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THE DIGITAL BANKING PROFITABILITY CHALLENGES: ARE THEY DIFFERENT BETWEEN CONVENTIONAL AND ISLAMIC BANKS?¹

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Abstract

This study aims to analyze the digital banking industry in uncertain global financial conditions. This analysis used binary logistic regression models, to predict the Indonesia commercial digital banking profitability performances in new normal life based on the analysis of digital banking performances in the second wave of global financial crisis 2017. The probability of bank profitability improvement as dependent variable. The Liquidity Risk, Bank Size, Bank Portfolio Risk, and E-Money transactions as independent variables. Fintech and Bank Type are used as control variables. The analysis period is 2015-2019, based on the time when the rapid progress of digital banking technology was adopted in Indonesia. Data obtained from 57 commercial bank annual reports, statistics of Bank Indonesia and The Financial Services Authority. By the Logit Regression Model, it is concluded that Liquidity Risk, Fintech and Bank Type do not statistically significant, while the Bank's Portfolio Risk, E-Money transactions and Bank Size statistically significant influencing The Digital Banking Profitability Improvements. From the structural break analysis conducted at the level of the digital banking profitability, there is a difference in the time of "shock" between conventional and Islamic banks. The conventional banks was experienced a structural break over global financial conditions two months before Islamic banks.

Keywords: *Structural Break, Digital Banking, Fintech*

Abstrak

Penelitian ini bertujuan untuk menganalisis industri perbankan digital dalam ketidakpastian kondisi sistem keuangan global. Model Analisis yang digunakan adalah regresi binari logistik, untuk memprediksi performa profitabilitas perbankan digital Indonesia di masa new normal menggunakan performa profitabilitas bank digital di masa krisis keuangan global gelombang kedua tahun 2017. Probabilitas peningkatan profitabilitas perbankan digital sebagai variabel dependen. Risiko likuiditas, ukuran bank, risiko portfolio and jumlah transaksi uang elektronik (E-Money) sebagai variabel independen. Industri Fintech dan Tipe Bank digunakan sebagai variabel kontrol. Periode penelitian adalah tahun 2015-2019 sebagai tahun dimana pertumbuhan pesat atas adopsi teknologi perbankan digital di Indonesia. Data yang digunakan adalah Laporan Tahunan 57 Bank Komersial, Statistik Keuangan Bank Indonesia dan Otoritas Jasa Keuangan. Berdasarkan analisis model regresi logit disimpulkan bahwa risiko likuiditas, fintech dan tipe bank secara statistik tidak signifikan, sedangkan risiko portofolio, jumlah transaksi uang elektronik (E-Money), dan ukuran bank berpengaruh signifikan terhadap peningkatan profitabilitas bank digital. Berdasarkan analisis struktural pada tingkat profitabilitas perbankan digital, disimpulkan bahwa bank konvensional mengalami perubahan mendadak atas fluktuasi kondisi keuangan global 2 bulan lebih awal dari pada bank syariah.

Keywords: *Structural Break, Digital Banking, Fintech*

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INTRODUCTION

Background

Indonesia is a market with high digital banking transactions opportunities due to its population, which mostly does not have bank accounts and high cellular penetration rates. Internet users in Indonesia are 143.26 million or 54.8% of the total population of Indonesia, and 177.9 million are smart-phone users. Internet users in Indonesia around the age of 19-34 years. Coupled with 33.75% of the total population in 2017 is millennial generation (The Financial Service Authority, 2018). Thus, to compensate for the increasing demand in the future, traditional banks with old models are faced with the urgent challenge of changing their services digitally in line with the increasing public demand for the availability, access and control of digital banking services.

Along with the development of information technology in the series of digital revolution, the majority of researchers think that this could affect the business model of the Indonesian banking sector in the future (McKinsey, 2020). The digital revolution produced consumer behavior that demanded banks to be able to provide faster and easier access, which then demanded banks to continue to innovate in developing digital products. The digital revolution can make the dependence of transactions in physical Branch Offices lower, so that the existence of physical branch offices is irrelevant in the future (Andrews, 2020).

Banks, in particular are faced with a shift from traditional, interpersonal forms of service to digital financial services (Niemand et al., 2021). Banks need digital features that can be accessed from various online channels. In the new normal era, digital transformation will be a challenge for the banking industry to stay in business in the financial sector. Research conducted by McKinsey (2020) says that the banking industry is the sector most lagging in digital transformation compared to other industrial

sectors. The Covid 19 pandemic encourages innovation in the banking industry to create digital products, digital signatures and anything that is able to minimize physical contact between people.

Several studies identified several advantages of using the digital revolution in the financial services industry. Lee and Shin (2018) argue that the use of digitization reduces traditional activities in finance, increased operational efficiency and consumer-based services that are able to encourage transparency in business management in the financial industry. Loo (2018) believes that the use of technology in the financial industry positively increases the growth of the financial services industry and reduces the likelihood of a financial crisis. Aisyah (2018) argues that technology increases financial transactions and increases service offerings and increases consumer loyalty in Indonesia. The use of digitalization has led to increases in revenue and profit as well as a decrease in costs through better customer targeting for the branch networks, among other things (Alfaro et al. 2019).

Meanwhile, research conducted by Niemand et al (2019) argue that the sheer level of the digitalization of a bank does not affect profitability. There is a gap between previous studies regarding bank digitalization. This research predict the Indonesia commercial digital banking profitability performances based on the analysis of digital banking performances in the second wave of global financial crisis 2017. Based on the analysis in January 2008 until December 2019, Indonesia Financial Sector influenced by Global Financial Crisis that impacted islamic banking profitability and capital resilience. Research conducted by Yunita (2020) analyzed the structural break of capital resilience ratio of conventional and islamic banking through global financial crisis. The conventional bank experienced structural break a few months before islamic banks. Some studies predict that Islamic banking is more resistant to financial turmoil. Islamic banks should be

Structural Break of Conventional and Islamic Banking Capital resilience
January 2008 – December 2019

more stable in conditions of financial crisis due to the adoption of profit and loss sharing system contracts (Bourkhis and Nabi 2013; Cihak and Hesse 2010).

This research underlies on digital banking in the midst of uncertainty conditions and new normal life after the pandemic becomes something important and urgent to do. We divide our analysis by two segments, the conventional commercial digital banking and the islamic commercial digital banking. The conventional commercial bank use interest rate system while the islamic commercial bank use profit and loss sharing system. The existence of a dual banking system in Indonesia, requires precision and accuracy in the management of digital banking system in the new normal era. The difference in operating systems between conventional banks and Islamic banks is unique in that the effects of a global or national financial condition affect each bank type differently.

This study also examines structural breaks of digital commercial banks amid to the uncertainty of the second wave global financial crisis 2017. *The structural break* can be occurred in time series data or cross sectional data, when there is a sudden change in the variable being studied (Hansen 2012). There is the potential structural instability across the whole data range. It is possible to test every observation for a structural break (Bank Indonesia 2016). Examples include sudden policy changes such as a change in government or sudden

move in asset prices or serious international disaster (Bank Indonesia 2016). The structural break can be recognized in the structure of the economy and ongoing policies, specially in its timing, trend, change point and date shifts (Muthurami and Maheswari 2019). The structural break were directed towards the detection of parameter instability or parameter changes occurred at an unknown time (Bai and Perron, 1998).

This study uses the Logistic Regression Predictive Model to predict the Indonesia commercial digital banking profitability performances in new normal life based on the analysis of digital banking performances in the second wave of global financial crisis 2017. Logistic Regression Predictive Model is an analysis method where the dependent variable is not continuous, or its called binary. There are two dependent variables namely $Y = 1$ and $Y = 0$. The liquidity Risk, Bank Size, Bank Portfolio Risk, and E-Money transactions are the independent variables. The Fintech and Bank Type are used as the control variables. The analysis period is 2015-2019, based on the time when the rapid progress of digital banking technology was adopted in Indonesia. The data obtained from 57 Indonesia commercial bank consist of 47 conventional commercial banks and 10 islamic commercial banks.

Research question

According to McKinsey, several commercial banks most profitable areas could see reduction in revenue between 10% and 40% until 2025 if banks do not react appropriately to increasing competition (McKinsey 2016). Banks, in particular are faced with a shift from traditional, interpersonal forms of service to digital financial services (Niemand et al 2019). This is a problem for conventional commercial banks and Islamic commercial banks in new normal life environment when demands of digitalization in banking system greater than usual. Meanwhile the banking environment are facing uncertainty conditions that may occur the structural break. The structural break were directed towards the detection of parameter instability or parameter changes occurred at an unknown time (Bai and Perron, 1998). Examples include sudden policy changes such as a change in government or sudden move in asset prices or serious international disaster (Bank Indonesia 2016). Based on this problems, we formulate the following research questions:

1. How is the probability of Indonesia digital banking profitability performances after the second wave of global financial crisis?
2. Is there a difference level of profitability of conventional and Islamic banks, related to the digitalization of the banking system?
3. By the uncertainty of the global financial system in the second wave of global financial crisis, are conventional and Islamic banks experienced a structural break?

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Digital Banking Technology and Profitability

The digital revolution began in 1960 marked by the introduction of the concept of credit cards in the banking system. Digital transactions refer to every

transaction that uses digital instruments such as mobile payments, mobile wallets, cryptocurrency, and electronic payments. Whereas digital banking is a banking transaction that uses technology facilities to facilitate banking transactions (Sardana and Singhania 2020). Digital banking is generally associated with electronic banking transactions, internet banking and online banking. Digital banking transactions are introduced as an effort to streamline financial transactions (Aladwani 2001; Al-Malkawai et al. 2016; Leong et al. 2019).

Now the digital revolution is sharpened with blockchain technology. The main impacts on digital banking in the financial industry include the use of Artificial Intelligence (AI) and big data through the automation of all business activities. Digital banking technology in the financial industry increases the level of financial inclusion because it is able to reach diverse communities. The use of blockchain technology in banking finance provides a cost control solution. In the face of a series of digital revolutions, there are a number of challenges faced, including regarding cyber security, changing business models, operating efficiency, low costs, process innovation and digital service acceleration.

Adoption of technology can reduce unit costs and some bank services. Digitization in combination with advances in data analytics promises huge benefits for corporations in various industries (Konigstorfer and Thalmann 2020). Investment in digital technology can not only increase bank operating costs but also increase revenue. Based on digital banking research conducted by McKinsey (2014) the use of digital banking increases the potential for cost efficiency by 15-20%. Economic theory explains that technological development triggers increased productivity and efficiency. The more efficient and productive a bank will increase its capacity to compete and gain market dominance. Empirical studies said that most banks in The Indonesia banking sector have

adopted digital banking technology as the main strategy that has been implemented (Price Waterhouse and Coopers 2018).

Digitalized Bank System

The digitalization process has a serious impact on the operational efficiency, customer experience and marketing. Operational efficiency defined in three different categories (Ortakoy and Ozsurunc 2019). With the automation, it perform branch operational transactions automatically by the information technology system used by the bank.

Hypothesis

Implementation of digital banking technology

The more aggressive the bank in implementing digital banking technology, the more efficient the bank is compared to other banks, so the profitability is higher. However, the transmission effect on the implementation of digital banking technology is also determined by banking business activities in collecting and distributing funds. Lee and Shin (2018) argue that the use of digitization reduces traditional activities in finance, increased operational efficiency and consumer-based services that are able to encourage transparency in business management in the financial industry. Loo (2018) believes that the use of technology in the financial industry positively increases the growth of the financial services industry and reduces the likelihood of a financial crisis. Profitability will also depend on how the bank manages the portfolio of credit risk and liquidity risk. Liquidity risk affects bank profitability significantly and have a negative relationship by liquidity gap and non performing as the two factor exacerbates the risk (Arif and Anees 2012). Liquidity problems may affect earnings and capital. In an extreme situation may result a collapse solvent bank. Liquidity risk is the endogenous determinant of bank performance, it may lower bank profitability (Chen and Shen 2018).

More over, there will be a different of bank profitability level between Conventional and Islamic Digital Bank since the interest rate and profit and loss sharing system are implemented among the banks.

H₁: The more aggressive the bank in implementing digital banking technology, the more efficient the bank is compared to other banks, so the profitability is higher even structural break is occurred.

The profitability level of conventional and Islamic banks related to the banking digitation system

In addition to technological change, Khandani et al. (2010) estimate the cost savings to range anywhere between 6%-25% . Butaru et al. (2016) simulate the cost savings of banks in digital approach range between 9%-76%. The use of digital in credit risk management has the potential to banks to reduce their cost significantly. Hu (2005) concludes that deregulation within the financial service industries and the widespread acceptance of new technologies is increasing competition in the finance marketplace. Previous studies concluded that better operating efficiency is typically associated with greater bank profitability (Detragiache et al. 2018; Dietrich and Wanzenried 2011; Molyneux and Thornton 1992)

When market is characterized by uncertainty, the fit between the external demands of the operating environment and bank's strategic approach to digitalization is the main driver of performances. (Burns and Stalker 1961; Lumpkin and Dess 1996) This studies examine structural break in conventional digital banks and islamic digital banks. The structural break were directed towards the detection of parameter instability or parameter changes occurred at an unknown time (Bai and Perron, 1998). The structural break can be recognized in the structure of the economy and ongoing policies, specially in its timing, trend, change point and date shifts (Muthurami and Maheswari 2019). Examples include

sudden policy changes such as a change in government or sudden move in asset prices or serious international disaster (Bank Indonesia 2016).

H₂ : There is a difference in the level of profitability of conventional and Islamic banks related to the digitalization of the banking system

Structural Break of Uncertainty of The Global Financial System Experiencing

Some studies predict that Islamic banking is more resistant to financial turmoil. Islamic banks should be more stable in conditions of financial crisis due to the adoption of profit and loss sharing system contracts (Bourkhis and Nabi 2013; Cihak and Hesse 2010) however Alqahtani and Mayes (2018) believes that Islamic banks have a higher risk than conventional banks. The results conclude that during the crisis the Islamic bank did not have much impact on the financial turmoil, but when the crisis impact on the real sector, the Islami bank with larger size experienced financial instability compared to conventional banks. However, Islamic banks with smaller size are more stable and able to withstand financial crisis. Although the islamic banks hold on to funds, the condition of shocks in financial instruments is quite high, but they are affected by the real sector. Meanwhile, the conventional banks affected by the interest rate volatility (Alqahtani and Mayes 2018).

H₃ :There are different between conventional and Islamic banks in experiencing structural break of the uncertainty of the global financial system in pandemic situation

RESEARCH METHOD

Data

According to Indonesian Banking Statistics in June 2020 there are 110 banks in Indonesia, where several banks control and manage 80% of total banking assets. The sample used in this study is commercial banks both conventional and Islamic

commercial banks. In this study 57 banks were used as samples, consisting of 47 conventional banks and 10 Islamic banks. The analysis period for this research is 2015 to 2019. The selection of this period is based on the rapid advancement of digital banking technology adopted by the Indonesian banking industry. Data sources in this study are the annual report of commercial banks, the Indonesian Financial Stability Report from Bank Indonesia and Indonesian Banking Statistics, published by the Financial Services Authority.

In calculating Digital Banking profitability performance, this study uses Return of Assets (RoA). This ratio was chosen as the material of analysis because it illustrates the amount of returns from financing and credit disbursed. The independent variables used are Bank Size, Liquidity Risk, Bank Portfolio Risk, and Electronic Money Transactions (E-Money). Over the past few years, banks did not pay attention to the vital element of liquidity risk and bank portfolio risk. Lately, it has obtained a significant attention from researchers, regulators and financial institutions after various economic and banking crisis a cross the globe (Committee of European Banking Supervisors 2008). Liquidity risk has become a serious concern and challenge for the modern era banks.

We use Bank Size because some studies mentioned different result between small and large banking size. Stress in the banking sector and stress in the economy was varied along the bank size spectrum. Financial stress at larger banks has a different impact on the real economy than financial stress at smaller banks. Stress among larger banks has a greater negative consequence on the economy than does stress at smaller banks (Lorenc and Zhang 2020). Meanwhile liquidity risk and portfolio risk are systemic risks that influence banking performances. Electronic money transactions used by customer digital banking. This transactions massively increased through digital banking. In this research, to anticipate unobserved

Table 1
Variables

Variables	Proxy	Formula	Source
Dependent variable			
The probability of Bank profitability improve Y = 1, if ROA > 0.5 Y = 0, if ROA < 0.5	PROA	Bank's Profitability Performance = Return on Assets (RoA)	Commercial Bank Annual Report
Independent variable			
Bank Size			
Liquidity Risk	Size LFR	Ln Total Asset Loan to Funding Ratio	Annual report
Bank portfolio risk			
Electronic Money	NPL E-money	Gross Non-Performing Loans Electronic Money Transactions	Indonesian Financial Stability Review, Bank Indonesia
Control variable			
Fintech	Fintech	The dummy variable is the existence of the Financial Technology Industry	
1 = Fintech 0 = There is no Fintech			
Bank Type			
1 = Conventional Bank 0 = Islamic Bank		Banking System Dummy Variable	

heterogeneity, we use dummy variable of Fintech existences as the banking industry counterpart and dummy variable of Bank Type (conventional and islamic bank) as a control variables. Sheng (2020) analyzed that fintech can promote the supply credit from banks. Compared with small banks, fintech plays a stronger role in promoting larger banks credit supply, because the decline of original technical advantages of small banks due to fintech development.

Logit Probit Estimation Model

Data analysis in this study uses the maximum likelihood logistic regression predictive model. With the dependent variable is the probability of increasing bank profitability in the digital age, Y = 1 and Y = 0.

Logit Model

The logit regression model is used to predict the dependent variable which is not continuous or binary.

$y = \begin{cases} 1 \\ 0 \end{cases}$, where 1 is the probability of increasing bank profitability in the digital age and 0 vice versa

The relationship between dependent and independent variables is explained by the maximum likelihood curve. With the logit equation model as follows:

$$Y = \frac{Odds_i}{1 + Odds_i}$$

$$= \frac{e^{\beta + \beta_1 LFR + \beta_2 Size + \beta_3 NPL + \beta_4 E-Money + \beta_5 Fintech + \beta_6 Bank}}{1 + e^{\beta + \beta_1 LFR + \beta_2 Size + \beta_3 NPL + \beta_4 E-Money + \beta_5 Fintech + \beta_6 Bank}}$$

$$= \frac{1}{1 + e^{-(\beta + \beta_1 LFR + \beta_2 Size + \beta_3 NPL + \beta_4 E-Money + \beta_5 Fintech + \beta_6 Bank)}}$$

Where:

- Y : Probability increased Bank Profitability in the digitalization
- Size : Bank Size, Log Total Asset
- LFR : Liquidity Risk
- NPL : Bank portfolio risk
- E-money : Electronic Money Transactions
- Fintech : *Financial Technology*
- Bank : Bank type Conventional or Islamic Bank
- β_k : each coefficient of the independent variable

Probit Model

The probit regression model of the probability Y = 1 uses the cumulative standard normal distribution function, $\Phi(z)$. Probit regression models in this study are as follows:

$$\Pr(Y = 1|X) = \Phi(\beta + \beta_1 LFR + \beta_2 Size + \beta_3 NPL + \beta_4 E - Money + \beta_5 Fintech + \beta_6 Bank)$$

Φ is the cumulative standard normal distribution function and $z = \beta_0 + \beta_1 X$ is the "z-value" or "z-index" of the model.

Margin Effect Probit Regression

$$Y = \Phi((\beta + \beta_1 LFR + \beta_2 Size + \beta_3 NPL + \beta_4 E - Money + \beta_5 Fintech + \beta_6 Bank),$$

So that,

$$\frac{\partial Y}{\partial X_i} = \beta_i \Phi((\beta + \beta_1 LFR + \beta_2 Size + \beta_3 NPL + \beta_4 E - Money + \beta_5 Fintech + \beta_6 Bank)$$

Model Selection

The choice of model between logit and probit uses information standards such as Akaike Information Criteria (AIC) or Bayesian Information Criterion (BIC). In this study we compared the prediction accuracy of models using AIC and BIC. AIC provides an effective tool for model selection (Clements et al 2015; Dimitriou et al 2013). The number of parameters in the model is a log likelihood function. The model chosen is a model with minimum BIC and AIC values.

Parameter estimation uses Maximum Likelihood Estimation (MLE) which describes the best distribution of the studied data. Prob > chi2 The probability of obtaining the chi-square statistic for the null hypothesis is true. Or the probability of getting a chi-square statistic if in fact there is no influence of the independent variable. Logistic regression does not have R-squared as in OLS regression. Pseudo R2 = Model L2 / -2LLO. -2LLO measures an increase in the relative value of a log if it does not have an independent variable. Count R2 measuring the correct predicted fraction = the fraction Y's whose prediction probability is > 50% when $Y_i = 1$ or < 50% when $Y_i = 0$

The Structural Break Analysis

The studies on structural break began with the work of Gregory Chow in 1960, when the initiation of a fundamental break mechanism started (Muthurami and Maheswari, 2019). *The Structural Break*

can be occurred in time series data or cross sectional data, when there is a sudden change in the variable being studied (Hansen 2012). Examples include sudden policy changes such as a change in government or sudden move in asset prices or serious international disaster (Bank Indonesia 2016). The structural break can be recognized in the structure of the economy and ongoing policies, specially in its timing, trend, change point and date shifts (Muthurami and Maheswari, 2019). The literature on structural break were directed towards the detection of parameter instability or parameter changes occurred at an unknown time (Bai and Perron, 1998). This study examines the structural break of profitability level of conventional and islamic banks due to uncertainty in the global financial crisis. Our analysis uses the Wald test to detect structural breaks in the studied variables.

Period sample: $t = 1, \dots, n$

Breakdate: T1 (date of change)

Pre-break sample: $t = 1, \dots$ Observation of T1 or T1

Post-break sample: $t = T1 + 1, \dots, n$; observation of $n - T1$

Wald Test Statistics, (Hansen 2012)

$$W(T_1) = n(\beta_1' - \beta_2') \left(V_1 \frac{n}{T_1} + V_2 \frac{n}{n - T_1} \right)^{-1} (\beta_1' - \beta_2')$$

Where, and is the standard variance of asymptotic estimators for and in split samples. (Hansen 2012)

Research Stages

This research begins with building score probability level of profitability of commercial banks in Digital Banking operations. In this study we use binary logistic regression, where the dependent variable is $Y = 1$ and $Y = 0$. $Y = 1$ is the probability of bank profitability improvement regarding the digital banking technology adopted by banks. $Y = 0$ is the probability of decreasing bank profitability through global financial crisis. Our analysis generates $Y = 1$ and $Y = 0$ from Return on Assets of 57 commercial banks in the 2015-2019 study period.

Figure 1
Research Stages

$Y = 1$ is determined, if Return on Assets is higher than 0.5% and $Y = 0$ determined, if Return on Assets is lower than 0.5%. Next, we predict bank profitability improvement in digital banking operations using Linear Probability Model (LPM). Because the binary regression resulting a non linear relationships between dependent and independents variables, where there are $Y < 0$ and $Y > 1$, our next analysis using Probit Logit Regression Model to determine logistic regression use maximum likelihood.

RESULTS AND ANALYSIS

Descriptive Statistics: Dependent Variable

Descriptive statistics of bank profitability, ROA, are illustrated in table 2. The data used is the annual report of 57 commercial banks in Indonesia during 2015-2019. According to Financial Services Authority 2015-2019 is the year of rapid adoption of digital banking system in Indonesia. Throughout the adoption and

implementation of digital banking 2015-2019, the ROA of 57 banks are varied. There are (+) and (-) of 285 samples, the highest ROA is 9.55 and the lowest is -20.13. in this case, the selection of a cut off of 0.5 is determined on the value of the ROA in the year concerned. $ROA > 0.5$ means that there is a moderate level of profitability, while $ROA < 0.5$ means that the ROA achieved is low or even suffers losses from the implementation of digital banking. Based on the provisions of Basel Accord III International regulations for banking soundness levels adopted by Bank Indonesia and Financial Services Authority to determine the soundness of Indonesian Banking. In Bank Indonesia letter No.6/23/DPNP attachment 2d page 1, ROA range 0.5%-1.25% is categorized as sufficient. Taking into account the condition of uncertainty, 0.5% is the minimum limit for the soundness of banks with sufficient profitability. The proportion of the sample in this study consisted of 80.70% of conventional banks and 19.30% of Islamic banking. A total 285 units of

Table 2
Proportion of Samples

Type	Freq.	Percent	Cumulative
Conventional Bank	230	80.70	80.70
Islamic bank	55	19.30	100
Total	285	100	-

Table 3
Summary of Commercial Bank Profitability Performance Statistics

Sample	Variable	Obs	Average	Std. Dev	Min	Max
All Sample	ROA	285	1.39	6.39	-20,13	69.04
Conventional Bank	ROA	230	1.45	6.71	-15.89	69.04
Islamic Bank	ROA	55	1.15	4.83	-20,13	13.6

Table 4
Probability of Y for Commercial Banks

PROA	Freq.	Percent	Cumulative
Y = 1, increasing of ROA	197	69.47	69.47
Y = 0, ROA decreasing	87	30.53	100.00
Total	285	100	-

data, consist of 230 units of conventional bank and 55 units Islamic bank.

Bank profitability for all commercial banks is shown in table 3, the average score of profitability of commercial banks for all years is 1.394246%. The average value of conventional bank profitability for all years was 1.45%. Meanwhile, the average value of islamic banking profitability for all years was 1.15% lower than the profitability of conventional banks.

In this study binary logistic regression is used, where the dependent variable is $Y = 1$ and $Y = 0$. $Y = 1$ is the probability of bank profitability improvement. $Y = 0$ is the probability of decreasing bank profitability after digitalization. $Y = 1$ and $Y = 0$ are determined from the ratio of Return on Assets of 57 commercial banks for 2015-2019. $Y = 1$ is determined, if Return on Assets is higher than 0.5%. while $Y = 0$ determined, if Return on Assets is lower than 0.5%. From 285 samples observed, the highest ROA is 9,55% and the lowest is -20,13%. We cut off ROA 0.5% based on Central Bank regulation regarding Bank's performance (Surat Edaran Bank Indonesia No.6/23/DPNP tanggal 31 Mei 2004). $ROA > 0.5\%$ means that the digital banks are

experienced to have a moderate level of profit. While $ROA < 0.5\%$ means that the digital banks are experienced a low level of profit or even experienced losses.

From our analysis, the probability of $Y = 1$ occurs 197 times, while $Y = 0$ occurs 87 times. This means that the probability of bank profitability improvement by the digital technologies is 69.47%. The probability of profitability improved due to the application of digital banking is higher than not being digitalized.

Probability of $Y = 1$ for Islamic banks occurred 35 times, while $Y = 0$ occurred 20 times. This means that the possibility of islamic bank profitability improve is 63.64% due to digitalization, higher than non digitized banking operations. The probability of conventional bank profitability improve due to digital banking $Y = 1$ is 70.87%, while the probability of islamic banks profitability improve is 63.64% lower than commercial digitized banking operations. Tables 5 and 6 show that the probability of bank profitability improve on the digitalization of the banking system at conventional banks is higher than that of Islamic banks.

Table 5
Probability of Y for Islamic Banks

PROA	Freq.	Percent	Cumulative
Y = 1, increasing of ROA	35	63.64	63.64
Y = 0, decreasing of ROA	20	36.36	100.00
Total	55	100	-

Table 6
Probability of Y for Conventional Banks

PROA	Freq.	Percent	Cumulative
Y = 1, increasing of ROA	163	70.87	70.87
Y = 0, decreasing of ROA	67	29.13	100.00
Total	230	100	-

Table 7
Descriptive Statistics of Independent Variables (n=285)

Variable	Obs	Average	Std. Dev	Min	Max
LFR (%)	285	1.98	0.26	1.68	5.70
Size (million)	285	7.34	0.75	5.82	9.15
NPL (%)	285	3.89	7.17	0	74.46
E-money (million)	285	122	857	477	275
Bank Type	285	0.81	0.40	0	1
Fintech	285	0.80	0.40	0	1

Descriptive Statistics: Independent Variables

In this study, 6 independent variables were analyzed including Liquidity Risk (LFR), Bank Size, Bank Portfolio Risk (NPL), E-Money Transactions, Banks Type and Fintech. The Liquidity Risk (LFR) and Bank Portfolio Risk (NPL) are in percentage, E-Money Transactions in million Rupiah, Bank size generated from log of total assets, and BankTypes and Fintech are dummy variables. Bank Type = 1 is for conventional bank and Bank Type = 0 is for islamic bank. While, fintech = 1 means fintech industry is exist and fintech = 0 means fintech industry do not exist.

LFR is Loan to Financing Ratio, a measure of bank liquidity risk. In table 7, LFR has very high standard deviation and maximum value. This was happened due to some banking operations added their owner equity and delivered the amount to credit and financing activities. Bank Size is Natural Log of Total Assets Banks. NPL is Non Performing Loans, a measure of bank portfolio risk. E-money is electronic money

transactions of digital banking operations. LFR and NPL are measured in percentage, Size and E-money are in million Rupiah. Meanwhile, control variables consist of dummy variable of fintech existences and bank type (conventional and islamic bank).

Correlation Between Variables

Statistics for correlations between variables are illustrated in table 8. Correlation analysis between dependent and independent variables are carried out to identify the strength of the direction of relationship between dependent and independent variables.

Next, an analysis of correlations between independent variables was carried out. Correlation analysis between independent variables is done to help analyze whether there are multicollinearity problems among the independent variables. Multicollinearity is a problem in the regression model where there is relationship between independent variables (the correlation score that shows multicollinearity in regression is above 0.8).

Table 8
Correlations Between Dependents - Independent Variables

Obs = 285	Y	LFR	Size	NPL	E-money	Fintech	Bank type
Y	1,0000						
LFR	0.0390	1,0000					
Size	0.2559	-0,1187	1,0000				
NPL	-0,1607	-0.0315	-0,1229	1,0000			
E-money	-0.1509	0.1064	0.0782	0.0043	1,0000		
Fintech	0.0114	0.0298	0.0676	0.0380	0.4342	1,0000	
Bank type	0.0620	-0.1213	0.1245	-0.0427	0.0000	-0.0000	1,0000

Figure 2
Residual and Y Hat Linear Probability Model (LPM)

From the data presented in table 8, it can be seen that in general there is no multicollinearity for all variables. It can be assumed that logistic regression in this model is considered good to be used as a tool in predicting the probability of bank profitability improvement regarding digital banking technologies. From the correlation analysis, the Profitability of Digital banking is positively correlated with Liquidity risk, bank size, fintech industry and bank type. But negatively correlated with bank portfolio risk and Electronic money transactions.

Next steps, we examine testing hypothesis using Zscore by two tail testing hypothesis. Our data using average ROA 1.39, standard deviation 6.39 285 samples and $\mu = 0.5$. our calculation have Zscore = $2.36 > Z_{table} \pm 1.96$. because Zscore $2.36 > Z_{table} 1.96$ our conclusion is accepted our hypothesis. Means the more aggressive the bank in implementing digital banking technology, the more efficient the bank's

compared to other banks, so the profitability is higher even structural break is occurred. There is a difference in the level of profitability of conventional and Islamic banks related to the digitalization of the banking system and there are different between conventional and Islamic banks in experiencing structural break of the uncertainty of the global financial system in pandemic situation.

Logistic Regression Model

In predicting the probability of profitability of commercial banks in the digital technologies we conducted a regression analysis using the Linear Probability Model (LPM). From the stata application, the logistic regression model for the dependent and independent variables is shown in table 9.

The logistic regression model concluded that bank size is statistically significant at the 99% level affecting the probability of bank profitability

Table 9
LPM and Probit Logit Model
The Probability of Digital Banking Profitability Performances

Dependent variable: Probability of Bank Digital Profitability Improve	LPM	Logit Model	Probit Model
Independent variable			
LFR	1.39e-06	0.0000189	8.66e-06
Size	0.0600359 ***	0.3925865 ***	0.2361314 ***
NPL	-0.001767 **	-0.03897 *	-0.020687 **
E-money	-1.10e-10 ***	-6.12e-10 ***	-3.65e-10 ***
Fintech	0.1054707	0.5632178	0.3435138
Bank type	0.041386	0.2177745	0.1349512
_cons	-0.4140832	-5.440575 ***	-3.290229 ***
Number of observasi	285	285	285
LR chi2	-	LR chi2(5) 38.32	LR chi2(5) 38.30
Prob> Chi2	0.0000	0.0000	0.0000
Pseudo R-squared	0.1263	0.1093	0.1092
Log likelihood	-	-156.10711	-156.19656
Predicted	-	74.04%	74.04%
Sensitivity	-	94.95%	94.95%
Specificity	-	26.44%	25.4%

Note: *, **, *** show statistical significance at the levels of 0.10, 0.05, 0.01 respectively. LPM uses Prob> F and R-squared

Figure 3
Bank's 2015-2019 Profitability Performances

improvement regarding the digital banking technologies. It can be concluded that market share has an impact on the profitability of commercial banks. From statistics reported by the Financial Services Authority, banking assets dominated by large banks are shown by the concentration ratio (CR) of 4 bank assets that dominate 50.67% of the banking industry.

Bank Portfolio Risk (NPL) is statistically significant at the 90% level affecting the probability of bank profitability improvement in the digital technologies. The higher bad credit ratio

has an impact to lower profitability. E-money transactions are statistically significant at the 99% significance level affecting the probability of bank profitability improvement in digital banking technologies. The higher level of Electronic Money (E-Money) transactions indicates the greater number of digital banking transactions used by customers.

Indonesian Banking Profitability in 2015-2019

Our analysis tries to examine the profitability of Indonesian banks in 2015-

Source: Ascarya. Bank Indonesia. 2020.

Structural Break of Bank Profitability in 2015-2019

Figure 4
The Second Wave of Global Financial Crisis

2019. As shown in Figure 3, the profitability performance of commercial banks in 2015-2019 shows fluctuations in bank profitability that are influenced by global financial conditions and digital banking operations. The profitability performance of conventional banks shows a declining trend, while the profitability of Islamic banks shows an increasing trend.

Analysis of profitability level explained by the Wald test shows that the profitability of commercial banks experienced a structural break. *The structural break* can be occurred in time series data or cross sectional data, when there is a sudden change in the variable being studied (Hansen 2012). There is the potential structural instability across the whole data range. It is possible to test every observation for a structural break (Bank Indonesia 2016). Examples include sudden policy changes such as a change in government or sudden move in asset prices or serious international disaster (Bank

Indonesia 2016). The structural break can be recognized in the structure of the economy and ongoing policies, specially in its timing, trend, change point and date shifts (Muthuramu and Maheswari 2019). The structural break were directed towards the detection of parameter instability or parameter changes occurred at an unknown time (Bai and Perron, 1998).

Our analysis concluded that the profitability of conventional banks experienced structural break in February 2017, while Islamic banks experienced structural break in April 2017. From the historical data analysis, empirical evidence proved that conventional banks are more sensitives to the changes of global financial crisis. The second wave of the global financial crisis occurred in January 2017 (see figure 4) and the conventional bank profitability was experience a structural break in February 2017. (Cihak and Hesse 2010; Bourkhis and Nabi 2013; Alqahtani and Mayes 2018) mentioned that

Figure 5
Kernel Density Analysis for Bank Profitability

Figure 6
Correlation Between Profitability and Electronic Money Transactions

islamic banking is more resistant to the changes of global financial crisis.

The profitability of conventional banks experienced structural break earlier than Islamic banks. this is due to the prohibition of the interest system in Islamic banking operations. Islamic banking uses a profit and loss sharing system where the risk of volatility is lower (Ascarya 2013). Conventional banks use an interest system that is systematically more sensitive to the changes of the global financial crisis. This results in line with the previous studies concluded that Islamic banks should be more stable in conditions of financial crisis due to the adoption of profit and loss sharing system contracts (Bourkhis and Nabi 2013; Cihak and Hesse 2010).

The Impact of Digital Banking on Bank Profitability Level 2015-2019

The profitability performance of conventional banks and Islamic banks in 2015-2019 is shown in Figure 5, the density of conventional banks is higher than the normal distribution curve. While the profitability performance of Islamic banks is below the normal distribution curve. From the statistical analysis this indicates that the average profitability of conventional digital banks are mostly in the same level and lower standard deviation. while the average profitability of islamic digital banks are mostly spread in different level and larger standard deviation compare to conventional banks.

This can be occurred because the interest rate system applied in conventional digital banking are mostly in the same rate. While the profit and loss sharing system were applied in islamic digital banks, resulting different profitability performances among each islamic banks.

Figure 7
Correlation Between Profitability and Bank Portfolio Risk

Figure 8
Correlation Between Profitability and Liquidity Risk

Figure 6 shows that the correlation between bank profitability and electronic money transactions. From this figure it can be assumed that the profitability performance of Islamic banks is higher compared to conventional banks regarding electronic money transactions. This can be influenced by the size of conventional banks. Most of conventional banks are large banks that dominate the banking industry market share. Thus, as a proportion of bank profitability measures become lower than Islamic banks in digital transactions and electronic money transactions.

Figure 7 shows the correlation between profitability and risk of bank portfolios shown by Non-Performing Loans (NPL). From Figure 7 it can be analyzed that the risk of conventional bank portfolios is very stable over time. It can be concluded that conventional banks are very careful in managing their portfolio and bad credit risk. While the risk of Islamic bank portfolios

appears to fluctuate and spread. When bank portfolios are lower risk, bank profitability looks higher. But when the bank's portfolio is at higher risk, bank profitability looks lower. This is assumed to be the profit and loss sharing system effect applied to Islamic banking operations. This profit and loss sharing system requires Islamic banking financing through mudharaba and musyarakah contracts. Alqahtani and Mayes (2018) said that Islamic banks have a higher risk than conventional banks.

Figure 8 is the correlation between bank profitability and liquidity risk. From Figure 8 it can be seen that the liquidity risk of conventional banks is spread compared to Islamic banks. It can be assumed that the behavior of conventional banking in handling liquidity risk varies. Some conventional banks reduce liquidity risk by depositing funds in the central bank or the interest-based interbank money market. While Islamic banks appear to be more

Figure 9
Correlation Between Profitability and Bank Size

Figure 10
Correlation Between Bank Profitability and Fintech

stable because the profit and loss sharing system is applied to this banking system. Some Islamic banks divert their capital to financing so that the Islamic bank liquidity ratio (Financing to Deposit Ratio, FDR) is more than 100%.

Figure 9 is the correlation between profitability and bank size. As shown in Figure 9 that the profitability of Islamic banks varies based on the size of the bank. While the profitability of conventional banks looks stable for small or large sized banks. This can be caused by the interest system applied to conventional banks. And the profit and loss sharing system is applied to Islamic banks. Conventional bank interest rates are more stable depending on central bank certificate interest rate fluctuations. Meanwhile, Islamic banks show diversity because the profitability of Islamic banks is determined by the operational performance of each bank based on the financing contract.

Alqahtani and Mayes (2018) research concluded that during the crisis, the Islamic

banks did not have much impact on the financial turmoil, but when the financial turmoil had an impact on the real sector, the Islamic banks with a large size experienced financial instability compared to conventional banks. However, Islamic banks with smaller sizes are more stable and able to withstand financial turmoil.

Figure 10 is the correlation between bank profitability and the Fintech industry. The existence of the fintech industry does not significantly affect the profitability of banks. This can be concluded for conventional banks and Islamic banks. This can be assumed because the market share of the fintech industry is still very small. So that, at present it does not affect the performance of the banking industry in the digital era. However, in the future, when the market share of the fintech industry is greater than today, the influence of the fintech industry on the digital banking industry can change significantly.

In digitizing the banking industry, there are no differences in opportunities or challenges between conventional banks and Islamic banks. The difference in bank profitability performance is largely due to the different systems applied to each bank. Islamic banking with a profit and loss sharing system that is implemented, has a greater portfolio risk compared to conventional banking. However, the Islamic banking system is more resistant to structural breaks caused by the condition of the global financial system compared to conventional banks.

CONCLUSION

Our findings concluded that there is no different opportunities and challenges between digital conventional banks compare to islamic banks in digital environment. The islamic commercial banks and conventional commercial banks have different characteristics in line with the interest rate system and profit and loss sharing system applied. Conventional banks are very sensitives by the changes of global interest rate benchmark. In conditions of turmoil in the global or national financial system, the profitability of digital conventional banks experienced structural break earlier than that of Islamic banks. This, because the profit and loss sharing system that is applied to Islamic banking. Conventional banks use an interest rate system that is systematically sensitive to the changes of global financial crisis. This profit and loss sharing system requires Islamic banking financing through mudharaba and musharaka contracts, making bank portfolio risk influenced by real sector performance. Suggestions for further research is to develop this research model by using the panel logistic regression model and analyze latent variables in the regression model.

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