

## Credit Risk Management: A Comparative Study between Islamic and Conventional Banks in Turkey

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### Abstract

This study aims to identify variables which determine credit risk in Islamic and Conventional banks. Panel data fixed effect model employed to analyze which belongs to three Islamic Banks in Turkey for the period 2008 Q1 to 2017 Q4. While for conventional banks, previous studies that has been conducted in Turkey used to compare Islamic to Conventional banks (CB). Non-performing Loans (NPL) ratio was used as a proxy for credit risk. Result from fixed effect model showed that NPL in Islamic Banks is positively affected by Loan Loss Provision and Proportion of Loans to Deposits, and it is negatively affected by Assets Size. While literature showed that conventional bank's credit risk is positively affected by Net Interest Margin, Loan Loss Provision, and Capital Adequacy Ratio and it is negatively affected by Proportion of Loan to Deposits, Proportion of Loans to Assets and Size. There were clear differences between both Islamic and Conventional banks related to all variables of study except Loan Loss Provision and Proportion of Loan to Assets ratios.

**Keywords:** Credit Risk, Non-performing Loans, Islamic Banks, Conventional Banks, Turkey

**Jel Codes:** G23, G21, G32

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## Introduction

Islamic Banks (IB) belongs to the Islamic Finance industry which is showing a rapid growth during the previous four decades. Islamic finance is mainly based on Islamic Sharia principles and IBs aim to provide CBs' services in an appropriate model for Islamic principles. The main principles of IBs are the prohibition of interest (Riba) and promote profit-loss sharing. As IB a kind of transforming process aiming to modify conventional bank to fit Islamic Law and Muslims who have sensitivity toward interest, there are still shared principles between Islamic and Conventional banking models. Banks as financial intermediaries in general are sensitive toward financial risks. Financial risks such as liquidity risk and credit risk might lead to catastrophic crises and even bankruptcy. Credit risk, however, is crucial to Banks as the profit generator for banks in lending. Due to many mutual principles between IBs and CBs, IBs pay the same attention to credit risk and credit risk management. It is worth mentioning that, credit risk management in IBs is more difficult than CBs due to the restriction imposed by Islamic Law.

Objective of the study is to test whether the impact of selected variables on credit risk in IBs differs from the impact of the same variables on credit risk in CBs in Turkey. Turkey is on its way to be a leading country in the field of Islamic Finance. According to Turkish Participating Banks Union (TPBU) Total Assets of Turkish Islamic Banks reached 160 Billion Turkish Lira by the end of 2017. Currently there are six IBs operating in Turkey, the last one of them is Turkey Emlak Bank which previously operated as a conventional bank but in 2018 it was transformed into an Islamic Bank. Capital Adequacy Ratio (CAR), Loan Loss Provisions Ratio (LLP), Net Interest Margin (NIM), Proportion of Loans to Deposits (PLD), Proportion of Loans to Assets Ratio (PLA) and Assets Size are selected variables.

Research is applied through analyzing quarterly financial reports of three Islamic banks operating in Turkey for the period 2008 Q1 to 2017 Q4. Since data type is cross-sectional time series, the research employs panel data regression analysis to predict factors determining credit risk in IBs in Turkey with highlighting a comparison with CBs. Based on Hausman test results fixed effect model is best fitted in this study. The model is used to test the impact of selected bank-specific variables on the dependent variable non-performing loans ratio which is the proxy of credit risk in this research. For the purpose of applying a comparison between IBs and CBs, previous studies on CBs in Turkey are used as a secondary source of data.

Study will provide IBs credit risk managers with information about factors affecting credit risk. This information will help credit risk managers to set policies and strategies to minimize credit risk levels in their banks. Also, this study will measure the impact of bank internal variables as determinants for credit risk Islamic banks with highlighting a comparison between IBs and CBs in Turkey.

## 1. Credit Risk Management

The term risk has been used in all ages and different sectors of life and businesses. For financial institutions, however risk is considered more sensitive issue as it might have catastrophic consequences and damages for the institution and the other counterparts such liquidity crisis and even bankruptcy. According to BASEL II “The purpose of credit risk management is to maximize a bank’s risk-adjusted rate of return through preserving credit risk exposure within reasonable parameters”. In the modern era efficient risk management is needed as it is not only a tool for increasing return but also for creating a competitive advantage for the organization (Nazir, Daniel, Nawaz. 2012:115). Generally, financial risks consist of market, liquidity, and credit risk (Akkizidis, Kumar, 2008:32). Credit risk, however can be defined as the possibility that the counterpart might not be able to pay its obligations. As depts present more 70% of assets in banks’ balance sheets there is no wonder that credit risk is the main reason for banks bankruptcy (Van Greuning, Bratanovic, 2009:161).

### 1.1. Credit Risk Management in IBs

In IBs, we can define credit risk according to financial products. For example in Murabaha or Ijarah contracts the risk occurs when there is a possibility that customer would not make its due payments on time, while in Salam or Istisna it comes to existence when the producers fail to convey the commodity or the product on the agreed time and standards. However, in case of Musharaka or Mudaraba the relation between bank and counterpart is a partnership-based relation rather than creditor-debtor relation so credit risk occurs when the finance project has the possibility to not bear the expected revenue (Akkizidis, Kumar, 2008:119).

The main distinctions in credit risk management between CBs and IBs come to existence from differences in the financial principles as conventional banks work according to capitalism rules Islamic bank work according to Islamic sharia (Van Greuning, Iqbal, 2007:7).

During the last centuries as there were many credit risk management techniques that have been developed by CBs, there are still no credit risk management techniques special to under-development Islamic Banking which forces IBs to use Sharia-compliant conventional credit risk management techniques (Lekpek, 2018:33). Credit risk management in IBs is much wearisome as Islamic Sharia prevents banks from charge extra money for payment delays as it is considered interest so customers can delay payments or even avoid payment as they know no penalty shall be charged (Latif and others, 2014:18). Islamic financial products face different levels of risk exposures, e.g. Debt-based products such as Murabaha and Salam are exposed to a lower level of risk compared equity-based financing products such Musharaka and Mudaraba as the former involves guaranteed schedule payment while equity-based investments are based on profit-loss relation, as a result IB tend to concentrate more on debt-based investments (Khan, Mirakhor, 2015:169).

In contrast with CBs, IBs come face to face with credit risk. Profit-loss Sharing modes, however, bear credit risk when Mudareb in Mudaraba mode or Sharik (partner) in Musharaka mode does not pay profits to the bank, this situation might occur when the borrower hides

information which bank does not have access to, while in case of debt-based contracts such as Murabaha there is a fixed rate of return and scheduled payments so hazard potentiality would not rise (Siddiqui, 2008:685).

Studies show that IBs are more sensitive toward credit risk management than CBs, as they give more importance to evaluating and analyzing risks (Alfawwaz et al 2016, Masood et al 2012, Hachem and Sujud 2018).

## **1.2. How Credit Risk Rises From IBs Contract**

Murabaha is a transaction by which the trader buys a property on the purpose to sell it to buyer on agreed profit ratio plus cost, nowadays IBs take the role of trader (Van Greuning, Iqbal, 2007:23). As Murabaha contract mainly carries the risk of default which is considered credit risk. It has been mentioned that, in case of default banks cannot increase the amount of payment but they are allowed to charge late payment fees and penalties to customers, whom delay payments with no reason and then donate the extra money to charities as this tool cannot be used for increasing bank's profit (Tiby, Mohamed, 2011:127).

Salam contract is defined as the sale of a well-defined product to be conveyed in the future for a price paid presently, as the seller stays indebted to the buyer until he delivers the product (Al-Fijawi, 2016:65). However In Salam contract IBs, are exposed to credit risk as it is subject to default in case the customer might not pay its obligations to the bank exactly as in Murabaha, or the seller did not deliver the product in the time and according to the agreed quality. In this case the bank is able to claim against the advanced payment (Tiby, Mohamed, 2011:49,50).

Istisna is a contract made with a producer or a labor to create a good based on specific standards, some percentage of the payment can be advanced (Borhan, 2002:100). In Istisna contract credit risk arises as a result of the buyer disability to buy the agreed product or providing the installed payments after receiving the product (Akkizidis, Kumar, 2008:67).

In Ijarah contract lessor (the owner) gives the right to lease a specific property or a good for a fixed period of time against an agreed amount of money (Fatima, 2006:2). As in Murabaha contract credit risk arises in case the customer could not pay the agreed money to the banks (Vejsagic, 2014:3).

However, in Mudaraba contract the relationship between bank and Mudareb (funded counterpart) is a profit-sharing based product, banks cannot participate in managing the funded project or monitor Mudareb, so that the bank carries a higher credit risk as the whole profit and loss issue is related to Mudareb's ability to efficiently manage the project, as he can damage the banks equity intentionally or unintentionally (Kabir, Worthington, Gupta, 2015:329).

Musharaka is defined profit-loss based joint project or an enterprise in which partners share profit or loss according to predetermined ratio. Hence, the difference between Musharaka and Mudaraba is that in Musharaka the partnership includes sharing loss as it includes sharing profit, while in Mudaraba it includes sharing profit only (Bhatti, 2011:3). Credit risk in

Musharaka agreements come to existence as a result when the partner does not pay the profit shares to the bank or when the business outcomes vary from the banks expectations (Akkizidis, Kumar, 2008:45).

## **2. Determinants of Credit Risk**

Non-Performing Loans to Total Loans (NPL) ratio is a widely used standard statistic for evaluating the financial performance of banks (Serwa, 2013: 164). NPL ratio is used as a proxy for credit risk by many researchers such as Yuksel (2017), Ahmad and Ariff (2007), Salim et al (2016), Fiordelisi et al (2010), and Misman et al (2015). According to Waqas et al, (2019) a loan can be considered non-performing if its payments gets postponed for more than one year, while some other researchs have reported that it is considered non-performing if payments get deferred for more than 90 days(Dimitros et al, 2016:116). NPL ratio can also be named troubled debts, or bad debts, these terms refer to loans in default or closed to default (Garla, Boruah, 2018:1).

There is a great emphasis on measuring and studying NPL level due to its negative relationship with banks' total profitability and as a result, affects banks' lending behavior (Kingu et al, 2018:71). According to Fell et al. (2018), in the European area higher NPL ratio may impact individual banks' perception toward risk taking to decrease lending ratio through the periods of high credit risk. Low NPL ratios convinces the bank give more credit, and enhances trust of depositors toward the bank (Christaria, Kurnia, 2016:45)

### **2.1. Selected Variables**

In this study we are testing the effect of six bank specific variables on NPL, these variables are Capital Adequacy Ratio (CAR), Proportion of Loan to Deposit (PLD), Proportion of Loan to Assets (PLA), Net Interest Margin (NIM), Loan Loss Provision (LLP), and Assets Size (SIZE).

After the 2008 global financial crisis, Bank of International Settlement (BIS) proposed Basel III which suggests that banks have to keep a CAR of at least 10.5%, while Basel II required banks to keep a ratio of 8% (Li et al, 2016: 1). CAR is defined as the ratio of a bank's core capital to banks total assets weighted to risk (Bialas, Solek, 2010: 49).

CAR is important for evaluating the stability of banks financial structure as it measures the banks' ability to face any financial defaults such as credit default and avoid insolvency. It is computed by dividing banks' capital by risk weighted credit exposure (Fatima, 2014: 772). Higher CAR indicates banks' ability to survive even in case of loss. Thus, it increases trust of depositors toward the bank to deposit more money which increases banks' liquidity and ability to generate profit (Christaria, Kurnia, 2016:44).

Banks with high capital have a more aggressive lending procedures which may result in higher NPL level, in the another side lower capital ratio might force banks to adopt low lending standards in order to generate higher profit and increase owners' equity which might also result in higher NPL levels (Wood, Skinner, 2018:46).

According to Sinkey and Greenawalt (1991), banks with higher CAR have a higher loan quality and as a lower NPL ratio. It can be mentioned that CAR negatively affects NPL though it is statistically insignificant (Panta, 2018). In the European Banking sector the same result has been found (Trenca, Bozga, 2018). While Waqas et al (2013) made a study using Pakistani and Bangladeshi banks data as a sample reported that NPL ratio is significantly affected by CAR and same result in a similar study has been reported by Jameel (2014). Higher CAR reflects the banks' ability for long-term financing and resilience against insolvency (Koju et al, 2018: 2).

PLD is used for measuring liquidity, as the mentioned ratio gets higher, it means higher profitability as it represents the result of efficiently employing banks deposits which is attractive for investors who deposit money (Koju et al, 2018:3). According to Sharifi and Akhter (2016), PLD is a crucial tool for measuring banks' performance as it shows banks' ability to utilize funds in order to generate profit. It measures the banks aggressiveness in lending decision, thus measures the banks tendency to take risk. Higher PLD indicates risk preferences of the bank, so that a positive relation is expected between PLD and NPL ratio, while in case of low PLD it reveals the high liquidity of the bank which reduces insolvency risk (Tole et al, 2019:202). A study related to Pakistan has been showed that PLD negatively affects NPL ratio, but statistically insignificant (Jameel, 2014:707). Yağcılar and Demir (2015) have found a significant negative correlation between PLD and NPL that higher PLD is the result of a higher level of management efficiency. In contrast, Anjom and Karim (2014) found a significant positive relation between credit deposit ratio and NPL ratio. From the same point of view banks should not focus on employing all the funds in crediting as this behavior may result in increasing the riskiness of profit portfolio, instead they have research for safer investment (Wood, Skinner, 2018:47).

PLA of a bank evaluates its liquidity position as higher ratio represents higher liquidity (Kumbirai, Webb, 2010: 40). According to Sinkey and Greenawalt (1991), higher PLA represents the banks tendency to achieve more profitability despite risk cost. Theoretically, a higher PLA increases the chance for credit risk (Koju et al, 2017:3), as the same result statistically has been reported from a study taking the Albanian banks as a sample (Shinjergji, 2013: 151). A similar study in Srilanka (Ekanayake, Azeez, 2015: 878). On the line, Rajha (2016) has reported that loans to assets ratio is one of the most significant factors that positively affect NPL. It is reported that higher PLA indicates higher tendency for taking risk which means higher rate of NPL (Klein, 2013: 29). While in Turkey, a negative relation has been reached this negativity can be explained by understanding that banks with higher PLA have a chance to diversify their credit portfolio. Hence, they have ability to minimize credit risk (Macit, 2012: 37).

NIM which is also referred to as net interest profitability is the ratio of net interest income to banks' assets (Saksonova, 2014: 134). It has reported that a decrease in NIM might incentive policy maker to change lending standard which might lead to higher risk (Das, Gosh, 2007: 18). Banks with higher NIM charges higher interest rates from borrowers which generally could not borrow from other banks (Risky Borrowers) resulting greater credit risk; this behavior justifies the positive relation between NIM and NPL (Macit, 2012: 37). Adje et al

(2018) study showed that if NIM increases by 10% NPL may increase by 7% on the developed countries. Also, Angbazo's (1994) study found that NIM has a significant and positive relation with NPL. Shinjergji (2013) in his study on the Albanian banks has reported a positive relation between NIM and NPL. However, other researches could not find any significant relation between NIM and NPL (Das, Ghosh 2005, Radivojevic, Jovovic 2017). While a negative relation between NIM and NPL had been noticed in the Turkish banks (Abdioglu, Aytakin, 2016).

According to Laeven, Majnoni (2003) LLP refers to the amount of money that a bank assigns to restate the expected loan defaults generated from credit default. Soedarmono et al (2015) reported that banks emphasize more on LLP as it is a crucial tool for mitigating credit risk, mentioning that it is sensitive in case of cyclicity. It is expected that in bad economic situations banks tend to keep higher rates of LLP to be ready for the expected high rates of loan defaults which signals a positive correlation between LLP and NPL (Ozili, 2019: 5). According to Ahmad and Ahmad (2005), LLP ratio should have a positive correlation with NPL, as it represents the level of loan quality. Karimiyan et al. (2013) study related to Malaysia reached the same result after analyzing data belonging to twelve commercial banks for the period of 2004-2011 through Fixed Effect Model. Other studies supported the same findings (Boudriga et al, 2009, Ekanayake, Azeez, 2015). While it can be mentioned that non-discretionary loan loss provisions cannot be easily regulated as they depend on NPL (Soedarmono et al, 2015).

According to Ranjan, Dhal (2003), SIZE measured as the ratio of a specific bank's total assets to total assets of the all banks in the sector. Theoretically, banks with larger size have better resources and abilities to evaluate credit requests which leads to higher loan quality and lower ratio of NPL (Hu et al, 2004, Das, Josh, 2005). This theory has been supported in many studies. Ranjan and Dhal (2003) found a significant negative relation between both of them. In South-Asian countries, Islam and Nishiyama (2016) could reach the same findings. It is also mentioned that as banks get larger efficiently evaluating credit requests gets more difficult which opens the door for loan problems (Alhassan et al, 2014). This theory was supported by the findings of Us (2016) in Turkey. Das and Ghosh (2007) reported a positive impact of SIZE on NPL for India. While Macit (2012) reached that the relationship between SIZE and NPL is insignificant, as it is supported by his empirical study in Turkey.

## **2.2. Studies Related to Turkey**

Three studies have been conducted in Turkey to predict factors affecting NPL ratio. Using probit model, Yüksel (2017) analyzed the determinant of NPL in Turkey for 24 deposit banks from 2004 to 2014. Results from probit model, industry production index has a significant and positive impact on NPL while other variables such as growth rate and unemployment have no significant impact.

Yağcılar and Demir (2015) conducted a study to test the impact of macroeconomic and bank specific variables on NPL in 26 commercial banks operating in Turkey. Researchers analyzed panel regression model based on the period 2002:Q4-2013:Q1. The result shows that PLD is negatively related to NPL.

Macit (2012) analyzed financial reports belonging to the biggest fifteen commercial banks in Turkey for the period 2005:Q1-2010:Q4 by using Feasible Generalized Least Squares (FGLS) Estimation model. The study included Macroeconomic and Bank Specific Variables. According to regression results, PLA is negatively correlated with NPL ratio while CAR and NIM have a positive relation with NPL.

### **2.3. Non-Performing Loans in Islamic Banks**

Ahmad and Ahmad (2004) conducted a research on the Malaysian IBs and CBs to identify and compare factors affecting credit risk in both of them. The study analyzed data belonging to the six IBs and six CBs for the years 1996-2002 through panel data regression analysis. According to the study NPL in IBs is significantly influenced by SIZE. While in CBs, CAR, LLP, and loan exposure to risky sectors affect NPL. Both of them are similarly affected by leverage, funding cost, and risk weighted assets.

Zolkifli et al (2018) conducted a comparative study to investigate factors affecting NPL in both IBs and CBs in Malaysia by analyzing data for the period 2008-2016 through panel data analysis. In CBs NPL has a positive relation with bank size, funding cost, and PLD, and is negatively affected by leverage, management efficiency, and risky loan sector. While in IBs, only loan to risk weighted assets ratio and PLD have a significant positive impact on NPL while management efficiency, size, and risky loan sector are insignificant.

Firmansyah (2014) analyzed monthly average data for all Syariah Rural Credit Banks (SRCB) in Indonesia through multiple regression analysis with least squares equation. The study tested the impact of macroeconomic and bank specific variables on NPL. According to the results, GDP and inflation negatively affect NPL, while the effect of liquidity is positive. While, SIZE and inefficiency have no effect on NPL.

Wiryo and Effendi (2018) tested the impact of macroeconomic variables and bank specific variables on NPL of IBs in Malaysia. Data has been analyzed through panel data regression analysis. According to results, financing quality, financing expansion, GDP and inflation are negatively and significantly affect NPL.

Özkan and Işıl (2016) analyzed data related to four active IBs working in Turkey for the period 2006-2014 through panel data regression analysis in order to predict bank specific factors affecting NPL. According to the study, LLP to total assets ratio positively affects NPL while SIZE and proportion of loan to assets negatively affect NPL.

Havidz, and Setiawan (2015) conducted a research for investigating the predictors of bank efficiency and NPL by employing Data Envelopment Analysis. The study analyzed data for the period 2008-2014 with taking four Islamic Indonesian banks as a research sample. According to results, NPL ratio has a significant relation with operational efficiency ratio, size, and GDP growth rate. While the impact of PLD, CAR, inflation, and return on assets is insignificant.



### 3. Methodology

This study investigates variables affecting NPL in both IBs working in Turkey through employing panel data fixed effect model. Credit risk proxy in this study is NPL. While the study measures the effects of banks specific variables including Capital Adequacy Ratio (CAR), Natural Logarithm of Total Asset (SIZE), Proportion of Loan to Deposit Ratio (PLD), Net Interest Margin (NIM), Proportion of Loan to Asset Ratio (PLA), and Loan Loss Provision (LLP).

Data are collected from reports published on quarterly basis considering the period 2008 Q1 to 2017 Q4. Islamic banks reports were collected from internet website of Turk Participation Banks Union. Totally we have 120 observations. The participating banks analyzed in the study are Kuveyt Turk Banks, Albaraka Turk Bank, and Turkiye Finans Bank. For conventional banks, we have used previous studies conducted in Turkey as a secondary source of data to compare our empirical results to conventional banks results.

#### 3.1. Model

Balance panel data analysis is chosen as our data set is both time series and cross-sectional. Model can be written as

$$NPL_{i,t} = \alpha + \beta_1 CAR_{i,t} + \beta_2 LLP_{i,t} + \beta_3 NIM_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 PLD_{i,t} + \beta_6 PLA_{i,t} + \varepsilon_{i,t}$$

In order to conduct panel data regression analysis, we have to be sure that all variables are stationary. For this purpose, we conduct three tests.

#### Levin-Lin-Chu Test (LLC)

Instead of applying unit root test for each cross-section LLC provide a more powerful unit root test. LLC is suggested to be used for a moderate sized panel with N between 10 and 250 (Baltagi, 2010:241). The proposed null hypothesis states that every time series includes a unit root while the alternative hypothesis states that every individual time series is stationary. LLC test is usually used for balanced panel data. In case one of the variables contains a unit conduct the test again with considering the first difference instead of the first level value.

Test Hypothesis

$$H_0 : P_i = P = 0$$

$$H_a : P_i = P < 0 \text{ for all } i.$$

The structure of the test may be written as follows:

$$\Delta Y_{it} = \rho Y_{it-1} + \alpha_i + \alpha_{it} + u_{it}, \quad \text{where } i=1, 2, \dots, N, \quad t=1, 2, \dots, T$$

#### Im, Pesaran, and Shin Test (IPS)

IPS test is applied to test the existence of unit root in panel data and usually used for unbalanced panel data. As it has a superior test power by economics analysts it is applied in our study. Conducting IPS test starts with assigning a distinct ADF regressor for every cross-

section with individual trend and time trend. Here we mention that the null hypothesis of IPS test is that each series in the panel data contains unit root (not stationary).

Test Hypothesis

$$H_0 : \beta_i = 0, \text{ for all time series}$$

$$H_0 : \beta_i < 0, \text{ for one or more } i.$$

Test structure may be written as follows:

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{i,t-j} + \varepsilon_{it} \quad \text{where } i = 1, \dots, N \text{ and } t = 1, \dots, T$$

### Fisher-Type Tests (FT)

Fisher-type test proposed by Maddala and Wu (1999) and Choi (2001). This test combines p-value from unit root tests for each cross-section  $i$  to test unit root in panel data. According to Maddala et al. (2000) FT is superior to both IPS and LLC, in addition FT does not require a balanced panel data which is an advantage compared to IPS.

Test Hypothesis

$$H_0 : Y_i = 0 \text{ (} \pi_i = 1 \text{),}$$

$$H_1 : Y_i < 0 \text{ (} \pi_i < 1 \text{).}$$

Test structure may be written as follows:

$$\rho = -\frac{1}{\sqrt{N}} \sum_{i=1}^N \ln(\pi_i)$$

### Testing Autocorrelation

As autocorrelation is a reason for biasing standard errors and results inefficiency we use Wooldridge test to control data autocorrelation. Wooldridge test is attractive for researchers as it is applicable under general conditions and easy to implement. The null hypothesis of this test proposes that no first-order autocorrelation.

Test Hypothesis

$$H_0 : \sigma^2_\gamma = 0$$

$$H_0 : \sigma^2_\gamma \neq 0$$

Test structure may be written as follows:

$$y_{it} = \alpha + X_{it}\beta_1 + Z_i\beta_2 + \mu_i + \varepsilon_{it} \quad \text{where } i \in \{1, 2, \dots, N\}, t \in \{1, 2, \dots, T_i\}$$

In case of autocorrelation, we solve the problem panel-specific AR (1) autocorrelation structure is used.

### 3.2. Selecting Panel Regression Model

Hausman test is used to select between Fixed Effect Model and Random Effect Model for panel regression analysis. Hausman test, simply, test the correlation between unique errors ( $U_i$ ) and regressors as the null hypothesis, the null hypothesis is that there is no correlation. In case of accepting the null hypothesis of the test random effect model is chosen while if it is rejected the fixed effect model is preferred as an estimator. After performing the test if P value is higher than 5% we select random effect model.

$$H_0: \text{Random Effect Model } [Cov(\alpha_i, x_{it}) = 0]$$

$$H_1: \text{Fixed Effect Model } [Cov(\alpha_i, x_{it}) \neq 0]$$

$$H = (\beta_c - \beta_e)' (V_c - V_e)^{-1} (\beta_c - \beta_e)$$

In Hausman test the null hypothesis refers to that covariance of  $\alpha_i$  is equal to the covariance of  $x_{it}$  and in this  $\beta^{FE}$  is consistent with  $\beta^{RE}$ , which means random effect model is more efficient as it has a standard error less than the standard error of fixed effect model.

## 4. Results and Discussion

### 4.1. Unit Root Test Results

**Table 1:** Unit Root Test Results for Islamic Banks Model

Variable	Test	First Level	P-value considering First Difference
NPL	Levin, Lin & Chu t	0.3343	0.0000
CAR		0.6192	0.0000
LLP		0.6964	0.0000
NIM		0.0738	0.0000
SIZE		0.9916	0.0000
PLD		0.4809	0.0000
PLA		0.0235	0.0000
NPL	ADF - Fisher Chi-square	0.6414	0.0000
CAR		0.8973	0.0000
LLP		0.886	0.0000
NIM		0.3565	0.0000
SIZE		0.9948	0.0001
PLD		0.7522	0.0000
PLA		0.1616	0.0000
NPL	PP - Fisher Chi-Square	0.7257	0.0000
CAR		0.9452	0.0000
LLP		0.9082	0.0000
NIM		0.1131	0.0000
SIZE		0.9955	0.0000
PLD		0.3532	0.0000
PLA		0.0084	0.0000

After applying Levin, Lin & Chu t test, ADF – Fisher Chi-square test and PP – Fisher Chi-square test for IBs data, as shown in Table 1, we found that all variables were containing unit root at the first level which forces as to accept the null hypothesis. As an econometric solution we reapplied the test by using the first difference and we could find a p-value of 0.0000 for all variables, so we reject the null hypothesis and state each time series in the data set is stationary.

#### 4.2. Autocorrelation Testing Results

**Table 2:** Autocorrelation Wooldridge Test Results

	P-value	Decision
Islamic Banks	0.0034	Null Hypothesis Rejected

As Wooldridge autocorrelation test is based on the null hypothesis that “No first order autocorrelation”, we reject the null hypothesis in IBs model which means that there is an autocorrelation problem in IBs model as P-value is less than 0.05. So, a statistical solution will be implemented.

#### 4.3. Hausman Test Results

**Table 3:** Hausman Test Results

	P-value	Decision
Islamic Banks Model	0.0370	Null Hypothesis Rejected

Based on results shown in table 3 null hypothesis is rejected in IBs Model which means that the difference in coefficients is systematic so fixed effect model is selected.

#### 4.4. Results from Fixed Effect Model

**Table 4:** Fixed Effect Regression Results

	Coef.	Std. Err.	z	P-value
CAR	0.0083777	0.0217861	0.38	0.701
<b>LLP</b>	<b>0.9578313</b>	<b>0.0805823</b>	<b>11.89</b>	<b>0.000</b>
NIM	-0.0136321	0.1166002	-0.12	0.907
<b>PLD</b>	<b>0.0143598</b>	<b>0.0063266</b>	<b>2.27</b>	<b>0.023</b>
<b>PLA</b>	<b>-0.0221218</b>	<b>0.0109181</b>	<b>-2.03</b>	<b>0.043</b>
SIZE	-0.4572714	0.4075677	-1.12	0.262
<b>-cons</b>	0.0191265	0.0107741	1.78	0.076
R-sq	0.62			

Fixed effect regression results show that CAR variable has a positive relation with NPL in IBs, but statistically the relation is not significant. While in conventional banks Yağcılar and Demir (2015) have reported a positive relation between CAR and NPL in CBs. This result is justified

that banks with strong financial structure are ready to take more risk while as IBs are still junior institutions they are more sensitive toward risk.

As expected, LLP is positively and significantly related to NPL in IBs. It could be seen coefficient is slightly different as it is 0.9578313. This result supports the findings of many other studies related to CBs (Ozili, 2019) and (Ahmad, Ahmad, 2005) as banks prefer to keep higher rates of LLP in case of higher expected NPL. Also, Isik and Bolat (2016) reached same results for Turkish conventional banks.

NIM in IB has a negative relation with NPL but this relation is statistically insignificant. In conventional banks, Macit (2012) could find a significant positive relation between NIM and NPL, he justified this result that banks with higher NIM tend to charge higher interest rates which attracts only risky borrowers. While in IBs, even though they charge high rates they still not to lend risky borrowers as they have less alternatives in case of credit default.

PLD positively affect NPL in IBs, these findings support Anjom, and Karim (2014) findings and exemplifies the theory of Wood and Skinner (2018) which states that as banks tend to have a bigger credit portfolio, they accept more risk. In conventional banks, however, Yağcılar and Demir (2015) have reported a negative relation between PLD and NPL. Justification was that as banks increase lending ratios they increase the quality of credit requests evaluation process and perform a more professional loan portfolio diversification. The same situation is not existing in IBs, this problem might be due to the restricted loan portfolio diversification as Islamic Banking is limited to specific types of transactions.

PLA variable has a significant negative relation with NPL in IBs meaning that an increase by 1% in PLA in Islamic banks will result in a decrease by 0.0221218% in NPL. As Macit (2012) reported the same conclusion related to conventional banks in Turkey. Macit (2012) has mentioned banks with higher PLA have a better ability to diversify credit. Credit diversification helps banks to distribute risk among different sectors, thus, the collapse or crisis of sector will have a significant impact on credit portfolio as most credit is given to other sectors which minimized credit problems.

SIZE in Islamic banks negatively related but statistically this relation is insignificant as P-value 0.262. While in conventional banks, Yağcılar and Demir (2015), have concluded that SIZE is negatively impacting NPL. The justification her is that, loan defaults in bigger banks cost more and it will be a bigger damage for shareholders. So, these banks struggles hard to avoid loan defaults. In IBs, however, as they still small sized, bank size has no impact on NPL ratio.

## Conclusion

Study aims to identify factors which effect credit risk faced by IBs in Turkey with observing differences between IBs and CBs. We employed panel data regression to analyze quarterly data belonging to three IBs in Turkey for the period 2008 Q1-2017 Q4. Based on Hausman test results FE model is selected. While the results of previous studies conducted in Turkey have been used to compare our empirical findings to CBs. NPL has been used as a proxy for credit risk in this research. According to empirical results NPL ratio in IBs has a positive significant relation with LLP and PPL while it has a significant negative relation with PLA. NPL in IBs does not have any significant relation with CAR, NIM or SIZE. However in CBs, NPL ratio was significant and positively affected by LLP, NIM and CAR while it was significant and negatively affected by PLD, PLA and SIZE. The similarities were related to LLP and PLA.

It can be proposed that, IBs need to concentrate more on managing loan portfolio in order to create a negative correlation between credit expansion and NPL ratio.

In the future the same research can be applied with using macroeconomic variables instead of bank specific variables as the economic situation of the country affect individual borrowers' financial situation, thus, it affects their ability to pay back loans which might result in a change in NPL ratio.

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