Determinants of Banking Credit Default in Indonesia: A Comparative Analysis

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Abstract

This study aims to analyze the determinants of Islamic banking credit default compared with conventional banking in Indonesia. This study utilized time-series analysis, by which ordinary least square method is adopted. 40 monthly data observations from January 2003 until April 2006 are used. The study is divided into two models, namely Islamic banking model and conventional banking model. The values of non-performing financing (NPF) in Islamic banking and non-performing loan (NPL) in conventional banking are treated as the dependent variables. The results showed that two-month lagged of non-performing financing (NPF), total asset (ASSET), the amount of third-party-funds (TPF), one-month lagged of total financing (DFIN), and growth of gross-domestic product (GDPG) variables have significant impact to the ratio of non-performing financing (NPF) in Islamic banking. Meanwhile, the three-month lagged of non-performing loan (DDDNPL), total asset (CASSET), three-month as well as two-month period lagged of total loan (DDDCRED and DDCRED), inter-bank money market (PUAB), and growth of gross-domestic (GDPG) are significant to influence the ratio of non-performing loan (NPL) in conventional banking. The result also implied that the general election in 2004 had a significant influence to the ratio of non-performing financing (NPF) in Islamic banking.

Even tough from the outset, it seems Islamic banking has a better performance than conventional banking by having a relatively low NPF, this study, however, has found the opposite. Albeit, Islamic banking showing a good long-run as well as short-run dynamics among all variables in the beginning, after modifying the model into autoregressive in the main analysis, results showed that conventional banking has a better performance than Islamic banking with higher correlation of determination. In this regard, we cannot assume that Islamic banking is performing poorly in managing credit default problems. This is because the result implied that the level of Islamic banking's R-squared, R-bar-squared and DW values are good. Therefore, although Islamic banking is relatively a new comer in the Indonesian banking industry, it has shown a good performance in the banking credit risk management and can compete head-on with conventional banking, respectively.

JEL Classification: C32, C82, G21
Keywords: *Islamic Banking, Conventional Banking, Indonesia, Credit Default, and Time-Series Analysis*

1. Introduction

1.1. Background of Study

Islamic banking has been performing a remarkable growth in Indonesia. The development of Islamic banking in terms of number of banks has shown a sound improvement. Since Bank Muamalat Indonesia (BMI) was established in 1992, another seventeen Islamic banks were also established from 1998-2005. During the period of 1998 to 2001, Islamic banking has grown rapidly in terms of assets size at about 74% annually, from 479 billion IDR to 2.718 trillion IDR. Currently, the total asset of Islamic banking is increasing to the level of 20.58 trillion IDR.

In 2005, third party's funds collection activity of Islamic banking increased from 3.7 trillion IDR (31.4%) to 15.6 trillion IDR. From the account type, *wadiah* current account increased by 0.4 trillion IDR (26.2%), *mudharabah* saving increased by 1.1 trillion IDR (33.9%), while *mudharabah* time deposit increased by 2.2 trillion IDR (31.4%). Likewise, the increasing trend raised the share of Islamic banking third party's funds in the national banking industry for 1.38%. From profitability side, Islamic banking was able to record a profit level of 238.6 billion IDR in 2005, increased by 76.3 billion (47%) compared to 2004. The revenue of Islamic banking (79%) mostly resulted from the margin of *murabahah* and the profit sharing from *musharakah and mudharabah* financing.

Despite showing a good performance, Islamic banking has to bear with several challenges. One of which is the issue of risk management, particularly credit risk. Credit risk, or financing risk in Islamic banking term, is the risk that counterparty will fail to meet its obligations timely and fully in accordance with the agreed terms (Khan and Ahmed, 2001). This risk can occur in the banking and trading books of the bank. Credit risk arises when counter-party fails to meet its loan or financing obligations fully in the stipulated time. This risk is associated with the problem of credit default. Due to this risk, there is uncertainty of net-income and market value of equity arising from non-payment and delayed payment. This risk is often measured by a specific financial ratio, namely non-performing loan (NPL).

When financial crisis took place in Indonesia during 1998-2001, the Indonesian banking sector has been badly hit by the depreciation of Indonesian rupiahs (IDR) against the US dollar. IDR fall has multiplied the value of the banks foreign debts as well as the value of their US dollar loans, which mostly fall under the non-performing category due to the real sectors bleak performance and their failure to make the necessary credit risk assessments. Interestingly, Islamic banking could still perform better to manage credit default problems compared to conventional banking as indicated by having a relatively low level of non-performing loan (NPL) just after the economic crisis in Indonesia.

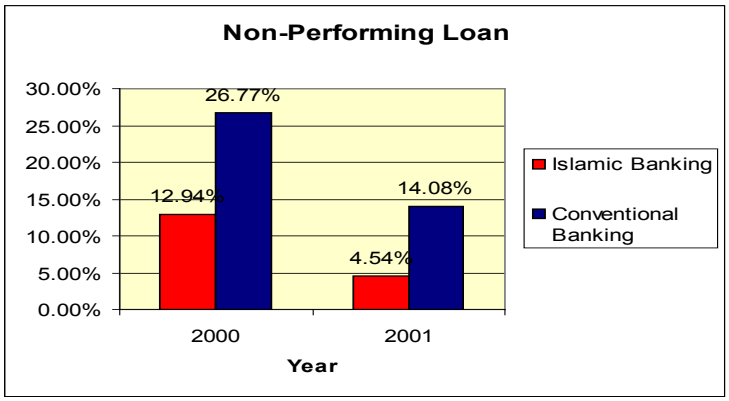

Figure.1 Non-Performing Loan

Source: Central Bank of Indonesia **(**www.bi.go.id**)**

Figure 1.1 describes that the value of NPL in Islamic banking is smaller compared to conventional banking in 2000 until 2001. In 2005, the concentration risk from financing allocated to the three main sources (business service, trading and construction) was also relatively controllable as reflected in the non-performing loan ratio against the total financing per sector which was under 5%.

Question now arises. How Indonesian Islamic banking cater the problem of credit risk as a result of credit default? What are the determinants of credit default in Indonesian Islamic banking compared to conventional banking? To answer these questions, this present study is conducted to model the determinants of credit default in Islamic banking. In order to know the position of Islamic banking, this study will utilise conventional banking as a benchmark analysis. It is expected that this study will give the latest picture of Islamic banking to manage the problem of credit default in Indonesia.

1.2. Aim and Objectives

This study aims to model the determinants of banking credit default in Indonesia through comparative analysis between Islamic and conventional banking.

The objectives of study are briefly explained as follows:

1. To measure the determinants problems of credit default in Islamic banking compared to the conventional banking.
2. To analyze on how Islamic banking manage its credit risk.
3. On the other place, to examine on how conventional banking solves the credit risk problems.

Hence, to postulate these aim and objectives, the following hypothesis is used to give a proper direction in this study.

H_1: Islamic banking has a better performance in managing credit default problem than conventional banking.

H_2: Conventional banking has a better performance in managing credit default problem than Islamic banking.

2. Previous Studies: A Survey

Recent empirical works have been attempted by several scholars in the area of credit risk management in banking context. Jimẽnez and Saurina (2006) had analyzed a study of credit cycles, credit risks, and prudential regulation with Spain as a case study. The study utilized the ratio of non-performing loan (NPL) as a dependent variable, and on the other side, independent variables are represented by the lagged one year of NPL, the growth rate of gross domestic products (GDPG), the real interest rate as a proxy of interbank interest rate less the inflation of period, total collaterized loans, size of the banks, and two Herfindhal indexes (one for region and one for industry).

Using GMM estimator, the study found that the macroeconomic control variables, i.e. GDPG and real interest rates, are both significant and have the expected signs. The acceleration of GDP as well as decline in real interest rates brings about decline in problem loans. The parameter of collaterized loans, although positive, is not significant. The size of the bank does not have a significant to the problem loan ratio. Finally, the rate of loan growth lagged four years is positive and significant at the 1 percent level. The loan growth rate lagged three years is also positive, although not significant. Therefore, rapid credit growth today results in lower credit standards that eventually bring about higher problem loans.

On the other study, How, Karim, and Verhoeven (2005) had examined whether Islamic financing can explain three important bank risks in a country with a dual banking system: credit risk, interest-rate risk, and liquidity risk. Using Malaysian data, the study found that commercial banks with Islamic financing have significantly lower credit and liquidity risks but significantly higher interest-rate risk than banks without Islamic financing. There is also evidence that bank size is significantly related to credit risk; the proportion of loan sales to total liabilities and bank size are significant determinants of interest-rate risk; and off-balance-sheet financing, the extent of securitization, loan volatility, bank capital, and bank size are statistically significant related to liquidity risk.

Kalotychou and Staikouras (2003) had measured a study of loan concentration risk in Latin America. A logit framework was employed based on macroeconomic and financial data to determine the causes of Latin American debt crises in the last two decades. The analysis used a modification of the default indicator to explicitly incorporate country arrear capacity. A number of domestic and international signals are found to be important in determining earlier as well as recent incidents. Domestic fundamentals, however, bear a much heavier weight than global conditions, implying that policy-makers still enjoy some freedom in preventing crises by monitoring country vulnerability. Furthermore, this study focuses on the out-of-sample classification accuracy of the proposed estimator using various criteria and provides one-, two- and three-year-ahead forecasts for country default probabilities. Predictive performance is satisfactory with a reasonable reduction in accuracy in the out-of-sample period. Nevertheless, the findings indicate an upward bias towards type II errors.

Ranjan and Dahl (2003) had explored an empirical approach to the analysis of commercial banks' non-performing loans (NPLs) in the Indian context. The empirical analysis had evaluated on how banks' non-performing loans are influenced by three major sets of economic and financial factors, i.e., terms of credit, bank size induced risk preferences and macroeconomic shocks. The empirical results from panel regression models suggest that terms of credit variables have significant effect on the banks' non-performing loans in the presence of bank size induced risk preferences and macroeconomic shocks. Moreover, alternative measures of bank size could give rise to differential impact on bank's non-performing loans. In regard to terms of credit variables, changes in the cost of credit in terms of expectation of higher interest rate induce rise in NPLs. On the other hand, factors like horizon of maturity of credit, better credit culture, and favorable macroeconomic and business conditions lead to lowering of NPLs. Business cycle may have differential implications adducing to differential response of borrowers and lenders.

Lastly, Dy Nora'ain Hj Awg Besar (2005) had employed the topic of credit risk management as for her MA dissertation. The study analyzed Islamic Bank of Brunei Berhad (IBB) in terms of the performance of this bank profitability over the last ten years as well as its effectiveness in managing its credit risk. The main focus of the study was on the risk management aspect whilst, the minor part is the performance measurement. In order to analyze the profitability and effectiveness of its risk management, ratio analysis will be employed to measure its profitability, whereas financing loss provision will be used to study its credit risk management. A comprehensive ratio analysis utilized to provide the descriptive or as a non-parametric approach then proceed with the parametric studies to facilitate a more rigorous and dynamic analytical approach.

These several previous studies had concluded that the study of credit risk management in the banking sector is very important. Departing from these, this study aims to examine the performance of Islamic banking in credit risk management.

3. Methodology Of Study

3.1. Research Method

Research method is divided into two categories, i.e. qualitative and quantitative (Umar, 2002). Considering the aims and objectives, quantitative method is applied in this research. It uses time series analysis by utilizing Ordinary Least Square (OLS) method. OLS is a statistical technique that uses sample data to estimate the true population relationship between two variables, namely dependent and independent variables. OLS is a method to estimate and find the best fitting line which minimizes the sum of squared residuals (SSR), (Koop, 2000:40).

The reason why this study adopts this method is that under certain condition the OLS estimator can be shown to be more efficient than many competing estimators. One estimator is said to be more efficient than another if on average the former yields more accurate estimates than the latter. According to Pesaran and Pesaran (1997), the

reason for this terminology is that an estimator which yields more accurate estimates can be thought of as utilizing and defining the information available in the sample more efficiently.

3.2. Data

Mainly, economic data can be divided into two types, i.e. time series data and cross-sectional data (Koop, 2000:5-6). Time series data can be observed at many frequencies, such as: annually, quarterly, and monthly-basis. In contrast, the ordering of data in cross-sectional does not matter. This study adopts time series data, where it employs monthly secondary data of Islamic as well as conventional banking in Indonesia. Due to availability of data in Indonesia, this study focuses on 40 observations from January 2003 to April 2006. It is expected that by choosing this period, the latest capture of determinants of non-performing financings in Indonesia will be represented, since it covers the data for the last three years.

Data are mainly collected from four sources, as follows:

(1) Monthly Islamic Banking Statistics (Published by Bank Indonesia),

(2) Monthly Indonesian Financial Statistics (Published by Bank Indonesia),

(3) Monthly Indonesian Economic and Banking Review, and

(4) Monthly Data from Indonesian Statistic Centre Bureau.

2.3. Model Specification and Defining Variables

Basically, the departure point of this study is based on assumption adopted from Jimẽnez and Saurina (2006), which have written a paper with the title: "*Credit Cycle, Credit Risk, and Prudential Regulation"*, Banco de Espaňa, published on the International Journal of Central Banking. The study presented the model of determinants of banking credit default, which emphasizes on measuring problem loan ratios. In this regard, the credit risk is mostly resulted from the possibility of non-performing loan ratio occurred in the banking practice. There are, at least, five variables that have to be considered to measure the determinants of non-performing loan ratio that are as follows:

- Size of the banks
- Total loans
- Real interest rates as a proxy of inter-bank money market
- Growth of gross domestic product as a macroeconomic indicator; and
- Industrial index that represent the real sector of business activities

Hence, model specifications of determinants of banking financing defaults are explained from these following steps:

3.2.1. Basic Model

This study starts from this following basic regression model equation:

$$Y = \alpha + \beta X + \varepsilon \qquad (1)$$

where:

Y is referring to the dependent variable

X the independent or explanatory variable

α and β are the coefficients

ε is the error term

Since it applies a different case study, this study modifies the model with the variables that are available in the data sources. This study divides into main models, namely Islamic banking model and conventional banking model. Islamic banking model is the model of determinants credit default in Islamic banking, where the ratio of non-performing financing is treated as a dependent variable. Meanwhile, conventional banking model represents the determinants of loan credit default in conventional banking, by which the non-performing loan ratio is utilsed as a dependent variable. The models are estimated as follows:

3.2.2. Islamic Banking Model

$$NPF_t = \alpha + \beta_1 ASSET + \beta_2 TPF + \beta_3 FIN + \beta_4 PUAS + \beta_5 GDPG + \beta_6 MANI + \varepsilon \quad (2)$$

where:

NPF is the ratio of non-performing financing over total financings for Islamic banking in year *t.*

ASSET is the total assets of Islamic banking which represent the size of the banks.

TPF is total amount of third party's funds in Islamic banking.

FIN is the total financings to the customer in Islamic banking.

PUAS is a proxy as the Islamic inter bank money market in each period.

GDPG is the real growth rate of the gross domestic product in Indonesia. The availability of data is in quarterly basis; hence GDP growth is transformed via a Chow-Lin interpolation procedure into a monthly series data.

MANI is a manufacturing industrial index that represents the real sector.

3.2.3. Conventional Banking Model

$$NPL_t = \alpha + \beta_1 CASSET + \beta_2 CTPF + \beta_3 CRED + \beta_4 PUAB + \beta_5 GDPG + \beta_6 MANI + \varepsilon \quad (3)$$

where:

NPL is a ratio of non-performing loan over total loans for Islamic banking in year *t.*

CASSET is the total assets of conventional banking which represent the size of the banks.

CTPF is the total amount of third party's funds in conventional banking.

CRED is the total financing to the customer in conventional banking.

PUAB is a proxy as the inter bank money market in each period.

GDPG is the real growth rate of the gross domestic product in Indonesia. Since the

availability of data is in quarterly basis; hence GDP growth is transformed via a Chow-Lin interpolation procedure into a monthly series data.

MANI is a manufacturing industrial index that represents the real sector.

The dependent variable in both models is NPF/L. It is the ratio of non-performing financing/loans over total financing/loans. This study includes as a control variable the size of the banks, which is total asset in each period of time. In addition, the third party's funds are used as a control variable for the effectiveness of banks. Total financings/loans are also applied to consider the relationship with the non-performing ratio. The more financing given the more possibility suffer from problem of financing default. Also, this study controls for the macroeconomic indicator of credit default through the real rate of growth of the gross-domestic product and the real interest rate, proxies as the inter-bank money market. Since Islamic inter-bank money market, which is interest-free rate, is established in Indonesia, this study uses this variable for Islamic banking model. Furthermore, this study controls the risk-diversification strategies of banks through the inclusion of manufacturing industrial index.

4. Rectified Model

The basic model usually presents a lot of persistence from the problem of autocorrelation and heteroscedasticity. Autocorrelation comes up when the error terms of a regression model are correlated among themselves. Durbin-Watson (DW) statistic is used to detect the presence of autocorrelation problem, whereby the model will not suffer from this problem if the value of DW is in between 1.8 and 2.2. Meanwhile, heteroscedasticity is the situation when the error terms on the regression model do not have the same variance (Davidson and Mackinnon, 2004:197). If the error terms do have a same variance and it is said to be homoscedasticity.

Hence, in case of the possibility of these two problems might occurs in both models, Jimenez and Saurina (2006) suggested to modify the model into autoregressive (AR) model. It is a regression model where the independent variables are lags of the dependent variable (Koop, 2000:190). This study adds one, two, or three period lagged of variable non-performing financing/loans and replaces total financings/loans with one lagged period of the total financing/loans to the right hand side of the equation.

4.1. Steps of Empirical Analysis

To measure Islamic and conventional banking models, econometric procedure of empirical analysis is utilized. The procedure steps in the analysis of empirical result chapter are as follows:

1. Unit-Root Test

For a number of reasons, it can be important to know whether or not an economic time series has a unit-root (Davidon and Mackinnon, 2004:613). The distributions of estimators and test statistics associated with first integration iteration regressors may well

differ sharply from those associated with regressors that are at the level. Non-stationary data often has important economic implications. Therefore, it is very important to be able to detect the presence of unit roots in the time series. Hence, the unit root test is a necessary prelude to analyze the empirical result, where this study will adopt this test before estimating the model.

2. Co-Integration Test and Error Correction Model

After testing for unit-root problems, economic theory often suggests that two or more economic variables should be linked more or less closely (Davidson and Mackinnon, 2004:624). Although deterministic relationships among the variables in any one of the sets of model are usually assumed to hold only in the long-run, economic forces are expected to act in the direction of eliminating short run deviations from these long term relationships. The variables should have a long-run relationship and have to be co-integrated. Hence, the co-integration test will be employed in this study in order to detect whether there are a long run relationship in all variables or not.

Moreover, Asutay (2005) said that after detecting the long-run relationship, short-run dynamics should be tested. After having confirmed of the co-integration test, this study then will detect the short-run relationship by applying error correction model (ECM). ECM is a tool to measure the relationship among all variables in the model for the short-run dynamics.

3. Model Estimation

After utilizing unit-root test, co-integration test, and error-correction model, this study will estimate the models by applying ordinary least square method (OLS). Estimation of the model is the procedure by which the study infers information about the true but unknown values of the population parameter from the sample observations (Azid, 2006). The analysis will emphasize on testing the significance of each individual coefficients using the *t* test and the overall model using the *F* test, comment on the R^2 and $\overline{R}^2$ values as correlation determination between dependent and independent variables, and testing for the presence of autocorrelation and heteroscedasticity problems in both model.

5. Analysis of Empirical Results

5.1. Unit Root Test

Unit-Root test is applied to consider the trend-cycle decomposition of a time series equation [y_t] (James, 2005). The time series of dependent variable as well as independent variables are the examples of non-stationary time series. It is generated by random process and can be written as follow:

$$Y_t = Y_{t-1} + \varepsilon_t$$

where ε_t is the stochastic error term that follows the classical assumptions, which has zero mean, constant variance and is non-autocorrelated and Y is the time series. Since

this study needs to apply the stationary time series for the next cointegration test, error correction model, model estimation, and we also need to solve this unit root problem, hence the regression of unit root test based will be used on the following equation:

$$\Delta Y_t = \mu + \gamma Y_{t-1} + \delta_1 \Delta Y_{t-1} + \varepsilon_t$$

where this study adds the lagged difference terms of dependent variable Y to the right-hand side of equation (4). This augmented specification is then used to test this following hypothesis:

H_o: $\gamma = 0$ H_1: $\gamma < 0$

The Augmented Dickey-Fuller (ADF) statistics is used to test the unit root problem.

Islamic Banking

Table.1 Unit Root Test for Islamic Banking Model

Variables	Statictical Test and Critical Value				Integration Levels
	Levels		First Differences		
	ADF	CV (5%)	ADF	CV (5%)	
NPF	-1.9906 (7)	-3.5562	-3.8675 (2)	-3.5615	I (1)
ASSET	-2.3111 (0)	-3.5562	-4.6397 (2)	-3.5615	I (1)
TPF	-.37572 (4)	-3.5562	-5.4757 (2)	-3.5615	I (1)
FIN	-2.5768 (7)	-3.5562	-4.1165 (0)	-3.5615	I (1)
PUAS	-3.9066 (1)	-3.5562	-9.6208 (0)	-3.5615	I (0)
GDPG	-.40648 (0)	-2.9558	-3.1571 (0)	-2.9591	I (1)
MANI	-4.7921 (0)	-3.5562	-3.6492 (2)	-3.5615	I (0)

Source: Author's Own Calculation

Under the unit root test, the result shows that all variables of non-performing financing in Islamic banking are stationary at the first difference [I(1)], except the variable of Islamic inter-bank money market (PUAS) and manufacturing industrial index, by which both variables are stationary at the level [I(0)].

Conventional Banking

Table.2 Unit Root Test for Conventional Banking Model

Variables	Statictical Test and Critical Value				Integration Levels
	Levels		First Differences		
	ADF	CV (5%)	ADF	CV (5%)	
NPL	-1.0906 (7)	-3.5562	-4.0838 (0)	-3.5615	I (1)
CASSET	-1.7845 (7)	-3.5562	-8.0997 (0)	-3.5615	I (1)
CTPF	-.75453 (7)	-3.5562	-4.5684 (0)	-3.5615	I (1)
CRED	-2.0666 (7)	-3.5562	-4.4368 (0)	-3.5615	I (1)
PUAB	-.32735 (7)	-3.5562	-5.4951 (1)	-3.5615	I (1)

GDPG	-.40648 (0)	-2.9558	-3.1571 (0)	-2.9591	I (1)
MANI	-4.7921 (0)	-3.5562	-3.6492 (2)	-3.5615	I (0)

Source: Author's Own Calculation

On conventional banking model, the result shows that only manufacturing industrial index (MANI) variable that is able to reject the null hypothesis (H_0) at the levels. The rest variables are stationary at the first difference. It can be summarised that all of the variables in both Islamic and conventional banking models are stationary and the unit-root problem will not occur in both models.

5.2. Co-Integration Test

Co-integration test is employed to obtain the existence of a long-run relationship between time-series variables (Asutay, 2005). When it happens, the variables are said to be co-integrated. When variables are cointegrated, they satisfy one or more long-run relationships (Davidson and Mackinnon, 2004:624). The Residual-based ADF Test for co-integration is used to analyse this co-integration relationship.

Islamic Banking

Table.3 Co-integration Test for Islamic Banking Model

Co-integration Regression	Calculated ADF Residuals	Critical Value – (5%)
NPF = f (DDNPF, ASSET, TPF, DFIN, PUAS, GDPG, MANI)	-5.9333 (0)	-5.1757

Source: Author's Own Calculation

Under the residual-based ADF test, the result shows that the calculated ADF residual is higher than the critical value; hence we reject the null hypothesis that said there is no co-integration in the model. It can be concluded that there are long run relationship among all variables in Islamic banking model.

Conventional Banking

Table.4 Co-integration Test for Conventional Banking Model

Co-integration Regression	Calculated ADF Residuals	Critical Value –(5%)
NPL = f (DDDNPL, DDNPL, CASSET, DCTPF, DDDCRED, DDCRED, PUAB, GDPG, MANI)	-5.5264 (0)	-5.1757

Source: Author's Own Calculation

Similarly with Islamic banking model, all variables in conventional banking model have relationship in the long run, since the calculated ADF residual is higher than the critical value. Hence, this study needs to analyze the short-term relationship among all variables in the short-run.

Having confirmed the long run or cointegration relationship in the Islamic banking model, this study then will find the short-run relationship by constructing error correction model test. After taking the relevant variables in difference and residuals in one period lagged, then this study runs another regression. The result shows that residual in one period lagged (RES1) is not significant, which means that in one month period the variables do not have a short-run relationship. In order to know the relationship for every two month period, this research then adds variable RES2. The result finds that variable RES2 is statistically significant at 1% level. Hence, it can be concluded that there is a short-run relationship among all variables in every two month period.

5.3. Error Correction Model

Islamic Banking

Table.5 Error Correction Model Test for Islamic Banking Model

Dependent Variable DNPF	
Constant	4.4462[0.000]
DDNPF	4.4691[0.000]
DASSET	-3.9878[0.000]
DTPF	0.78167[0.441]
DFIN	0.32511[0.747]
DPUAS	0.37054[0.714]
DGDPG	-2.2333[0.033]
DMANI	-3.5617[0.001]
RES1	0.98825[0.331]
RES2	11.3656[0.000]
R^2	0.92627
Ř bar ^{2}	0.90593
DW	1.8568

Source: Author's Own Calculation

Conventional Banking

Table.6 Error Correction Model Test for Conventional Banking Model

Dependent Variable DNPL	
Constant	1.0402[0.307]
DDNPL	5.0014[0.000]

DCASSET	-.42307[0.675]
DCTPF	-1.2343[0.227]
DCRED	-.22576[0.823]
DPUAB	-.17336[0.864]
DGDPG	.37140[0.713]
DMANI	-1.3917[0.175]
RES1	0.63906[0.528]
RES2	0.63906[0.528]
R^2	0.70324
Ř bar ^{2}	0.62138
DW	2.2806

ource: Author's Own Calculation

Contrary with Islamic banking model, the result implies that all variables in conventional banking model do not have short-run relationships for one month period as well as two month period. It is confirmed by the variables of RES1 and RES2 which are not significant at any level. Thus, Islamic banking model is more controllable than conventional banking model in terms of short-run relationship among all variables.

5.4. Empirical Results: Model Estimation

The empirical results analysis will be divided into two main models, i.e. Islamic banking model and conventional banking model.

5.4.1. Islamic Banking Model

The result on table.7 confirms that only variables ASSET, TPF, GDPG, and FIN have significant impact to the ratio of non-performing financing (NPF) in Islamic banking. It is supported by showing a significant t-ratio of these variables. The slope coefficient ASSET indicates that for every 1 unit change in total assets of Islamic banking, the ratio of NPF increases by 0.57293. In contrast, a negative relationship occurs between TPF and NPF. It means that for every change of third party funds in every 1 unit, the ratio of NPF will be decreased by 1.2838. Meanwhile, if total financings in Islamic banking increase for 1 unit, the ratio of NPF will increase for 0.366. The change in growth of gross domestic product for unit will affect the increasing of ratio of NPF for 0.1164.

Table.7 Summary of Regression Result for Islamic Banking Basic Model

Equation	Significant at 0.01	Significant at 0.5	Significant at 0.1	Not Significant
NPF Constant = 1.8515 **R²** = 0.69737 Ř bar ² = 0.64234 **F-stat.** F(6,33) 12.6739[0.000] **DW-statistic** 1.4883 **Heteroscedasticity** *F(1,38)= 1.0159[0.320]	**TPF** Coef: -1.2838 T-Ratio -4.5855 **GDPG** Coef: 0.11640 T-Ratio 3.0393	**ASSET** Coef: 0.57293 T-Ratio 2.3053 **FIN** Coef: 0.36600 T-Ratio 2.1524	-	**PUAS** Coef: 0.0089445 T-Ratio 0.18938 **MANI** Coef: 0.0085129 T-Ratio 0.70398

Source: Author's Own Calculation

The heteroscedasticity problem will not occur in the model and the value of F-statistic finds that this model is overall significant. The value of R-squared and R-bar-squared are relatively high. Unfortunately, this model might suffer from the autocorrelation problem since the value of DW-statistic less than 1.8. The problem of autocorrelation occurs when the error terms of a regression model are correlated among themselves. Hence, this study modifies the model into autoregressive in order to remove the problem of autocorrelation.

Rectified Model: Introducing the Lagged Variables of NPF and FIN

Table.8 Summary of Regression Result for Islamic Banking Rectified Model

Equation	Significant at 0.01	Significant at 0.5	Significant at 0.1	Not Significant
NPF Constant = 0.063783 **R²** = 0.75950 Ř bar ² = 0.70520 **F-stat.** F(7,31) 13.9857[0.000] **DW-statistic** 1.5060 **Heteroscedasticity**	**DNPF** Coef: 0.51163 T-Ratio 3.2904 **ASSET** Coef: 0.88546 T-Ratio 4.6392 **TPF** Coef: -1.3407 T-Ratio -5.2076	**MANI** Coef: 0.023983 T-Ratio 2.3451	-	**DFIN** Coef: -0.32216 T-Ratio -1.1566 **PUAS** Coef: 0.0053959 T-Ratio 0.12350

*F(1,37)= 3.1688[0.083]	**GDPG** Coef: 0.11452 T-Ratio 3.1588		-	

Source: Author's Own Calculation

Since the problem of credit default presents a lot of persistence, this research adds the NPF variable in right-hand-side lagged one month, namely DNPF. Meanwhile, the ratio of NPF in one period is also affected by the total financings in the previous period, hence variable of DFIN is introduced to replace the variable FIN, where this variable is a proxy of lagged one month of variable FIN. From table.8, the result shows that although the variable DNPF is satistically significant, but the problem of autocorrelation cannot be removed since the value of DW statistic still less than 1.8. To solve this problem, this research adds variable DDNPF as a two month lagged of NPF to replace DNPF.

Final Model

Interestingly, after processing another regression analysis by adding the variable DDNPF and DFIN in the model, the value of DW statistic is 1.9763. Therefore, the problem of autocorrelation can be removed from the model. With a high value of R^2 = 0.79047, Řbar^2 = 0.74158, this model is overall statistically significant by showing a good F-statistic result. Heteroscedasticity problem will not occur in this model since the value of *F which is not significant at any level. Hence, this study uses this calculation as the final model of Islamic banking model.

Table.9 Summary of Regression Result for Islamic Banking Final Model

Equation	Significant at 0.01	Significant at 0.5	Significant at 0.1	Not Significant
NPF Constant = 0.97871 **R²** = 0.79047 Ř bar ² = 0.74158 **F-stat.** F(7,30) 16.1680[0.000] **DW-statistic** 1.9763 **Heteroscedastic-ity** *F(1,36)= 2.4155[0.129]	**DDNPF** Coef: 0.48787 T-Ratio 4.1228 **ASSET** Coef: 0.76558 T-Ratio 4.1706 **TPF** Coef: -1.1494 T-Ratio -4.721 **GDPG** Coef: 0.10927 T-Ratio 2.8963	**DFIN** Coef: -0.60655 T-Ratio -2.3738	-	**PUAS** Coef: 0.024073 T-Ratio 0.55670 **MANI** Coef: 0.016707 T-Ratio 1.6878

Source: Author's Own Calculation

The regression model of determinants of financing default in Islamic banking is now as follows:

$$NPF_t = 0.97871 + 0.48787\,DDNPF + 0.76558\;\; ASSET - 1.1494\;\; TPF - 0.60655\;\; DFIN + 0.10927\;\; GDPG$$

It can be interpreted that the slope coefficient DDNPF indicates that for every change in 1 unit of ratio of NPF in two month behind, the ratio NPF will increase for 0.48787. The coefficient ASSET indicates that for every 1 unit change in total assets of Islamic banking, the ratio of NPF increases by 0.76558. In contrast, a negative relationship still occurs between TPF and NPF. For every change of third party funds in every 1 unit, the ratio of NPF will be decreased by 1.1494. The result also finds that if total financings in Islamic banking increase for 1 unit, the ratio of NPF in the next month will decrease for 0.60655. The more financings are given to the customer, the less possibility of Islamic banking might suffer from financing default. This result contradicts with the early hyphothesis used in this research, whereby the more financing should impact the more possibility suffers from problem of financing default.

From macro variable, the change in growth of gross domestic product for a unit will affect the increasing of ratio of NPF for 0.10927. The result also shows that variable PUAS and MANI are not significant, since the t-calculated values of both variables are less than t-table. Although both variables have a positive correlation, but from the model it can be concluded that Islamic inter-bank money market and manufacturing industrial index do not statistically give significant influence to the NPF ratio in Islamic banking.

5.4.2. Conventional Banking Model

Table.10 Summary of Regression Result for Conventional Banking Basic Model

Equation	Significant at 0.01	Significant at 0.5	Significant at 0.1	Not Significant
NPL **R²** = 0.80319 Ř bar ² = 0.76741 **F-stat.** F(6,33) 22.4463[0.000] **DW-statistic** 1.4712 **Heteroscedasticity** *F(1,38)= 3.0907[0.087]	**PUAB** Coef: 0.48898 T-Ratio 6.6570 **GDPG** Coef: -0.23345 T-Ratio -5.0103	-	-	**CASSET** Coef: -0.0010200 T-Ratio -0.20876 **CTPF** Coef: 0.0040249 T-Ratio 0.55932 **CRED** Coef: 0.0097176 T-Ratio 1.5550 **MANI** Coef: -0.0029590 T-Ratio -0.23228

Source: Author's Own Calculation

This model is strong, since the value of R^2 (0.80319) and Ř bar ^{2} (0.76741) are high. F-statistic result also confirms that this model is overall significant. Only variable PUAB and GDPG have significant impact to the ratio of non-performing loan in conventional banking, as it is shown by the result of both t-ratios. Unfortunately, the DW statistic result confirms model might suffer from the problem of autocorrelation. Similarly, heteroscedasticity problem also occurs in the model since the value *F is significant at 10% level. Thus, similarly with Islamic banking model, this study modifies the model by introducing one-period-lagged from the variables.

Rectified Model 1: Introducing Lagged Variables of NPL and CRED

Table.11 Summary of Regression Result for Conventional BankingRectified Model (1)

Equation	Significant at 0.01	Significant at 0.5	Significant at 0.1	Not Significant
NPL Constant = -4.5846 **R^2 =** 0.85597 Ř bar ^{2} = 0.82345 **F-stat** F(7,31) 26.3201[0.000] **DW-statistic** 1.0790 **Heteroscedas-ticity** *F(1,37)= 1.0447[0.313]	**DNPL** Coef: 0.63241 T-Ratio 3.6349 **PUAB** Coef: 0.40383 T-Ratio 10.0251 **GDPG** Coef: -0.21413 T-Ratio -5.7617	**CTPF** Coef: 0.013925 T-Ratio 2.7192	-	**CASSET** Coef: -0.0013676 T-Ratio -0.31570 **DCRED** Coef: 0.0092865 T-Ratio 0.92410 **MANI** Coef: 0.0043268 T-Ratio 0.37251

Source: Author's Own Calculation

This study modifies the model by adding variable DNPL (one period lagged of NPL) and replacing CRED with its lagged variable, namely DCRED. Eventhough the values of R^2 and Ř bar ^{2} increase and the variable DNPL is significant and the heteroscedasticity problem will not occurs in the model, but the result reports that the problem of autocorrelation still occurs since the value of DW statistic decreases from 1.4712 to 1.0790. Hence, like the previous model, this study adds DDNPL as the value of two-period-lagged of NPL to substitute DNPL variable.

Rectified Model 2

Table.12 Summary of Regression Result for Conventional Banking Rectified Model (2)

Equation	Significant at 0.01	Significant at 0.5	Significant at 0.1	Not Significant
NPL Constant = -3.3897 **R² =** 0.85837 Ř bar ² = 0.82532 **F-stat** F(7,30) 25.9743[0.000] **DW-statistic** = 1.4430 **Heteroscedasticity** *F(1,36)= 1.4038[0.244]	**DDNPL** Coef: 0.44050 T-Ratio 3.7003 **PUAB** Coef: 0.37130 T-Ratio 8.6119 **GDPG** Coef: -0.20565 T-Ratio -5.3056	**CTPF** Coef: 0.012071 T-Ratio 2.3113	-	**CASSET** Coef: -0.4198E-3 T-Ratio -0.096417 **DCRED** Coef: -0.9390E-3 T-Ratio -0.088100 **MANI** Coef: 0.9495E-3 T-Ratio 0.081349

Source: Author's Own Calculation

After running another regression, the value of DDNPL is significant at 1% level. Unfortunately, the result in table 5.12 still finds that the value of DW-statistics is 1.4430 which means that it still in the range of autocorrelation problem.

Final Model: Utilising Lagged Variables of NPL, CTPF, and CRED

Table.13 Summary of Regression Result for Conventional Banking Final Model

Equation	Significant at 0.01	Significant at 0.5	Significant at 0.1	Not Significant
NPL Constant = -2.6869 **R² =** 0.89072 Ř bar ² = 0.85429 **F-stat** F(9,27) 24.4522[0.000] **DW-statistic** 1.8641 **Heteroscedasticity** *F(1,35)= 0.74597[0.394]	**DDDNPL** Coef: 0.57187 T-Ratio 2.9903 **CASSET** Coef: 0.0082605 T-Ratio 4.4799 **PUAB** Coef: 0.39127 T-Ratio 8.3290 **GDPG** Coef: -0.21641 T-Ratio -5.2006	**DDCRED** Coef: -0.031205 T-Ratio -2.5476	**DDDCRED** Coef: 0.019508 T-Ratio 2.0467	**DDNPL** Coef: -0.19772 T-Ratio -0.86035 **DCTPF** Coef: 0.0088884 T-Ratio 1.2861 **MANI** Coef: -0.4829E-4 T-Ratio -0.0044692

Source: Author's Own Calculation

This study then adds DDDNPL as a three-month-lagged of variable NPL and DCTPF as a one-month lagged of variable CTPF. This study also uses three-month lagged as well as two month lagged of variable CRED, namely DDDCRED and DDCRED. This study still utilizes variable DDNPL in the model, in order to run another regression analysis.

Interestingly, in this fourth process of regression, lots of variables are significant in the model. Variable DDDNPL as a three-month lagged variable of NPL is significant at 1% and has a positive relationship with the value of NPL. CASSET, PUAB, and GDPG are also significant at 1% level. CASSET and PUAB have a positive impact to the ratio of non-performing loan; meanwhile growth of domestic product has a negative relationship with the value of NPL. Two-month and three-month lagged variable of variable CRED are significant at 5% and 10% level of significant. On the other side, DDNPL, DCTPF, and MANI are not significant at any level.

6. Conclusion And Recommendation

6.1. Conclusion

This study attempted to analyze the determinants of banking credit default in Indonesia. Departing from the model developed by Jimẽnez and Saurina (2006), this study aims to analyze the quality of Islamic banking in managing credit default problem compared with conventional banking in Indonesia. This study utilized time-series analysis, by which ordinary least square method is adopted. 40 monthly data observations from January 2003 until April 2006 are used.

The study is divided into two models, namely Islamic banking model and conventional banking model. The values of non-performing financing (NPF) in Islamic banking and non-performing loan (NPL) in conventional banking are treated as the dependent variable. Meanwhile, the independent variables are represented by total assets (ASSET), total amount of third-party-funds (TPF), total financing/loan (FIN/CRED), inter-bank money market (PUAS/PUAB), growth of gross domestic product (GDPG), and manufacturing industrial index (MANI).

Table.14 Significant Variables in Both Models

Significant Variables	
Islamic Banking	**Conventional Banking**
• Two-month lagged of NPF (DDNPF) • Total asset (ASSET) • The amount of third-party-funds (TPF) • One-month lagged of total financing (DFIN) • Growth of gross domestic product (GDPG)	• The three-month lagged of non-performing loan (DDDNPL) • Total asset (CASSET) • Three-month lagged of total loan (DDD-CRED) • Two-month lagged of total loan (DD-CRED) • Inter-bank money market (PUAB) • Growth of gross domestic product (GDPG)

Source: Author's own calculation

In terms of significant variables, Table 6.1 shows that two-month lagged of non-performing financing (NPF), total asset (ASSET), the amount of third party's funds (TPF), one-month lagged of total financing (DFIN), and growth of gross-domestic product (GDPG) variables have significant impact to the ratio of non-performing financing (NPF) in Islamic banking.

Meanwhile, the three-month lagged of non-performing loan (DDDNPL), total asset (CASSET), three-month as well as two-month period lagged of total loan (DDDCRED and DDCRED), inter-bank money market (PUAB), and growth of gross-domestic (GDPG) are significant to influence the ratio of non-performing loan (NPL) in conventional banking. The result also implied that the general election in 2004 had a significant influence to the ratio of non-performing financing (NPF) in Islamic banking.

Table.15 Summary of Regression Result of Final Model

Final Model	
Islamic Banking	**Conventional Banking**
• **R^2** = 0.79047	• **R^2 =** 0.89072
• Ř bar **²** = 0.74158	• Ř bar **²** = 0.85429
• **F-stat.** F(7,30) = 16.1680[0.000]	• **F-stat** F(9,27) = 24.4522[0.000]
• **DW-statistic** = 1.9763	• **DW-statistic =** 1.8641
• **Heteroscedasticity**	• **Heteroscedasticity**
*F(1,36)= 2.4155[0.129]	*F(1,35)= 0.74597[0.394]

Source: Author's own calculation

Even tough from the outset, it seems Islamic banking has a better performance than conventional banking by having a relatively low NPF, this study, however, has found the opposite. Albeit, Islamic banking showing a good long-run as well as short-run dynamics among all variables in the beginning, after modifying the model into autoregressive in the main analysis, results showed that conventional banking has a better performance than Islamic banking with higher correlation of determination.

Despite attaining a value of correlation of determination not as strong as conventional banking, we cannot assume that Islamic banking is performing poorly in managing credit default problems. This is because the result shows that the level of Islamic banking's R-squared, R-bar-squared and DW values are good. Therefore, even though Islamic banking is relatively a new comer in the Indonesian banking industry, it has shown a good performance in the banking credit risk management and can compete head-on with conventional banking.

6.2. Implications for Islamic Banking in Indonesia

Islamic banking can consider the study findings as an essential input in formulating credit risk management strategy for its operations. There are five variables which have a significant impact on the ratio of non-performing financing (NPF) in Islamic banking. These variables can be used as important determinants to cater the financing default problems. These variables are as follows:

1. Two-period lagged of non-performing financing has a positive correlation with the ratio of non-performing financing itself. The determinants of credit default in future period are strongly influenced by credit default problems at the current as well as previous period. Hence, Islamic banking should analyze the behavior of the previous ratio trend in order to detect the trend movement in the future ratio.
2. Size of the bank, which is represented by the total assets, has a positive relationship with the ratio of non-performing financing. This finding contradicts with the previous study result conducted by Jimenez and Saurina (2006), which stated that size of the bank is not significant. Islamic banking, therefore, can control this ratio by synergizing the total assets with the risk management policy.
3. The negative relationship between the ratio of non-performing financing and the amount of third party's funds can be utilized to attract more investor to invest their funds in Islamic banking.
4. The previous total financing given to the demand side of customer gives a strong influence to the non-performing financing ratio. Thus, Islamic banking can control the financing given by allocating it to prospective and controllable businesses as well as to the growing industry sector.
5. Gross-domestic product as an external indicator is significant to the ratio. Hence, Islamic banking should consider the trend of the growth of gross-domestic product in formulating the credit risk management strategy as well as financing policy to the customer.

6.3. Suggestions for Further Studies

Further studies need to be conducted. In particular, this study examined the performance of Islamic banking to manage credit default problem in the context of aggregate or macro perspective. It would be interesting to focus attention on the analysis on individual banks or micro level. Comparison between Islamic banks will be beneficial as well, in terms of analyzing the effectiveness performance of each individual bank in managing credit risk, particularly credit default problems.

Furthermore, further studies might utilize inflation rate as the independent variable in the model. This is due to analyze whether inflation has a significant influence to the financing default in both Islamic banking as well as in conventional banking. The increasing trend of inflation in Indonesia, however, will result in increasing the interest rate. This can affect the problem of credit default as a result of high interest rate as well as total cost of production.

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