CREDIT RISK DIFFERENTIAL BETWEEN ISLAMIC AND CONVENTIONAL BANKS IN MALAYSIA

Abstract

Despite the renewed interest post-2008, experts remain divided on whether Islamic banks (IBs) are riskier than conventional banks (CBs). Hence, we aim to study their credit risk differential more closely. Extant studies have analysed IBs collectively as a group in multi-country settings. We differ by studying one country, Malaysia, over the 2006 – 2019 period, to remove the noise from cross-country differences. We chose Malaysia because of its established dual banking system and global leadership in Islamic banking. We studied two credit risk aspects (the bank's bankruptcy risk and its customers' default risk) in a two-phased approach (a t-test and a regression). We also tested the robustness of our findings through a feasible generalised least squares linear model. We find that IBs are generally riskier but the customer default risk differential in the regression is insignificant. Moreover, the IB-CB risk differential has narrowed in recent years. Our findings present implications for practitioners in terms of the risk differential and opportunities arising from the narrowing gap. Policymakers may consider increasing the market liquidity and risk management options for IBs. Future research may consider studying the recent narrowing risk gap and whether the standalone IBs differ from those which are part of a CB group.

Keywords

Islamic banks, conventional banks, credit risk, Malaysia

1. Introduction

Islamic banking was institutionalised with the establishment of Mit Ghamr in Egypt in 1963. Despite being fairly new, Islamic banking has grown rapidly across the world, with more than 1500 Islamic financial institutions operating in forty-six countries, including non-Islamic ones (Johnes, Izzeldin and Pappas 2014; Islamic Finance Development Report 2020). It provides an alternative financing option to Muslims who may feel more comfortable to deal with banking transactions that adhere to their religious beliefs. Non-Muslims may also deal with Islamic banking products because of cost or product features considerations. Malaysia is no exception; its Islamic financing as a proportion of total loans and financing has catapulted from five per cent in 2000 to thirty nine per cent in 2019 (Bank Negara Malaysia 2018; Bank Negara Malaysia 2020).

During the tumultuous 2007-2009 period, some blamed the CBs' speculative activities for triggering the Global Financial Crisis. They argued that IBs had lower risk as seen in their lower non-performing loan (NPL) ratios. This is because IBs cannot engage in usury and speculative activities (Trabelsi 2011; Abedifar, Molyneux and Tarazi 2013). Others, however, assert that the IBs' risk is not very different from that for CBs (Iqbal and Mirakhor 2011; Bank Negara Malaysia 2011). Yet others argue that IBs are riskier than CBs (Elgari 2003; Hussain and Al-Ajmi 2012). Hence, there are mixed views as to the IBs-CBs risk differential.

Moreover, most extant studies compare IBs and CBs across several countries. They analyse IBs collectively as a group distinct from that for CBs. Hence, we need to consider reducing the noise from cross-country differences. Accordingly, we focus on one country – Malaysia – and extend Lassoued 2018's work in terms of the study period, risk measures and robustness tests. We choose Malaysia as the study context because it is a global leader in Islamic banking (Sundarajan and Errico 2002). Further, section 27 of the Central Bank of Malaysia Act 2009 explicitly states that Malaysia has a dual banking system. This was the first legislation in the world that expressly acknowledged such a system (Bank Negara Malaysia 2009). Hence, Malaysia's dual banking system (comprising both CBs and IBs) is also seen as a blueprint for many countries which are considering adopting or expanding Islamic banking (Van Greuning and Iqbal 2008).

While we aim to compare the IBs' and CBs' risk levels in Malaysia, we also need some granular risk categories and measures. We focus on credit risk because it is "the leading source of problems in banks world-wide" (Basel Committee on Banking Supervision 2000, p. 1). Next,

there are several ways of measuring credit risk. This paper measures credit risk through two indicators, namely the *Z*-score and the NPL ratio, as adapted from Bank Negara Malaysia 2017. First, as a borrower, a bank may present credit or default risk to its depositors and lenders. We use the *Z*-score to indicate bankruptcy risk (Chong and Liu 2009). A higher *Z*-score suggests greater financial stability and hence, lower bankruptcy risk. Second, we extend Lassoued 2018's work by studying another indicator, i.e. the NPL ratio. As a lender, a bank is exposed to its borrowers' credit risk, i.e. the risk that these customers are unable to repay their loans. We use the NPL ratio to measure a bank's exposure to its borrowers' credit risk. A lower NPL ratio is associated with a lower customer default risk and hence, lower credit risk (Johnes, Izzeldin and Pappas 2014).

Accordingly, this paper aims to determine whether IBs have higher credit risk than CBs in Malaysia, from two dimensions:

1. the bank's **bankruptcy risk**, via the *Z-score* (a higher *Z-score* suggests a lower credit risk); and
2. the **customers' credit risk**, via the nonperforming loans *(NPL) ratio* (a lower *NPL ratio* suggests a lower customer credit risk)

We arrange the remaining portions of this paper as follows. Section 2 reviews extant literature which compare the risks of IBs and CBs. Section 3 discusses the methodology used to obtained make sense of the data. Section 4 analyses the results and discusses the findings. Finally, Section 5 concludes.

2. Literature Review

This section discusses extant studies which compare the credit risks of IBs and CBs.

2.1 IBs are less risky

Some studies find that the application of Shariah (Islamic law) principles result in the IBs having lower risks. They argue that IBs are generally more ethical and conservative in their investment decisions (Bourkhis and Nabi 2013). IBs also generally maintain higher levels of cash deposit ratio and avoid excessive debt (Metwally 1997; Alam 2020). Besides, where IBs co-exist with CBs, IBs tend to have more onerous set-up capital requirements. This is because the regulators typically address the IBs' specificities so as to facilitate sound banking practices.

Thus, IBs tend to have higher capitalisation and lower bankruptcy risk (Kabir, Worthington and Gupta 2015; Trabelsi 2011).

The IBs' customers are also more conservative and cautious. For instance, Abedifar, Molyneux and Tarazi 2013 assert that the IBs' customers tend to be more religious and honour their repayment obligations. Further, unlike the CBs' apparently more impersonal or transactional nature of dealing, the IBs' Musharakah (partnership) approach promotes a closer bank-customer relationship based on mutual trust (Bank Negara Malaysia 2017). This results in better assessment of customer creditworthiness and hence, reduce credit risks (Johnes, Izzeldin and Pappas 2014).

Moreover, the IBs' inherent structural setups make it less risky for three reasons. First, IBs share their credit risks with their depositors (Trabelsi 2011; International Monetary Fund 2014). IB depositors do not earn interest but share, as business partners, in the bank's profits or losses. Thus, these depositors are incentivised to monitor the banks' risk and business performance more closely.

Second, under an IB's Murabahah (mark-up) concept of financing, its customers may be more highly motivated to pay. In a CB loan, the customer's motivation to pay is to fulfil its debt repayment obligation and to reduce interest charges. In an IB, however, the IB first owns the asset before selling the asset to the customer who requisitions it. Moreover, the Murabahah concept encourages a business partnership mindset wherein the customer should be more motivated to pay the bank in order to own the asset (Johnes, Izzeldin and Pappas 2014; Hassan, Khan and Paltrinieri 2019). Third, Islamic banking prohibits uncertainties. Thus, IBs are not exposed to the risks inherent in, and the vagaries of, complex derivatives prevalent in CBs (Johnes, Izzeldin and Pappas 2014; Khan and Ahmed 2001).

Among the popularly used risk measures are the accounting-based ones such as the NPL ratio, the ratio of loan loss provisions to assets, and the *Z*-score. Authors such as Abedifar, Molyneux and Tarazi 2013 and How, Karim and Verhoeven 2005 use the NPL ratio and the ratio of loan loss provisions to total assets respectively. Both papers find that IBs have lower risks. In terms of the *z*-score, some find that the smaller IBs have lower risks than the CBs but the reverse happens for the larger IBs (Cihak and Hesse 2008; Smaoui, Mimouni and Temimi 2020). This is because it is harder to manage the non-standardised Islamic banking contracts in larger operations. Moreover, there may be limited access to Shariah-compliant hedging instruments

especially when dealing with larger amounts. Meanwhile, Ferhi 2017 finds that the larger IBs have credit risk levels which are closer to (but not higher than) those of CBs.

Although Abedifar, Molyneux and Tarazi 2013 find that IBs have lower risks in terms of lower NPL ratios, the *Z*-score measure differential is insignificant. Other authors use market-based measures such as the models of Merton's distance to default and the probability of default. Using these measures, IBs seem less risky (Boumediene 2011; Kabir, Worthington and Gupta 2015). Nonetheless, Kabir, Worthington and Gupta 2015's findings using the NPL ratio and *Z*-score reveal the opposite: IBs are riskier. The preceding discussions suggest that different risk measures may yield different conclusions as to whether the IBs are more or less risky. Although the market-based measures may have strong predictive abilities, they are rarely used in Islamic banking studies because stock price information is limited. Moreover, the stock price may not fully reflect the bank's value in illiquid markets especially for the newer Islamic bank stocks. As such, this paper focuses on the *Z*-score and NPL ratio.

2.2 IBs are more risky

A common argument for IBs being riskier is that they have limited credit risk management techniques (Elgari 2003). This limitation is due to Shariah-compliance requirements and also the lack of market depth. For instance, unlike CBs, IBs are generally not allowed to take collateral or use credit default swaps so as to reduce credit risks (Sundarajan and Errico 2002; Lassoued 2018). IBs may occasionally request for collateral only to the extent of managing moral hazard (e.g. to prevent the borrower from disappearing) but not as a means to reduce its credit risks.

Besides, the application of Shariah principles to financing contracts may differ across contracts and banks. This is because the Shariah principles are subject to different individual interpretations and applications. Hence, this increases variations and uncertainties in the contracts and thus, increases the IBs' credit risk (Kabir, Worthington and Gupta 2015). To mitigate such adverse impacts, IBs need to adopt appropriate Shahriah-based governance frameworks (Bank Negara Malaysia 2011). In fact, Grassa, Moumen and Hussainey 2020 argue that IBs are riskier than CBs. This is because besides having risks comparable to those of CBs, IBs are also exposed to the additional unique risks arising from Shariah considerations.

Differences in product specifications in terms of quality or price may also cause potential losses from contract disputes pertaining to products bought under mark-up financing contracts. This

is especially true in delivery of commodity products which are subject to unexpected market price fluctuations (Iqbal and Mirakhor 2011).

Further, IBs confer full freedom to the borrower in terms of his business projects and decisions. IBs are not allowed to engage in decision making and monitoring of the borrower's business and projects. This is unlike CBs which typically insist on close monitoring of the business and projects so as to decide whether to continue or withdraw funding. Hence, IBs are exposed to agency problems and higher credit risks (Kabir, Worthington and Gupta 2015). Finally, IBs are not allowed to impose penalties for customer's late repayments (Van Greuning and Iqbal 2008). This may lull some borrowers into delaying their payments, prioritising other payments and worse, into defaults.

2.3 Others

Besides the mixed findings arising from different measures and bank size, as discussed in Section 2.1, some researchers find that IBs' risks are not too different from those of CBs. Chong and Liu 2009 reason that the IBs in Malaysia deviate from the Islamic banking concept of profit and loss sharing arrangements. These IBs operate, in substance, very similar to the CBs. Hence, their risks are not very different from those of CBs.

But this is dismissed as a "minority view" (Cihak and Hesse 2008, p. 5). In fact, Cihak and Hesse 2008, in a study of 18 banking systems, find that despite the overall lower risks, the larger IBs are riskier than the CBs. This is because the larger banks find it harder to manage the various non-standardised bank contracts. Moreover, the IBs' risks are not significantly different from those of CBs during the 2008 Global Financial Crisis (Kabir, Worthington and Gupta 2015; Bourkhis and Nabi 2013).

Others argue that it is not so much whether IBs are riskier than CBs. Rather, the difference lies more on the different risk characteristics or risk categories. For instance, CBs may usually face higher credit risks but IBs may face other risks that do not apply to CBs such as unique operational and Shariah non-compliance risks (Elgharbawy 2019).

3. Methodology

Prior to running a regression analysis, we ran a diagnostic test. The initial raw dataset was not normally distributed; it was skewed to the left with high kurtosis. In our efforts to obtain unbiased estimators in the regression model, we studied the distribution of their natural

logarithm values. We find that these natural logarithm values had skewness and kurtosis indices which were within an acceptable range of ±2 (Gravetter and Wallnau 2016). Hence, it was reasonable to run a regression analysis.

We employ a two-phased approach as adapted from Kabir, Worthington and Gupta 2015. The first phase measures and ascertains whether the two credit risk indicator scores (i.e. the *Z*-score and NPL ratio) significantly differ between the Islamic and CBs. The second phase tests the robustness of the results by regressing these two credit risk indicator scores on the control variables.

3.1 Phase one: do the credit risk indicator scores significantly differ between the IBs and CBs?

We study whether the two credit risk indicator scores (i.e. the *z*-score and NPL ratio) significantly differ between the IBs and CBs via a *t*-test. The first indicator, i.e. the *z*-score, is a popular measure of a bank's financial stability and is inversely related to the chances of the bank going bankrupt. The *z*-score measures the number of standard deviations by which a bank's return has to fall below its expected value so as to erode its equity and render the bank insolvent (Cihak and Hesse 2008; Kabir, Worthington and Gupta 2015). The *z*-score is operationalised as follows:

$$z - score = \frac{ROAA + {}^{E}/_{A}}{SD_{ROAA}} \quad \textbf{Equation 1}$$

where:

- ROAA = Return on average assets
- E/A = Equity / Assets
- SD_{ROAA} = standard deviation of ROAA (i.e. returns volatility)

A higher *z*-score suggests that the bank is more financially stable and hence, has a lower bankruptcy risk (Abedifar, Molyneux and Tarazi 2013; Altman and Saunders 1998). The *z*-score is "objective... [because] it focuses on the risk of insolvency...[and] applies equally to banks that use a high risk/high return strategy and those that use a low risk/low return strategy" (Cihak and Hesse 2008, p. 7). It is possible, however, that the *z*-score may under-estimate an Islamic bank's financial strength. This is because IBs can largely, in theory, share risks with their depositors and this risk-sharing ability is not captured in the *z*-score. But this potential limitation may be refuted by two counterarguments. First, anecdotal evidence in Malaysia suggests that "Islamic bank depositors in practice do not fully share in the financing losses"

perhaps due to competition with their more established CBs (Chong and Liu 2009, p. 142). Second, CBs may also share these risks with their customers by adjusting and/or delaying adjustments to their deposit and loan rates (Cihak and Hesse 2008). Hence, the *z*-score is a reasonable comparative bankruptcy risk indicator.

The second credit risk indicator is the *NPL ratio*. Adapting Kabir, Worthington and Gupta 2015, we operationalise the NPL ratio as follows:

$$NPL\ ratio = \frac{gross\ impaired\ loans}{gross\ loans} \quad \textbf{Equation 2}$$

A higher NPL ratio means that a higher proportion of the bank's loans are deemed impaired or non-performing and hence, the bank is exposed to higher customer credit risk. This ratio, or variants thereof, is also widely used as an indicator of bank financial soundness or more specifically, the bank's vulnerability to customer default (Abedifar, Molyneux and Tarazi 2013; International Monetary Fund 2014).

We sourced the data of all banks in Malaysia from the *Orbis Bank Focus* database. We excluded one CB because of data non-availability. Hence, we used the annual data on 39 banks (16 Islamic and 23 conventional) for the period 2006 - 2019 and obtained a total of 435 observations. We have chosen this period as IBs' data are available only from 2006 onwards in the database. We also cross-checked the Islamic/CB segregation against Malaysia's central bank's list[1]. Having obtained and computed the two sets of credit risk indicator scores, we then compare whether the scores differ significantly between the IBs and CBs, using the *t*-test.

3.2 Phase two: regress the credit risk indicators on the control variables

In this second phase, we adapt the regressors in Cihak and Hesse 2008 and Kabir, Worthington and Gupta 2015. We exclude their dummy country macroeconomic variables because these are not relevant for our country-specific study. The regression equation is as follows:

$$CR_{i,t} = \alpha + \beta_1 Ln(Total\ asset)_{i,t} + \beta_2 Asset\ growth_{i,t} + \beta_3 Cost\ to\ income_{i,t} + \beta_4 Loan\ to\ asset_{i,t} + \beta_5 Diversification_{i,t} + \beta_6 Islamic\ dummy_{\ i,t} + \beta_7 GDP_{i,t} + \beta_8 Inflation_{i,t} + \beta_9 Governance_{i,t} + \beta_{10} Concentration_{i,t} + \varepsilon_{i,t} \quad \textbf{Equation 3}$$

Equation **3** helps us examine whether the credit risk for IBs and CBs significantly differ. The dependent variable $CR_{i,t}$ is the *z*-score and the NPL ratio for bank *i* at

[1] http://www.bnm.gov.my/?ch=li&cat=islamic&type=IB&lang=en

time *t*, for each of the two regressions respectively. The bank-specific and macroeconomic variables serve as control variables.

The bank-specific variables for bank *i* at time *t* are the natural logarithm of total assets, asset growth, cost to income, loan to asset, diversification, and a dummy variable for IBs. The sign and significance of the coefficient β_6 for 'Islamic dummy' help determine whether the credit risk for IBs significantly differ from that of the CBs. Meanwhile, the macroeconomic variables are GDP growth, inflation rate, governance and concentration. $\varepsilon_{i,t}$ is the regression model's residual. All β's are estimated coefficients of each variable in the regression model. We describe the variables in the ensuing paragraphs.

First, *total assets* is a proxy of a bank's size and the natural logarithm is used to attain data normality so as to estimate a linear regression equation (Kabir, Worthington and Gupta 2015). Past research has found that IBs are typically smaller than CBs. Further, larger banks tend to have an edge in terms of scale economies and risk diversification. Therefore, we expect a higher total assets value to be associated with better credit risk (Cihak and Hesse 2008; Abedifar, Molyneux and Tarazi 2013; How, Karim and Verhoeven 2005).

Second, high *asset growth* increases the chances of moral hazard. Abedifar, Molyneux and Tarazi 2013 and Kabir, Worthington and Gupta 2015 study the relationship between asset growth and credit risk. Both studies mention that high asset growth suggests more relaxed credit screening standards or low interest rate in a bank. This in turn increases the likelihood of moral hazard problems. Kabir, Worthington and Gupta 2015 find that asset growth has a positive impact on the *z*-score but a negative impact on the NPL ratio. Hence, we expect high asset growth to worsen credit risk.

Third, *cost to income ratio* is a proxy of a bank's cost inefficiency. A higher ratio means lower cost efficiency and tends to indicate that the bank is poorly run. Such a bank is likely to be less prudent in monitoring its credit risk (Kabir, Worthington and Gupta 2015; Abedifar, Molyneux and Tarazi 2013). Hence, we expect a higher cost to income ratio to worsen credit risk.

Fourth, the *loan to asset ratio* indicates the proportion of a bank's earning assets to its total assets. We expect a higher *loan to asset ratio* to improve credit risk. This is because a higher ratio means that there is a higher proportion of earning assets and hence, higher earning capacity. This helps reduce the bank's default risks (Bourkhis and Nabi 2013).

Fifth, *diversification* is measured by the ratio of non-core to core activities. A higher ratio means that a bank diversifies its income source away from the traditional lending interest income. This may improve credit risk because the bank is able to gather more information and income from other products or business lines (Kabir, Worthington and Gupta 2015; Ghosh 2015).

Sixth, the *Islamic dummy* variable helps us to assess whether we fail to reject the null hypotheses that the IBs and CBs have similar risk levels. This dummy variable carries a value of 1 for IBs otherwise a value of 0 for the CBs. For instance, when we regress the *z*-score with this dummy variable, the coefficient's sign explains its relationship. If IBs are riskier than CBs, we would have a negative coefficient. This would in turn explain the inverse relationship of the *z*-score and credit risk indicator. In other words, a higher risk is represented by a lower *z*-score and corresponds with a negative coefficient value for the dummy variable (Cihak and Hesse 2008). Conversely, a higher NPL ratio indicates a higher credit risk which in turn corresponds with a positive coefficient value for the dummy variable. Thus, a positive coefficient suggests that IBs are riskier, and a negative coefficient suggests that IBs are less risky than CBs.

Besides bank-specific variables, we also study the impact of four macroeconomic variables. In general, nominal *GDP growth* rate and good *governance* have favourable influences on overall banking activities (Kabir et al., 2015). Thus, we expect these variables to reduce credit risk. Conversely, unfavourable conditions as indicated by higher *inflation rates* and industry *concentration ratio* should increase credit risk. Table 1 summarises the discussions in the preceding paragraphs in the form of the control variables, descriptions and expected relationship with the credit risk indicators.

We run Beck and Katz 1995's panel-corrected standard errors (PCSE) estimation technique by following Banna 2020 and Alfadli and Rjoub 2020. This helps mitigate potential problems arising from serial correlation, cross-sectional dependency and endogeneity issues (Alfadli and Rjoub 2020).

Prior to running the regression, however, we assess whether it is appropriate to include all the independent variables. Towards this end, we study whether there is multicollinearity, i.e. whether the paired variables are highly correlated. In general, a correlation coefficient of 0.5 and above is deemed large. In this study's context of multiple regression, however, multicollinearity is a problem only if the correlation coefficient is 0.9 and above (Pallant 2005).

4. Results and Analysis

This section presents the results and analyses the findings under three sub-sections. First, it studies the descriptive statistics of the variables. In particular, it compares the credit risk indicator scores between the CBs and IBs. The credit risk indicators are the *Z*-score as a proxy for a bank's bankruptcy risk and the NPL ratio as a proxy of the bank's customer credit risk. Second, it identifies the determinants of bankruptcy and customer credit risk (i.e. the *z*-score and NPL ratio respectively) by studying the results of a panel (PCSE) regression. Third, it tests the robustness of the results. Throughout our analysis, we split our sample into CBs and IBs, along with the full sample.

4.1 Descriptive statistics

Table 2 presents the descriptive statistics of the variables studied.

Before zooming in to the two key variables of interest (i.e. *Z*-score and NPL ratio), we review the control variables so as to have some background insights. A review of Table 2 shows that the CBs have, on average, higher amounts of assets and lower ratios in terms of cost to income, loan to asset and income diversification. Besides, the IBs have a much higher average asset growth. The CBs' higher asset amounts and lower cost to income ratios suggest that the CBs are better resourced, enjoy better scale economies and hence, are more efficient. This also reflects the fact that in Malaysia, the CBs have a much longer history since 1875, and has a more entrenched position as compared with the introduction of IB only in 1983.

The CBs' lower loan to asset ratio and income diversification ratio suggest that the CBs may have a lower asset-earning capacity and lower non-traditional income base. This phenomenon may be due to historical, legacy and administrative factors. As the CBs are generally much older, they would typically carry a larger proportion of non-earning assets. Besides, in situations where a banking group offers both CB and IB products, the bulk of shared facilities would tend to be parked in the CBs because of their more established central administrative roles and also because of their much higher asset bases. Moreover, the CBs are still enjoying a very healthy interest spread and hence, their reliance on net interest income is still very high. In the case of IBs, however, being newer and smaller banks, they are probably charging their borrowers lower rates and offering their depositors higher profit-sharing rates. As such, the IBs may have a lower net profit and loss sharing margin. This in turn results in the IBs lower net profit and loss sharing income (i.e. analogous to the CBs' net interest income). In other words,

the IBs' traditional income proportion is lower and hence, the IBs' diversification ratio is higher than that for the CBs. Hence, from this angle, the CBs may have a higher credit risk because their income source is less diversified as they still rely more on the traditional income source.

Meanwhile, the IBs have a much higher asset growth compared with the CBs (0.919 versus 0.07 for CBs). This may be due to the IBs' smaller asset base and the concerted efforts to promote IB by the banks and also the central bank. However, the higher asset growth may mean that the IBs may potentially have higher moral hazard and hence, credit risks.

Next, we study the *Z*-score and NPL ratio. On average, the banks' mean *Z*-score is 4.739. The IBs' mean *Z*-score of 4.474 is lower than the CBs' 4.956. This means that the CBs' bankruptcy risk is lower. In terms of the NPL ratio, the mean scores for the banks, CBs and IBs are 2.544 per cent, 2.445 per cent and 2.661 per cent respectively. This suggests that the CBs have lower credit risk than the IBs. In sum, both the *Z*-score and NPL ratio statistics suggest that on average, the CBs seem to have lower credit risk.

Our findings are similar to Kabir, Worthington and Gupta 2015 who find that IBs have lower *Z*-score and higher NPL ratio over the period of 2000-2012. The authors provide three possible reasons. First, IBs are newer and thus, their investment decision skills may lag behind those of the CBs. Second, the IBs' business models may be more complex and restrictive because of the need to comply with Shariah principles and prohibitions. This reduces the options or instruments available in managing investment portfolios and diversifying risk. Third, IBs tend to have a larger portion of their investment portfolios in the riskier real estate and construction sectors.

If, however, we study the year-wise comparison of the *Z*-scores as shown in Figure 1, we see that the IBs' *Z*-score seem to be improving while that of the CBs seem to be declining. In fact, in 2017 and 2018, the IBs out-performed the CBs.

We repeat the year-wise comparison for the NPL ratio, as shown in Figure 2. The IBs' NPL ratio was initially higher than that for the CBs but dipped below their CB counterparts from 2013 onwards. The narrowing bankruptcy and credit risk gaps between the Islamic and CBs may be due to more concerted competency development efforts over time. This may be seen from, among others, the growth in professional training programmes and the expansion of INCEIF as the postgraduate university for Islamic finance (Bank Negara Malaysia 2018).

Next, we determine whether the *Z*-scores and NPL ratios significantly differ between the conventional and IBs. We do this by comparing the mean *t*-test of the *Z*-score and the NPL ratios, as shown in Table 3.

A study of Table 3 suggests that while the mean *Z*-score significantly differs, the NPL ratio does not. In other words, the CBs display significantly lower bankruptcy risk compared with the IBs. The CBs' customer default risk (NPL ratio) seems lower than that of the IBs but it is not significantly lower.

4.2 Regression results

This subsection identifies the determinants of credit risk of Malaysian banks (both IBs and CBs) using the unbalanced panel data over the 2006-2019 period. However, prior to running the regression, we assess whether there is multicollinearity by conducting a pairwise correlation analysis, as shown in Table 4.

A review of the pairwise correlation matrix suggests that although some correlation coefficients seem statistically significant, their values are generally below 0.3 and are deemed small. The largest coefficient is 0.491 which is still below 0.5 and is deemed medium size (Pallant 2005). Hence, there is no major multicollinearity problem. We proceed with running two regression equations in the next two subsections, with the dependent variables being the *Z*-score and NPL ratio respectively.

4.2.1 Z-score

Our PCSE regression run produced the results as shown in

Table ***5***. The column "expected relationships" refer to what we expect based on our literature review discussions, as summarised in Table 1. We also divided the sample into the subsamples of CBs and IBs. For instance, columns 1 and 2 relate to the full sample, columns 3 and 4 relate to the CBs, and columns 5 and 6 relate to the IBs. Finally, columns 1, 3 and 5 consider only the bank-specific variables while columns 2, 4 and 6 include the macroeconomic variables too.

The results in

Table ***5*** show that the *Islamic bank dummy* is negatively significant. This suggests that CBs have lower bankruptcy risk. In other words, CBs are more financially stable than IBs. This result is similar to Lassoued 2018. Moreover, there are very few variables whose nature of relationships with the dependent variable significantly differ from our expectations.

Bank size (total assets) has a significant positive relationship with *Z*-score across each of the six columns. Hence, larger banks tend to have lower bankruptcy risk, be it for the overall Malaysian banking industry or CBs or even IBs. This is in line with our expectations and also with Cihak and Hesse 2008.

In the full sample, *asset growth* has a negatively significant effect on *Z*-score. This suggests that asset growth increases the banks' credit risk. Although both IBs and CBs also display similar negative relationships, asset growth does not significantly affect the *Z*-score.

Furthermore, *loan to asset* has a significant positive relationship with *Z*-score. This means that a higher loan to asset ratio reduces credit risk in Malaysia for the full sample of all banks. In terms of bank types, the results are mixed. For IBs, loan to asset ratio has a significant positive relationship whereas for CBs, it has a positive insignificant relationship.

For the income/ revenue *diversification*, we have mixed findings. For the full sample and IBs, income diversification has a positive significant relationship with *Z*-score, similar to (Lassoued 2018). This means that income diversity reduces credit risk of IBs. In the case of CBs, however, the relationship is insignificant and negative.

We find a positive insignificant link between the *cost to income* ratio and *Z*-score regardless of bank types, similar to Abedifar, Molyneux and Tarazi 2013. This suggests a reduction in credit risk by reducing inefficiencies.

As to macroeconomic variables, *GDP growth* has an insignificant negative relationship with *Z*-score, which is unexpected. However, as expected, *inflation* has a significant negative relationship with *Z*-score which suggests that reducing inflation can increase financial stability, i.e. reduce bankruptcy risk. *Governance* and *concentration* are also negatively linked with *Z*-score in which only for CBs, governance is significant; for IBs, however, concentration is positive but insignificant.

In sum, the IBs have higher bankruptcy risk as evidenced by the significant negative Islamic bank dummy coefficient. The other variables also largely fit our expectations and hence, provide comfort that the model is reasonably specified.

4.2.2 NPL ratio

We repeat the regression run with the NPL ratio as the dependent variable, as shown in

Table ***6***. The *Islamic bank dummy* has a significant positive relationship with the NPL ratio. This means that IBs have higher NPL ratio than CBs. In other words, IBs have higher credit risk than the CBs which is in line with our expectations. Moreover, the relationships between these control variables and the dependent variable are largely in line with our expectations.

Bank size has a positive relationship with the NPL ratio for the full sample and also CB's. However, it has an insignificant negative relationship for IB's. *Asset growth* has mixed relationships with the NPL ratio: positive for the overall banking industry and also for CB's but negative for IB's. However, the coefficients are insignificant.

Loan to asset is negatively related with the NPL ratio. However, it is significant only for the IB's. The findings suggest that a decline in loan to asset reduces credit risk but the impact is significant for IB's only.

Income diversification has a significantly negative relationship with the NPL ratio. This suggests that increases in income diversification reduces the credit risk.

Cost to income ratio has mixed relationship with NPL ratio. The relationship is positive for the full sample and the IB's but negative for CB's. Nonetheless, the impact is insignificant.

In the case of macroeconomic variables, only *concentration* has a significantly positive relationship with the NPL ratio regardless of bank type. The other macroeconomic variables, i.e. *GDP growth*, *inflation* and *governance* are insignificant.

In sum, the IBs have higher customer credit risk as evidenced by the significant positive Islamic bank dummy coefficient. The other variables also largely fit our expectations and hence, provide comfort that the model is reasonably specified.

4.3 Robustness test

In order to check the robustness of our findings in sub-section 4.2 (

Table ***5*** and

Table ***6***), we use the feasible generalised least squares (FGLS) panel linear model. The FGLS regressions are shown in

Table *7* and Note: Standard errors are in parenthesis

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

Table *8* for the equations whose dependent variables are the *z*-score and NPL ratio respectively.

The findings in

Table *7* and Note: Standard errors are in parenthesis

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

Table *8* are similar with those from our review of

Table ***5*** and

Table ***6***. The results of this estimation do not change the relationship among the variables and the significance of the pertinent variables. Hence, the FGLS results reaffirm our findings from the PCSE regression in sub-section 4.2. In sum, the IBs have higher credit risks compared with the CBs. The regression models also broadly fit our expectations and are therefore reasonably specified.

4.4 Implications

The findings from this paper contribute in three ways. First, theory-wise, it departs from prior multi-country studies which may contain the noise arising from inter-country differences. Instead, it focuses on a single country study. By focusing on one country, we sharpen the focus on the risk differentials between the CBs and IBs. We reduce potential distractions which may arise from inter-country differences in aspects such as demographic, socio-political and economic conditions. In addition, we reaffirmed our regression findings through a robustness test using the feasible generalised least squares (FGLS) panel linear model. We believe the above efforts help enhance the accuracy of our findings.

Second, it reminds practitioners of the potentially higher credit risks inherent in IBs. This may arise from the following three factors: (1) the constrained credit risk management techniques because of Shariah-compliance requirements and lack of market depth, (2) the variations and uncertainties in IB contracts stemming from the different interpretations and applications of Shariah principles, and (3) IBs confer full freedom to the borrower in terms of his business projects and decisions. Hence, practitioners may wish to reflect on ways to mitigate the risks arising from these three factors. But at the same time, there may also be opportunities arising from the narrowing gap of the IBs' credit risks vis a vis the CBs. The narrowing gap may reduce the potential prima facie biased perception that IBs would typically be riskier than CBs. Hence, this may facilitate a more balanced effort channelled towards product and business development even for IB products.

Third, from a public policy perspective, efforts towards enhancing market liquidity and risk management options for IB products may be considered. This may provide a wider range of options available, in terms of Syariah-compliance products, the willing and available counterparties, and a wider range of channels to better exchange, transfer and manage their risks. In other words, such efforts may help enhance market depth and liquidity so as to facilitate a more sustainable growth and a more vibrant IB market. The policymakers' talent development initiatives seem to be heading the right direction and ought to be further improved.

5. Conclusion and recommendations

This paper aimed to determine whether the IBs in Malaysia had bankruptcy and customer credit risks which significantly differ from the CBs. Towards this end, we employed a two-phased approach. First, we compared the scores for the bankruptcy and customer credit risk indicators via *t*-tests. Second, we regressed the bankruptcy and customer credit risk scores against some independent and control variables.

We ran a panel-corrected standard errors (PCSE) regression. We also ran a robustness test via a feasible generalised least squares (FGLS) panel linear model. We found that the variables exhibited relationships which were largely within expectations and hence, the models were reasonably specified. The results in both phases suggest that the IBs are significantly riskier than the CBs. Nonetheless, the gap between the IBs and the CBs seem narrower in more recent times.

Future research may consider studying the reasons for the narrowing risk gap in more recent years. This may include, for instance, identifying banks whose bankruptcy and customer credit risks were significantly improving or deteriorating and the reasons thereof. It may also be useful to differentiate between the IBs which are standalone versus those which are part of a CB group. The latter may be run with substantially similar approach with their CB counterparts.

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Tables and Figures

Table 1. Control variables, descriptions and expected relationships

Bank-specific variables:	**Description**	**Impact of higher independent variable values**		
		Better/Worse credit risk[2]	***Z*-score**	**NPL ratio**
Ln (Total asset)	Natural logarithm of total assets	B	+	-
Asset growth	Change in total assets	W	-	+
Cost to income	Total operating cost/total operating income	W	-	+
Loan to asset	Gross loan/ total assets	B	+	-
Diversification	Noninterest income/total operating income	B	+	-
Islamic dummy[3]	1 = IBs, 0 = CBs	W	-	+
Macroeconomic variables:	**Description**			
GDP	Growth rate of nominal GDP	B	+	-
Inflation	Change in CPI	W	-	+

[2] A better ('B') credit risk situation corresponds with a higher (+) *Z*-score and a lower (-) NPL ratio.
[3] The 'Islamic dummy' is the variable of interest. If IBs have higher credit risks than CBs, the coefficients for the *Z*-score and NPL ratio should be negative and positive respectively.

Governance[4]	Mean of measures of six governance Indicator	B	+	-
Concentration	% share of assets of five-largest banks	W	-	+

Table 2. Descriptive statistics

(1) Full Sample

	N	mean	standard deviation	minimum	maximum
Ln (*Z*-score)	401	4.739	1.341	-0.031	9.751
Non-performing loans ratio (NPL)	421	2.544	3.466	0.003	33.333
Bank Size (ln (Total Asset)	435	8.725	1.465	3.626	12.225
Asset Growth	402	0.452	6.273	-0.897	125.400
Cost to Income Ratio	426	49.033	16.142	1.881	127.366
Loan to Asset	434	0.578	0.193	0.000	1.088
Diversification	428	0.444	0.265	-1.232	1.732
GDP growth	435	4.903	1.831	-1.514	7.425
Inflation	435	2.315	1.270	0.583	5.441
Governance	435	0.357	0.103	0.190	0.586
Concentration	435	74.034	11.638	62.264	100.000

(2) CBs

Ln (*Z*-score)	220	4.956	1.336	2.157	9.751
Non-performing loans ratio (NPL)	228	2.445	3.512	0.003	33.333
Bank Size (ln (Total Asset)	241	8.963	1.698	5.774	12.225
Asset Growth	221	0.070	0.215	-0.897	1.036
Cost to Income Ratio	241	44.603	13.567	1.881	95.045
Loan to Asset	241	0.541	0.210	0.001	0.776
Diversification	241	0.380	0.165	-1.232	0.865

[4] The governance indicator is the mean value of six governance indicators obtained from the World Bank's website, namely (1) control of corruption, (2) government effectiveness, (3) political stability and absence of violence/terrorism, (4) regulatory quality, (5) rule of law, and (6) voice and accountability. Retrieved from <http://data.worldbank.org/data-catalog/worldwide-governance-indicators?gclid=CjsKDwjw0cXIBRCxjqnE3K3sHhIkAL1LezQguAd-xl340hPdDWRctigd3Gh-wwzB0jdq0moSLDbRGgITd_D_BwE> on 21 May 2017

(3) IBs

Ln (*Z*-score)	181	4.474	1.303	-0.031	8.963
Non-performing loans ratio (NPL)	193	2.661	3.417	0.070	22.113
Bank Size (ln (Total Asset)	194	8.429	1.040	3.626	11.001
Asset Growth	181	0.919	9.339	-0.226	125.400
Cost to Income Ratio	185	54.805	17.395	22.636	127.366
Loan to Asset	193	0.625	0.157	0.000	1.088
Diversification	187	0.527	0.337	-0.016	1.732

Table 3. Mean *t*-test of *Z*-score and NPL ratio

	CB	**IB**	**dif**	**St_Err**	***t*_value**	***p*_value**
Ln z-score	4.957	4.474	0.482	0.133	3.650	0.001
NPL ratio	2.445	2.662	-0.216	0.340	-0.650	0.524

Note: dif: Differences, St. Err.: Standard Error

Table 4. Pairwise correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Ln (*Z*-score)	1.000										
(2) NPL	-0.180*	1.000									
(3) Bank Size	0.270*	-0.162*	1.000								
(4) Asset Growth	-0.101*	-0.013	-0.021	1.000							
(5) Cost	-	0.02	-	-	1.00						

to Income	0.027	2	0.173*	0.076	0						
(6) Loan to Asset	0.191*	-0.200*	0.491*	0.026	-0.025	1.000					
(7) Diversification	0.051	-0.100*	0.051	-0.088	0.251*	0.031	1.000				
(8) GDP growth	0.110*	-0.006	0.042	0.006	0.052	0.024	0.066	1.000			
(9) Inflation	-0.056	0.010	-0.072	0.135*	-0.055	-0.064	-0.148*	0.374*	1.000		
(10) Governance	0.206*	-0.001	0.145*	-0.077	0.098*	0.125*	0.255*	0.286*	-0.393*	1.000	
(11) Concentration	-0.232*	0.187*	-0.304*	0.058	-0.246*	-0.247*	-0.323*	0.105*	0.025	-0.286*	1.000

Note: NPL: Non-performing loans ratio. * shows significance at the .05 level

Table 5. PCSE regression: *Z*-score

	Expected relationship	**Results = expected relationship? Yes/No**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
			Full	**Full**	**CB**	**CB**	**IB**	**IB**
Bank Size	+	Y	0.152**	0.128**	0.202***	0.169**	0.282**	0.335**
			(0.060)	(0.060)	(0.075)	(0.077)	(0.122)	(0.133)

Asset Growth	-	Y, insignificant	-0.134**	-0.109	-0.118	-0.071	-0.117	-0.130
			(0.068)	(0.071)	(0.104)	(0.105)	(0.090)	(0.094)
Loan to Asset	+	Y	0.321**	0.306**	0.113	0.090	0.670**	0.834***
			(0.152)	(0.144)	(0.193)	(0.172)	(0.298)	(0.303)
Diversification	+	Y	0.273***	0.123	-0.510	-0.509	0.300***	0.313**
			(0.088)	(0.110)	(0.345)	(0.344)	(0.090)	(0.124)
Cost to Income	-	N, insignificant	0.227	0.171	0.263	0.074	0.471	0.666
			(0.186)	(0.192)	(0.210)	(0.209)	(0.420)	(0.442)
IB Dummy	-	Y	-0.500***	-0.514***				
			(0.172)	(0.170)				
GDP growth	+	N, insignificant		-0.740		-0.598		-0.897
				(0.642)		(0.899)		(0.868)
Inflation	-	Y		-0.312*		-0.631**		0.126
				(0.188)		(0.259)		(0.255)
Governance	+	N, insignificant		-0.639		-1.168**		-0.335
				(0.405)		(0.568)		(0.538)
Concentration	-	N, insignificant		-0.457		-1.118		1.361
				(0.702)		(0.938)		(0.972)
Observations			265	249	140	136	125	113
R-squared			0.180	0.185	0.130	0.194	0.248	0.236

Table 6. PCSE regression: NPL ratio

	Expected relationship	Results = expected relationship? Yes, No	(1) Full	(2) Full	(3) CB	(4) CB	(5) IB	(6) IB
Bank Size	-	N	0.187**	0.254***	0.442***	0.549***	-0.048	-0.081
			(0.074)	(0.078)	(0.125)	(0.122)	(0.076)	(0.072)
Asset Growth	+	Y, insignificant	0.007	-0.064	0.085	-0.035	-0.042	-0.054
			(0.071)	(0.078)	(0.131)	(0.144)	(0.060)	(0.064)
Cost to Income	+	Y, insignificant	0.193	0.430	-0.050	0.331	0.079	0.161
			(0.283)	(0.284)	(0.380)	(0.361)	(0.242)	(0.266)
Loan to Asset	-	N, insignificant	-0.072	-0.043	-0.349	-0.344	-0.557**	-0.641***
			(0.254)	(0.240)	(0.315)	(0.282)	(0.227)	(0.234)
Diversification	-	Y	-0.562***	-0.424***	-1.818***	-1.835***	-0.407***	-0.363***
			(0.074)	(0.097)	(0.485)	(0.464)	(0.060)	(0.097)
IB Dummy	+	Y	0.402**	0.522***				
			(0.178)	(0.185)				
GDP growth	-	Y, insignificant		-0.598		-1.091		-0.412
				(0.677)		(1.089)		(0.598)
Inflation	+	N, insignificant		0.192		0.208		0.038
				(0.199)		(0.296)		(0.180)
Governance	-	N, insignificant		0.126		0.009		0.245
				(0.438)		(0.665)		(0.406)
Concentration	+	Y		2.921***		4.277***		1.115
				(0.681)		(0.953)		(0.807)
Observations			256	240	132	128	124	112
R-squared			0.146	0.201	0.173	0.285	0.350	0.399

Table 7. FGLS regression *Z*-score

	(1) Full	(2) Full	(3) CB	(4) CB	(5) IB	(6) IB
Bank Size	0.152**	0.128**	0.202**	0.169**	0.282**	0.335**
	(0.062)	(0.064)	(0.085)	(0.084)	(0.123)	(0.137)
Asset Growth	-0.134*	-0.109	-0.118	-0.071	-0.117	-0.130
	(0.070)	(0.073)	(0.109)	(0.113)	(0.089)	(0.093)
Loan to Asset	0.321**	0.306**	0.113	0.090	0.670**	0.834**
	(0.136)	(0.136)	(0.171)	(0.168)	(0.326)	(0.329)
Diversification	0.273***	0.123	-0.510	-0.509	0.300***	0.313**
	(0.094)	(0.117)	(0.350)	(0.345)	(0.093)	(0.130)
Cost to Income	0.227	0.171	0.263	0.074	0.471	0.666
	(0.201)	(0.212)	(0.248)	(0.258)	(0.388)	(0.432)
IB Dummy	-0.500***	-0.514***				
	(0.165)	(0.169)				
GDP growth		-0.740		-0.598		-0.897
		(0.637)		(0.902)		(0.863)
Inflation		-0.312		-0.631**		0.126
		(0.192)		(0.262)		(0.266)
Governance		-0.639		-1.168**		-0.335
		(0.421)		(0.589)		(0.569)
Concentration		-0.457		-1.118		1.361
		(0.675)		(0.893)		(1.012)
Observation	265	249	140	136	125	113

Note: Standard errors are in parenthesis

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

Table 8. FGLS regression: NPL ratio

	(1)	(2)	(3)	(4)	(5)	(6)
	Full	Full	CB	CB	IB	IB
Bank Size	0.187***	0.254***	0.442***	0.549***	-0.048	-0.081
	(0.066)	(0.067)	(0.107)	(0.104)	(0.082)	(0.086)
Asset Growth	0.007	-0.064	0.085	-0.035	-0.042	-0.054
	(0.074)	(0.077)	(0.132)	(0.135)	(0.061)	(0.061)
Loan to Asset	-0.072	-0.043	-0.349*	-0.344*	-0.557**	-0.641***
	(0.140)	(0.138)	(0.208)	(0.197)	(0.217)	(0.208)
Diversification	-0.562***	-0.424***	-1.818***	-1.835***	-0.407***	-0.363***
	(0.097)	(0.119)	(0.423)	(0.405)	(0.062)	(0.083)
Cost to Income	0.193	0.430**	-0.050	0.331	0.079	0.161
	(0.211)	(0.218)	(0.307)	(0.302)	(0.257)	(0.273)
IB Dummy	0.402**	0.522***				
	(0.174)	(0.177)				
GDP growth		-0.598		-1.091		-0.412
		(0.651)		(1.050)		(0.547)
Inflation		0.192		0.208		0.038
		(0.196)		(0.301)		(0.171)
Governance		0.126		0.009		0.245
		(0.435)		(0.687)		(0.370)
Concentration		2.921***		4.277***		1.115*
		(0.688)		(1.021)		(0.647)
Observation	256	240	132	128	124	112

Note: Standard errors are in parenthesis

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

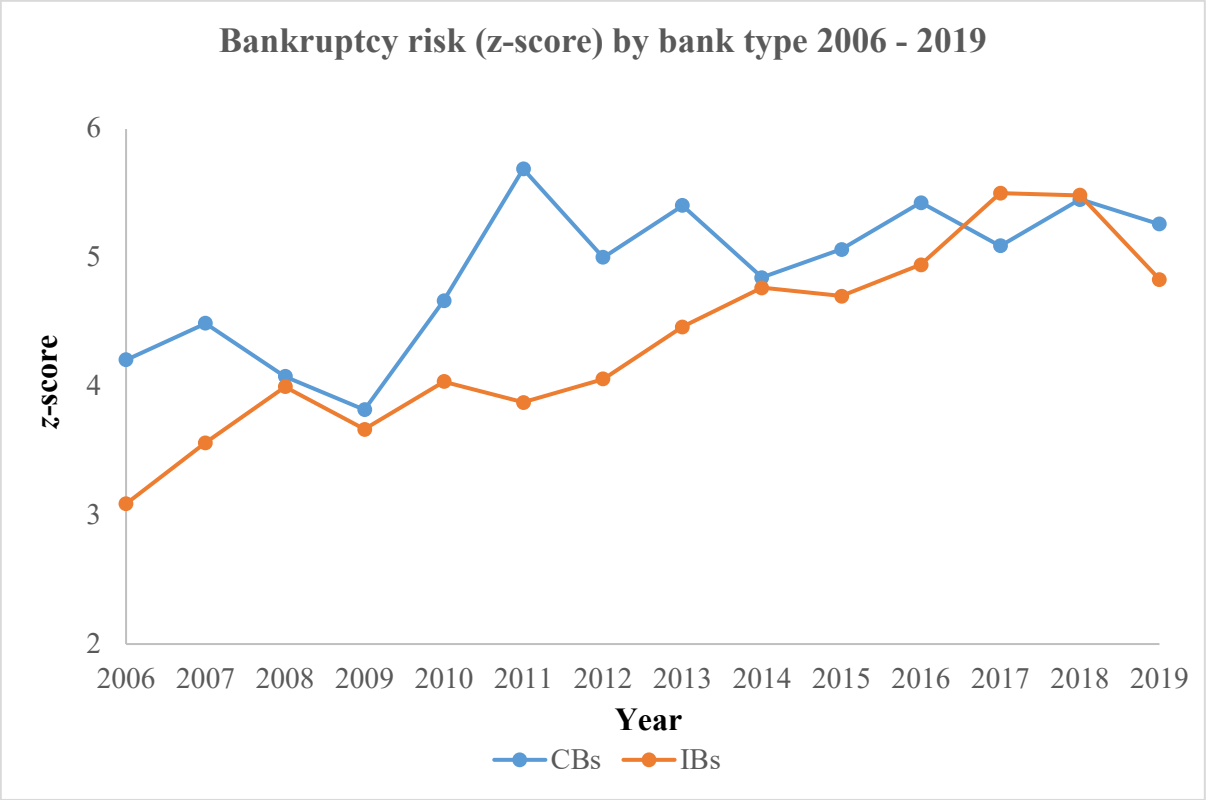

Figure 1. Ln (*Z*-score) of the Malaysian CBs and IBs. (Source: Authors' calculation based on the *Orbis Bank Focus* database.)

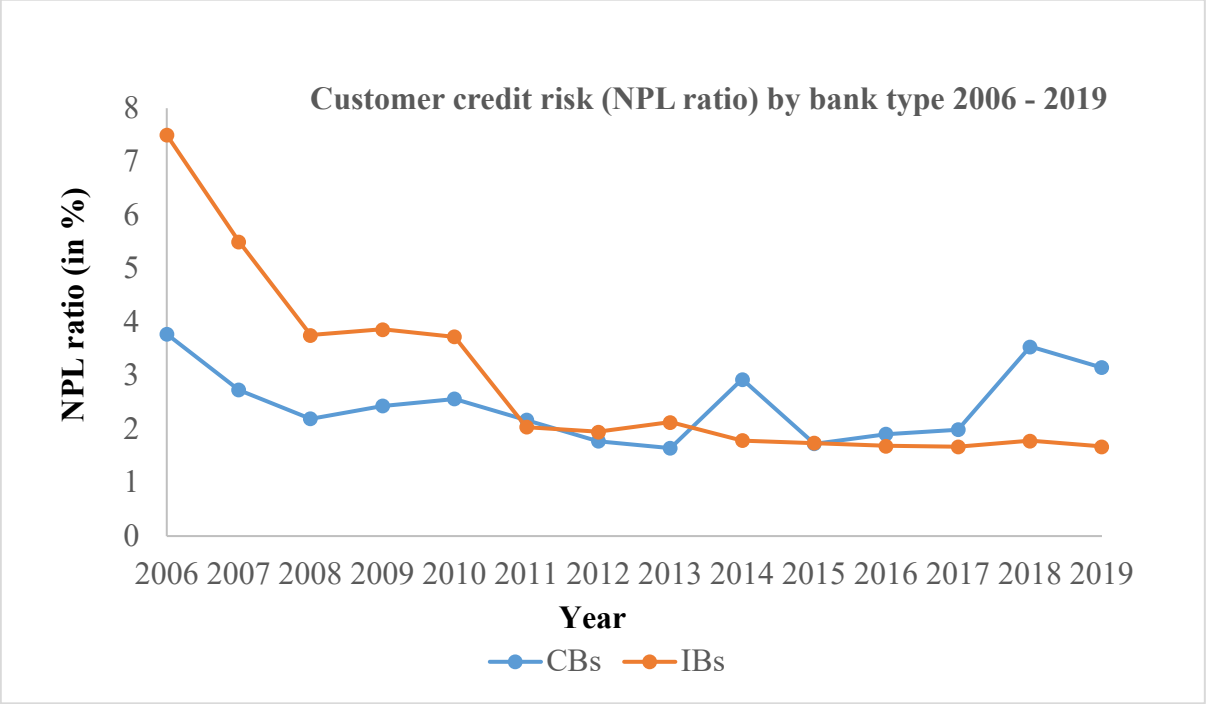

Figure 2. Credit risk (NPL ratio) of Malaysian banking industry by bank type over the period of 2006-2019. Source: Authors' calculation based on the *Orbis Bank Focus* database

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