

Credit Risk Analysis Of Islamic Bank VS Conventional Bank In Malaysia

Nurul Farhanah Kamsani¹, Siti Aida Sheikh Hussin², Zalina Zahid³

^{1,2,3}Lecturer Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA (UiTM)

Shah Alam, Selangor, Malaysia.

DOI: 10.47750/pnr.2022.13.S10.027

Abstract

The market-based approach is an alternative to accounting-based approach. The use of accounting information alone does not reflect the appropriate level of credit risk for banks. Therefore, comparisons of credit risk between two groups of banks using both approaches are essential. The aim of this present study is two-fold. First, the level of credit risk between Islamic banks and conventional banks was measured and compared. Second, the level of credit risk was empirically compared using several approaches. The credit risk of two domestic full-fledged Islamic banks and four domestic conventional banks was assessed between 2014 and 2018 using two accounting-based approaches (non-performing financing (NPF) & non-performing loan (NPL) ratios) and Z-score. For higher comparability, the level of credit risk was measured based on distance to default (DD) and probability of default (PD) using KMV Merton model as the market-based indicator. Further statistical test for equality of variances was performed to execute a reliable and meaningful comparison between the two bank groups. The results derived from Z-score and KMV Merton model revealed higher credit risk in Islamic banks, in comparison to conventional banks. The NPF and NPL ratios exhibited contradicting outcomes for Islamic banks (lower credit risk). These findings signify that it is vital for Islamic and conventional banks to implement both accounting- and market-based measures as varying approaches yield different results for credit risk assessment.

Keywords: Credit risk, non-performing financing, KMV Merton model.

INTRODUCTION

In Malaysia, the banking industry is very competitive with dual banking systems - Islamic banks and conventional banks. Credit risk occurs throughout the activities undertaken by the banking institution, such as loans and derivatives trading. There is no exception even for large banks, for example, Lehman Brothers who was the fourth-largest U.S investment bank had been exposed to severe credit risk due to subprime loans and filed for bankruptcy in 2008. This case proves that even a large and successful bank can face bankruptcy. Consequently, the collapse of Lehman Brothers had triggered economic downturn, not only in the U.S and Europe but also in Malaysia. Financial crises have created an ongoing argument among the public regarding the stability and resilience of Malaysian local banks, especially Islamic banks due to their different asset and liability management as well as profit and loss sharing basis when compared to conventional banks.

On the asset side of the balance sheet, conventional banks rely on fixed-income securities with interest-based investment that has low credit risk, while Islamic banks rely on a combination of equity (Mudarabah & Musharakah) and debt-based (Murabahah, Ijarah, Salam, & Istisna) instruments that not only possess credit risk but also higher uncertainty in the rate of return on investment. Islamic banks are assumed to possess higher credit risk than conventional banks. In opposed to expectations, Kabir et al. [i] found the accounting-based approach results using non-performing loans (NPL) ratio and Z-score contradicted the market-based approach results using Merton model. Accordingly, this issue has led to an interesting debate on whether credit risk varies depending by on the method deployed.

DATA

Data were gathered from the financial statements published by firms and the Thomson Reuters database. In addition, daily share prices were selected from Yahoo Finance. All data were derived from year 2014 to 2018. Table 1 tabulates the description of variable.

Table 1. Description of variables

Variable	Description
Non-Performing Financing (NPF) and Non-Performing Loan (NPL) ratios	
a) Gross impaired financing	The number of total financing which are doubtful
b) Total gross financing	The nominal value of financing to customer
c) Non- performing loans	The number of loans which are doubtful
d) Total loans	The nominal value of loans to customer
A lower NPL/NPF ratio indicates better asset quality	
Z Score	
a) Net profits	Net income after taxes
b) Total assets	Total assets of a company
c) Total equity	The total value of equity
A higher Z-score implies lower probability of bank's insolvency	
KMV Merton Model: Distance to Default (DD) components	
a) Daily share price	Adjusted closing price for dividend and splits
b) Number of outstanding shares	The number of shares issued and are currently owned by investors
c) Short term liabilities	Total short term borrowings of a bank
d) Long term liabilities	Interest bearing debt with maturities beyond one year
e) Risk free rate	3/6-month treasury rate
Higher DD score highlights that the value of firm is far from default point	

METHODOLOGY

Non-Performing Financing and Non-Performing Loan Ratios

In this study, the level of credit risk was estimated using the same method that was employed by Kabir et al. [1], namely NPF and NPL ratios; NPF ratio is the credit risk indicator in Islamic banks that has similar interpretation with NPL ratio for conventional banks. Equations 1 and 2 present the formula for NPF and NPL ratios.

$$NPF_{ratio} = \frac{\text{Gross impaired financing}}{\text{Total gross financing}} \quad (1)$$

On the contrary, the NPL ratio in conventional banks is given by:

$$NPL_{ratio} = \frac{\text{Non-performing loans}}{\text{Total loans}} \quad (2)$$

Ratio portrays the ability of a bank to manage problem; either loan or financing, and to improve credit risk management practices.

Z-Score

Z-score is a key index used to measure the level of credit risk interpreted as the necessary number of the standard deviations of return on assets (ROA) to wipe out equity capital, with the assumption normality of bank returns [2]. Hence, Z-score is expressed as:

$$Z\text{-score} = \frac{\mu + K}{\sigma} \quad (3)$$

In equation 3, " μ " is ROA or net income over total assets; K is leverage ratio or total equity over total assets; and " σ " is standard deviation of ROA as a proxy for return volatility.

KMV Merton Model

The level of credit risk can be estimated in a more reliable manner by using market-based approach, such as KMV Merton model. Originally, Merton model has two assumptions. First, the total market value of firm assets follows the stochastic process, which is a geometric Brownian motion:

$$dV_A = \mu V_A dt + \sigma_A V_A dW \quad (4)$$

where " V_A " is the market value of firm assets, " μ " is the expected ROA, " σ_A " is the volatility of assets, and " dW " is the standard Weiner process. If any firm issues a single discount bond maturing in T period, Black and Scholes equation for call options should be applied for the value of firm equity:

$$V_E = V_A N(d_1) - X e^{-rT} N(d_2) \quad (5)$$

where V_E is the market value of firm equity, X is the default point, and r is the risk-free rate. $N(d_1)$ and $N(d_2)$ are the cumulative standard normal distribution functions of d_1 and d_2 , whereby:

$$d_1 = \frac{\ln\left(\frac{V_A}{X}\right) + (r + 0.5\sigma_A^2)T}{\sigma_A \sqrt{T}} \quad (6)$$

$$\text{and } d_2 = d_1 - \sigma_A \sqrt{T}$$

KMV Corporation has further extended the Merton model:

$$\sigma_E = \left(\frac{V_A}{V_E}\right) N(d_1) \sigma_A \quad (7)$$

In other words, KMV Merton model is composed of two non-linear simultaneous equations, one being Black–Scholes (5) and the other equation is from Ito's Lemma (7). Given these points, there are three major steps in estimating default probability using KMV model: (a) estimate asset value " V_A " and its volatility " σ_A "; (b) measure distance to default (DD), and (c) map the probability of default (PD) with DD [3].

In step 1, five input variables are required to compute market value of assets, " V_A " and its volatility, " σ_A " using Mathcad software. The steps are as follows:

- a. Calculate market capitalisation by multiplying the closing share price with the number of outstanding shares.

- b. Calculate daily returns of the adjusted share price for each year, from 1st January to 31st December by $\sigma_{D_t} = \ln\left(\frac{S_{i,t}}{S_{i,t-1}}\right)$, where $S_{i,t}$ and $S_{i,t-1}$ are the underlying stock closing price after adjustments. Subsequently, annualise the daily returns by multiplying daily volatility of equity with average trading days based on Malaysia market for five years: $\sigma_{Y_t} = \left[\sigma_{D_t}\right] \times \sqrt{249}$.
- c. Calculate default point by adding up short-term debt and half of long-term debt, as default occurs more frequently at critical point of 50%.
- d. Determine risk-free-rate issued by BNM based on 3-6 months of Treasury rate.
- e. Set the time horizon to 1 year and solve equations (5) and (7).

In step 2, the DD at time "T" is mathematically expressed as:

$$DD_t = \frac{E(V_{A,t}) - X_t}{E(V_{A,t}) \times \sigma_A} \quad (8)$$

Subsequently, $E(V_{A,t})$ is $V_0 \exp(\mu t)$, which is log-normality distributed. Hence:

$$DD_t = \frac{\ln\left(\frac{V_{A,t}}{X_t}\right) + \left(\mu - \frac{1}{2}\sigma_A^2\right) T}{\sigma_A \sqrt{T}} \quad (9)$$

However, calculation of the company drift rate needs to be undertaken first before measuring DD. Alternatively, DD is estimated based on the similar approach used by Wang *et al.* [iv]. It is assumed in measuring DD, $E(V_A) = V_A$. Therefore:

$$DD_t = \frac{V_{A,t} - X_t}{V_{A,t} \times \sigma_A} \quad (10)$$

Lastly, in step 3, the theoretical implied PD at one-year interval can be described as:

$$PD = N(-DD) = 1 - N(DD) \quad (11)$$

DATA ANALYSIS AND INTERPREATION

Findings on Non-Performing Financing (NPF) and Non-Performing Loan (NPL) Ratios

Table 2 highlights the NPF and NPL ratios of Islamic and conventional banks respectively, for year 2014 to 2018. In 2014, the average of NPF was slightly higher than the average of NPL; indicating marginal losses for Islamic banks. On the contrary, over the past four years, the average of NPF was lower than the average of NPL; suggesting lower credit risk in Islamic bank. This signified that the customers were willing to place their savings in Islamic banks. According to Nor and Masih [v], financing derived its value from Shariah-compliant products that differ from conventional products, therefore, NPF was lower than NPL, but sufficient to create high demand from time to time.

While conventional banks charge *riba* (interest) on customers' default, which is prohibited by Shariah, Islamic banks have been implementing two mechanisms: *ta'widh* (compensation) and *gharamah* (penalty). These actions prevent moral hazard as people do not take for granted any credit or financing given to them, keeping NPF fall below conventional loans [vi]. From this analysis, it can be concluded that from 2015 onwards, Islamic banks had lower credit risk, thus more stable than conventional banks in Malaysia based on financing and loan quality.

Table 2. Average Trend of NPF and NPL Ratio by year (%)

Year	Islamic Banks					Conventional				
	O	Mean	SD	Min	Max	O	Mean	SD	Min	Max
2014	2	1.9	1.0	1.1	2.6	4	1.7	1.1	0.6	3.1
2015	2	1.6	0.8	1.09	2.2	4	1.7	1.0	0.5	3.1

2016	2	1.5	0.8	0.98	2.2	4	2.0	1.2	0.5	3.3
2017	2	1.6	0.9	0.93	2.1	4	2.0	1.2	0.5	3.4
2018	2	1.4	0.7	0.92	1.9	4	1.8	1.0	0.5	2.9

Bold represents higher NPF/NPL

Findings on Z-Score

Table 3 shows the Z-score of Islamic banks and conventional banks for year 2014 to 2018. Interestingly, the average amount of Z-score of Malaysian conventional banks far surpassed the average amount of Z-score of Malaysian Islamic banks over the past five years; reflecting the lower credit risk in conventional banks. Wahid and Dar [7] also found that the Z-score of Malaysian conventional banks was generally higher than the Z-score of the Malaysian Islamic banks during the post-crisis period, from 2008 to 2013. This is due to the reason that both profitability (ROA) and leverage ratios indicate a positive effect on Z-score.

On average, conventional banks displayed higher ROA than Islamic banks over the five years. This observation revealed that the conventional banks in Malaysia had utilised their assets efficiently, hence they were more capable of generating profits than Islamic banks. This scenario is ascribed to wide shares of conventional banks in the financial market [8-9]. Significantly, the outcome offers compelling evidence as it is supported by Wahid and Dar [7] based on data in Malaysia from 2004 to 2013.

Table 3. Average Trend of Z-Score by year

Year	Islamic Banks			Conventional						
	O	Mean	SD	Min	Max	O	Mean	SD	Min	Max
2014	2	95.6	45	63	127	4	152.0	91	59	261
2015	2	92.1	47	58	125	4	154.9	100	58	276
2016	2	92.5	41	63	121	4	164.9	102	61	287
2017	2	98.7	47	65	132	4	172.7	105	63	300
2018	2	98.	40	69	126	4	173.1	108	65	307

Bold represents lower z-score (higher credit risk)

On average, conventional banks exhibited a higher leverage ratio than Islamic banks over the selected period (2014 to 2018), signifying that conventional banks were indeed well-capitalised. The leverage ratio for conventional banks was higher than Islamic banks after the post-crisis period, from 2008 until 2013 [7]. This depicts that conventional banks were more solvent than Islamic banks after the post-crisis period due to their ability to improve their resilience. To sum up, a higher Z-score was obtained from higher ROA and leverage ratio; reflecting low exposure to credit risk.

Findings on KMV Merton Model

Two important quantities of the KMV Merton model, namely DD and PD, were used as market-based indicators of credit risk. For this analysis, year 2014 was excluded due to data unavailability to calculate the default point of Islamic banks.

The DD results are presented in Table 4. Throughout the sample period of 4 years, the Islamic banks generally exhibited higher credit risk due to smaller DD. This is attributed to the KMV Merton approach, in which value of assets and its volatility are critical parameters in determining credit exposure; market value of assets indicates a positive effect on DD, but at the same time, volatility of assets exerts a negative effect on DD [3].

Table 4. Average Trend of DD by year

Year	Islamic Banks					Conventional				
	O	Mean	SD	Min	Max	O	Mean	SD	Min	Max
2014										
2015	2	4.9	0.9	4.4	5.6	4	5.8	2.7	3.1	8.4
2016	2	3.2	1.7	2.0	4.4	4	6.3	4.8	2.6	13.0
2017	2	4.7	2.2	3.1	6.2	4	9.2	5.2	5.4	16.6
2018	2	3.5	2.1	2.0	4.9	4	8.3	2.3	5.5	10.6

Bold represents lower DD (higher credit risk)

The market value of assets for Malaysian Islamic banks obtained from Mathcad software fell well below that of the Malaysian conventional banks in the last 4 years. These results could stem from the smaller size of Islamic banks; hence they might have faced higher constraints to receive loans or raise funds at a reasonable cost over the period. Conventional banks, on the other hand, had higher assets value as they are larger in size and could compete more effectively to gain more funding via deposits, especially on the basis of loans (e.g., savings & term deposit). As smaller market value of assets in Islamic banks decreased the DD, it increased the level of credit risk and vice versa.

Meanwhile, the asset volatility of Islamic banks was larger and this lowered its DD. Conventional banks, on the other hand, had smaller asset volatility, hence increased its DD. Correia et al. [10] pointed out that higher asset volatility (in this case, Islamic banks) implies a greater chance that market value of assets will not cover debt in future, thus increasing the PD. To sum up, this finding is consistent with the expectation of the KMV Merton model.

There was insignificant difference in the means of Islamic banks and conventional banks samples. The two bank groups had approximately equal variance on the NPF and NPL ratios. On the contrary, there was a statistically significant difference between the variances for Islamic and conventional banks using Z-score and KMV Merton model (DD & PD). To put it differently, conventional banks displayed statistically significant higher variability than Islamic banks.

CONCLUSION

All methods revealed that Islamic banks had higher credit risk than conventional banks, except the first method - NPF and NPL ratios. Based on Z-score, DD, and PD, the observed difference between Islamic banks and conventional banks in this study had been significant, despite the insignificant difference between both bank groups using NPF and NPL ratios. Therefore, it is difficult to reach a general conclusion from the gathered evidence. In precise, Islamic banks might be doing well in managing their impaired financing, but the single aspect alone does not make it clear if the banks as a whole is stable and far from default. Although it is quite possible for a firm with strong balance sheets to file for bankruptcy as firm failure takes several years to happen, the market-based approach has the appropriate and superior predictive ability in capturing extreme events as it contains all the information in accounting statements while simultaneously reflecting market instruments. To sum up, it is crucial to imply both accounting- and market-based measures as different approaches yield different results in analysing the credit risk of Islamic banks and conventional banks.

REFERENCES

1. N. A. Karim, S. M. S. J. Alhabshi, S. Kassim and R. Haron, "Measuring bank stability: A comparative analysis between Islamic and conventional banks in Malaysia," in Proceedings of the 2nd Advances in Business Research International Conference, Singapore, 2018.
2. J. Li and M. Olsson Lo, "Credit risk management of the Chinese banks based on the KMV model," M.S. thesis, School of Economics and Management, Lund University, Lund, Sweden, 2009.
3. C. P. Wang, L. J. Qu and J. W. Li, "Commercial bank credit risk measurement based on KMV model studies," presented at the International conference on Engineering Management, Engineering Education and Information Technology, Paris, 2015.

4. A. M. Nor and M. Masih, "Do Islamic banks lead or lag conventional banks? Evidence from Malaysia," MPRA Paper, 2017.
5. A. Abdullah, "Late payment treatment in Islamic banking institutions in Malaysia: A Maqasid analysis," *International Journal of Academic Research in Business and Social Sciences*, vol. 8, no. 11, pp. 30–43, 2018.
6. M. A. Wahid and H. Dar, "Stability of Islamic versus conventional banks: A Malaysian case," *Jurnal Ekonomi Malaysia*, vol. 50, no. 1, pp. 111-132, 2016.
7. M. H. Anuwar and M. M. Jaffar, "Grading the Probabilities of Credit Default Risk of Malaysian Listed Companies by Using the KMV-Merton Model," *AIP Conference Proceeding*, vol. 2870, no. 1, 2017.
8. M. Z. Hazny, H. M. Hasim and A. Y. Yusof, "Mathematical Modelling of a Shariah-Compliant Capital Asset Pricing Model," *Journal of Islamic Accounting and Business Research*, pp. 1-21, 2020.
9. A. N. A. Ramli, S. S. M. Khairi and N. A. Razlan, "Performance Measurement of Islamic and Conventional Banking in Malaysia Using Two Stage DEA Model," *International Journal of Academic Research in Business and Social Sciences*, vol. 8, no. 4, 2018.
10. N. M. Yusof and M. M. Jaffar, "Forecasting the Probability of Default of PN18 Company Using KMV-Merton Model," *International Journal of Applied Mathematics and Statistics*, vol. 53, no. 5, 2014.
11. R. M. Dom, M. F. Ibrahim and C. L. C. Sulaiman, "Performance of Unit Trust Funds in Malaysia: A Comparison between Conventional and Islamic Unit Trust," *Social and Management Research Journal*, vol. 11, no. 1, 2015.
12. T. Khan, W. Ahmad, M. K. U. Rahman and F. Haleem, "An investigation of the performance of Islamic and interest-based banking evidence from Pakistan," *HOLISTICA—Journal of Business and Public Administration*, vol. 9, no. 1, pp. 81-112, 2018.
13. R. Sukmana and N. A. Febriyati, "Islamic banks vs conventional banks in Indonesia: An analysis on financial performances," *Jurnal Pengurusan (UKM Journal of Management)*, vol. 47, pp. 81-90, 2016.
14. M. Correia, J. Kang and S. Richardson, "Asset volatility," *Review of Accounting Studies*, vol. 23, no. 1, pp. 37-94, 2018.