CORPORATE ATTRIBUTES AND BANKRUPTCY PREDICTION: THE CASE OF LISTED HALAL FOOD AND BEVERAGE COMPANIES

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ABSTRACT

This study investigates the relationship between corporate attributes and the probability of bankruptcy among halal food and beverage companies in five countries: Indonesia, Malaysia, Pakistan, Saudi Arabia, and the United Arab Emirates (UAE). Analyzing data from 56 firms from 2008 to 2021 using static panel data method, we find that the working capital period (cash conversion cycle), leverage, and firm growth increase the probability of bankruptcy for these companies. In contrast, liquidity, profitability, and firm size reduce bankruptcy probability. The findings reveal essential firm attributes that can guide the management of halal food and beverage firms, relevant regulators, and potential investors in ensuring the firms' long-term viability.

I. INTRODUCTION

Corporate bankruptcy refers to a state of corporate financial distress, failure, or insolvency, wherein a firm is unable to meet its liabilities (Khan, 2018). Legally, bankruptcy entails situations where firms and individuals are unable to fulfill obligations to or claims by creditors through a legal process (Shahdadi, Anvary Rostamy, Sadeghi Sharif, & Ranjbar, 2020). Given its critical implications for business survival (Mossman, Bell, Swartz, & Turtle, 1998), developing early warning signals or the ability to predict the likelihood of bankruptcy has garnered significant attention in the literature. Altman (1968) pioneered the bankruptcy prediction model, which has since been widely adopted in research on banking, finance, and credit risk globally (Altman, Iwanicz-Drozdowska, Laitinen, & Suvas, 2017).

Following the development, in 1968, of the Altman Z-score for measuring corporate bankruptcy probability, numerous studies have identified factors contributing to the likelihood of corporate bankruptcy. However, our review of the extant literature reveals three key points. First, while there has been ample research on bankruptcy prediction in the past, recent empirical studies examining factors determining corporate bankruptcy likelihood are scarce. Given that firms worldwide are periodically exposed to various social, economic, and health problems, there is a need for further research predicting corporate bankruptcy probability. However, recent studies have predominantly focused on developed economies (Appiah & Amon, 2017; Cultrera & Brédart, 2016; Trinh, Nguyen, Hao, & Wongchoti, 2021; Yazdanfar, 2011). Hence, there is a need for studies focusing on developing and emerging economies, particularly in light of the COVID-19 pandemic and its consequences.

Second, the scope of bankruptcy prediction has yet to extend to new, emerging sectors, notably the halal food and beverage sector. In recent years, halal cuisine has gained traction among both Muslim and non-Muslim consumers, evolving from a religious dietary practice to a promise of food safety, hygiene, and reliability (Grand View Research, 2023). The COVID-19 pandemic and Russia-Ukraine conflict have highlighted the importance of securing food supplies, prompting countries in the Organization of Islamic Cooperation (OIC) to prioritize increased self-sufficiency in food production (27Group, 2023). Additionally, the emergence of the COVID-19 pandemic has created new markets for halal food e-commerce and delivery services (KerryDigest, 2023). Consequently, the global halal food market reached a value of USD 1.29 trillion in 2023 and is projected to reach USD 3.23 trillion by 2033, with an annual growth rate of 9.6% (Future Market Insights, 2023). Yet despite the industry's acceptance, increasing market value, and the growth of halal food and beverage products around the world, we find no empirical studies on the factors influencing the corporate bankruptcy of halal firms.

Third, and from a methodological standpoint, recent studies have primarily relied on the ordinary Z-score to measure risk-taking or stability in predicting corporate insolvency. We believe that the Altman Z-score offers a more comprehensive approach to predicting corporate bankruptcy. Altman (1968) employed a discriminant-ratio model to accurately predict bankruptcy, with 95% of all companies correctly categorized into their respective bankrupt and non-bankrupt groups. Given its value as an instrument for use by investors, rating

agencies, asset managers, and distressed enterprises (Altman et al., 2017), the Altman Z-score remains a relevant tool for predicting corporate failure both in theory and practice.

Based on the above, this study investigates the effects of corporate attributes on the probability of bankruptcy among halal food and beverage companies operating in five countries: Indonesia, Malaysia, Pakistan, Saudi Arabia, and the United Arab Emirates (UAE). Specifically, it focuses on Malaysia, Saudi Arabia, the UAE, and Indonesia as these countries respectively rank as the top four producers of halal products, while Pakistan holds the eighth position among the top 15 member countries of the OIC based on the Global Islamic Indicator Report (OIC, 2021). The study covers 14 years from 2008 to 2021.

There are three key reasons for examining the halal food industry. First, Islamic teachings on halal primarily focus on food, with the Qurán prohibiting Muslims from consuming certain animals and drinking alcohol. Therefore, food consumption serves as a key means for Muslims to understand permissible dietary choices. Second, halal food and beverage companies constitute a significant proportion of the global halal market, accounting for 31.46% of the market share in 2021 (Statista, 2023). Third, the halal food sector has links with other halal sectors. For example, halal food is provided to customers in halal tourism, while many halal pharmaceuticals are edible, thus requiring halal foods as ingredients. Consequently, the development of halal foods is essential for the growth and advancement of other halal sectors.

This study contributes to the literature in four ways. First, it is likely a pioneering effort in providing empirical evidence on the relationship between corporate bankruptcy among halal food and beverage companies and various firm attributes such as the cash conversion period, liquidity, leverage, profitability, firm size, and firm growth. Second, the findings of this study may be of value to numerous regulatory bodies and agencies involved in supporting, directly or indirectly, the sustainable operations of halal food and beverage companies. These include the Malaysian Investment Development Authority (MIDA), the Sharia Advisory Committee Council of Securities Commission Malaysia, the Indonesia Halal Lifestyle Center, Bank Indonesia and DinarStandard, the Islamic Food and Nutrition Council of America (IFANCA) Pakistan, C3 Arabia (Saudi Arabia), and the Saudi Food and Drug Authority (SFDA), among others. Third, in undertaking their agency duties, the management of halal food and beverage companies can use the results to formulate corporate strategies aimed at mitigating the risk of bankruptcy. Finally, given the increasing attractiveness of the halal food and beverage sector for investment in both Islamic and non-Islamic countries, potential investors can utilize the findings of this study when determining the optimal level of corporate attributes to ensure the sustainability of their firms' operations. For instance, new entrants in the halal food industry can determine the appropriate capital structure (leverage) and cash conversion period to ensure the ongoing strength of their firms.

The remainder of this paper is structured into four sections. Section two presents the literature review and hypotheses development. The research methodology is presented in section three. Section four contains the results and analysis. Finally, section five concludes the paper.

II. BACKGROUND AND LITERATURE REVIEW

2.1. Background of the Halal Food and Beverage Industry

The halal food industry stands as one of the most significant consumer markets worldwide, as documented in the Global Islamic Economy Report (Thomson Reuters, 2014). Muslim spending on halal products is predicted to reach USD 2.4 trillion by 2024, with an estimated USD 1.38 trillion allocated for halal foods (KerryDigest, 2023). As highlighted by Baharuddin, Kassim, Nordin, and Buyong (2015), the concept of halal includes compliance with Shariah principles. The requirements of cleanliness, hygiene, and safety render halal food highly appealing to customers who prioritize food safety and healthy living. While Muslims constitute the primary consumer base for halal food, the demand for healthy and safe food alternatives also extends to non-Muslims (27Group, 2023). As previously indicated, this study focuses on halal food and beverage companies operating in Malaysia, Saudi Arabia, the UAE, Indonesia, and Pakistan. According to the 2020 Global Islamic Economy Indicator (GIEI) report, Malaysia leads with the highest score in the halal food sub-index at 209.80, along with other OIC member countries such as the UAE (104.4), Indonesia (71.5), Pakistan (54.7), and Saudi Arabia (51.1) (OIC, 2021).

Malaysia was the first country to establish a government agency responsible for regulating and certifying the halal industry, bolstering international confidence and recognition of its locally produced products (Malaysian Investment Development Authority, 2023). Having maintained the top spot in the Global Islamic Economy Index for nine consecutive years, Malaysia has established itself as a prominent leader in the global halal food industry (27Group, 2023). The country boasts over 300 firms producing halal food and beverage products that meet international standards (Malaysian Investment Development Authority, 2023). Additionally, Indonesia, with the largest Muslim population, has the potential to become the largest market for halal products worldwide. In 2023, the country accounted for 11.34% of global halal expenditure (InCorp Editorial Team, 2023) and consequently recorded the highest expenditure on halal foods, totaling USD 15.4 billion in 2023 (Harinderan, 2023).

Furthermore, a report released by the SFDA indicates that all food available for sale within the Kingdom meets halal standards (Saudi Gazette, 2023). Saudi Arabia has emerged as the country with the largest consumption of halal products in the Middle East (Arab News, 2023). According to the Saudi Food and Drug Authority (2022), from 2019 to 2022, 198 food enterprises acquired certification from the Saudi Halal Center, and 75 establishments received licenses to issue halal certificates in 43 nations. The authority also notes that the issuance of halal dispatch certificates has exceeded 59,000. The current value of the Saudi halal food market stands at roughly USD 6 billion, indicating the country's potential to secure the lion's share of the USD 1.3 trillion global halal market (Saudi Horeca, 2023). Similarly, the UAE is striving to internationalize the halal industry and has emerged as a leading force in establishing the world's first halal food system, incorporating accreditation, certification, and evaluation standards and practices (Asia Pacific Food Industry, 2019). Additionally, Pakistan has been ranked as the fourth-largest producer of rice, the fifth largest in dairy production, the fourth largest in wheat production, and the fifth-largest supplier of cattle (Fazl-e-Haider,

2018). Unfortunately, the country has not yet fully utilized its potential to rank among the leaders in exporting halal foods. However, according to the Islamabad Multi-Sectoral Stakeholders Policy Dialogue on "Export-Oriented Halal Trade & Industry," Pakistan could enhance its export of halal products (Salama, 2023).

2.2. Firm Attributes and Corporate Bankruptcy

Corporate bankruptcy has been extensively discussed and investigated (Mačerinskienė & Mendelsonas, 2013). Since the 1960s, scholars have explored the determinants of firm bankruptcy prediction (Khan, 2018; Kristóf & Virág, 2020). Consequently, predicting corporate bankruptcy can be seen as a topical issue in accounting and finance literature (Khan, 2018; Nyitrai & Virág, 2019). The evaluation of the financial health of organizations using various models has become an important subject in both scientific research and corporate practices (Gavurova, Bačík, Miskufova, & Letkovský, 2022).

The number and average size of insolvent companies have grown substantially due to the global financial crisis, piquing the interest of governments, financial institutions, and regulatory bodies (Khan, 2018; Succurro, Arcuri, & Costanzo, 2019). The distress experienced by these companies negatively affects shareholders, customers, employees, society, and the economy (Altman, 1968; Mačerinskienė & Mendelsonas, 2013). According to Shahdadi, Anvary Rostamy, Sadeghi Sharif, and Ranjbar (2020), identifying the determinants of corporate bankruptcy could enable managers and investors to take preventive measures when provided with timely warnings. They add that it is essential to predict the probability of corporate bankruptcy before its occurrence to minimize or even prevent its detrimental consequences. In practice, predicting corporate bankruptcy has predominantly been considered an important issue as it protects the interest of bankers, creditors, and regulators (Nyitrai & Virág, 2019). Consequently, bankruptcy research is highly valued by academics, practitioners, and financial analysts (Khan, 2018).

Several corporate attributes can influence the prediction of corporate bankruptcy. However, this study focuses on working capital, liquidity, leverage, profitability, firm growth, and firm size, which are essential firm-level attributes believed to influence the probability of firms becoming bankrupt (Gavurova et al., 2022; Kovalová, 2019; Rettobjaan, 2020; Yazdanfar, 2011).

2.3. Working Capital and Corporate Bankruptcy

Working capital is often represented by the cash conversion cycle (CCC) (Baños-Caballero, García-Teruel, & Martínez-Solano, 2012). This is also referred to as a cash conversion period and must be effectively managed to sustain firm operations. Working capital management (WCM) encompasses the practices and policies for managing current assets and liabilities (Briones, Camino-Mogro, & Navas, 2022). While holding too many current assets can reduce a company's return, holding too few can elevate the risk of insolvency (Deari, Kukeli, Barbuta-Misu, & Virlanuta, 2022). Hence, regardless of the nature and size of firms, effective WCM is essential for their successful operations (Altaf & Shah, 2018). Effective WCM is crucial because internal funds are available, which is a far less expensive source

than seeking outside finance (Mandipa & Sibindi, 2022). Firms that effectively design and implement their working capital policies are likely to enhance their performance and value, while those with poor WCM may face collapse (Tran, Abbott, & Jin Yap, 2017).

Moreover, weak WCM can lead to liquidity problems and a decline in profitability, jeopardizing the likelihood of business survival (Gill & Biger, 2013; Thenuwara & Ekanayake, 2021; Ukaegbu, 2014). Specifically, in Kenya, poor WCM was found to be a major contributor to the failure of around 40% of small-scale enterprise start-ups by the second year, and at least 60% by the fourth year (Nyamao, 2012). Hence, effective firm working capital is expected to reduce the probability of firm bankruptcy (Kovalová, 2019). Few studies have investigated how working capital influences company bankruptcy. For instance, Gavurova et al. (2022) established that the working capital ratio is negatively associated with the likelihood of corporate bankruptcy. Utilizing a sample of 200 firms, Fernandez and Sanchez (2023) found that excessive working capital increases the likelihood of corporate bankruptcy. Based on these findings, we formulate the following hypothesis for our analysis of the halal food and beverage industry:

H1. The cash conversion cycle significantly influences the bankruptcy probability of listed halal food and beverage companies.

2.4. Liquidity and Corporate Bankruptcy

The term "liquidity" describes the ease with which an asset can be exchanged at its intrinsic value, with cash being the most liquid asset and non-current (fixed) assets having the lowest liquidity value (Shahdadi et al., 2020). Liquidity problems are among the key factors contributing to corporate bankruptcy filings (Bryan, Tiras, & Wheatley, 2002). Liquidity can be measured in various ways, with the current ratio (CR) being commonly used to measure firm liquidity. This refers to the number of times current assets cover current liabilities and is used to evaluate a business's ability to repay its short-term liabilities within a period not exceeding 12 months (Cultrera & Brédart, 2016). Theoretically, inadequate liquidity or reduced asset value can lead to corporate insolvency (Bandyopadhyay, 2006). Similarly, the CR can be used to predict the likelihood of corporate bankruptcy (Mossman et al., 1998). Hence, an increase in a firm's liquidity position is expected to reduce the likelihood of its bankruptcy (Kovalová, 2019).

Previous studies have predominantly suggested that liquidity reduces firm bankruptcy. For instance, Bryan et al. (2002) established that companies with high liquidity and low solvency risks are more likely to avoid bankruptcy. Cultrera and Brédart (2016) found that an increase in the value of the CR reduced the bankruptcy of Belgian SMEs. Appiah and Amon (2017) documented that liquidity reduced the insolvency risk of UK-listed non-financial companies. Shahdadi et al. (2020) used a sample of 147 listed Iranian firms over eight years (2010–2017) and demonstrated that stock liquidity significantly reduced the probability of corporate bankruptcy. Similarly, Rettobjaan (2020) analyzed a sample of SMEs based on PEFINDO25 over five years (2013–2017) and established that liquidity reduced the probability of bankruptcy. Trinh, Nguyen, Hao, and Wongchoti (2021), using daily data, noted that stock liquidity reduced the likelihood of corporate default risk in the

US and Vietnam. Additionally, Gavurova et al. (2022) utilized a sample of 2,384 firms between 2018 and 2019 and found that a quick ratio decreased the likelihood of corporate bankruptcy. Sehgal, Mishra, Deisting, and Vashisht (2021) established that liquidity reduced the likelihood of corporate financial distress in India. It is worth noting that few studies have focused on developing countries. Hence, the following hypothesis is proposed:

H2. Liquidity significantly reduces the probability of bankruptcy for listed halal food and beverage companies.

2.5. Leverage and Corporate Bankruptcy

Leverage denotes the extent to which a firm is financed by debts. According to Appiah and Amon (2017), a firm's going concern or continuity is heavily influenced by its capital structure. Similarly, an increase in a firm's leverage indicates heightened exposure to bankruptcy (Hernandez Tinoco & Wilson, 2013). Consequently, firms with higher leverage or gearing ratios are likely to face financial difficulties in repaying their debts. Hence, higher amounts of debt indicate a higher likelihood of bankruptcy or financial hardship (Berk, Stanton, & Zechner, 2010). Moreover, during crises, firms may default or seek additional debt, further exacerbating their risk and potentially leading to insolvency and business failure (Žiković, 2016). Breaching debt covenants serves as an early warning sign of bankruptcy, alerting creditors to potential problems (Bryan et al., 2002). Therefore, leverage serves as a predictor of firm bankruptcy (Mossman et al., 1998).

Empirically, we identified several studies investigating the relationship between leverage and firm bankruptcy. For example, Yazdanfar (2011) established a significant positive association between financial leverage and the likelihood of SME bankruptcy in Sweden. Similarly, Abduh and Zein Isma (2017) identified a significant positive relationship between leverage and the solvency of family takaful firms in Malaysia. Furthermore, Kim (2020) used panel data spanning 11 years (1991 and 2001) to demonstrate that firm debts significantly and positively influenced the probability of firm bankruptcy in Korea. Additionally, Rettobjaan (2020) discovered a positive association between debt structure and SME bankruptcy. However, Tung and Phung (2019) found that leverage had a significant negative association with firm bankruptcy risk in Vietnam.

Briefly, the findings of these empirical studies indicate that a higher proportion of firm leverage tends to increase the probability of corporate bankruptcy. Thus, we formulate the following hypothesis:

H3. Leverage significantly increases the probability of bankruptcy for halal food and beverage companies.

2.6. Profitability and Corporate Bankruptcy

Profitability reduces the likelihood of firm failure (Kovalová, 2019). Liu (2004) found that profit is negatively related to corporate failure rates in the UK. Yazdanfar (2011) established a significant negative relationship between firm profitability and SME bankruptcy in Sweden. Similarly, a study by Cultrera and Brédart (2016) found that profitability reduced bankruptcy among SMEs in Belgium. Tung and Phung

(2019) discovered that profitability significantly reduced corporate bankruptcy risk in Vietnam. Additionally, Kim (2020) found that firm size significantly reduced the probability of bankruptcy for both chaebol and non-chaebol Korean firms. Rettobjaan (2020) documented a significant negative association between profitability and the likelihood of bankruptcy for SMEs. Sehgal et al. (2021) established that profitability (ROE) reduces the likelihood of corporate financial distress in India. The finding of a study by Gavurova et al. (2022) indicated that profitability is negatively related to the probability of firm bankruptcy. Hence, we develop the following hypothesis:

H4. Profitability significantly reduces the probability of bankruptcy for listed halal food and beverage companies.

2.7. Firm Size and Corporate Bankruptcy

Firm size is an important variable in predicting firm bankruptcy. According to Kovalová (2019), large firms are more stable and are less prone to bankruptcy than smaller ones. However, empirical findings on the relationship between firm size and corporate bankruptcy reveal inconsistent results. For instance, Sehgal et al. (2021) discovered a positive association between firm size and the probability of financial distress for firms in India. Freitas Cardoso, Peixoto, and Barboza (2019) found that larger Brazilian firms face higher rates of financial distress than smaller ones. Conversely, Yazdanfar (2011) found that firm size reduced the probability of bankruptcy for SMEs in Sweden. Additionally, Appiah and Amon (2017) established a significant negative association between firm size and corporate insolvency risk in the UK. Hence, we propose the following hypothesis:

H5. Firm size significantly reduces the probability of bankruptcy for listed halal food and beverage companies.

2.8. Firm Growth and Corporate Bankruptcy

This study posits that firm growth, typically measured as sales growth, serves as a key determinant of firm bankruptcy. According to Brounen, De Jong, and Koedijk (2004), firms can effectively achieve their goals through growth by increasing shareholders' wealth and net income. Hence, practitioners and finance managers can develop growth plans for their firms to generate additional funds, given that the financial resources tied up in working capital are not readily available for investment growth opportunities (Sawarni, Narayanasamy, Chattopadhyay, & Chakrabarti, 2022).

Empirically, this study finds no research that clearly establishes the relationship between firm growth and corporate bankruptcy. Prior studies primarily aimed to investigate the effect of firm growth on firm performance. These studies generally found that firm growth enhanced firm financial performance, which is often regarded as a key indicator in the prediction of corporate bankruptcy, as developed by Altman (1968). For example, Mun and Jang (2015) established a significant positive relationship between sales growth and the profitability of US restaurants. Similar findings were obtained by Cumbie and Donnellan (2017). Le, Vu, Le, Du, and Tran (2018) discovered that firm growth significantly and

positively contributes to firm financial performance in Vietnam. Similarly, Tran, Abbott, and Jin Yap (2017) demonstrated that sales growth positively contributes to SME financial performance in Vietnam. Additionally, Gołaś (2020) documented a positive association between revenue growth of Polish dairy companies and financial performance. Furthermore, Setianto, Sipayung, and Azman-Saini (2022) revealed that firm growth enhances firm financial performance in ASEAN countries. However, Ibrahim and Isiaka (2021) found a significant negative relationship between firm growth and earnings per share among non-financial firms in Nigeria. Based on these findings, this study develops the following hypothesis:

H6. Firm growth significantly reduces the probability of bankruptcy for listed halal food and beverage companies.

III. METHODOLOGY
3.1. Sample and Data
This study empirically examines the predictors of corporate bankruptcy among halal food and beverage firms in five Muslim countries: Malaysia, Saudi Arabia, Indonesia, the UAE, and Pakistan. Specifically, we focus on firms exclusively engaged in the production of halal food and beverage products. For Malaysia, it was relatively easy to identify relevant firms using a list of halal food and beverage companies compiled by the Sharia-compliant securities report of the Sharia Advisory Committee under the Securities Commission of Malaysia. Similarly, we identified listed halal food and beverage companies from the list of Shariah-compliant companies in the Dubai Financial Market, compiled by the Unified Committee of Islamic Banks for Sharia Screening Equities. In the case of Indonesia, the names of halal food and beverage companies were derived from the Indonesia Halal Market Report, prepared by the Indonesia Halal Lifestyle Center with the support of Bank Indonesia and DinarStandard. Additionally, for Saudi Arabia, we used a list compiled by the Argaam Investment Company, the premier financial news platform providing real-time information about financial markets and macroeconomics in the Kingdom of Saudi Arabia. Finally, we identified Pakistani-listed halal food and beverage firms from IFANCA Pakistan, a leading halal certification company headquartered in Faisalabad, Pakistan. Data for the identified halal food and beverage firms, spanning a minimum of four years, were sourced from the Bloomberg database. Our dataset comprises an unbalanced panel sample of 56 listed halal food and beverage companies covering the period from 2008 to 2021. Table 1 shows the sample distribution across countries.

Table 1.
Sample Distribution

Country	Firms		Observations	
	Number	Percentage	Number	Percentage
Indonesia	4	7.14	48	6.69
Malaysia	35	62.50	466	64.99
Pakistan	2	3.57	28	3.91
Saudi Arabia	12	21.43	133	18.55
United Arab Emirates (UAE)	3	5.36	42	5.86
Total	56	100	717	100

Source: Author's computation using Stata version 14.

Table 1 illustrates the uneven distribution of the sample, which was caused by two key factors. First, it was challenging to identify full-fledged halal firms in the studied countries, aside from Malaysia. Consequently, a majority of the sampled firms originate from Malaysia as it is the only country with an official publication by the Securities Commission listing fully halal firms. Secondly, the study relies solely on data sourced from the Bloomberg database. This presents limitations in accessing information for halal firms, except for those in Malaysia. While data for Malaysian halal food and beverage companies are available on Bloomberg, the same does not apply to halal firms in the other countries considered in this study. Consequently, the inclusion of a limited number of samples from these countries, particularly Indonesia, Pakistan, and the UAE, is not deliberate; it reflects the scarcity of available data through the aforementioned sources.

3.2. Variables and Measurements
The variables used in this study and their measurements are explained below:

Dependent variable: Our dependent variable is corporate bankruptcy, measured using the Altman Z-score. Altman's (1968) five-factor model encompasses profitability, operating efficiency, solvency, liquidity, and investment ratios. This multi-dimensional model for predicting corporate bankruptcy is presented as follows: Z-Score = $1.2p1 + 1.4p2 + 3.3p3 + 0.6x4 + 1.0p5$, where p1 represents the ratio of working capital to total assets, p2 is the ratio of retained earnings to total assets, p3 signifies the ratio of earnings before interest and tax to total assets, p4 is the ratio of book value of equity to total liabilities, and p5 denotes the sales to total assets ratio.

Altman (1968) classified enterprises into three groups based on their Z-score: those with a Z-score greater than 2.99 are non-bankrupt, those between 2.99 and 1.81 are in the zone of ignorance or gray area, and those with scores less than 1.81 are insolvent. Thus, higher Z-score values indicate a lower probability of corporate bankruptcy, and vice versa. The Altman Z-score remains relevant and has been widely adopted in contemporary studies (Fich & Slezak, 2008; Ji, Shi, & Zhang, 2022; Tung & Phung, 2019).

Firm Attributes: These form our key independent variables and are explained below:

Working capital: We use the CCC to represent working capital, a common metric in the literature (Baños-Caballero et al., 2012). Usually expressed in days, the CCC measures the efficiency of WCM by illustrating how rapidly current assets are converted into cash (Yazdanfar, 2011). Ordinarily, the CCC serves as a proxy for WCM efficiency (Mun & Jang, 2015). In line with previous studies such as Altaf and Shah (2018), Le et al. (2018), Ngo and Van Nguyen (2022), and Yazdanfar (2011), the CCC is computed using the following formula:

CCC = ARP+ICP-APP

Where ARP stands for the accounts receivable period = Average receivables/Sales ×365; ICP, inventory conversion period = Average inventories/Cost of sales ×365, and APP, accounts payable conversion period = Average payables/Cost of sales ×365.

Liquidity ratio: This study uses the CR as a measure of firm liquidity. It measures the number of times current assets can meet current liabilities. We measure the CR using the following formula: Current assets/current liabilities (Cultrera & Brédart, 2016; Mossman et al., 1998).

Leverage: Leverage is measured as the proportion of assets financed by debts, using the following formula: Leverage = Debts/total assets (Altaf & Shah, 2018; Shahdadi et al., 2020; Yazdanfar, 2011).

Profitability: We use return on assets (ROA) to measure firm profitability, measured as follows: Profit before interest and tax/total assets (Altaf & Shah, 2018; Le, Vu, Le, Du, & Tran, 2018; Yazdanfar, 2011).

Firm growth: Represented as a firm's sales or revenue growth. It is the percentage change in annual sales and is widely computed as follows: Current year sales minus previous year sales/ Previous year sales (Cumbie & Donnellan, 2017; Mun & Jang, 2015; Sawarni et al., 2022).

Firm size: Previous studies mostly measure firm size as the natural logarithm of total assets (Altaf & Shah, 2018; Sawarni et al., 2022; Shahdadi et al., 2020), which we follow in the present study.

Control variables: The literature establishes that macro-level factors influence corporate bankruptcy (Ji et al., 2022). This study considers the GDP growth rate, inflation rate, and unemployment rate, which are key macroeconomic factors affecting the corporate bankruptcy rate (Mačerinskienė & Mendelsonas, 2013). We use the annual growth rate of gross domestic product (Altaf & Shah, 2018; Huhtilainen, 2020; Mačerinskienė & Mendelsonas, 2013; Nguyen, 2022). An improved GDP growth rate is likely to reduce the likelihood of firms becoming bankrupt. The inflation rate represents the percentage change in the consumer price index of respective countries. The higher the inflation, the more likely corporate bankruptcy would be (Mačerinskienė & Mendelsonas, 2013). Finally, in line with Huhtilainen (2020), Jing et al. (2023), and Žiković (2016), we include the unemployment rate as a macro control variable.

3.3. Econometric Model

To address our research objectives, we specify the following panel model:

$$
\begin{aligned}
\text{ALTZSCORE}_{it} &= \beta_0 + \beta_1 \text{CCC}_{it} + \beta_2 \text{CR}_{it} + \beta_3 \text{LEV}_{it} + \beta_4 \text{ROA}_{it} + \beta_5 \text{SIZE}_{it} \\
&+ \beta_6 \text{RGW}_{it} + \beta_7 \text{GDGPR}_{it} + \beta_8 \text{INFL}_{it} + \beta_9 \text{UNEM}_{it} + \varepsilon_{it}
\end{aligned}
\qquad 1
$$

Where: ALTZSCORE is the Altman Z-score representing corporate bankruptcy; CCC, cash conversion cycle; CR, current ratio; LEV, firm leverage; ROA, return on assets; SIZE, firm size; RGW, revenue growth; GDGPR, gross domestic product growth rate; INFL, inflation; UNEM, unemployment; β_0, constant term; β_1–β_9, the coefficients of the explanatory variables (independent and control); Subscript i and t denote bank and year, respectively, and ε, the error term. Based on the Hausman test, Breusch and Pagan Lagrange multiplier (LM) test, and a modified Wald test for groupwise heteroskedasticity for panel data, we opt for the feasible generalized least squares (FGLS) method to estimate the model.

IV. RESULTS AND ANALYSIS
4.1. Descriptive Statistics

Table 2.
Descriptive Statistics

Variable	Obs	Mean	Minimum	Maximum	SD	Skewness	Kurtosis
ALTZSCORE	682	5.22	-6.64	28.59	4.02	1.59	7.39
CCC	660	79.64	-14.20	184.00	53.00	5.96	94.39
CR	717	2.18	0.67	5.71	1.41	3.41	17.39
LEV	717	11.45	0.00	45.28	13.50	2.41	10.90
ROA	717	0.08	-0.07	0.28	0.09	14.10	312.51
SIZE	702	5.21	1.06	6.95	0.68	0.32	4.72
RGRW	650	0.04	-0.20	0.30	0.13	7.09	94.70
GDGPR	714	3.54	-6.13	10.00	3.31	-1.48	4.64
INFL	714	308.70	97.83	30886.32	729.63	3.55	13.83
UNEMP	714	3.87	0.42	7.45	1.21	0.77	3.67

ALTZSCORE is the Altman Z-score representing corporate bankruptcy; CCC, cash conversion cycle; CR, current ratio; LEV, firm leverage; ROA, return on assets; SIZE, firm size; RGW, revenue growth; GDGPR, gross domestic product growth rate; INFL, inflation; UNEM, unemployment

Source: Author's computation using Stata version 14.

Table 2 displays the descriptive statistics of the variables used in the study. The Altman Z-score (ALTZSCORE) has an average value of 5.22, exceeding the minimum of 2.99. This indicates that, on average, the sampled halal food and beverage companies are solvent or not under the threat of bankruptcy. The ALTZSCORE scores range from -6.64 to 28.59. The CCC, representing WCM, has an average duration of 79.64 days, with a minimum of 6.64 days and a maximum of 184.00 days. The liquidity ratio, measured by the CR, indicates that, on average,

current assets can cover current liabilities 2.18 times, with values ranging from 0.67 to 5.71 times. The leverage (LEV) statistics indicate that, on average, debts constitute 11.45% of the total assets, with some firms having no debt (0.00%) and others reaching 45.28%.

Profitability, measured by ROA, has an average value of 8%, ranging from -7% to 28%. SIZE, represented by the natural logarithm of total assets, has an average value of 5.21, with minimum and maximum values of 1.06 and 6.95, respectively. Firm growth (RGRW) has an average growth rate of 4%, with values ranging from -20% to 30%. Regarding the control (macroeconomic) variables, the GDP growth rate has an average of 3.54%, varying from -6.13 to 10.00%. Inflation (IFL) ranges from 97.83 to 30886.32, with an average of 308.70. Finally, unemployment (UNEMP) has an average of 3.87, ranging from 0.42 to 7.45.

Table 2 also presents the skewness and kurtosis. Following Nomran and Haron (2021) and Umar, Abduh, and Besar (2023), this study uses 3 and 10 as the thresholds for skewness and kurtosis to infer deviation from normality. Based on these, we observe that CCC, CR, LEV, ROA, RGRW, and INFL are not normally distributed. Therefore, to reduce the effects of outliers in our model estimation, these variables are winsorized at the 5% or 95% significance levels (Bala, Amran, & Shaari, 2020; Umar, 2022; Umar, Abduh, & Besar, 2023).

4.2. Correlation Matrix

Table 3 presents the Pearson correlation matrix, showing the correlation coefficients among the variables. The maximum coefficient is 0.652, representing the correlation between ALTZSCORE and ROA. Based on the suggestion by Hair, Black, Babin, and Anderson (2014) and Kennedy (2008), there is no significant collinearity as none of the coefficients exceed 0.80. The variance inflation factor (VIF) results, presented in Table 3, range between 1.12 and 1.67, further confirming that multicollinearity should not be a concern.

Table 3.
Pearson Correlation Matrix

Variable	ALTZSCORE	CCC	CR	LEV	ROA	SIZE	RGRW	GDGPR	INFL	UNEMP	VIF
ALTZSCORE	1.000										
CCC	-0.129	1.000									1.50
CR	0.443***	0.346***	1.000								1.66
LEV	-0.378***	0.150***	-0.389***	1.000							1.67
ROA	0.652***	-0.324***	0.128***	-0.250***	1.000						1.36
SIZE	0.068*	-0.045	-0.187***	0.307***	0.139***	1.000					1.43
RGRW	0.046	0.095**	-0.045	0.028	0.197***	0.068*	1.000				1.12
GDGPR	0.058	-0.004	0.047	-0.056	0.100***	-0.030	0.239***	1.000			1.30
INFL	0.004	-0.049	0.021	0.262***	-0.009	0.243	-0.004	0.085**	1.000		1.22
UNEMP	0.020	-0.012	-0.072*	0.135***	-0.002	0.341***	-0.007	-0.345***	0.110***	1.000	1.43

Notes: *p <0.10; **p <0.05; ***p <0.01

Source: Author's computation using Stata version 16.

4.3. Multiple Regression Results

Table 4 contains the multiple regression results obtained using the Heteroskedastic Panels Corrected Standard Errors (HPCSE) regression after conducting two essential tests. First, the Hausman test result is statistically significant at 5% (*p*= 0.0219), suggesting the appropriateness of fixed effects (FE) regression over random effects (RE) regression (Ascarya & Indra, 2022). Second, the panel heteroskedasticity test result is statistically significant at 1% (*p*=0.000). Hence, we employ the HPCSE regression results.

Table 4.
Heteroskedastic Panels Corrected Standard Errors (HPCSE) Regression

Dependent variable = Altman Z-score			
Explanatory Variable	**Label**	**coef.**	**p-value**
Cash conversion cycle	CCC	-0.009	0.000***
Current ratio	CR	1.300	0.000***
Leverage	LEV	-0.025	0.006***
Return on assets	ROA	24.406	0.000***
Size	SIZE	0.620	0.043**
Revenue growth	RGRW	-1.868	0.029**
GDP growth rate	GDGPR	0.054	0.159
Inflation	INFL	-0.0001	0.150
Unemployment	UNEMP	0.304	0.054*
Constant	CONST	-2.860	0.026
Hausman test (p-value)		0.0219**	
Panel heterokedas. test (p-value)		0.0000***	
Wald chi2		919.99	
Prob>chi2		0.0000***	
R-squared		0.6006	
Notes: *p <0.10; **p <0.05; ***p <0.01			

Source: Author's computation using Stata version 16.

Table 4 illustrates the relationships between corporate attributes and the Altman Z-score of listed halal food and beverage companies. The result indicates that CCC has a significant negative association with the Altman Z-score (β= -0.009, p=0.000). This implies that the CCC exposes halal food and beverage companies to a high probability of becoming bankrupt. This finding aligns with Fernandez and Sanchez (2023), who concluded that working capital increases the probability of firm bankruptcy. Hence, the first hypothesis (H1) is supported. Evidence from the regression result shows that the CR has a significant positive association with the Altman Z-score of listed halal food and beverage companies (β=1.300, p=0.000). This implies that as the CR increases, halal food and beverage companies face a reduced probability of bankruptcy, and vice versa. This result is consistent with the findings of Bryan et al. (2002), Cultrera and Brédart (2016), Rettobjaan (2020), and Trinh et al. (2021), who documented that liquidity reduces the probability of corporate bankruptcy. Thus, the result supports the second hypothesis (H2),

indicating that liquidity significantly reduces the possibility of listed halal food and beverage companies becoming bankrupt.

In terms of leverage (LEV), the regression coefficient is both significant and negative (β=-0.025, p=0.006). This signifies that an increase in leverage is likely to increase the probability of halal food and beverage companies becoming bankrupt. This result corroborates earlier findings by Yazdanfar, (2011), Abduh and Zein Isma (2017), and Rettobjaan (2020). Thus, the third hypothesis (H3) proposing a significant negative relationship between leverage and the bankruptcy probability of halal food and beverage companies is supported. Next, ROA has a significant positive association with the Altman Z-score of listed halal food and beverage companies (β=24.406, p=0.000). This suggests that companies with higher profitability are less likely to face bankruptcy. This finding is consistent with those of Liu (2004), Yazdanfar (2011), Cultrera and Brédart (2016), Tung and Phung (2019), Rettobjaan (2020), Sehgal et al. (2021), and Gavurova et al. (2022). Hence, the fourth hypothesis (H4) linking profitability to a reduction in the likelihood of bankruptcy for halal food and beverage companies is accepted. Similarly, firm size has a significant positive relationship with the Altman Z-score of halal food and beverage companies (β=0.620, p=0.043). This signifies that larger firms have a lower probability of bankruptcy. This finding is consistent with those of Yazdanfar (2011) and Appiah and Amon (2017). Consequently, the fifth hypothesis (H5) is accepted. Finally, firm growth (RGRW) has a significant negative association with the Altman Z-score of halal food and beverage companies (β=-1.868, p=0.029). This implies that these companies face a heightened probability of bankruptcy when their revenue grows, contradicting the sixth hypothesis (H6).

Concerning the control variables, the GDP growth rate (β=0.054, p=0.159) and inflation (β=-0.0001, p=0.150) show insignificant relationships with the Altman Z-score of halal food and beverage companies. However, unemployment has a significant positive association with the Altman Z-score of these companies (β=0.304, p=0.054).

4.4. Robustness Check

As a robustness check, we estimate the model using one-year lagged values of independent variables and OLS robust regressions to establish the robustness of the major regression findings. We use one-year lagged values of independent variables since the regression results in Table 4 may be influenced by the endogeneity problem stemming from reverse causality (Brauer & Wiersema, 2018). According to Bamahros et al. (2022), lagging independent variables can reduce endogeneity problems to a tolerable level. OLS robust regression offers one means of checking the robustness of regression results (Nomran & Haron, 2021).

Table 5 contains the multiple regression results using one-year lagged values of independent variables alongside the OLS robust regression. In the case of one-year lagged values of dependent variables, we present the FGLS regression results as the Hausman specification test statistic is insignificant (*p*=0.6230) and the Breusch and Pagan LM test and panel heteroskedasticity test results are all significant at a 1% level of significance (*p*=0.0000). Moreover, the OLS robust regression results are presented to address the heteroskedasticity problems observed in the OLS regression model.

Table 5.
Alternative Regression Results

Dependent variable = Altman Z-score		One-year lagged		OLS robust	
Explanatory Variable	Label	coef.	p-value	coef.	p-value
Cash conversion cycle	CCC	-0.006	0.048***	-0.009	0.000***
Current ratio	CR	1.078	0.000***	1.300	0.000***
Leverage	LEV	-0.029	0.013**	-0.025	0.001***
Return on assets	ROA	25.653	0.000***	24.406	0.000***
Size	SIZE	0.515	0.015**	0.620	0.040**
Revenue growth	RGRW	-2.666	0.008***	-1.868	0.018**
GDP growth rate	GDGPR	0.027	0.506	0.055	0.213
Inflation	INFL	-0.0001	0.584	0.000	0.186
Unemployment	UNEMP	0.133	0.284	0.304	0.067*
Constant	CONST	-1.363	0.203	-2.860	0.038
Hausman test (p-value)		0.6230			
Breusch and Pagan LM test		0.0000***			
Heterokedas. test (p-value)		0.0000***		0.0000***	
Wald chi2/F-value		607.85		104.34	
Prob>chi2/Prob>F		0.0000***		0.0000***	
R-squared				0.6006	
Notes: *p <0.10; **p <0.05; ***p <0.01					

Source: Author's computation using Stata version 16.

The regression results presented in Table 5 are compared with those in Table 4. CCC, leverage, and revenue growth exhibit a significant negative association with the Altman Z-score in both Tables 4 and 5. Conversely, the CR, profitability, and firm size show a significant positive relationship with the Altman Z-score in both tables. Consequently, the results are entirely consistent between Tables 4 and 5.

4.5. Analysis of Findings

The findings of the study indicate that working capital, measured by the CCC, increases the probability of bankruptcy for listed halal food and beverage companies. This implies the need to reduce the working capital period to sustain or enhance the solvency of these firms through proper and effective WCM. Poor management of WCM can lead to liquidity problems and a decline in profitability, ultimately risking the firm's viability as a going concern (Ukaegbu, 2014). To address this issue, halal food and beverage companies should reduce their investment in current assets and utilize credit purchases to reduce the cash conversion period. Therefore, firms must adopt an aggressive WCM policy by reducing their investments in inventories and receivables to shorten the cash conversion period (Briones et al., 2022). However, care must be taken in establishing an optimal cash conversion period. This is because continuously reducing investments in current assets beyond a certain level will expose firms to liquidity problems. Additionally, the study found that liquidity, measured by the CR, enhances the financial stability of halal food and beverage firms. Thus, increasing the liquidity of halal food and beverage companies is likely to reduce their likelihood of bankruptcy.

Nonetheless, firms must be cautious not to hold excessive or obsolete inventories, or incur bad debts, due to excessive investments in inventories and receivables. Firms should aim for a CR of two times, which implies that their current assets cover two times their current liabilities.

Regarding leverage, the findings show that it reduces the likelihood that halal food and beverage companies will remain as a going concern. This implies that companies relying heavily on debt financing are at a higher risk of bankruptcy. Therefore, firms should use equity sources to finance their operations with a view to avoiding bankruptcy. Moreover, the study reveals that profitability increases the likelihood of halal food and beverage companies remaining solvent. Similarly, larger halal food and beverage companies are less likely to become bankrupt. However, the findings show that revenue growth leads to reduced stability for halal food and beverage companies. This could occur for two key reasons. First, firms may inefficiently utilize the growth to improve and sustain their operations. Second, the growth may occur as a result of excessive credit sales resulting in high investment in accounts receivable, which in turn increases the risk of bad debts.

V. CONCLUSION AND RECOMMENDATIONS

This study explored the relationship between corporate attributes and the probability of bankruptcy among halal food and beverage companies operating in five countries: Indonesia, Malaysia, Pakistan, Saudi Arabia, and the UAE. Using a sample of 56 halal food and beverage firms from 2008 to 2021, the study establishes that working capital, leverage, and firm growth significantly increase the probability of bankruptcy for these companies. Conversely, liquidity, profitability, and firm size significantly reduce the likelihood of bankruptcy. These results were confirmed through a robustness check using alternative regression techniques.

The findings of the study have implications for various stakeholders of halal food and beverage companies. First, the findings suggest several ways that firms can reduce their exposure to the possibility of bankruptcy. The management within these companies should reduce their working capital period (cash conversion period), leverage, and credit sales, thereby promoting the companies' solvency. Second, potential or existing firms seeking to venture into halal food and beverage production could benefit from this study by setting target ratios to ensure sustainable operations. Third, government agencies or regulatory bodies promoting the operations and sustainability of halal firms can utilize this study to develop standard ratios as guidance or standards for these firms. Fourth, researchers interested in further exploring the determinants of firm bankruptcy prediction can leverage the study's findings, utilizing key firm attributes as control variables.

Despite its various contributions, the study has three key limitations. First, the sample size is limited to 56 halal food and beverage companies operating in five countries. The sample is also unevenly distributed among countries due mainly to challenges in identifying full-fledged listed halal food and beverage firms outside Malaysia. Hence, future research should seek to include more firms, particularly from Indonesia, the UAE, and Pakistan. Second, the study was restricted to halal food and beverage firms. Therefore, it is highly recommended that future studies

consider other sectors within the halal industry, such as industrial products and services, energy, healthcare, transportation and logistics, plantation, and more. Lastly, our study employs the Altman Z-score (an accounting-based model) to measure corporate bankruptcy, whereas future research may adopt market-based models to provide additional insights into the issue.

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