

The Effects of Productivity and Liquidity on the Profitability of Islamic Banks in Indonesia

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Abstract. *This study is to measure and analyze the levels of productivity and liquidity of Islamic Banks in Indonesia. This study uses a non-parametric method, contrived from the Malmquist Productivity Index, to measure and analyze the level of productivity of Islamic Banks. Also, this study uses the Liquidity Creation (LC) scale as a liquidity indicator. The regression of the Tobit model is used to measure the effects of independent variables, namely; productivity, liquidity, Financing to Deposit Ratios/FDR, Non-Performance Financing/NPF, and the Capital Adequacy Ratio/CAR, on the profitability of Islamic banks, as represented by Return on Assets/ROA. This study shows that FDR, NPF, and CAR are statistically significant to ROA, while Total Factor Productivity/TFP and LC are not statistically significant. Other results show the level of productivity of Islamic Banks decreased during the period 2011-2020. In terms of liquidity level, Islamic banks did have a sound level of liquidity, based on mapping the criteria of FDR, NPF, and CAR, where the LC always grew. This study shows the novelty of integrating productivity, liquidity, and profitability techniques, to measure Islamic Banking Performance in Indonesia.*

Keywords: *Islamic Bank, Total Factor Productivity, Liquidity Creation, profitability*

Abstrak. *Tujuan dari penelitian ini adalah untuk mengukur dan menganalisis tingkat produktivitas dan likuiditas Bank Umum Syariah di Indonesia. Penelitian ini menggunakan metode non parametrik yakni Malmquist Productivity Index untuk mengukur dan menganalisis tingkat produktivitas Bank Umum Syariah. Selain itu, penelitian ini menggunakan Liquidity Creation (LC) sebagai indikator likuiditas. Regresi model Tobit digunakan untuk mengukur pengaruh variabel bebas, yaitu; produktivitas, likuiditas, Financing to Deposit Ratio/FDR, Non-Performance Financing/NPF, dan Capital Adequacy Ratio/CAR terhadap profitabilitas bank syariah yang direpresentasikan oleh Return on Assets/ROA. Penelitian ini menunjukkan bahwa FDR, NPF, dan CAR berpengaruh signifikan terhadap ROA, sedangkan Total Factor Productivity/TFP dan LC tidak berpengaruh signifikan. Hasil lainnya menunjukkan bahwa tingkat produktivitas Bank Umum Syariah menurun selama periode 2011-2020. Dari sisi tingkat likuiditas, bank syariah memang memiliki tingkat likuiditas yang sehat berdasarkan pemetaan kriteria FDR, NPF dan CAR, dimana LC selalu meningkat setiap periode. Studi ini menunjukkan kebaruan dalam integrasi teknik produktivitas, likuiditas, dan profitabilitas, untuk mengukur kinerja perbankan Syariah di Indonesia.*

Kata kunci: *Bank Syariah, Total Factor Productivity, Liquidity Creation, profitability*

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Introduction

Since the establishment of the first Islamic bank in Indonesia in 1992, Islamic banking businesses have constantly achieved significant assets growth. Based on the CAGR (Compound Annual Growth Rate), in the period 2008 to 2020, the growth of total assets, financing, and third-party funds of Islamic Banks was higher than the average growth in these aspects for the overall banking industry in Indonesia. The growth of Islamic banks was at twice the rate of conventional banks, where the growth of assets of Islamic banks was 25.05%, compared to 12.89% for conventional banks. The growth of financing of Islamic banks was 23.96%, compared to 14.50% for conventional banks, and the growth of funding of Islamic banks was 25.80% compared to 11.95% for conventional banks. These figures indicate that Islamic banks were more competitive than conventional banks from 2008 to 2020. This fact also indicates that Islamic banks have a huge potential market in Indonesian society because the average growth of Islamic Banks was higher than the average growth of the overall banking industry in Indonesia (Karim Consulting Indonesia, 2015).

Many techniques have examined Islamic banking performance regarding productivity, liquidity, and profitability. Historically, ratio analysis has been the standard technique used by regulators, industry analysts and management, to examine performance at all levels. The ratio analysis measures the relationship between two variables and has limitations when measuring more than two variables. Although the traditional ratio measurements are attractive to analysts, many methodological problems and limitations need to be considered (Paradi & Zhu, 2013).

Measurement of productivity is very important in management to determine the ability to deliver services and identify opportunities for improvement. A bank is more productive than its competitors if the securities transaction is settled and cleared with fewer resources, such as minimizing operation costs. The effectiveness of Islamic banks as intermediary institutions can be seen from how well Islamic banks can offer innovative and sophisticated products at more competitive prices than conventional banks (Sulfian, 2007).

Yeh (1996) stated that every single ratio must be compared with some benchmark ratio, one at a time, while assuming that other factors are fixed, and the benchmarks chosen are suitable for comparison. To ensure this occurs, the Frontier-Based Analysis was developed to compute the efficiency and productivity by transforming multiple inputs into multiple outputs relative to its peers, which may provide a fine mechanism for deriving appropriate categories. This study used

the Malmquist Total Factor Productivity (Malmquist TFP) to measure productivity based on Frontier-Based techniques.

Frontier-Based Analysis consists of non-parametric and parametric approaches (Chen, 2002). The Data Envelopment Analysis (DEA) and Malmquist TFP approaches use mathematical programming techniques to construct a precise linear frontier and can be referred to as a non-parametric programming approach. Studies by Chen (2002) and Muhari and Hosen (2013) stated that the non-parametric and parametric approaches do not exhibit significant differences in results.

The Malmquist TFP is a well-established method for analyzing the productivity of homogeneous Decision-Making Units (DMUs) performing the same tasks, e.g., schools, hospitals, banks and branches of a bank (Porembski, Breitenstein, & Alpar, 2005). This study measured the Malmquist TFP for Islamic Banks in Indonesia because of their homogeneity.

Many studies conducted by Athanassopoulos and Giokas (2000), Porembski, Breitenstein, and Alpar (2005), Yeh (1996), Paradi and Zhu (2013), Hsiao *et al.* (2011), Azadeh *et al.* (2011), Tortosa-Ausina *et al.* (2008), Sufian and Kamaruddin (2014), Zhang, *et al.* (2012), Wu, Yang, and Liang (2006), and Paradi, Yang, and Zhu (2011) proved that it is better to understand banking performance using the Frontier-Based Techniques, rather than to use a Financial Ratio Analysis.

The main goals of the DEA and the Malmquist TFP are to identify best practices and worst practices and to find ways to improve company performance (Porembski, Breitenstein, & Alpar, 2005). The study by Abedifar *et al.* (2015) implied that one of the goals of Islamic Banking organizations, as business entities, is to improve their performance by increasing profitability. It may then be suggested that there is a link between efficiency and productivity regarding banks' profitability. Studies by Setyawati *et al.* (2017), Zarrouk *et al.* (2016), Ramlan and Adnan (2016), and Riyadi and Yulianto (2014) also implied that efficiency and productivity could affect the profitability of Islamic banks. Unfortunately, the efficiency measurement from those previous studies was based upon financial ratio analysis, which has many limitations.

Moreover, profitability is also affected by the liquidity levels of Islamic banks. The level of liquidity is likely to have an important impact on the funding structure and profitability (Housa, 2013). Based upon the financial intermediation theory, banks play two main roles in the economy; creating liquidity and transforming risk (Berger *et al.*, 2019). Islamic banks with higher liquidity levels can have decreased levels of profitability. Specifically, the study aimed to measure and analyze the levels

of productivity and liquidity, and the effects of both, on the profitability of Islamic banks in Indonesia, during the period 2011 to 2020. Productivity was measured using a non-parametric method, via the Malmquist Productivity Index, to measure and analyze their productivity levels, with Total Factor Productivity (TFP) as a productivity indicator, and using Liquidity Creation (LC) as the liquidity indicator. The Regression of Tobit model was used in this research to measure the effect of independent variables, namely; productivity, liquidity, Financing to Deposit Ratios (FDR), Non-Performance Financing (NPF), and Capital Adequacy Ratio (CAR), related to the profitability of Islamic banks, as represented by their Return on Assets (ROA). This study showed the novelty of integrating productivity, liquidity, and profitability techniques, to measure Islamic Banking Performance in Indonesia.

Literature Review

To observe the continued output growth in Islamic banks in Indonesia, productivity growth is needed in time series analysis. Productivity in this study is used to measure the Total Factor Productivity (TFP), consisting of the overall factors of production without partially differentiating factors of production. TFP can be measured using a non-parametric approach, namely the Malmquist Productivity Index (MPI).

The evaluation of productivity and liquidity in the banking business, including that of Islamic banks, is not easy to achieve. A bank has an intermediary function as a financial institution. Based on the theory of financial intermediation, banks play roles in the economy because of their ability to create liquidity and transform risks (Berger and Bouwman, 2009).

Furthermore, based on the writings of Berger and Bouwman (2009), *“Banks generally transform short-term funds from depositors to non-liquid long-term assets in the economy. In this case, banks also create risk transformation. Banks will protect their customers from liquidity problems, but at the same time, they also face liquidity risks. In extreme cases, the liquidity problem arises when many customers withdraw their funds simultaneously. The liquidity problem will worsen if sudden cash withdrawal occurs across all banks”*.

Liquidity is one of the guarantees for the public to encourage them to place their funds in banks. In addition, liquidity is also a benchmark for the public to show how far Islamic banks can give freedom to their customers to withdraw their funds at any time, when needed (Ahmed *et al.*, 2011).

Problems related to the importance of maintaining the level of liquidity, and

the need to improve the productivity of Islamic banks, will eventually be related to the objectives of Islamic banks as *profit-oriented* institutions. Banks are required to have a high level of productivity so that their production function can be effective and efficient and in line with profitability.

Saluja and Kumar (2012) state that "*Liquidity and profitability also have a relationship based on the theory that, if the bank does not lend or invest its collected funds, to maintain liquidity, the idle funds will be higher, and the effect will be to decrease profitability ratios. It can then be said that there is a gap between profitability and liquidity*". Thus, it may be concluded that the policy of Islamic banks to maintain liquidity will impact their levels of profitability.

Many studies have been conducted on the productivity, liquidity and profitability levels of banks in a number of countries. Sulfian (2007) studied the productivity levels of Islamic banks in Malaysia, using the Malmquist Productivity Index, with the approach of financial intermediation theory, and compared the level of productivity of the domestic Islamic banks with foreign Islamic banks during the period 2001-2004. This study shows that the productivity of domestic banks was better than the productivity of foreign banks. The values of productivity were influenced, mainly, by changes in technology, as opposed to changes in efficiency.

Research conducted by Linh and Nguyen (2012) measured the Total Factor Productivity (TFP) in the major banks in Thailand, 2007-2010, using a DEA-Malmquist Index approach. Variables used consisted of interest and non-interest expenses as inputs, and interest and dividend income and non-interest income, as outputs. This research shows that the level of productivity of banks in Thailand decreased by the value of their TFP. This was owing to the influence of the Global Financial Crisis, which occurred in 2008. Lartey *et al.* (2013), in their study of the relationship between liquidity and profitability of a bank, are listed in Ghana conclude that there is a positive relationship between the liquidity and profitability of commercial banks.

Meanwhile, Olgunju *et al.* (2011) examined the relationship between the management of liquidity and the profitability of the commercial banks in Nigeria. As a result, there is a significant relationship between liquidity and profitability. Tran *et al.* (2016), in their study of the relationship between Liquidity Creation (LC), capital, and the profitability of banks, concluded that the bank which creates liquidity might reduce profitability, meaning Liquidity Creation may have a negative correlation to profitability.

Alharbi (2017) showed that bank size, equity, other operating income, income *per capita*, and oil prices, positively affected Islamic bank profitability. Moreover, Abedifar *et al.* (2015) analyzed the profitability comparison between Islamic and conventional banks. The study provided discussions, such as profit and loss sharing behaviour, risks, competition, financing of small businesses, and financial inclusion. The research indicated that most literature showed no major differences between Islamic and conventional banks regarding competition, efficiency, and risks. Meanwhile, Ramlan and Adnan (2016) conducted a similar study in Malaysia. The results of this study showed that the performance of Islamic banks in profit earning is better than that of conventional banks.

Riyadi and Yulianto (2014) examined the impact of profit sharing, financing, purchase financing, Non-Performing Financing (NPF) and Financing Debt Ratio (FDR) on profitability (proxied by ROA) of Islamic banks in Indonesia. The results of this study indicated that NPF does not affect profitability and that FDR has a positive effect on profitability. Sabir *et al.* (2012) analyzed the effects of the ratio of bank soundness, using CAR and ROA, resulting in the conclusion that the NPF has a negative effect on ROA and that CAR has a positive effect on ROA. These results are similar to those in Yuliani's (2007) study that CAR does have an effect.

Islamic banks' characteristics are; compliance with *Sharia* (Islamic law), by prohibiting interest rates and referring to Islamic law, sharing revenue, risk sharing, concerning themselves with social functions, and limiting financial innovation. Oubdi and Elouali (2017) mentioned that "*Islamic banks face liquidity problems because of a limited number of participants, lack of secondary financial markets, difficulties in developing Islamic financial instruments, and the absence of an Islamic interbank market*".

Setyawati *et al.* (2017) investigated the internal and external matters that affect the profitability of Islamic banking in Indonesia and the effects of the Global Financial Crisis (GFC). The study results showed that the profitability of Islamic banks is significantly affected by non-performing financing and inflation. It was also found that the profitability of Islamic banks had improved since the GFC. On the other hand, different results were found by Hassan and Aliyu (2018), that the performance of Islamic banks in earning profits was below that of their conventional counterparts, even with the spill-over effect on the Islamic banks from the GFC. Yanikkaya (2018) suggested that developing new products and undertaking alternative financing development to enhance Islamic banks' profitability was important.

The findings by Zarrouk *et al.* (2016) showed that "*the profitability of Islamic banks is affected positively by their levels of capitalization, asset quality, bank cost-effectiveness, and the level of non-financing activities. Besides that, non-financing activities, such as fee-based income allow Islamic banks to increase profits. On the other hand, the level of inflation has a negative effect on the profitability of Islamic banks. The study also found that Islamic banks, at the higher levels of gross domestic product (GDP) and investment, enjoy higher levels of profitability*". Nevertheless, similar research by Narayan (2018) produced a somewhat different result; that Islamic banking in emerging countries with high investment is more profitable than in developed countries.

Akhtar *et al.* (2011) concluded their research that conventional banks are better at managing liquidity than Islamic banks. Meanwhile, Pappas *et al.* (2012) stated that Islamic banks faced greater liquidity problems than conventional banks. Alamsyah (2011) stated that, without installing the "Lender of Last Resort" system, based again upon Islamic law, Islamic banks had higher levels of liquidity problems than conventional banks.

For these reasons, study regarding liquidity is very important from the perspective of Islamic banks in Indonesia because Indonesian scholars nowadays conduct very few studies.

Research Method

Data and Research Variables

The objects of this study are 11 Islamic banks in Indonesia, *i.e.* the Bank Muamalat Indonesia, the Bank Syariah Mandiri, the Bank Mega Syariah, the Bank BRI Syariah, the Bank BNI Syariah, the Bank BJB Syariah, the Bank Bukopin Syariah, the Panin Bank Syariah, the Bank BCA Syariah, and the Bank Victoria Syariah in the period 2011 to 2020. The data used is secondary data, with time-series data and panel data taken from the annual financial statements of each bank. The sources are "Publication of Financial Statements and Islamic Banking Statistics" from the Financial Services Authority (FSA), the published Statements of the Central Statistics Agency (CSA) and the financial statements of each Islamic bank.

This study uses a DEA-Malmquist Productivity Index to measure Islamic banks' productivity. In determining the input and output variables, to calculate the value of Total Factor Productivity (TFP), a reference is made to Suffian (2007), who used Islamic banks as intermediate institutions. Input variables used in this

study are Fixed Assets (I1), Third Party Funds (I2), and Labour Costs (I3), while output variables used were Total Financing (O1) and Operational Income (O2).

The measurement of liquidity is done by using a number of liquidity ratios. The first ratio is Liquidity Creation (LC), describing the ability of a bank to create liquidity in the economy. Banks create liquidity when they lend to the real sector (Berger and Bouwman, 2009). For example, IDR.1 liquidity in the economy is created by investing IDR.1 of liquid liabilities (e.g. time deposits) into IDR.1 of non-liquid assets. Next is the Financing to Deposit Ratio (FDR), the ratio between the amount of financing provided and the number of third-party funds. This ratio is mapped to the ratio of Non-Performing Financing (NPF) to describe the liquidity risk and the Capital Adequacy Ratio (CAR) to indicate the ability of a bank to cover liquidity risks.

The last stage is to analyze the influence of productivity and liquidity on profitability, represented by Return on Assets (ROA), using regression of the Tobit model. The independent variables are TFP (X1), LC (X2), FDR (X3), NPF (X4) and CAR (X5), while the dependent variable is ROA (Y).

Malmquist Productivity Index

The Malmquist Productivity Index (MPI) is used to measure changes in productivity (productivity change). The index value can be composed of changes in technology (technological change) and change in efficiency (efficiency change). The MPI is based on the concept of the production function measurement at maximum production function, with input at a pre-determined limit.

Many previous studies have used the MPI to measure productivity because the Index has several beneficial characteristics. Firstly, the MPI is a method of non-parametric measurement, so it does not require the specification of the functional form of production. Secondly, this Index does not require the assumption of the economic behaviour of production units, such as cost minimization or profit maximization, so it is useful for measuring productivity at entities. Thirdly, the index calculation does not require data prices, often unavailable. Fourthly, the MPI can be broken down into two components: efficiency and technological change. Measurement of productivity, in this Index, refers to the change in total factor productivity (TFPCH) of all factors used. The MPI can be formulated as follows:

$$Total\ Factor\ Productivity\ Change = \frac{D^{t+1}(y^{t+1}, x^{t+1})}{D^t(y^t, x^t)} \times \left[\frac{D^t(y^{t+1}, x^{t+1})}{D^{t+1}(y^{t+1}, x^{t+1})} \times \frac{D^t(y^t, x^t)}{D^{t+1}(y^t, x^t)} \right]^{\frac{1}{2}}$$

or

$$Total\ Productivity\ Change = Efficiency\ Change \times Technology\ Change$$

where

$$Efficiency\ Change = \frac{D^{t+1}(y^{t+1}, x^{t+1})}{D^t(y^t, x^t)}$$

$$Technology\ Change = \left[\frac{D^t(y^{t+1}, x^{t+1})}{D^{t+1}(y^{t+1}, x^{t+1})} \times \frac{D^t(y^t, x^t)}{D^{t+1}(y^t, x^t)} \right]^{\frac{1}{2}}$$

Total Factor Productivity (TFP) is the result of technological change (TECH) and changes in efficiency (EFCH), based on changes at the latest production point (xt and yt + 1 + 1), against the previous production point (xt and yt) in the period t and t + 1. D is the distance function output.

Efficiency Change (EFCH) is an indicator of efficiency, commonly referred to as Technical Efficiency. In the DEA analysis model, variable returns to scale (VRS) reflect that technical efficiency consists of purely technical and scale efficiency. Pure technical efficiency describes the ability of managers to take advantage of their resources, while scale efficiency represents how well a company can operate on proper scale production.

In connection with the input and output used for measuring productivity in the MPI, three approaches can be used: the asset, production, and intermediation. In this research, the approach used is the intermediation approach. According to Hadad (2003) and Firdaus and Hosen (2013), the activity of an intermediation approach is suitable for a banking institution.

Tobit Model

The Tobit calculation was proposed by Tobin (1958) when he analyzed the expenditures of households in the United States used in buying a car. Spending on a car, in some households, would be zero (because the household did not buy a car). This affected the results of the regression analysis. Tobin found that if the OLS regression were still used, parameter calculation would tend to approach zero as well and become insignificant, or, if it were to become significant, the value could be biased (too high or too low) and also inconsistent. If there were to be new data, the results would not be the same or not be in accordance with the results of the original (Firdaus and Hosen, 2013).

The Tobit method assumes that the independent variables are not limited in value (non-censored); only the dependent variable is censored; all variables are measured correctly; there is no autocorrelation; no heteroscedasticity; there is no perfect multicollinearity, and the mathematical model used is correct.

Empirical Results

Productivity of Islamic Banks: the Malmquist Productivity Index

Table I shows an average of the summary of TFPCH, TECH, EFCH and decomposition by PECH and SECH, from 2011 to 2020. From this period, the year 2011 was the year used as the reference, and therefore the overall indicator MPI score is 1 (100%). The score of each indicator changes in the following year, becoming either larger or smaller than 1 (100%) indicates the change in each indicator of the MPI.

Table 1. TFP Decomposition of Full Fledged Islamic Banks in 2011 to 2020

Period	Productivity Change (TFPCH)	Technology Change (TECH)	Efficiency Change (EFCH)	Pure Efficiency Change (PECH)	Scale Efficiency Change (SECH)
2011-2020	0.880	0.924	0.952	0.971	0.952
2011-2012	1.070	0.008	0.061	1.026	0.983
2012-2013	0.418	0.409	0.022	0.632	0.647
2013-2014	0.671	0.336	0.503	1.163	1.149
2014-2015	0.612	0.341	0.457	0.995	1.348
2015-2016	0.568	0.030	0.551	1.019	1.011
2016-2017	2.177	0.977	2.228	1.043	0.937
2017-2018	0.830	0.693	1.197	0.694	0.999
2018-2019	1.118	0.296	0.863	1.485	0.872
2019-2020	0.880	0.924	0.952	0.971	0.952

Source: Islamic Banks Annual Report, Data Processed

During the period 2011-2020, Islamic banks had increased productivity levels, which could be measured from the average score of TFPCH, which is worth 0.880 or is 12.2% smaller than the value of the reference year (1.00). This shows that Islamic banks' productivity levels decreased an average of 12.2% during this

period. The decreasing level of productivity was dominated by TECH as a major source of the increase in TFPCH, compared to EFCH. The average score of TECH was 0.924, or a decrease of -7.6%, on the value of the reference year (1.00). That is, the overall increase in productivity of Islamic banks was created, owing to the ability of banks to utilize a combination of technical inputs to the production of efficiency and to produce good output. At the same time, the EFCH decreased by -4.8%. The decline in most major EFCH was caused by the PECH value also decreasing by -2.9% and by the SECH, which also decreased slightly, by -4.8%. If the observations are of a specified period of years, the TFP increases trend both upwards and downwards.

The main factors causing the increase of the TFPCH of Islamic banks each year were compared with the EFCH and the TECH, where the values of the TECH in 2010-2011 decreased by 99.2%. In 2014, it increased dramatically to 40.9%, although in 2020, it experienced an increase only to 92.4%, which was lower compared to the initial years. Meanwhile, the value of the TECH was an indicator of the inefficiency of the EFCH in Islamic banks, which decreased dramatically in 2012 and the value of the EFCH in other years was below 100%, which illustrated the level of efficiency decreasing, or the occurrence of inefficiency.

The decline in the efficiency performance of Islamic commercial banks, based on the value of the EFCH, is dominated by banks based on pure efficiency performance PECH than scale efficiency value based on the value SECH. From 2011 to 2020, the value of the TECH was always below 100%. Meanwhile, the SECH was a little better from 2012 to 2016.

Islamic banks increased productivity (TFP) is caused by changes in the technology used (technological change). This indicated that the production functions of the bank were better than the technical efficiency. Overall, the bank's ability to utilize its inputs, which were assets, deposits and labour, may have produced output in the form of financing and maximum revenue. This showed in the productive performance of Islamic banks. However, banks are not always efficient at earning. From 2011 to 2020, Islamic banks increased productivity due to the increasing value of technological change, but not to a high-efficiency level.

The decline in the efficiency performance of Islamic banks in this regard was influenced by pure efficiency (*pure efficiency*, *technical*/PECH), which indicated the ability of the leadership of Islamic banks to utilize their resources and also the scale of efficiencies (*Scale of efficiency*/SECH), symbolizing that banks can operate at the right scale of production. If both values are increased, resources can be optimized, and the bank is located on the right production scale.

If banks enjoy a rise in the value of their technical efficiency (*efficiency*), this will increase their productivity. Conversely, if the value of both technical efficiency and productivity decrease, banks will become less efficient. This then will not affect productivity improvements.

This occurred from 2011 to 2020, where the efficiency of Islamic banks decreased (*inefficiency*), caused by a decline in technology change. Still, this decline did not affect increasing productivity, owing to technological factors.

Liquidity of Islamic Banks in Indonesia

Liquidity Creation (LC)

Table 2 shows the LC of Islamic banks in Indonesia during the period 2011 to 2020:

Table 2. Liquidity Creation of Full-Fledged Islamic Banks in Indonesia, in 2011 to 2020

Year	Liquidity Creation (LC) (in billion rupiahs)	LC/Total Assets (TA)	LC/Equity (EQ)
2011	1,594	22.66%	1.54
2012	1,025	14.32%	1.12
2013	1,310	12.99%	5.11
2014	2,615	13.37%	1.82
2015	2,601	12.97%	1.14
2016	3,210	17.59%	1.51
2017	3,978	16.72%	1.88
2018	3,658	16.34%	1.25
2019	4,624	16.80%	1.38
2020	4,508	20.50%	1.52

Source: Islamic Banks Annual Report, Data Processed

All Indonesian Islamic banks, in 2011, were able to create liquidity, or money, in the economy of Indonesia, of Rp. 1,594 billion, and were able to continue to grow each year. In 2012 the amount of money decreased to Rp. 1.025 billion. In 2020, significant growth occurred, compared to figures from previous years, increasing to Rp. 4,508 billion.

When the LC of Islamic Banks is compared to equity (LC/EQ), the result explains how equity can create liquidity. Based on these results, the Islamic banks

were able to generate Rp. 1.54 of liquidity from Rp 1 of capital in 2011. In 2020, the ratios slightly decreased to Rp. 1.52.

If Islamic banks' liquidity level is compared to total assets (LC/TA), Liquidity Creation by Islamic banks was 22.66% of total assets in 2011 and decreased to 20.50% in 2020. The value growth was in line with the growth of LCs, which both increased and decreased during the period under study. These scores indicated that the liquidity risk of Islamic banks was relatively low.

The results showed that the liquidity creation of Islamic banks in the Indonesian economy increased every year. Besides this, the capability of Islamic banks to create liquidity from equity can be stated to have been in "good" condition because every Rp. 1.00 of equity can generate more than Rp 1.00 of liquidity.

Financing to Deposit Ratio (FDR)

The Financing to Deposit ratio (FDR) is one of the ratios used to measure the ability of banks to meet short term liability, based on the amount of financing and deposit. A high ratio of FDR shows the high usage of third-party funds issued by Islamic banks. If the ratio of FDR is higher than 100%, this means that financing is higher than deposits, so it may be stated that the intermediary function of Islamic Banks is not working well. Moreover, a high ratio of FDR can escalate the liquidity risk, whereas a lower ratio of FDR shows that Islamic banks are not effectively transforming third party funds to financing.

Table 3. FDR of Fully-Fledged Islamic Banks, 2011 to 2020

Bank	Average
Bank Syariah Mandiri	81.73
Bank Muamalat	84.14
BRI Syariah	85.66
BNI Syariah	83.35
Bank Mega Syariah	89.31
Bank Syariah Bukopin	101.39
BJB Syariah	91.32
Panin Bank Syariah	102.94
BCA Syariah	86.47
Bank Victoria Syariah	80.50

Source: Islamic Banks Annual Report, Data Processed

In Table 1.3, one can see the growth of the FDR ratio of Islamic banks in Indonesia between 2011 and 2020. The FDR ratio of Islamic banks, in general, met the requirement of the regulator's standards (except Panin Bank Syariah and Bank Syariah Bukopin). Overall, Islamic banks in Indonesia were classified as good and performed optimally to maximize the intermediation function to transform third party funds to financing while maintaining the correct liquidity risk level.

Mapping of the Effects of NPF and CAR on FDR

The amount of financing disbursed can be influenced by several factors, including the performance involved in risk financing (NPF) and the capital adequacy ratio (CAR). The risk of bad loans can affect the bank's decision-making to issue financing. The sufficiency of capital can cater for the risk of bad loans and risks regarding liquidity. In this subsection, the mapping of the effects of NPF and CAR to FDR is demonstrated to compare each bank's performances in the period 2011 to 2020.

The mapping can be classified into four categories based on the score of each variable. These are:

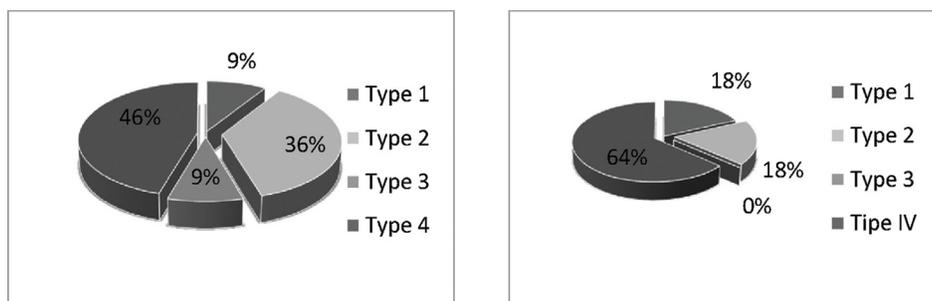
- 1) Category 1; Islamic Banks with high NPF/CAR and FDR scores.
- 2) Category 2; Islamic Banks with a high NPF/CAR score but a low FDR score.
- 3) Category 3; Islamic Banks with a low NPF score and a high FDR score.
- 4) Category 4; Islamic Banks with NPF/CAR and FDR scores low.

The mapping between NPF and FDR can be seen in Figure 1. Banks classified in Category 4 were the majority, 46% of the total. The banks which were included in this category were BRI Syariah, BNI Syariah, Bank Mega Syariah, Bank Bukopin Syariah, and Bank BCA Syariah. About 36% of Banks were classified in Category 2, *i.e.* Bank Syariah Mandiri, Bank Muamalat, BJB Syariah, and the Bank Victoria Syariah. Meanwhile, Maybank Syariah Indonesia bank and the Panin Bank Syariah were classified as Category 1 and Category 2.

The mapping between CAR and FDR showed that the banks classified in Category 4 were in the majority, with 64% of the total, which means that those banks had small CAR and FDR scores. The banks classified in this category were the Bank Syariah Mandiri, Bank Muamalat, BRI Syariah, BNI Syariah, Bank Mega Syariah, Bank Bukopin Syariah, and BJB Syariah bank. Banks in Category 1, with

18% of overall numbers, were BCA Syariah and the Bank Victoria Syariah, whilst the Maybank Syariah bank and the Panin Bank Syariah were included in Category 2. None of the banks was included in Category 3.

Figure 1. The Results of the Effects of NPF and CAR to FDR



Source: Islamic Banks Annual Report, Data Processed

The Influences of Productivity and Liquidity on Profitability

In this section, measurement of the Malmquist Total Factor Productivity (Malmquist TFP) is used as a productivity variable. For liquidity variables, Liquidity Creation to Total Assets (LC/TA) ratios are used, the Financing to Deposit Ratio (FDR), Non-Performing Financing (NPF), and Capital Adequacy Ratio (CAR). The Return on Assets (ROA) is used as a profitability variable. In this section. The range of data covers the period 2012 to 2020.

Table 4 shows the effects of liquidity and profitability on productivity, using a Tobit regression model.

Table 4. Results of Tobit Model

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	2,18370	0,5984	3,649	0,0003
TFP	-0,0001	0,0031	-0,0582	0,9536
LC	-6,1776e-09	2,4352e-08	-0,2537	0,7997
FDR	-0,0106	0,0054	-1,960	0,0500
CAR	0,0188	0,0109	1,725	0,0045
NPF	-0,3026	0,0669	-4,523	0,0000

Source: Islamic Banks Annual Report, Data Processed

Based on Table 4, Total Factor Productivity (TFP) does not have a statistically significant effect on levels of profitability. It has no such statistically significant effect because of inefficiency problems. As mentioned in the previous section, the main factor affecting productivity is technological changes, while efficiency does not have any effect. This means that the raising of productivity does not optimize efficiency. The results of the Tobit regression are in line with the mapping of TFP and ROA, where TFP affects some Islamic commercial banks. The results of this study are in accord with results from Tran, Lin, and Nguyen (2016), which stated that the TFP has a significant effect on the profitability of banks.

The Liquidity Creation (LC) variable is one of the liquidity indicators used to measure how Islamic banks met short-term debt. High levels of LC ratio indicates a considerable amount of idle funds, so Islamic banks lost the opportunity to optimize profit by providing loans or financing. LC is not statistically significant for profitability. Meanwhile, the regression coefficient shows a negative value, which means that a lot of liquidity can reduce the level of productivity of Islamic banks. The high level of LC allows Islamic banks to increase their capability in maintaining liquidity risk.

The FDR (Financing to Deposit Ratio) has a statistically significant effect on the profitability of Islamic banks, and the result is in line with Riyadi and Yulianto (2014). The FDR level shows the effectiveness of Islamic banks in playing intermediary functions. The regression coefficient shows a positive value, which means that a large loan or financing ratio increased the profitability level of Islamic banks. However, the level of FDR should be at a moderate level to maintain liquidity risks. From the study results, it can be seen that there is a difference between the concerns of the Islamic banks, whether to maximize profits or to maintain liquidity risks.

The Ratio of Non-Performing Financing (NPF) is one of the factors used to measure poor performance loaning or financing at Islamic banks. From the results of the Tobit regression, it can be seen that the NPF has a statistically significant effect on the profitability level of Islamic banks. That result aligns with Sabir, Ali, and Habbe (2011). Furthermore, the coefficient regression of the NPF shows a negative value, which means that poor performance financing can reduce the level of profitability. The high level of the NPF decreases the level of payment from its debtors. Islamic banks should put aside some funds to increase the level of their Loan-Loss Provisions. The Loan-loss Provision is the requirement for money to be put aside by Islamic banks to overcome bad debt problems. Hence, a high level of NPF is a serious problem that can reduce Islamic banks' ability to generate profits.

A Capital Adequacy Ratio (CAR) requirement is noteworthy for each bank because of its important role in mitigating risks, operating banking activities, and expanding business (Riyadi, 2005). The level of CAR in an Islamic bank should be moderate. A high level of CAR indicates that a bank is not optimally utilizing its capital, whilst a low level of CAR indicates a bank is in severe circumstances, considering its capability to mitigate risks. It can be seen from the results of the study that the CAR is statistically significant to the profitability levels of Islamic banks. This result is in line with Laurentia and Lindawati (2010) but not in line with Sabier (2012) and Yuliani (2007). Moreover, the coefficient regression of the CAR shows a negative value, meaning that Islamic banks were too aggressive in generating business without considering risk mitigation.

Conclusion

This study provides some important findings. Islamic banks decreased their productivity in the study period, with TFP growth over ten years being -12.2%. The Malmquist Productivity Index shows that Technological Changes (TECH) influence is greater than Efficiency Changes (EFCH), with scores of -7.6% and -4/8%, respectively. Even though it operated inefficiently, Islamic banks could implement their production functions properly.

Based on the results of the Tobit regression, it can be seen that the efforts of the Islamic banks to generate profits often negated their efforts to mitigate risks. The variables represented in risk mitigation, such as LC, NPF, and CAR, show negative values. Therefore, Islamic banks need to generate more profits. However, they should also meet the risk mitigation requirements, as one of the key roles of intermediary financial institutions.

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