year 2020, the number of companies with high financial risk increased and by the end of 2022, it decreased, approaching the results of 2019, a trend similar to that observed in studies conducted in other regions where the probability of bankruptcy became more likely (Fitriyah et al., 2022; Matejić et al., 2022; Rahmah & Novianty, 2021; Sumner et al., 2020; Wieprow & Gawlik, 2021), especially for those companies located in the high-risk zone as postulated by one of the hypotheses of this study.

Among the three subsectors analysed, food and beverages were the most vulnerable, despite closing 2022 with a fewer number of companies in the high-risk zone compared to 2019. This is unlike the analysis by Kaura (2023), which demonstrates that the tourism sector is financially sound and low risk which means that it would not have financial troubles.

The variables that contribute the most to the insolvency of a corporation are the profitability of net assets, asset turnover, retained earnings and the ratio between current assets and total assets

(Correia et al., 2022). Operational inefficiency in the tourism industry forces enterprises to use debt that has a negative correlation with liquidity that impacts profitability. Such circumstances contribute to organizations falling into the high-risk zone.

Conclusions

The tourism sector significantly contributes to both the global and national economies. However, it stands out as one of the most vulnerable sectors to financial risk due to its reliance on customers for operational activities. This is exacerbated during global crisis.

Throughout the 2018-2022 period, several crises have had a profound impact on the tourism sector, placing it in a financial bankruptcy high-risk zone. These include the COVID-19 pandemic, the geopolitical risk from the conflict between Ukraine and Russia, Israel and Hamas, the escalating tensions between the West and China and the growing frequency of natural disasters due to climate change.

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These situations have tested the resilience and adaptability of the sector, which by the end of 2022 has not significant improvement over pre-pandemic levels (Rahmah & Novianty, 2021).

Upon the application of the Altman Z"-Score model, the results revealed variations in the number of companies placed in high-risk levels. The study's findings suggest that companies should focus on improving their liquidity, operativity and profitability indicators to reduce their vulnerability to financial risk.

ANOVA results confirm that the values of liquidity, operability, leverage, and profitability variables were highly heterogeneous, leading to a decrease in Z"-Score values in 2019 and 2020. As expected, the Chi-square test confirmed the hypothesis of an association between companies in the medium-high risk zone and the short-term probability of bankruptcy, compared to companies in the low-risk zone.

Companies must also diversify their income streams and look for new market openings to decrease their reliance on the vagaries of the tourism industry.

The empirical data analysis indicates the need to adopt strategies at the national, local and commercial level to boost the tourist sector. These plans should be the basis for strategic decisions on long-term capacity development.

In the context of crisis, monitoring financial data becomes essential. Identifying which financial indicators require more attention is a key action for business leaders to detect potential issues and act more objectively and dynamically. Adequate business management can prevent companies from entering high levels of financial risk, hence it is imperative to develop capabilities in innovation (Galarza et al., 2023), creativity, resilience, agility, flexibility, sustainability, restructuring, and service differentiation—factors that have proven effective in facing times of crisis (Andhiny et al., 2022).

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