ANTecedents of Social Funds’ productivity of Islamic banks in Indonesia

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Abstract

Purpose: The study aims to analyse the social funds’ productivity of Islamic banks in Indonesia and the antecedents of it. The study will measure the social fund productivity followed by the investigation about the variable which can determine the Islamic bank productivity.

Methodology: The study conducted at nine Islamic banks Indonesia. Two stages of the Malmquist productivity index were applied to annual data from 2012-2018. The variables which are tested its effect on social funds’ productivity return on asset, operational efficiency, inflation, OPEC oil price, and economic growth.

Main Findings: social funds’ productivity of Islamic banks in Indonesia has experienced progress during the observation period. It is supported by the progress on technological change and efficiency change. The antecedents of social funds’ productivity return on asset and operational efficiency, while macroeconomics conditions have no significant effect on social funds’ productivity.

Applications of this study: This study enriches the research on Islamic banks and gives the recommendation for policymakers to supervise better and for banks’ managers to improve the social funds’ productivity.

Novelty/Originality of this study: This research is the preliminary study on the determinant of social funds’ productivity in Islamic banks.

Keywords: Social Funds, Productivity, Islamic Banks, Macroeconomics, Return on Asset, Operational Efficiency.

INTRODUCTION

The Islamic banking system had the fastest growth in the financial industry and appeared as a new intermediation institution (Abbas et al., 2016; Olson & Zoubi, 2017). By the biggest Muslim population, Islamic banks in Indonesia enjoyed the rapid growth for 27 years (Pambuko et al., 2018). Table 1 show that the Indonesian banking industry experienced an increase in the number of Islamic commercial banks and the decrease in the number of Islamic business units or Islamic windows. The condition is supported by the Act of Islamic banking in Indonesia that obligate the Islamic windows to separate from its conventional parent’s bank (Act Number 21 2008 about Islamic Banking, 2008). The Islamic rural bank also experienced the improvement of its number. In the term of performance, the Islamic banking industry in Indonesia over ten years experienced positive growth despite in 2015 and 2019 are very low. The financing from third-party funds also had better allocation although the operational efficiency still far from standard (Monetary Service Authority, 2019).

Table 1: The Growth of Indonesian Islamic Banking Industry 2010-2019

| Islamic banking network                          | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | Sept 2019 |
|-------------------------------------------------|------|------|------|------|------|------|------|------|------|-----------|
| Islamic commercial bank                         | 11   | 11   | 11   | 11   | 12   | 12   | 13   | 13   | 14   | 14        |
| Islamic business unit                           | 23   | 24   | 24   | 23   | 22   | 22   | 21   | 21   | 20   | 20        |
| Islamic rural bank                              | 150  | 155  | 158  | 163  | 163  | 166  | 167  | 168  | 165  |           |
| Islamic Banking Performance                     |      |      |      |      |      |      |      |      |      |           |
| Asset growth (%)                                | 47.60| 49.20| 34.10| 24.20| 12.40| 8.80 | 20.30| 19.00| 14.70| 2.80      |
| Deposit growth (%)                              | 45.50| 51.80| 27.80| 24.40| 18.70| 6.10 | 20.80| 19.90| 11.50| 4.80      |
| Financing growth (%)                            | 45.40| 50.60| 43.70| 24.80| 8.70 | 6.90 | 16.40| 15.20| 14.00| 7.40      |
| Financial Performance                           |      |      |      |      |      |      |      |      |      |           |
| Capital adequacy ratio (%)                      | 16.25| 16.63| 14.13| 14.42| 15.74| 15.02| 16.63| 17.91| 20.39| 20.39     |
| Return on asset (%)                             | 1.67 | 1.90 | 2.14 | 2.00 | 0.41 | 0.49 | 0.63 | 0.63 | 1.28 | 1.66      |
| Non-performing financing (%)                    | 3.02 | 2.52 | 2.22 | 2.62 | 4.95 | 4.84 | 4.42 | 4.76 | 3.26 | 3.32      |
| Financing to deposit ratio (%)                  | 89.67| 88.94| 100.00| 100.32| 86.66| 88.03| 85.99| 79.61| 78.53| 81.56     |
| Operational Efficiency (%)                     | 80.54| 78.41| 74.97| 78.21| 96.97| 97.01| 96.22| 94.91| 89.18| 85.14     |

Keywords: Social Funds, Productivity, Islamic Banks, Macroeconomics, Return on Asset, Operational Efficiency.

References

Abbas et al., 2016; Olson & Zoubi, 2017; Pambuko et al., 2018; Monetary Service Authority, 2019.
This research was the extended study from our previous research, they are Pambuko et al. (2019), Pitaloka et al. (2018), and Usman et al. (2019). For instance, since the regulator issued an Act that obligated to manage the financial and social funds simultaneously, Islamic Banks in Indonesia have different intermediation role that another country (The Act Number 21 2008 about Islamic Banking, 2008). Therefore, it is also a unique and special case for Indonesia. The purpose of this study is to analyse the social funds’ productivity of Islamic banks in Indonesia and the antecedents of it.

LITERATURE REVIEW

The research on the productivity of Islamic financial institutions has developed quite rapidly. However, few studies have discussed the productivity analysis of social funds in Islamic banks. In the term of productivity analysis, the Islamic banks’ productivity continues to increase (Afriatun & Wiryono, 2010; Arijomandi et al., 2012; Rodoni et al., 2017). After spinning off, Islamic banks also increased their productivity (Norfitriani, 2016). It also applies to the conditions after Islamic banks are merged and foreign Islamic banks are more productive than domestic ones (Kamarudin et al., 2017). Islamic windows are less productivity than full-fledged Islamic banks (Sufian, 2007). But, other researchers mention that Islamic banks have to decrease their productivity (Bahrini, 2015; Johnes et al., 2015).

Guzmán and Reverte (2008) on his studying Spanish banks in the period 2000-2004 show that banks with higher efficiency and productivity changes have a higher shareholder value. Return on assets also gives a positive impact on efficiency and productivity. Akhtar (2010) states that MPI reflects an improvement in the average productivity of banks. However, the major increase in productivity gains emerged through technological change relative to the efficiency change. Fluctuations in technical efficiency and productivity between 2001 and 2006 are more likely the result of changes in oil prices and production quotas. Sharma and K. Sharma (2015) stated that overall productivity increase with technological improvement. Financial crisis 2008–2009 and the listing in the stock exchange exhibits a positive and significant impact on the productivity Indian banking sector. GDP and inflation exhibit a negative and significant association with the productivity gains of the Indian banking sector.

Based on the literature review above and to the best of our knowledge, the previous research is only focused on the financial analysis of Islamic banking. It has missed the social issue as an integral part of the development of the Islamic economic system. In our previous works, the social funds’ productivity of Islamic banks in Indonesia increased after the spin-off decision despite it has not a significant effect on productivity. Therefore, independence in managing resources will boost the Islamic banks’ performance (Pambuko et al., 2019). Subsequently, the social funds are more productive than financial funds and productivity change tends to trade-off. The productivity of social funds is progressed by 8.2% while the financial funds are regressed by 5.4% (Usman et al., 2019). Return on the asset has a positive significant effect on social funds’ productivity of Islamic banks, while capital adequacy ratio and zakah institutions ownership have a negative impact (Pitaloka et al., 2018). All studies also have a similar result that productivity change is influenced by the technological aspect rather than the efficiency aspect.

METHODOLOGY

Malmquist Productivity Index

Malmquist Productivity Index (MPI) forms a measure of productivity change and efficiency evaluation of a DMU among two periods (Caves et al., 1982; Nishimizu & Page, 1982; Renaud, 1971). It is based on the output distance function. Implicitly, the assumption built into this comparison is all DMUs have equal access to production technology. Therefore, this method can be compared among DMUs and estimated with a single production frontier (Huang et al., 2015).

Malmquist productivity index (MPI) generates primary output called total factor productivity (TFP) as the representation of overall productivity. It can be decomposed into two components, namely efficiency change and technological change. For measuring productivity, Fare et al. (1994) use a linear programming model based on Data Envelopment Analysis (DEA) with the non-parametric Malmquist productivity index. The output-based Malmquist productivity index specifies as follows.

\[
m_0(y_{t+1},x_{t+1},y_t,x_t) = \left[ \frac{d_1^s(x_{t+1},y_{t+1})}{d_0^s(x_t,y_t)} \times \frac{d_1^{s+1}(x_{t+1},y_{t+1})}{d_0^{s+1}(x_t,y_t)} \right]^2
\]

It reflects the production point’s productivity \((x_{ot}, y_{ot})\) relative to the production point \((x_o, y_o)\). This index is the geometric mean of two output-based Malmquist index. One index uses period \(t\) technology and the other period \(t+1\) technology. An index higher than one represent the positive TFP growth from period \(t\) to \(t+1\) (Coelli et al., 2005). In an output-oriented evaluation, index more than 1 indicates the progress in productivity, while index equal to 1 indicates the status quo and index less than 1 indicates the regress in productivity.

Panel Data Regression

Using econometric techniques with a panel data approach has some advantages. These include panel data, the provision of suitable context for the development estimation methods and the theatrical results which help the researchers use...
cross-sectional time series to analyse issues that are not possible to be studied in either just cross-sectional or just time series (Baltagi, 2013). Panel data regression has three models, namely the common effect model (CEM), fixed effect model (FEM), and random effect model (REM) (Nuryanto & Pambuko, 2018).

Data and Selection of Variables

This study conducts in Indonesia, and at present, there are 14 Islamic banks and 20 Islamic Windows. The sample of the study is 9 Islamic banks (Table 2) as we cannot reach the desired input-output variables. Data has collected from the Islamic banks’ annual reports and other related documents from 2012 to 2018 (with a total of 63 DMU’s). The period is used following the changes in the authority of supervisory and coaching for the financial industry from Bank Indonesia to the financial services authority (OJK) based on Law Number 21 of 2011.

Table 2: List of Selected Islamic Banks

| Bank Muamalat (BMI) |
|---------------------|
| Bank Syariah Mandiri (BSM) |
| Bank Mega Syariah (BMS) |
| Bank Rakyat Indonesia Syariah (BRIS) |
| Bank Panin Syariah (BPS) |
| Bank Syariah Bukopin (BSB) |
| Bank Negara Indonesia Syariah (BNIS) |
| Bank Central Asia Syariah (BCAS) |
| Bank Victoria Syariah (BVS) |

DEA analysis sets the requirements to achieve optimum results; one of them is the number of observations. For this reason, the observed number of Islamic banks should be equal to or larger than the number of input and output variables (Boussofiane et al., 1991). Based on the literature review, we acquire two output variables and two input variables for social funds. Hence, the requirement has met. The outputs are $y_1$: zakat distribution and $y_2$: charity distribution; while the inputs are: $x_1$: zakat fund and $x_2$: charity fund. All variables are denoted in an IDR million. The selected variables developed from available data which is reported by Islamic banks. Furthermore, the antecedents of social funds’ productivity are internal and external factors. Internal factors are return on asset (ROA) and operational efficiency (OE), while external factors are inflation (CPI), OPEC oil price (OIL), and economic growth (IPI).

Research Model

Our models are based on the regression such as:

$$ TFP_{it} = a_0 + a_1ROA_{it} + a_2OE_{it} + a_3CPI_{it} + a_4OIL_{it} + a_5IPI_{it} + \epsilon_{it} $$

Where TFP represents social funds’ productivity, ROA is the return on asset, OE is the ratio of operating expenses and operating incomes, CPI is the inflation rate, OIL is a log of OPEC Basket price (IDR), IPI is economic growth, $i = (1,2,.., N)$ represents the number of cross-section which is a cross-section of the 9 Islamic banks in this study is, and $t = (1,2,.., T)$, represents the period which is the period examined in this study are 8 years for Islamic banks.

RESULTS AND DISCUSSION

Table 3 shows the descriptive statistics for 9 Indonesian Islamic Banks related to the input and output variables for all years of 2012 to 2018.

Table 3: Summary of Descriptive Statistics about Islamic Banks (IDR x Million)

| Variable          | Max  | Min  | Mean  | Std. dev |
|-------------------|------|------|-------|----------|
| Social Funds      |      |      |       |          |
| Zakat Distribution ($y_1$) | 50,794 | 0    | 7,691 | 10,651   |
| Charity Distribution ($y_2$) | 85,208 | 0    | 3,203 | 11,778   |
| Zakat Fund ($x_1$) | 37,282 | 0    | 7,513 | 9,765    |
| Charity Fund ($x_2$) | 73,738 | 12   | 4,827 | 13,216   |

The statistics in Table 3 shows that there are large variations between DMU’s of Indonesian Islamic banks concerning the input and output variables. The social funds’ variables, charity distribution have the largest degree of variation while the other social funds’ variables also had large variations. In Indonesia, social funds are still secondary activities for Islamic banks behind the financial funds.

The Analysis of Social Funds’ Productivity

The level of productivity is measured by the Malmquist Productivity Index (MPI) method. MPI can be broken down into three components, namely: technological change (TECHCH), efficiency change (EFFCH), and productivity change (TFPCH). We calculate these components separately and then analyse the results based on these separate components.
Productivity analysis of social funds in 63 Decision-Making Unit (DMU) with output orientated and the assumption of Variable Return to Scale (VRS). A value of 1.000 means there is no change in productivity, $x > 1.000$ means there is an increase in productivity and $x < 1.000$ means there is a decrease in productivity. The calculation of the social funds’ productivity at 9 Islamic banks on the period 2012-2018 is presented in table 4.

**Table 4: The level of Social Funds’ Productivity**

| Firm       | Technological Change (TECHCH) | Efficiency Change (PECH) | Productivity Change (TFPCH) |
|------------|-------------------------------|--------------------------|----------------------------|
| BMI        | 1.055                         | 0.997                    | 1.052                      |
| BSM        | 1.240                         | 1.000                    | 1.240                      |
| BMS        | 1.150                         | 1.020                    | 1.172                      |
| BRIS       | 1.033                         | 0.913                    | 0.943                      |
| BPS        | 1.063                         | 1.078                    | 1.146                      |
| BSB        | 0.996                         | 0.918                    | 0.914                      |
| BNIS       | 1.055                         | 1.030                    | 1.086                      |
| BCAS       | 1.110                         | 1.189                    | 1.320                      |
| BVS        | 1.216                         | 1.005                    | 1.222                      |

**Summary**

|                | Mean       | Max        | Min        |
|----------------|------------|------------|------------|
| Technological  | 1.099      | 1.258      | 0.910      |
| Efficiency     | 1.014      | 1.189      | 1.000      |
| Productivity   | 1.114      | 1.265      | 0.910      |

|                | number of increase | number of decreases | number of no change |
|----------------|--------------------|---------------------|---------------------|
| Technological  | 8                  | 1                   | 0                   |
| Efficiency     | 5                  | 3                   | 1                   |
| Productivity   | 7                  | 2                   | 0                   |

Productivity in managing social funds at 9 Islamic banks in Indonesia during the observation period was increased by 11.4% (1.114). This condition is supported by the increase in technological changes (TECHCH) of 9.9% (1.099) and efficiency changes (EEFCH) of 1.4% (1.014). Therefore, Islamic banks should care about presenting new technologies and capital equipment that deliver positive changes in the production frontier. These findings are in line with our previous works (Usman et al., 2019). The analysis of individual banking shows that 7 Islamic banks have increased their productivity (TFPCH) in managing social funds and 2 Islamic banks have decreased their productivity. The Islamic banks which are increased their productivity, namely: Bank Muamalat (5.2%), Bank Mandiri Syariah (24.0%), Bank Mega Syariah (17.2%), Bank Panin Syariah (14.6%), BNI Syariah (8.6%), Bank Syariah BCA (32.0%), and Bank Victoria Syariah (22.2%). BCA Syariah has experienced the highest increase in productivity and Bank Muamalat has experienced the lowest increase in productivity. It shows that large Islamic banks are no more productive than small Islamic banks (in terms of assets) in managing social funds. Furthermore, Islamic banks that experienced the decrease in productivity were BRI Syariah (5.7%) and Bank Syariah Bukopin (8.6%).

The highest productivity of BCA Syariah is influenced by the high value of efficiency by 18.9% (1.189). This is due to an increase in managerial aspects (PECH) by 19.9% (1.199) even though the value of SECH is decreased by 0.08% (0.992). However, the technological change also supports this productivity level with an increase of 11.0% (1.110), so that it can sustain high productivity during 2012 - 2018. In line with BCA Syariah, there are 5 Islamic banks that the products are supported by technological changes and efficient conditions, namely Bank Syariah Mandiri, Bank Mega Syariah, Bank Panin Syariah, BNI Syariah, and Victoria Syariah Bank. Then, 1 other Islamic bank which also experienced an increase in productivity during the observation period was only supported by technological changes, while the level of efficiency had decreased, namely Bank Muamalat.

Figure 1. shows the changes in Islamic banks’ productivity in managing social funds and the components that influence it during the observation period, namely the level of efficiency and technological change. In the past six years, there have been fluctuations in productivity levels wherein 2012-2013, 2014-2015 and 2016-2017, the productivity decreased by 0.1%, 25.0%, and 11.8%, respectively due to the decrease in efficiency (EFFCH) and technology (TECHCH). On the other hand, in 2013-2014, 2015-2016, and 2017-2018, the productivity of Islamic banking in managing social funds has increased by 42.2%, 56.4%, and 28.9%, respectively. Thus, there are fluctuations in the management of social funds in Islamic banks where after an increase in productivity occurs, then the following year there is a decline and vice versa. Broadly, an increase or decrease in the productivity level of Islamic banks is influenced by technological changes, while changes in the level of efficiency become a control variable that sustains the achievement of productivity levels. The result is in line with the findings of (Akhtar, 2010; Rodoni et al., 2017; Suzuki & Sastrosuwito, 2011; Usman et al., 2019).
Antecedents of Social Funds’ Productivity

The results of social funds’ productivity level will be further examined to analyse the determinants that boost the Islamic banks’ productivity in managing social funds. The variables tested for its effect on productivity are return on assets (ROA), operational efficiency (OE), inflation (CPI), economic growth (IPI), and OPEC oil prices (OIL).

At the initial stage, this study conducted a model suitability test using the Chow test, LM test, and Hausman test. First, the Chow test is used to choose the best model between common effect and fixed effect. Chow test shows the value of sig. Cross-section F of 0.7424 which is greater than 5%. Thus, the common model is better than fixed effects. Second, the LM test is used to choose the best model between the common effect and the random effect. LM test results show the value of sig. Chi-square cross-section of 0.5948 which is greater than 5%. Thus, the common model is better than random effects. Because the two results above determine that the common effect or pooled least square is the best model, then a Hausman test is not necessary. The results of the analysis can be seen in table 5.

Table 5: The Result of the Chow Test and LM Test

| Effects Test              | Statistic | d.f. | Prob. |
|--------------------------|-----------|------|-------|
| Cross-section F          | 0.636374  | (8,40) | 0.7424 |
| Cross-section Chi-square | 6.469363  | 8    | 0.5948 |

After the best model is obtained, the next step is to analyse the pooled least square model. Table 6 generates the following equation.

\[
\text{TFP}_t = -4.017481 + 0.758838 \text{ ROA}_t + 0.076726 \text{ OE}_t + 0.136355 \text{ CPI}_t - 0.441134 \text{ OIL}_t + 0.022827 \text{ IPI}_t
\]

The five independent variables tested for its effect on the social funds’ productivity in Islamic banks, only two variables had a significant effect. First, the profitability variable measured by the ROA ratio has a probability value of 0.0349 which is smaller than 5% and a positive coefficient value of 0.758838. It shows that profitability increases, it will increase the social funds’ productivity in Islamic banks. The finding is in line with Guzman and Reverte (2008) and Pitaloka et al. (2018) that describe that ROA has a positive impact on productivity. Second, the efficiency variable measured by the OE ratio has a probability value of 0.0179 which is smaller than 5% and a positive coefficient value of 0.076726. It means that the more inefficient in an Islamic bank, the productivity of social funds will also increase. This finding is in line with the Malmquist analysis as the productivity change supports by technological change rather than efficiency change. It also supports the finding of Frimpong et al. (2014) and Pitaloka et al. (2018). Then the three macroeconomic variables do not have a significant effect because the probability value is above 5%. The result is not supporting the findings of Akhtar (2010) and Sharma and K. Sharma (2015) who state that inflation, economic growth, and oil prices affect banking productivity change. It means that the management of social funds in Islamic banking is not disrupted by the volatility of macroeconomic conditions.

Table 6: Pooled Least Square Analysis

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|-------|
| C        | -4.017481   | 8.901236   | -0.451340  | 0.6538|
| ROA?     | 0.758838    | 0.349501   | 2.171202    | 0.0349*|
| OE?      | 0.076726    | 0.031284   | 2.452547    | 0.0179*|
| CPI?     | 0.136355    | 0.123279   | 1.106072    | 0.2742|
| OIL?     | -0.441134   | 0.656481   | -0.671967   | 0.5048|
CONCLUSION

This study analysed the social funds’ productivity change and its antecedents over the period of 2012–2018 using two-stages Malmquist Productivity Index of 63 DMU’s from 9 Islamic banks in Indonesia. The results indicate that the productivity of social funds is progressing during observation periods. The Malmquist index also shows that the progress in productivity is due to the technological and efficiency aspect. The panel regression concludes that internal banks’ variables are more powerful than macroeconomics conditions to affect the social funds’ productivity in Islamic banks.

The findings provide the policymakers and Islamic banks’ managers an important insight into the social funds’ management. The policymakers may strengthen the supervisory and coaching to increase the Islamic banks’ productivity while the Islamic banks’ managers should need to improve their business processes to manage social funds. As the preliminary research, this work only used the small samples in one country and done with limited variables. Due to its limitation, we suggest that this research can be expanded in several works. Further research needs to extend the observation and comparing it with another country.

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AUTHORS CONTRIBUTION

Conceived and designed the experiments (L.A; N.U.; Z.B.P), performed the experiments (Z.B.P), analysed and interpreted the data (L.A; N.U.; Z.B.P), contributed materials, analysis tools or data (N.U; L.A), and wrote the paper (Z.B.P; L.A.; N.U.)

REFERENCES

1. Abbas, M., Hammad, R. S., Elshahat, M. F., & Azid, T. (2016). Efficiency, productivity and islamic banks: an application of DEA and malmquast index. Humanomics, 31(1), 118–131. https://doi.org/10.1108/H-03-2013-0022
2. Afiatun, P., & Wirjono, S. K. (2010). Efficiency and productivity of Indonesian islamic banking. Jurnal Manajemen Teknologi, 9(3), 264–278.
3. Akhtar, M. H. (2010). Are Saudi banks productive and efficient? International Journal of Islamic and Middle Eastern Finance and Management, 3(2), 96–112. https://doi.org/10.1108/17538391011054354
4. Arjomandi, A., Harvie, C., & Valadkhani, A. (2012). An empirical analysis of Iran’s banking performance. Studies in Economics and Finance, 29(4), 287–300. https://doi.org/10.1016/j.spie.2012.03.017
5. Bahrini, R. (2015). Productivity of MENA islamic banks: a bootstrapped malmquist index approach. International Journal of Islamic and Middle Eastern Finance and Management, 8(4). https://doi.org/10.1108/IJMEFM-11-2014-0114
6. Baltagi, B. H. (2013). Econometric analysis of panel data, 5th edition. John Wiley and Sons.
7. Boussofiane, A., Dyson, R., & Thanassoulis, E. (1991). Applied data envelopment analysis. European Journal of Operational Research, 52(1), 1–15. https://doi.org/10.1016/0377-2217(91)90331-O
8. Caves, D. W., Christensen, L. R., & Diewert, W. E. (1982). The economic theory of index numbers and the measurement of input, output, and productivity. Econometrica, 50(6), 1393–1414. https://doi.org/10.1108/IJMEFM-11-2014-0114
9. Coelli, T., Rao, P. D. S., O’Donnell, C. J., & Battese, G. E. (2005). An introduction to efficiency and productivity analysis. Springer US. https://doi.org/10.1007/b136381
10. Fare, R., Grosskopf, S., Norris, M., & Zhang, Z. (1994). Productivity growth, technical progress, and efficiency change in industrialized countries. The American Economic Review, 84(1), 66–83. www.jstor.org/stable/2117971
11. Frimpong, K. A., Gan, C., & Hu, B. (2014). Cost efficiency of Ghana’s banking industry: a panel data analysis. Business and Finance Research, 8(2), 69–86.
12. Guzmán, I., & Reverte, C. (2008). Productivity and efficiency change and shareholder value: evidence from the Spanish banking sector. Applied Economics, 40(15), 2033–2040. https://doi.org/10.1080/00036840600949413
13. Huang, M. Y., Juo, J. C., & Fu, T. tan. (2015). Metafrontier cost malmquist productivity index: an application to Taiwanese and Chinese commercial banks. Journal of Productivity Analysis, 44(3), 321–335. https://doi.org/10.1007/s11123-014-0411-1
14. Johnes, J., Izzeldin, M., & Pappas, V. (2015). Efficiency and productivity change in islamic and conventional banks: evidence from the gulf cooperation council (GCC) countries. 13th International Conference on Data Envelopment Analysis, April, http://eprints.hud.ac.uk/27824/
15. Kamarudin, F., Hue, C. Z., Sufian, F., & Anwar, N. A. M. (2017). Does productivity of islamic banks endure progress or regress?: empirical evidence using data envelopment analysis based malmquist
productivity index. *Humanomics*, 33(1), 84–118. https://doi.org/10.1108/H-08-2016-0059
16. Monetary Service Authority. (2019). *Sharia banking statistics september 2019*. https://ojk.go.id/id/kanal/syariah/data-dan-statistik/statistik-perbankan-syariah/Documents/Pages/Stistik-Perbankan-Syariah---September-2019/Statistik_Perbankan_Syariah_Sepember_2019.pdf
17. Nishimizu, M., & Page, J. M. (1982). Total factor productivity growth, technological progress and technical efficiency change: dimensions of productivity change in Yugoslavia, 1965-78. *The Economic Journal*, 92(368), 920–936. https://doi.org/10.2307/2232675
18. Norfitriani, S. (2016). Analisis efisiensi dan produktivitas bank syariah di Indonesia sebelum dan sesudah spin off. *Jurnal Ekonomi Syariah Indonesia*, 6(2), 134–143. http://ejournal.almaata.ac.id/index.php/JESI/article/view/430
19. Nuryanto, & Pambuko, Z. B. (2018). *Eviews untuk analisis ekonometrika dasar: aplikasi dan interpretasi*. Unimma Press.
20. Olson, D., & Zoubi, T. (2017). Convergence in bank performance for commercial and islamic banks during and after the global financial crisis. *Quarterly Review of Economics and Finance*, 65, 71–87. https://doi.org/10.1016/j.qref.2016.06.013
21. Pambuko, Z. B., Ichsan, N., & Anto, M. H. (2018). Islamic banks’ financial stability and its determinants: a comparison study with conventional banks in Indonesia. *Iqtishadia: Jurnal Kajian Ekonomi Dan Bisnis Islam*, 11(2), 371–390. https://doi.org/10.21043/iqtishadia.v11i2.3346
22. Pambuko, Z. B., Usman, N., & Andriyani, L. (2019). Spin-off and social funds’ productivity of islamic banking industry in Indonesia. *First International Conference on Progressive Civil Society (ICONPROCS 2019)*, 7–10. https://doi.org/10.2991/iconprocs-19.2019.2
23. Pitaloka, J. M., Cholis, N., Islamiyah, A., & Pambuko, Z. B. (2018). Determinan produktivitas sosial perbankan syariah di Indonesia: two-stage malmquist productivity index. *Li Falah Jurnal Studi Ekonomi Dan Bisnis Islam*, 3(1), 36-40. http://ejournal.iainkendari.ac.id/lifalah/article/view/1186
24. Renaud, F. (1971). Theory of cost and production functions. By R. W. Shephard. Princeton: Princeton university press, 1970. *The Journal of Economic History*, 31(3), 721–723. https://doi.org/10.1017/S0022050700007457X
25. The act number 21 2008 about islamic banking, 1 (2008).
26. Rodoni, A., Salim, M. A., Amalia, E., & Rakhmadi, R. S. (2017). Comparing efficiency and productivity in islamic banking : case study Indonesia, Malaysia and Pakistan. *Al-Iqtiyad: Journal of Islamic Economics*, 9(2), 227–242. https://doi.org/10.15408/aiq.v9i2.5153
27. Sharma, D., & K. Sharma, A. (2015). Influence of turbulent macroeconomic environment on productivity change of banking sector: empirical evidence from India. *Global Business Review*, 16(3), 439–462. https://doi.org/10.1177/0972150915569932
28. Sufian, F. (2007). Malmquist indices of productivity change in Malaysian islamic banking industry: foreign versus domestic banks. *Journal of Economic Cooperation*, 28(1), 115–150.
29. Suzuki, Y., & Sastrosuwito, S. (2011). Efficiency and productivity change of the Indonesian commercial banks. *International Conference on Economics, Trade and Development IPEDR. Vol. 7*.
30. Usman, N., Andriyani, L., & Pambuko, Z. B. (2019). Productivity of islamic banks in Indonesia: social funds versus financial funds. *Journal of Asian Finance, Economics and Business*, 6(3), 115–122. https://doi.org/10.13106/jafeb.2019.vol6.no3.115