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Do bankruptcy profiles of Islamic banks differ across organizational structure? evidence from Malaysia

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Article Info	Abstract
	Malaysian Islamic banks operate in different organizational structures, namely domestic, locally foreign incorporated, and development financial institutions, which might influence their stability. This research evaluates the bankruptcy profiles of 19 selected Malaysian Islamic banks from 2010 to 2017 and analyses the insolvency risk associated with the three different organizational structures. Using an Altman's Z-Score Model (2000), a stability test was conducted. **Findings/Originality:** the paper finds that, on average, the development financial institutions were the most stable banks, followed by foreign Islamic banks. It also finds that bigger domestic Islamic banks were situated in the safe zone as they had high Z-score values. Furthermore, the asset quality ratio contributed to higher Z-score values. Appropriate asset-liability management, therefore, helps ensure the stability of Islamic banks in Malaysia. An effective macroprudential supervisory regime must also be in place to increase the resilience of the financial system.

Introduction

The economic and financial crises have had long-range impacts on the banking sector across the world. Banking stability is the key to ensuring financial stability and resilience in any country. However, Islamic banks are usually insulated from any adverse effects (Odeduntan et al., 2016). This is because they operate differently and are heavily regulated by the principles of shariah. Conversely, they are also associated with unique risks (Hassan, 2009) that make them more susceptible to bankruptcy and insolvency. In Malaysia, Islamic banks operate within different organizational structures that might influence their stability.

Islamic banks offer products and services that comply with Islamic law to meet the needs of Muslims. The first Islamic bank in Malaysia was Bank Islam Malaysia Berhad (BIMB), which began to operate in 1983. In a majority Muslim country like Malaysia, the presence of an Islamic banking and finance industry was a much-awaited measure. To ensure the banks operate competitively, Bank Negara Malaysia (BNM) introduced the Islamic Financial Services Act (IFSA) in 2013 to promote safe, efficient, and reliable payment systems and instruments (BNM, 2013).

The Association of Islamic Banking and Financial Institutions Malaysia (AIBIM) categorizes its members into four types of bank organizations based on their structure: domestic, development financial, foreign, and international financial. AIBIM was established in 1995 to promote Islamic banking systems and practices in Malaysia. These four banking structures all vary

in terms of their business scale. It is possible to ascertain its size by considering their working capital. Working capital refers to the balance of the institution after current assets and liability are subtracted (Kenton, 2018). In selected Malaysian Islamic banks, there has been an unsatisfactory decrease in the value of working capital. Moreover, most Islamic banks have negative working capital each year, and these figures are getting worse for the following years. However, this trend is not equal across the different organizational structures. Figure 1 shows the average working capital of selected Islamic banks in Malaysia from 2010 to 2017.
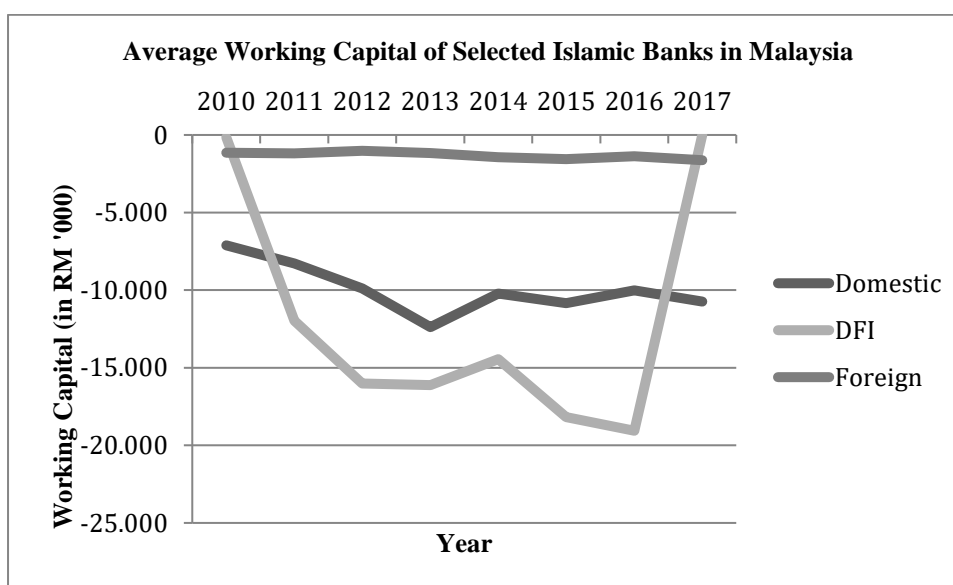

Figure 1. Average Working Capital of Selected Islamic Banks in Malaysia

Therefore, these different structures will be used in this study to determine the stability and bankruptcy profile of selected Malaysian banks based on Altman's Model. This paper also analyses the insolvency risk and stability profile within different organizational structures and determines whether asset quality and efficiency ratio affect the stability of the selected banks. Using the asset quality and efficiency ratio, we test the relationship between these variables and the calculated Z-score values using the Altman's model.

Many studies have shown that stability between Islamic and conventional banks can differ, yet this has never been explained in terms of organizational structure. This paper provides the stability of Malaysian Islamic banks in the post-Subprime Crisis era. The study will examine which type of Islamic banking structure is more stable and less insolvent. Even though Islamic banks in Malaysia never show concern regarding their stability portfolios, practitioners need to forecast the future of the Islamic banking sector so that they can take precautions against any possible challenges as well as strategize their businesses. Regulators must also take the initiative to provide guidelines that vary according to different organizational structures, as these banks adopt different cultures when operating their businesses.

Khan, Akhtar, Ullah, Iqbal, and Riasat (2013) explored the insolvency risk associated with Islamic banking through a study of selected Pakistan and Malaysia Islamic banks. Despite using Altman's Model, the study used data regression analysis and accomplished a comparative analysis of the financial performance ratios. They found that Malaysian Islamic banks were more exposed to a default risk than Pakistani Islamic banks. However, at the time study was conducted, Islamic subsidiary banks in Malaysia had not prepared a distinct report on each banking entity; instead, the report included overall figures for the banking groups. Therefore, the findings of this study were questionable.

Several studies on lending (financing) structure of conventional and Islamic banks in Malaysia and the insolvency risk, credit risk, and liquidity risk have been conducted using generalized least squares (GLS) techniques. These have shown that real estate and concentrated lending (financing) increase risk exposure for both types of banks (Abdul Rahman, 2011; Abdul Rahman & Shahimi, 2010; Rahman, Sulaiman, & Mohd Said, 2018).

To measure stability, Cihak and Hesse (2008) used the Z-score as a measure of bank soundness. They argued that this is an objective measure of stability because it focuses on the risk of insolvency and can be applied equally to banks using a high risk or high return strategy. However, the Z-score model used by Cihak and Hesse is not the exact model proposed by Altman. The researchers investigated 77 Islamic banks and 397 conventional banks worldwide and found that, on average, the Z-scores of Islamic banks were higher than those of commercial banks. Moreover, the result shows that while small Islamic banks were more stable than small commercial banks (Islamic banks have higher Z-scores), large Islamic banks had lower Z-scores than large commercial banks. This finding suggests that Islamic banks are more stable when operating on a small scale, as it is more complex for Islamic banks to adjust their credit risk monitoring system when they are larger. However, the data collected for this study were taken from 1993 to 2014, a period when Malaysia's Islamic banks were still in the development phase. Therefore, the current study will use updated data and the original Z-score model proposed by Altman.

Beck et al. (2010) adapted the Z-score model to include the variables proposed by Cihak and Hesse (2008). They found that in a dual banking system, conventional banks are more cost-effective than Islamic banks. They argued that even though Islamic banks are more profitable and better capitalized, the returns tend to be much more volatile. They concluded that Islamic banks are, therefore, more efficient but less stable than conventional banks. These findings were supported by Wahida and Robin (2010), who explored the efficiency of Islamic banks and conventional banks in Turkey, Germany, and the United Kingdom. They employed a non-parametric method as a measure of efficiency and found that even though the value of assets held by Islamic banks was less than that of conventional banks, Islamic banks were more efficient in terms of cost. Farook, Hassan, and Clinch (2012) agreed that Islamic banks were not as financially stable as conventional banks, yet small Islamic banks were more financially stable than conventional banks. In the case of Malaysia, Wahid and Dar (2016) examined the efficiency of 17 Islamic banks and 21 conventional banks from 2004 to 2013. They found that large Islamic banks were less stable than large conventional banks, whereas small Islamic banks were more stable than small conventional banks. They also discovered that both Islamic and conventional banks in Malaysia shared similar determinants of stability. To date, studies have only compared Islamic banks and conventional banks; however, in some dual banking systems, a conventional bank may open its Islamic bank as a subsidiary. Thus, it will also be informative to compare fully-fledged Islamic banks with subsidiary Islamic banks to see whether the same results can be obtained.

Shahid and Abbas (2012) used a similar approach to previous studies to compare the stability of Islamic banks with conventional banks in Pakistan. They found that small Islamic banks were much stronger than small conventional and Islamic banks, whereas large conventional banks were more efficient. In Malaysia, Mat Rahim and Zakaria (2013) conducted a similar study to Shahid and Abbas (2012) but with the addition of an NPL model to calculate the level of non-performing loans. A higher value indicates that the bank is operating with less profit and has a high risk of default. They found that Islamic banks were indisputably more stable than commercial banks.

To evaluate the bankruptcy profile of Islamic banks in Malaysia, Jan and Marimuthu (2015) applied Altman's Model to the top five Islamic banking countries according to global Islamic banking assets. An ANOVA post hoc Scheffe test was performed to make a comparative analysis of financial characteristics relating to bankruptcy. The sample comprised 25 Islamic banks, five for each of the top five Islamic banking countries. However, there were variations in the school of

Islamic thought adopted, which meant that the products and services differed for each bank and thus rendered the selection of the sample unconvincing. In a later study, Jan and Marimuthu (2016) applied an Altman's Model to selected foreign and domestic Islamic banks operating in Malaysia. They also performed a comparative analysis of the selected banks in terms of the top bankruptcy predictors: liquidity, profitability, productivity, and insolvency. A Z-Score was calculated yearly for each Islamic bank from 2009 to 2013.

However, because foreign Islamic banks hold a bigger entity in the market, the results were biased towards foreign Islamic banks. Furthermore, Sufian, Kamarudin, and Noor (2014) examined revenue efficiency and returned to scale in the Malaysian Islamic banking sector from 2006 to 2010 and found that the revenue efficiency of domestic Islamic banks was significantly lower than that of foreign Islamic banks. This was primarily assumed to be because foreign Islamic banks utilized advanced technology that helped them to manage risks more effectively. Sufian and Kamarudin (2015) then analyzed the potential determinants of revenue efficiency for domestic Islamic banks in Malaysia, Indonesia, and Brunei from 2006 to 2011. The findings showed that bank size, asset quality, capitalization, liquidity, management quality, gross domestic product, and inflation all improve the revenue efficiency of the sample. In terms of managing risks, Rosman & Rahman (2015) found that Islamic banks lacked effective risk management practices concerning liquidity risk, displaced commercial risk, and equity investment risk. The authors claimed that the use of shariah reviews enhances operational risk management in Islamic banks, thus avoiding any unexpected loss due to a failure in operations.

Mian (2003) identified three (3) dominant types of banks in emerging markets: government, private domestic, and foreign. Typically, private domestic and foreign banks[1] are of a similar size and age distribution across developing countries, while government or development financial institutions (DFIs) tend to be both bigger and older. This is because developing countries with weak financial markets need to have big government banks to jump-start the economy. Comparing the different structures of Islamic banks, Mian (2003) identified the strengths and weaknesses of three dominant organizational designs (domestic, foreign, and government banks) from panel data obtained from 1,600 banks in 100 emerging countries. He found that foreign banks can enjoy many advantages, especially when they can tap into the external liquidity of their parent banks. However, this also can be a disadvantage as parent banks may put their capital at risk because they want to guarantee prudent banking in the emerging market.

Moreover, the multi-layered hierarchy and long-distance communication may imply that the top management in the parent bank cannot offer much discretion to the local foreign bank. Abdul Majid and Hassan (2011) investigated the efficiency of a sample of Islamic and conventional banks in Malaysia from 2000 until 2008 to determine the influence of foreign-owned banks and Islamic banking subsidiaries on performance. The findings showed that fully-fledged Islamic banks require higher factor input while Islamic banking windows have higher potential output. This implied that Islamic windows would exhibit high performance in terms of efficiency estimates, whilst conventional banks with an Islamic subsidiary have higher than average efficiency estimates.

Zainuddin and Shahida (2017) found that fully-fledged Islamic banks in Malaysia are more stable than Islamic subsidiary banks. They grouped selected Islamic banks into those who were fully-fledged and those who were a subsidiary, and also those who were big and small depending on their working capital. On average, despite having lower capital, small fully-fledged Islamic banks were less insolvent than their competitors. In a recent study on stability of Malaysian banks from year 2000 to 2011, Sulaiman, Mohamad, and Hashim (2018) found that a bank's characteristics

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[1] A Foreign Islamic bank is a subsidiary of a foreign owned conventional bank that caters for the needs of Islamic banking services in Malaysia. The conventional bank acts as a parent bank to their respective Islamic bank.

influence bank's performances. Based on Z-score analysis, only 8 Islamic banks and 11 conventional banks are highly stable.

Akerlof and Romer (1993) expressed concern that in a developing country with weak regulation and legislation, private domestic banks would be prone to losses when banking crises and failures happen. Nevertheless, private domestic banks maintain strong market shares without excessive default rates, unlike government banks (Mian, 2003), who often make losses due to government intervention that needs to be minimized. However, foreign banks are more likely to be bailed out by their shareholders. When a parent bank monitors a subsidiary bank, there is the advantage of an internal capital market. Gertner, Scharfstein, and Stein (1994) suggested that, when a unit (subsidiary bank) of the corporate headquarters (the parent bank) performs poorly, its assets can be redeployed efficiently by combining them with other assets controlled by the parent. Moreover, the use of an internal capital market allows cash to be transferred throughout the group to reduce financing costs and increase flexibility (Dewaelheyns & Van Hulle, 2010).

According to BNM, the DFIs are specialized and were established by the government with a specific mandate to develop and promote key sectors of strategic importance to the overall socio-economic development of the country. As such, DFIs might receive help from the government in times of trouble. However, given that many DFIs in Malaysia have been privatized in the last few years, the situation might now be different. Because their function is to serve businesses in key sectors to boost socio-economic development, they tend to extend their financing to risky segments without due diligence; this may expose them to insolvency and bankruptcy risks. Thus, locally incorporated foreign banks in Malaysia enjoy the advantages of this perk. While both DFIs and foreign banks can enjoy the advantages of having a parent, private domestic banks work hard to remain competitive. Mian (2003) claimed that, despite operating independently, domestic banks appear to be more aggressive in their lending and therefore hold more assets in the form of loans.

Altman (1968) employed multiple discriminant analysis (MDA) as a means of bankruptcy prediction due to its compatibility with ratio analysis. MDA is a statistical method used to classify an observation and make predictions for problems where the dependent variable appears in qualitative forms, such as either bankrupt or non-bankrupt. The advantage of MDA is that it considers an entire profile of characteristics common to the relevant firms and the interaction between these properties. However, the data used by Altman were limited to manufacturing corporations, and these firms operate differently in the banking sectors. The five variables included in Altman's model were working capital to total assets, retained earnings to total assets, earnings before interest and taxes to total assets, market value of equity to book value of total debts, and sales to total assets.

In contrast, Beaver (1966) conducted a univariate study that used individual financial ratios to predict distress. He suggested that cash flow to total debt, net income to total assets, and total debt to total assets were important in predicting predict failure. However, Ohlson (1980) identified several inadequacies in MDA concerning the assumption of normality and group dispersions. Ohlson, therefore, used logit analysis, which involved employing a dummy technique. Thus, a healthy company value is 0, and distressed company value is 1. Ohlson then found that size, financial structure, performance, and current liquidity were important determinants of a firm's failure (Abdullah, Halim, Ahmad, & Rus, 2008).

Hillegeist, Keating, Cram, and Lundstedt (2004) measured the effectiveness of Altman's Z-Score Model and Ohlson's O-Score in summarizing information about the probability of bankruptcy. The researchers stated that "According to option-pricing theories (Black & Scholes, 1973; Merton, 1974), a market-based measure called BSM-PB contains more information than Score variables, but the accounting measures will not be incrementally informative to BSM-PB". A large sample consisting of 65,960 firm-year observations, including 516 bankruptcies from 1979-1997, was then used to test the validity of these implications. The findings showed that BSM-PB

has more explanatory power than the Altman and Ohlson Score Models. Nevertheless, the Score Models contained more significant and incremental information, which means that BSM-PB is an insufficient statistic to use in determining the probability of bankruptcy.

Abdullah et al. (2008) compared the effectiveness of MDA, Logistic Regression, and the Hazard Model in predicting corporate failure among Malaysia's listed companies in Bursa Malaysia. The data was obtained from twenty companies, comprising ten distressed and ten non-distressed companies that were matched based on the industry, while sizes were used as the holdout sample. The findings showed that the logit model could correctly predict 82.7% and 80% of the respective estimation and holdout samples. In comparison, MDA provides overall accuracy rates of 80.8% and 85% and the Hazard Model 94.9% and 63.9% for the respective estimation and holdout samples. This shows that the Hazard Model gives a high accuracy rate in the estimation model. However, when the estimated equation is applied to the holdout sample, MDA gives a higher accuracy rate (Abdullah et al., 2008). In a later study, Altman (2000) developed a Z-Score Model, which he tested on 86 distressed companies from 1969-1975, 110 bankrupts from 1976 to 1995, and 120 bankrupts from 1997 to 1999. He found that the model, using a cut-off of 2.675, was between 82% and 94% accurate. Altman, Haldeman, and Narayanan (1977) had also devised a ZETA Model to incorporate current refinements in the utilization of discriminant statistical techniques. The ZETA Model was effective in classifying bankrupt companies up to five years prior to a failure sample of corporations consisting of manufacturers and retailers. In his model, Altman used seven (7) variables instead of the five (5) variables used in MDA. Overall, the ZETA model exhibited significantly improved accuracy compared to the original Z-Score Model with bankruptcy classification accuracy reaching above 96% in one period before bankruptcy. However, very few studies have adopted the ZETA Model as a theoretical framework with which to study bankruptcy in financial institutions.

When testing the bankruptcy prediction models for Dutch listed and large non-listed firms, Avenhuis (2013) found that the accuracy rates for the models of Altman (1968), Ohlson (1980) and Zmijewski (1984) models were 80.6%, 93.8%, and 95.3%, respectively when the original statistical techniques were used. However, this overall accuracy rate has to be interpreted with some caution. For instance, although Zmijewski's model had the highest accuracy rate, it predicted 0% of the bankrupt firms correctly and 99.4% of the non-bankrupt firms correctly. This showed that the model had failed to discriminate between bankrupt and non-bankrupt firms and exhibited a high frequency of Type 1 errors. When all three models used the same statistical techniques, Ohlson's model was the most accurate, implying that the explanatory variables in this model are the best predictors of the likelihood of bankruptcy. However, these models are mostly used to examine manufacturing firms and retailers. Altman (2000) later carried out a further revision of his model and adapted it for non-manufacturers or service firms. In the revised model, Altman omits one of existing variables and adds the book value of equity. Further discussion of the revised model will be presented in the methodological section.

Jordan, Rice, Sanchez, Walker, and Wort (2010) stated that many failed banks were trapped in the real estate market collapse. Because they did not have sufficient capital to ride out the cycle, the Federal Deposit Insurance Corporation (FDIC) forced them to merge with or be sold to other institutions. Thus, it is important to ensure banks have adequate capital to remain competitive and solvent. Chieng (2013) verified the validity of Altman's Z-Score Model as a predictor of bank failures in the case of the Eurozone. Her results showed that the ratio book value of equity to total liabilities was significant and that the model could predict bank failures. She also established the ability of the Z-Score Model to predict banking failures, but the analysis was somewhat biased considering the fate of the failed banks was already known. Furthermore, the Z-score was only effective at predicting failure five years before the bankruptcy.

A sound and stable global financial system are essential for sustainable growth. Therefore The World Bank urges balanced global growth and financial stability. Tata (2012) emphasized the need for effective resolution systems for all financial institutions to safeguard global financial stability and minimize moral hazard. Researchers, therefore, need to conduct in-depth studies and analyze insolvency issues related to financial institutions, especially in the Islamic banking sector. However, few studies have evaluated the performance of Islamic banks in terms of organizational design or structure. This paper will evaluate the bankruptcy profile of selected Islamic banks in Malaysia by applying Altman's Model to different organizational structures: domestic, locally incorporated foreign banks, and development financial institutions.

Research Method

This study employed an Altman's Z- Score Model to examine the bankruptcy profile of Malaysian Islamic banks in Malaysia. This is because, in his later research, Altman developed a revised model that is suitable to use for non-manufacturing firms. The original Z-Score model is inappropriate for all emerging market corporates for two reasons: it requires the firm to have publicly traded equity and it is primarily for manufacturers (Altman, 2005). Chieng (2013) used this model to investigate Eurozone bank failures and found that the Z-Score Model has predictive power for up to five years before the bankruptcy. When Mamo (2011) applied Altman's bankruptcy prediction model to commercial banks in Kenya, he found it to be accurate for 8 out of 10 failed firms, which means the model's validity is 80%. In the cases of sample of non-failed firms, it proved that Altman's model validity is 90%. From his model, Altman derived three (3) types of formula:

For Public Firms
$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5 \tag{1}$$

For Private Firms
$$Z = 0.717X_1 + 0.847X_2 + 3.107X_3 + 0.402X_4 + 0.998X_5 \tag{2}$$

For Non-manufacturer (Bank) Firms
$$Z = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4 + 3.25 \tag{3}$$

Where X_1 is ratio of working capital to total assets, X_2 is a ratio of retained earnings to total assets, X_3 is ratio of Earning before interest and tax to total assets, and X_4 is the ratio of book value equity to total liabilities.

The difference between the adaptation of the Z-Score Model to manufacturer firms (either public or private) and non-manufacture firms is that variable X_5 in the first two models, the value of sales over total sales (sales/total sales), is omitted in the third model. This study only uses the model for non-manufacturer firms as banking is a type of service business. In addition, Altman, Hartzell, and Peck (1995) added a constant 3.25 so that scores that equal to or less than zero would be equivalent to the default situation in the financial industry. Therefore, $Z = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4 + 3.25$ is the most suitable model for this study.

Altman (2000) also proposed that a Z-Score value of 1.21 to 2.90 lies in the gray or ignorance zone, which is safe but with high alert (Jan & Marimuthu, 2016). A Z-Score below 1.21 shows that the firm is distressed while a score above 2.90 shows that the firm is safe. Table 1 describes the variables in the Z-Score model.

In this study, the asset quality and efficiency ratio were introduced to show whether, through the Panel regression model, they could help increase the Z-Score value for the selected Islamic banks. Moreover, it assessed whether asset quality and efficiency ratios either influence or have no impact on the stability of Islamic banking businesses.

Table 1. Description of Variables

Variable	Measurement	Description
X_1	Working Capital/Total Assets	The value of this variable is also a liquidity ratio. Working capital is the difference between current assets and current liabilities.
X_2	Retained Earnings/Total Assets	Retained earnings are the account and report the total amount of reinvested earnings or losses of a firm over its entire life. This measure of cumulative profitability over time might discriminate against young firms who might not have had sufficient time to build up their cumulative profits.
X_3	Earnings before Interests and Taxes/Total Assets	This ratio measures the productivity of a firm's assets, independent of any tax or leverage factors. This ratio is essential for studies investigating corporate failure. Because Islamic banks are not associated with interest, I used the value of Earnings before zakat and tax that appeared in the financial reports.
X_4	Book Value of Equity/Book Value of Total Liabilities	Equity is measured by the market value of all shares of stock and liabilities, both current and long term. This ratio measures how much the firm's assets can decline in value before the liabilities exceed the assets and the firm becomes insolvent.

Source: Altman (2000)

The sample included most of the Islamic banks that are members of AIBIM. There were 19 Islamic banks included in this research, which represents 73% of the population. Table 2 presents the list of Islamic banks selected for the sample.

Table 2. Sample Banks

No.	Bank	Organizational Structure
1.	Maybank Islamic Bank (Maybank Islamic)	
2.	Bank Islam Malaysia Berhad (Bank Islam)	
3.	Affin Islamic Bank (Affin Islamic)	
4.	Bank Muamalat Malaysia Berhad (Bank Muamalat)	
5.	CIMB Islamic Bank (CIMB Islamic)	
6.	Alliance Islamic Bank (Alliance Islamic)	Domestic Islamic Banks
7.	Hong Leong Islamic Bank (Hong Leong Islamic)	
8.	Public Islamic Bank (Public Islamic)	
9.	RHB Islamic Bank (RHB Islamic)	
10.	AmBank Islamic Bank (AmBank Islamic)	
11.	Bank Simpanan Nasional (BSN)	
12.	Bank Kerjasama Rakyat Malaysia (Bank Rakyat)	Developmental Financial Institutions (DFIs)
13.	Bank Pembangunan Malaysia (BPMB)	
14.	Al Rajhi Bank (Al-Rajhi)	
15.	Citibank	
16.	HSBC Amanah (HSBC)	
17.	Kuwait Finance House (KFH)	Foreign Islamic Banks
18.	OCBC Al-Amin	
19.	Standard Chartered As Sadiq (SC As Sadiq)	

Seven Islamic banks were omitted from the study: MBSB Bank, SME Bank, Agro Bank, BNP Paribas, MUFG, UOB, and AlKhair International Islamic Bank. This is because they had either been established for less than five years or had a different core business. This paper focuses on AIBIM members primarily because AIBIM classifies its members into three different organizational structures: domestic, locally foreign incorporated, and development financial

institutions. Havrylchyk (2006) found that foreign banks could produce higher profits due to modern information technologies and better risk management; they are therefore expected to have lower insolvency risks than their counterparts.

The data was collected from the annual reports of the selected Islamic banks from 2010 to 2017. The data started in 2010 to avoid the influence or impact of the Subprime Crisis on the stability of banks (this crisis roughly ended in 2009/2010). Additionally, it was also important to ensure the collection of data from each bank was standardized as a few banks began to publish their annual report from 2010 onwards. The end period was 2017, was the most recently audited annual report could be retrieved from the banks. In addition to data from annual reports, the previous literature was used as guidance to comprehend Altman's model. The data were collected every year from 2010 to 2017 for all Islamic banks in the sample, following which, using Excel, the ratio was calculated based on the variables established in Altman's Model. The next step was to calculate the Z-score. Table 3 shows the zones for Z-score values.

Table 3. Zones for Z-Score Values

Z-Score Value	Zone
>2.90	Safe
1.21-2.90	Safe but High Alert
<1.21	Distress

Source: Altman (2000)

The asset quality ratio and efficiency ratio were calculated to examine their relationships with the Z-score result for each selected Islamic bank tested using panel data analysis. Mun and Thaker (2017) used asset quality ratio and efficiency to evaluate whether asset-liability management was positively related to financial performance. This paper, therefore, also analyzes whether these two variables play a role in ensuring the stability of the selected Islamic banks. The model used in this research is:

$$ZScore = \beta_0 + \beta_1 AssetQualityRatio + \beta_2 EfficiencyRatio \tag{4}$$

Results and Discussion

Because there is no issue of insolvency or bankruptcy within Malaysia's Islamic banks, this study aimed to verify that its Islamic banking sectors were stable using Altman's Model. Using data collected annually from the selected Islamic banks, the Z-Score was calculated. Figures 2, 3, 4 and 5 show how the Z-score values were categorized based on organizational structure.
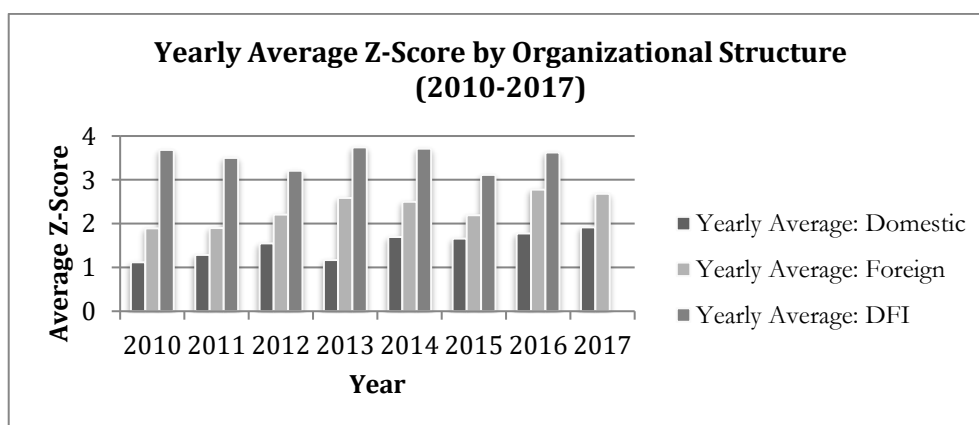

Figure 2. Yearly Average Z-Score based on Organizational Structure (2010-2017)

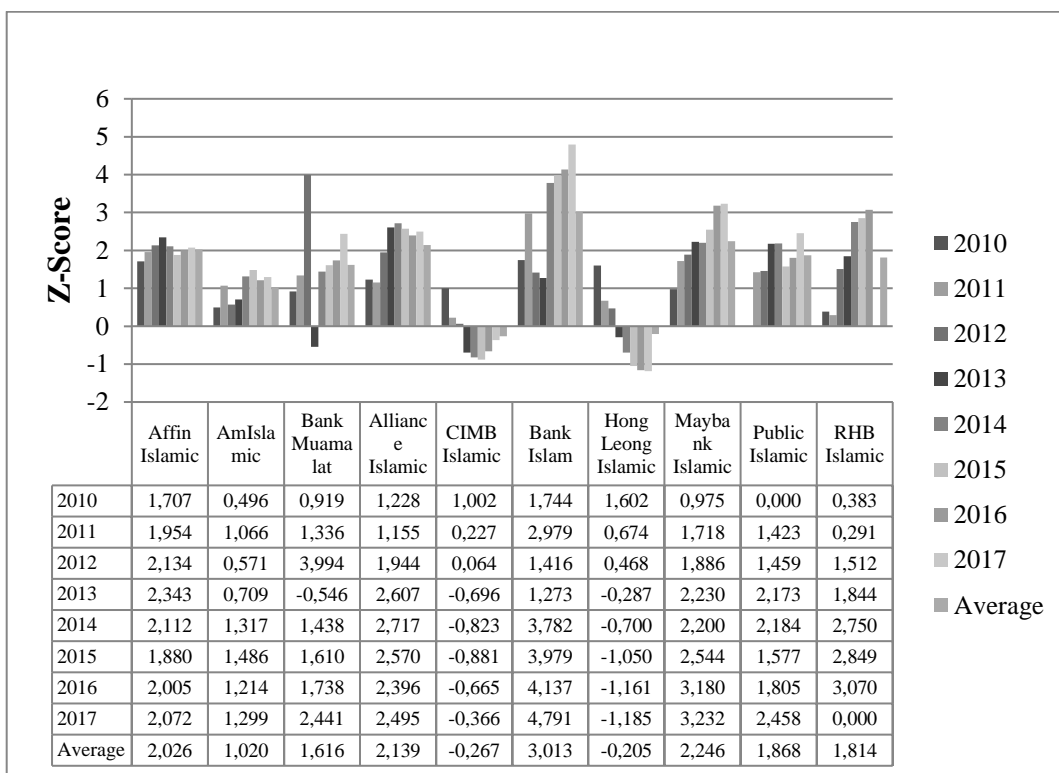|	Affin Islamic	AmIslamic	Bank Muamalat	Alliance Islamic	CIMB Islamic	Bank Islam	Hong Leong Islamic	Maybank Islamic	Public Islamic	RHB Islamic
2010	1,707	0,496	0,919	1,228	1,002	1,744	1,602	0,975	0,000	0,383
2011	1,954	1,066	1,336	1,155	0,227	2,979	0,674	1,718	1,423	0,291
2012	2,134	0,571	3,994	1,944	0,064	1,416	0,468	1,886	1,459	1,512
2013	2,343	0,709	-0,546	2,607	-0,696	1,273	-0,287	2,230	2,173	1,844
2014	2,112	1,317	1,438	2,717	-0,823	3,782	-0,700	2,200	2,184	2,750
2015	1,880	1,486	1,610	2,570	-0,881	3,979	-1,050	2,544	1,577	2,849
2016	2,005	1,214	1,738	2,396	-0,665	4,137	-1,161	3,180	1,805	3,070
2017	2,072	1,299	2,441	2,495	-0,366	4,791	-1,185	3,232	2,458	0,000
Average	2,026	1,020	1,616	2,139	-0,267	3,013	-0,205	2,246	1,868	1,814

Figure 3. Z-Score for Domestic Islamic Banks (2010-2017)

From figure 3, we can see that the average z-score for Domestic Islamic Banks, which shows that Bank Islam has the highest z-score as 4.791, of which is the highest score over the period. Bank Islam shows a positive trend since 2010. On the other side, z-score for Hong Leong Islamic in 2017 get the lowest score among the Islamic bank for -1.185. This figure Hong Leong Islamic bank has to recover from this condition before the score get worse. However, on average the lowest z-score is CIMB Islamic bank.
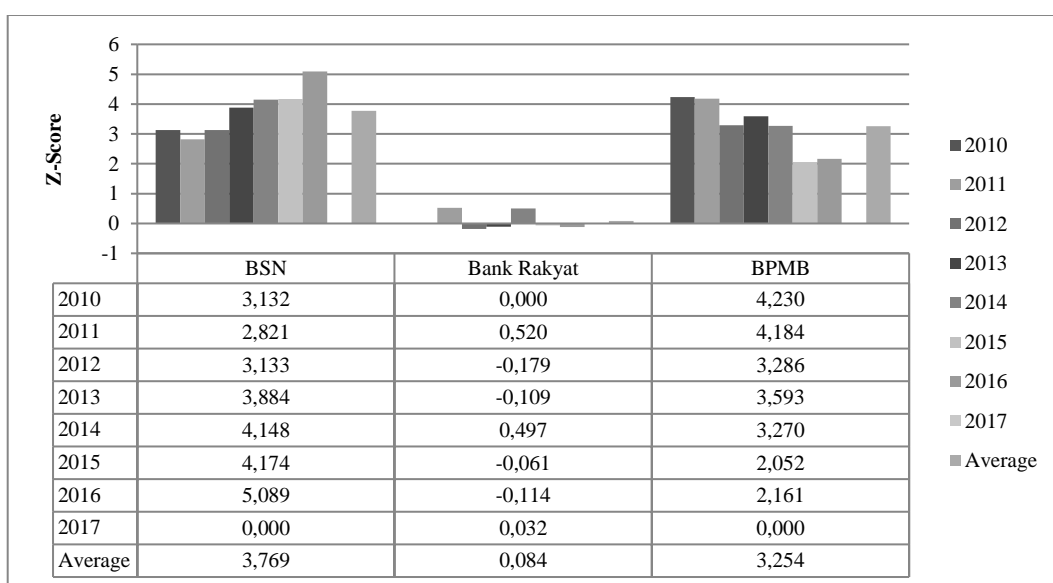

	BSN	Bank Rakyat	BPMB
2010	3,132	0,000	4,230
2011	2,821	0,520	4,184
2012	3,133	-0,179	3,286
2013	3,884	-0,109	3,593
2014	4,148	0,497	3,270
2015	4,174	-0,061	2,052
2016	5,089	-0,114	2,161
2017	0,000	0,032	0,000
Average	3,769	0,084	3,254

Figure 4. Z-Score for Development Financial Institutions (DFIs) (2010-2017)

The result of testing z-score in the Development Financial Institution shows in figure 4. For three banks in DFIs, BSN has the highest score as 5.089 in 2016. It is the highest score among the sample. Otherwise, Bank Rakyat gets the lowest score for in bankruptcy prediction as -0.179.
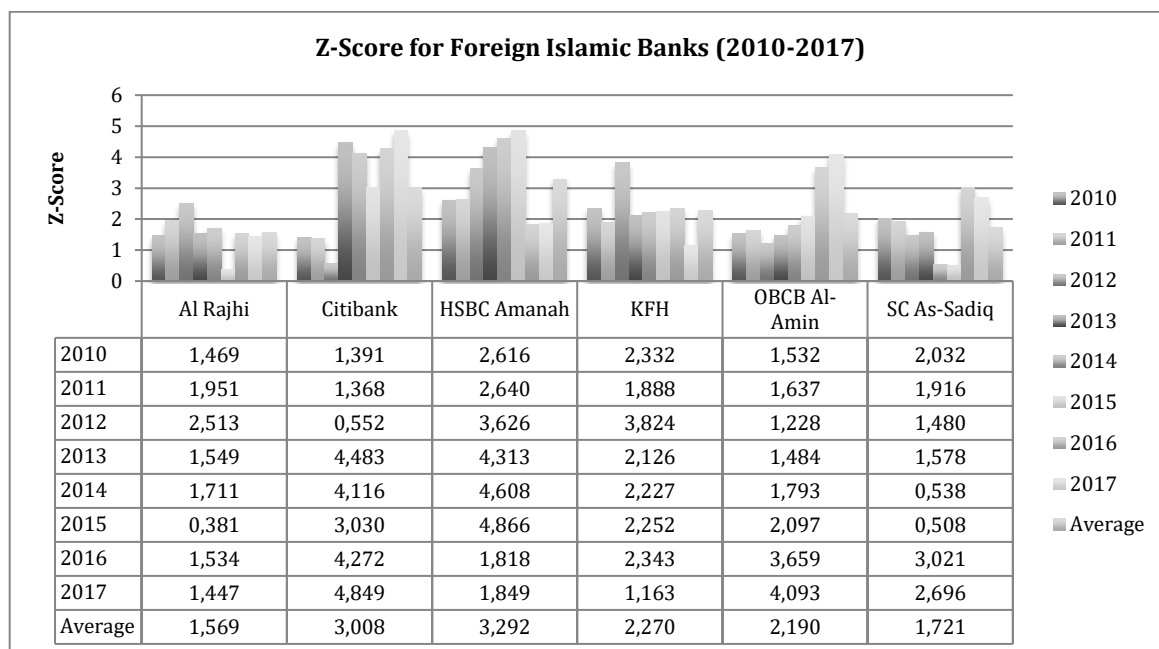
Z-Score for Foreign Islamic Banks (2010-2017)

	Al Rajhi	Citibank	HSBC Amanah	KFH	OBCB Al-Amin	SC As-Sadiq
2010	1,469	1,391	2,616	2,332	1,532	2,032
2011	1,951	1,368	2,640	1,888	1,637	1,916
2012	2,513	0,552	3,626	3,824	1,228	1,480
2013	1,549	4,483	4,313	2,126	1,484	1,578
2014	1,711	4,116	4,608	2,227	1,793	0,538
2015	0,381	3,030	4,866	2,252	2,097	0,508
2016	1,534	4,272	1,818	2,343	3,659	3,021
2017	1,447	4,849	1,849	1,163	4,093	2,696
Average	1,569	3,008	3,292	2,270	2,190	1,721

Figure 5. Z-Score for Foreign Islamic Banks (2010-2017)

The results show that, on average, development financial institutions (BSN) ranked first in terms of Z-score values, followed by locally incorporated Islamic banks (HSBC Amanah). Islamic banks that might receive external support will be more efficient than their counterparts as they do not bear the full operating costs and can copy their parents' shariah-compliant products. In addition, the Islamic banking sector is unlikely to move to the next tier while fully-fledged Islamic banks are unable or unwilling to play a leadership role in steering the industry towards new frontiers (Ariff, 2017). In the current scenario, Islamic locally incorporated foreign banks continue to 'Islamise' their conventional products with domestic Islamic banks passively the following suit.

Comparison of the three types of the organizational structure shows that, on average, DFIs are more stable than their counterparts, followed by locally incorporated foreign Islamic banks and then domestic Islamic banks. However, large Islamic banks such as Bank Islam and Maybank Islamic have large Z-score values that surpass the Z-scores of other foreign Islamic banks. Compared with DFIs, this type of bank is created by the government to cater to specific sectors that boost the country's economy and welfare. Its nature of business aims for more than other retail banks; thus, they have more positive values for working capital. This helped them achieve a good Z-score result as Altman's Model used working capital to calculate its variable, which has the highest value of coefficient. The ranking and z-score described in table 4.

The Z-scores for the banks in the sample belong to all three of the zones; safe, grey, and distressed, introduced by Altman. To be in the safe zone, the Z-score should be greater than 2.90. This is an area in which the Islamic banks can confidently do their business without any worry about becoming insolvent and bankrupt. The grey zone is still comparatively safe, but banks need to be alert to any circumstances, and the score should be greater than 1.21. A Z-score less than 1.21 implies that the Islamic banks are distressed but can still afford to operate. Prolonged time spent in this zone might be harmful; thus actions are needed to ensure that banks are safe. Only

one domestic bank, Bank Islam, makes it into the top 5 with a Z-score value greater than 2.9. As a pioneer Islamic bank in Malaysia, it operates safely without any fear of becoming bankrupt or insolvent. Despite this, CIMB Islamic and Hong Leong Islamic are performing poorly in terms of managing their bankruptcy portfolios. For instance, they are having difficulty maintaining a low current liability value; thus, their working capital is always negative.

Table 4. Ranking and Z-Score Zone for Islamic Banks

Islamic Bank	Rank	Organizational Structure	Zone
BSN	1	DFIs	
HSBC Amanah	2	Foreign	
BPMB	3	DFIs	SAFE
Bank Islam	4	Domestic	
Citibank	5	Foreign	
Kuwait Finance House	6	Foreign	
Maybank Islamic	7	Domestic	
OCBC Al-Amin	8	Foreign	GRAY
Alliance Islamic	9	Domestic	
Affin Islamic	10	Domestic	
Public Islamic	11	Domestic	
RHB Islamic	12	Domestic	
Standard Chartered As-Sadiq	13	Foreign	
Bank Muamalat	14	Domestic	
Al-Rajhi Bank	15	Foreign	DISTRESS
AmIslamic	16	Domestic	
Bank Rakyat	17	DFIs	
Hong Leong Islamic	18	Domestic	
CIMB Islamic	19	Domestic	

As noted previously, Cihak and Hesse (2008) and Farook et al. (2012) found that large Islamic banks are unstable compared to small Islamic banks and large conventional banks, and that small Islamic banks are the most stable in the system. Such findings are contradicted by the performance of Islamic banks operating in Malaysia. The current study clearly shows that being large helps you to be more stable. However, just because banks are small does not mean they cannot do better. In this study, the Affin Islamic Bank and Alliance Islamic Bank had the smallest total assets, yet they were more stable than bigger Islamic banks despite their organizational structure. Nevertheless, being stand-alone does have a disadvantage, as domestic Islamic banks still cannot beat most of the foreign Islamic banks.

The fourth variable that calculated form the ratio of the book value of equity over total liabilities, expected as the best bankruptcy predictors. The firm's assets can decline in value before the liabilities exceed the assets and the firm becomes insolvent (Altman, 2000). The higher the ratio, the less insolvent the bank. We conclude that Citibank's subsidiary Islamic bank is the least likely to become insolvent. In terms of the type of structure, both locally incorporated foreign banks and development financial institutions have a substantially high insolvency ratio. In Citibank's case, even though they only offer deposit activity in their operation in Malaysia, their large equity figure helps mitigate the insolvency risk.

Conversely, as a development financial institution, BPMB has a high risk of becoming insolvent. The bank only started to receive shareholder's equity from 2015 onwards. This is why

the company has a significantly low average ratio of insolvency, yet the insolvency ratio spiked once shareholders started to put aside equity as part of its financial strategy.

The yearly Z-score performance shows that the selected Islamic banks only entered the safe zone in 2016. Before and after 2016, Z-scores were back in the grey zone. This is probably because, in the second quarter of 2016, Malaysia's Islamic banking assets grew at a rate of 9.5% (IFSB, 2017). Furthermore, IFSB claimed that, despite large external liquidity outflows from the banking system in 2015, the gradual adoption of the liquidity coverage ratio (LCR) requirement that was effective from August 2016, the introduction of shorter-term liquidity instruments, and the reduction of the statutory reserve requirements in February 2016 enabled Islamic banks in Malaysia to match 98% of their short-term obligations in liquid assets. LCR was implemented by BNM to ensure that licensed banking institutions held enough high-quality assets (HQLA) and could thus withstand a serious liquidity stress scenario over a 30-day horizon at both the entity and consolidated levels (BNM, 2015).

This research did not explore the determinants of stability for all the different structures of Islamic banks in Malaysia. However, Wahid and Dar (2016) examined the factors that determine the stability of both Islamic and conventional Malaysian banks. They found that both types of banks shared similar determinants of stability, which are the total assets, the equity to total assets, and income diversification. Moreover, the cost to income ratio and non-performing loans hurt the stability of Islamic banks while the cost to income ratio, return on assets, and net loans to total assets had a positive effect on the stability of conventional banks (Wahid & Dar, 2016). This indirectly shows that total assets play a big role in determining the stability of banks. Based on Altman's Model, the coefficient of variable X_1, which is closely associated with the value of total asset, has the largest value in comparison to other coefficients. This finding implies that working capital over the total asset ratio could boost the stability of the Islamic banking industry in Malaysia. However, almost every selected Islamic bank in this study has negative working capital. This suggests that Malaysian's Islamic banking sector is heavily reliant on short-term deposits to finance its operations.

Table 5. Relationships between Z-Score and Asset Quality and Efficiency Ratio

	Coefficient	Std. Error	t-ratio	p-value
c	1.743	0.190	9.163	<0.000***
Asset quality	6.552	3.887	1.686	0.094*
Efficiency	0.069	0.247	0.280	0.780

Mean dependent var	1.909	S.D. dependent var	1.412
Sum squared residual	255.764	S.E. of regression	1.337
LSDV R-squared	0.122	Within R-squared	0.020
LSDV F(3, 143)	6.610	P-value(F)	0.000
Log-likelihood	−249.290	Akaike criterion	506.580
Schwarz criterion	518.541	Hannan-Quinn	511.440
rho	0.641	Durbin-Watson	0.718

Because asset quality may define the overall condition of a bank, we tested the relationship between the average Z-score and average asset quality as well as efficiency ratio for each bank. The average Z-score was the dependent variable, while the average asset quality and efficiency ratio were the independent variables. This test was conducted to determine whether asset quality ratio and efficiency ratio could determine the performance of the selected Islamic banks in achieving high Z-score values that might imply they are less insolvent. To obtain the asset quality ratio, we divided the yearly impaired financing by the total yearly assets, while to obtain the efficiency ratio

we divided the sum of yearly expenses by the yearly net income value. Before the regression test, we expected asset quality ratio to contribute to achieving a higher Z-score. The results in Table 5 show that the p-value of asset quality is statistically significant.

Uncertainty in this business dictates that having a good or bad asset quality rating might affect the stability of the selected Islamic banks. However, with unique risks such as shariah risk and displaced commercial risk, the Islamic banking sector faces greater challenges. Although many studies show that Islamic banks have more liquidity and are less risky, this does not guarantee that the industry will not face financial distress. Haron and Abdul Rahman (2012) discuss the financial distress-detection model specifically concerning Islamic banking and conclude that Islamic banking works differently to other businesses as it is subject to risks beyond those common to most businesses in the industry. Furthermore, the efficiency ratio has failed to show that being efficient can at least help ensure a more stable operation. Asset and liability management is vital in this respect. Negative working capital indirectly shows that selected Islamic banks in Malaysia receive more deposits rather than giving out loans to the customers. Domestic Islamic banks that provide services to all categories of people are suffering from more impaired financing and therefore have to be more stringent in evaluating customers' profiles.

The Islamic banking sector is vital to the growth of the Malaysian economy as it is directly linked to the real economy through profit participation, the sale and purchase of commodities, and the acquisition and leasing of assets (Odeduntan, Adewale, & Hamisu, 2016). Therefore, all banks need to prepare a more effective strategy to ensure they stay in the safe zone and remain competitive in the market. Although this model predicts scenarios that may not necessarily happen, they provide a good indication that Islamic banks need to stay alert and periodically improve.

Conclusion

This study assessed whether operating in a different structure will affect the stability and insolvency risk of selected Islamic banks in Malaysia. The results show that, based on Altman's Z-Score model, development financial institutions are more stable and less likely to become insolvent than their counterparts. According to Altman's model, a score higher than 2.9 meant banks were securely in the safe zone, scoring between 1.21 and 2.9 placed them in the gray zone, and scoring less than 1.21 placed them in the distressed zone. Most locally, foreign incorporated Islamic banks in Malaysia had Z-score values higher than those of domestic Islamic banks. However, big domestic Islamic banks such as Bank Islam and Maybank Islamic were placed in the safe zone. We then ranked the Z-scores and found that development financial institutions were more stable than locally foreign incorporated and domestic Islamic banks. Notably, CIMB Islamic and Hong Leong Islamic banks need to develop a new strategy as these two banks ranked the lowest and had a negative Z-score. Asset quality may also define the stability of banks as it has a positive relationship with the Z-score values but not the efficiency ratio.

Theoretically, based on the Altman Z-score model, each selected Islamic bank has to increase the value of current assets or working capital as this gives the best ratio to determine stability and thus mitigate the insolvency risk. Nevertheless, increasing capitalization or the total assets will help ensure Islamic banks become more solvent and stable. Additionally, Islamic banks have to ensure their operations are compliant with shariah. Despite being the first shariah-compliant bank in South Africa, Islamic Banks Limited (IBL) collapsed due to a lack of proper supervision from shariah-compliant entities (Ur Rahman & Zada, 2016). AIBIM, the Islamic Finance and Shariah Research Institute (ISRA), and other shariah supervisory agencies play a big role in ensuring the stability and resilience of the Islamic banking industry in Malaysia. Abdul Majid, Abdul Rahman, Jusoh, and Tabandeh (2016) also developed an early warning system using economic and political conditions and speculative attacks to predict human behavior. The findings suggest that current account deficits, economic slowdowns, financial sector problems, monetary

and currency instability, and inefficient regulations can increase the probability of a crisis. Therefore, authorities and policymakers have to monitor the economic and political conditions as well as debt status as these will forewarn them about any upcoming crisis.

However, this study only used Z-score results to analyze the bankruptcy profile of Islamic banks. The model used was, therefore, limited to bank-specific characteristics and thus tended to exclude other external factors that may be financial and macroeconomic in nature. For example, Fakhrunnas, Dari, and Mifrahi (2018) found that risk-taking behavior by banks was related in the long-term to macroeconomic factors. It suggests that policymakers may recommend banks to merge to help the banks become more stable when in case there will be problems come from macroeconomic factors. Further research can help identify best practices in helping banks to improve their Z-score and become more stable and competitive in the market. Islamic banks in Malaysia need to promote themselves as financial providers rather than financial keepers. This helps to create positive working capital, which impels them to become more stable.

Acknowledgment

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