COMPETITIVE STRUCTURE AND TECHNICAL EFFICIENCY OF BANKING INDUSTRY IN INDONESIA

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Abstract: Competition is an important aspect in an industry that may affect business continuity. The practice of a market structure concentrated on five major banks caused differences in efficiency and can ultimately influence competition between banks. This study aims to analyze the structure of competition and the level of technical efficiency in the banking industry during 2014-2018 period. 79 banks were grouped into business group according to the core capital and were analyzed based on the groups. This study used non-structural Panzar Rosse method to analyze the competition structure. Afterwards, non parametric DEA (data envelopment analysis) method was used to determine the level of efficiency. The results showed that the banking industry in Indonesia generally operates under monopolistic competition. In addition, based on efficiency performance, bank BUKU 4 has the highest performance. This is because large of banks can produce larger economies of scale.

Keywords: market structure, banking, panzar rosse model, efficiency, Data Envelopment Analysis (DEA)

Abstrak: Persaingan merupakan aspek penting dalam suatu industri yang bisa berdampak terhadap kelangsungan bisnis usaha. Praktik dari struktur pasar yang terkonsentrasi pada lima bank besar menyebabkan adanya perbedaan perilaku yang efisien dan pada akhirnya dapat mempengaruhi persaingan antar bank. Penelitian ini bertujuan untuk menganalis struktur persaingan dan tingkat efisiensi teknis pada industri perbankan selama periode 2014-2018. Sebanyak 79 bank di analisis yang kemudian di bagi ke dalam kelompok usaha berdasarkan modal inti. Dalam menganalisis struktur persaingan metode non struktural dari panzar rosse digunakan dalam penelitian ini. Metode non parametrik DEA digunakan untuk mengidentifikasi tingkat efisiensi bank. Hasil penelitian menunjukkan bahwa secara umum industri perbankan di Indonesia beroperasi di bawah persaingan monopolistik. Selain itu, dilihat berdasarkan kinerja efisiensi, bank buku 4 memiliki kinerja efisiensi tertinggi. Hal ini karena bank yang besar dapat menghasilkan skala ekonomi yang lebih besar.

Kata kunci: struktur pasar, perbankan, model panzar rosse, efisiensi, Data Envelopment Analisis (DEA)

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INTRODUCTION

Indonesia is in category of bank based country, in which there are many major banks and classified based on ownership group. Those banks are BUMN (state-owned) Bank, Private Bank, BPD (regional development banks) Bank, Mixed Bank and Foreign Bank. Banking as an intermediary plays important role in the economic system in Indonesia. Besides functioning in providing financing to the real sector, another important role of the banking industry is to be able to identify investment opportunities, mobilize savings, facilitate trade and diversify risk, and improve corporate governance mechanisms (Sufian and Habibullah, 2013).

As the existence is important, especially in increasing economic growth, Bank Indonesia as the central bank has made policy regulation Number 14/18/PBI/2012 concerning the rules for providing minimum capital. The program resulted in the existence of minimum capital rules that must be met by all banks in carrying out their functions. Besides, this policy is also supported by efforts to create a health banking system, to be able to develop and compete both nationally and internationally. Along with the enactment of policies related to the bank's minimum capital rules, it leads to the classification of bank groups that are divided into four categories which are Commercial Banks Business Activities or BUKU 1, 2, 3 and BUKU 4. The classification is based on the core capital owned by each bank. In bank group of BUKU 4, aside from having core capital above 30 trillion, this bank group can also carry out all of its business activities both domestically and abroad (international world wide). With a large core capital ownership, it makes these banks have a wide market network. Thus, it has an impact on the ability of banks, especially in obtaining funds as the main capital for investment financing. Based on Financial Services Authority, it is known that The banking sector is currently largely dominated by banks with the business group of Buku 4. The bank group controls half of the total collection of DPK (Third-party fund), loans and banking assets. The average mastery of DPK (Third-party fund), loans and bank assets during 2014-2018 were about 51.97% (DPK), 49.90% (credit) and 49.14% (assets) as shown in Figure 1.

The high level of market concentration dominated by business group of Buku 4 can affect market structure formation. A market with a relatively high level of concentration has the potential to create structures with oligopoly or monopolistic competition. While a market with a low level of concentration can create a market structure with monopolistic competition or perfect competition.

The company with the high market share can accumulate greater sales volume. Thus, this condition can reduce costs to be more efficient which in turn can increase ability to earn profits. These conditions can be seen in Figures 2 and 3, banks group of *Buku* 4 are able to generate positive earnings above average compared to *Buku* 1, 2 and 3. This is because the income earned can cover the expenses and costs that must be incurred. Therefore, the company can operate efficiently. This can be seen from the BOPO ratio with an average of 70.4%. It is lower than other bank groups that have an average BOPO ratio that is above 80%.

In the condition of certain competitive level, bank as financial intermediary is required to be able to operate efficiently. In fact, not all banks can optimize their resources to achieve a certain level of efficiency. Thus, efficiency plays an important role especially in the context of competition. There are two important reasons for conducting research a related to competition and banking efficiency. The first is competition is an important aspect that can affect business competition. Second, behaviour industrial market that tends to be concentrated in business activities can produce of market not competitive. This matter can have an impact on the behavior of existing companies to be less efficient. The low efficiency of a bank can automatically affect the capability to generate profits to be low, so that ultimately can threaten the business continuity of the bank. Some previous studies such as Octriana and Setiawati (2019), Wibowo (2016), Athoilah (2010), Putri (2018) and Pandi (2018) has conducted similar studies related to competitive conditions and the efficiency of conventional commercial banks in Indonesia. The results of research generally show that commercial banks in Indonesia operate under monopolistic competition. Furthermore, some of them conclude that banks with the greater asset ownership can operate efficiently.

The purpose of this study is to analysis how the competition structure that occurs in the banking sector in Indonesia and how the conditions technical efficiency of banking in Indonesian. In measure competition Panzar Roose (PR) model is a used. While the non-

parametric model with the Data Envelopment Analysis (DEA) method is used for measure the efficiency score of the banking system. Most of the previous researches with context of banking competition, only focused to aggregate without detailing based on capital. Therefore this study examines all conventional commercial bank samples and breaks down based on the amount of capital owned by each bank. In addition, given the change in time, it a possible too could be changes the existing banking conditions, so research is needed with a more recent time period.
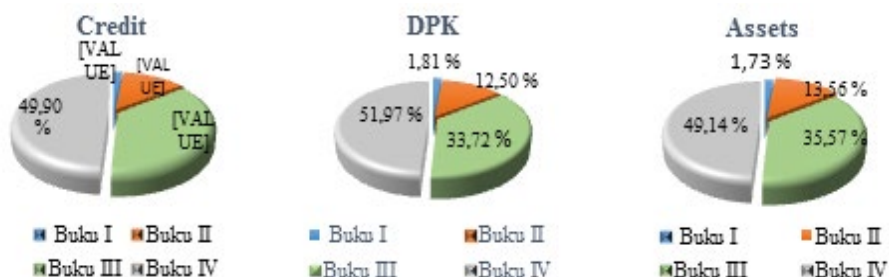

Figure 1. Credit market share, Third-party funds and banking assets (Indonesian Banking Statistics, 2019)
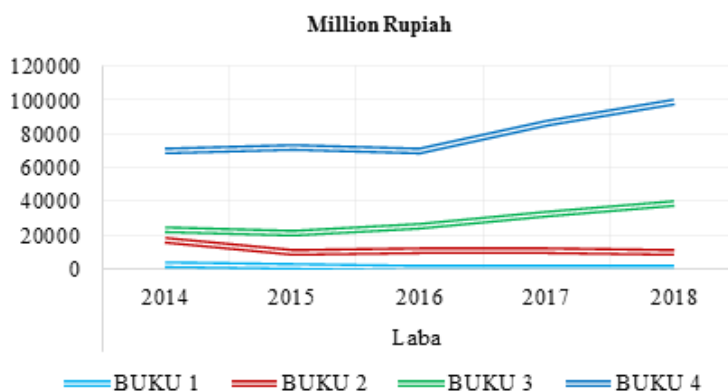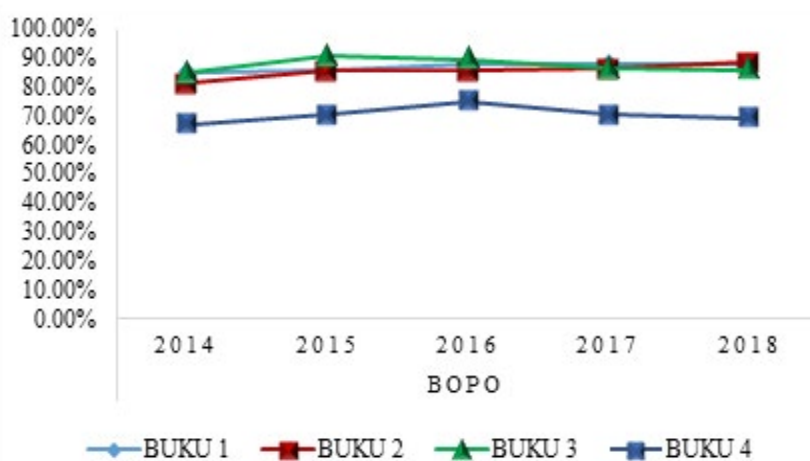

Figure 2. Bank Profit (SPI, 2019)

Figure 3. Banking BOPO Ratio (SPI, 2019)

The competition in banking sector encourages each bank to operate efficiently. It occurs because there is a struggle over productive resources, such as deposit funds and lending. Improving efficiency is part of the strategic steps taken to survive in all conditions. Reviewed from the micro perspective, the level of competition allows customers who are not bankable to obtain financing from banks. This condition will result in a low bank monitoring system that has the potential to reduce efficiency. As a result, it is difficult for banks to be able to maintain the number of customers they have. It is less likely to be able to attract new customers because of declining confidence. On the other hand, from a macroeconomic perspective, competition can also affect the costs of financial intermediation, which impacts on overall financial stability (Arrawatia et al. 2016).

In assessing the competition, there are currently two general method used, which are structural method based on concentration ratio and herfindahl index, and non structural such as lerner index and Panzer Rosse. In the structural method there, are three hypotheses built. First, the traditional hypothesis looks at the concentration of identical with market forces. The more concentrated the company, it will be more collusive. Thus, the company's incentive is greater to obtain supernormal profits. The second is differentiation hypothesis. It means that market concentration is formed as a result of product differentiation. By doing differentiation, market coverage will be even greater. Third is the efficiency hypothesis. This hypothesis considers market power resulting from company efficiency. In non-structural methods include the panzer rosse model. The panse rosse method is currently a popular method used because the estimation is able to assess market conditions at the industry level. Several studies have applied this model such as Li et al. (2019). It analyzed the condition of banking competition in India Empirical. The results indicated that, in general, Indian banking is in a monopolistic competition environment. For the measurement of efficiency, there are two methods that are parametric and non parametric. One of the non-parametric approach is DEA method. The DEA method can measure the efficiency of economic activities that have multiple inputs and outputs. Three concepts of the input output approach are used to measure efficiency, such as the production approach, the intermediation approach and the asset approach. Banking is as a financial institution, thus, the intermediation approach

is most appropriate. Because the role of intermediaries is to change the source of funds into financial assets in the form of credit and other types of investment.

METHODS

This research uses secondary data. It means that the data are obtained through annual publication of each bank's report in the Indonesian banking directory on the Financial Services Authority (OJK) website in 2014-2018. Data collection techniques use purposive sampling based on two criteria, such as conventional banks registered with the Financial Services Authority and publishing their complete financial statements in 2014 - 2018. Based on these two criteria, 79 conventional banks are selected consisting of 5 banks in the group of BUKU 4, 23 banks of BUKU 3 , 33 group of BUKU 2 and 18 banks of BUKU1.

Panzar Rosse Model

Panzar Model Rosse is a literature theory used to examine the condition of market competition (Li et al. 2019). This model can identify whether the competitive structure of an industry is in a competitive, monopolistic or monopolistic environment (Chung and Mohd 2018). In this approach, it introduces the concept of H-statistics, namely the sum of the elasticity of input prices by identifying the impact of changes in the price of production inputs on company income. If it is assumed that there are n-inputs used and the output produced is one, that is the number of gains, then the equation of this model can be stated as follows:

$$\text{LnTR}\left(\frac{\text{Total Revenue}}{\text{Total Assets}}\right) = \alpha + \sum_{i=1}^{k} \beta_i \ln \omega_i + \sum_{i=1}^{n} \gamma_i \ln \text{CF}_i + e$$

Where LnTR is total income consisting of interest income divided by total assets (Pandi 2018). represent the input factor of production and is a control variable which represent the non-input factor of production. Following Ventouri research (2018) and Hamza (2014) in estimate the of income with panzar rosse model it can be stated as follows:

$$\text{LnTR} = \alpha + \beta_1 \text{Ln}(P1_{it}) + \beta_2 \text{Ln}(P2_{it}) + \beta_3 \text{Ln}(P3_{it}) + \gamma_1 \text{Ln}(\text{EQTA}_{it}) + \gamma_2 \text{Ln}(\text{Credit}_{it}) + \gamma_3 \text{Ln}(\text{Branch}_{it})$$

Variable of total revenue is used as dependent variable. This is because the extent to which total revenue can react due to changes in costs and and non-interest income is the largest source of income generated by banks In the PR equation, the statistical H value is obtained from the sum of the coefficients of $\beta_1+\beta_2+\beta_3$ which form the input of factor prices. The sum of these coefficients can illustrate the level of competition and structure of the banking market in Indonesia.

$$H - Stat = \sum_{i=1}^{n} \beta_i$$

Addition from the three input price coefficients is due to the extent to which bank income can be changes as a result of an increase in costs. n other words, H-statistic which is a form of representation of the three price input factors can see a whether conduct of banks follow monopolistic /oligopolistic, monopolistic or perfect competition conduct Mustafa and Toçi (2017).

The estimation of revenue faction with panzar rosse model, needs the examination of long term balance. Test for balance is conducted by replacing the total income variable with the value of ROA as the dependent variable. The long-term balance test value is obtained from the sum of the elasticity of ROA toward the price of production inputs. The test for balance is carried out with the Wald test. In which, if the value of E-Statistics = 0, it indicates that the market is in a balanced condition in the long term. In other words, every individual in the industry has been operating in optimal and stable conditions. The equation for of equilibrium long run test can be stated as follows:

$$LnROA = \alpha + \sum_{i=1}^{k} \beta_i \ln \omega_i + \sum_{i=1}^{n} \gamma_i \ln CF_i + e$$

Where LnROA is a return on asset bank i represent the input factor of production and is a control variable which represent the non-input factor of production or with the equation following:

$$LnROA = \alpha + \beta_1 Ln(P1_{it}) + \beta_2 Ln(P2_{it}) + \beta3\ Ln(P3_{it}) + \gamma_1 Ln(EQTAit) + \gamma_2 Ln(Credit_{it}) + \gamma_3 Ln(Branch_{it})$$

DEA Method

Data envelopment analysis are used as a technique to measure efficiency toward operational conducted by the company. The DEA technique measures the relative performance of companies by comparing the many inputs and outputs of Alhassan and Asare (2016). Efficiency values are obtained through the ratio of the ratio of total weighted output divided by the total weighted input. The efficiency score of 0-1 gets closer to 1, the more efficient the company is. Measurement of efficiency with the DEA method can be carried out with two models, such as the Constant Return to Scale (CRS) model and the Variable Return to Scale (VRS). The use of the CRS model assumes that companies operate in the same conditions on an optimal scale. While, if there is an increase in input of 1%, it will increase output of 1%. In other words, the CRS model indicates that if there is an increase in production factors (inputs) then it will not have an impact on the output produced (Hapsari 2019). While, in the VRS model, it assumes that the company operates under conditions that are not optimal. In which an increase of input will produce output that is not the same as the input. In other words if there is an increase in a number of factors of production (input), it will provide an increase or decrease in output. Imperfect competition, financial problems and other factors cause companies to operate in sub-optimal conditions (Nasution et al. 2019). By making n decision making units (DMU) that produce s outputs with m inputs used from the DMU, the equation from the CRS model is as follows:

$$\max h_0 = \sum_{i=1}^{n} u_i y_{ir}$$

$$subject\ to:$$

$$\sum_{r=1}^{n} u_i x_{ir} - \sum_{j=1}^{n} v_j x_{jr} \le 0, r = 1,2 \dots N$$

$$\sum_{j=1}^{n} v_j x_{jr} = 1$$

$$u_r, v_i \ge 0\ r = 1,2 \dots m$$

In which is the value of technical efficiency. is the output weighted of i input weighted of i input weight of j, is the total input j As for the VRS equation model as follows:

$$\max h_0 = \sum_{i=1}^{n} u_i y_{ir} + U_0$$

subject to :

$$\sum_{r=1}^{n} u_i y_{ir} - \sum_{r=1}^{n} v_j x_{jr} \le 0 \ r = 1,2 \dots N$$

$$\sum_{j=1}^{n} v_j x_{jr} \ge 1$$

RESULT

Equilibrium long-term test

For analyze the competition with the use of the Panzar Rosse model, there are necessary condition that must be met are needed. Where the overall observation sample must be tested equilibrium . This test is carried out with a trial by adding up the E-statistic coefficient values of the regression coefficients. Where the LnROA value is the dependent variable. The purpose of this test is to ascertain whether banks have operated in long run equilibrium condition or not. The results of this test can generally be seen in Table 3.

Based on the results of the E-statistical calculations in Table 3 as a whole it is known that commercial banks are not in equilibrium long run condition during the observation period. This can be seen from the F-stat value of 0.0002 which is smaller than 0.05. Meanwhile, when the E-statistic estimation on each bank group, banks with BUKU 2, 3 and 4 BUKU groups are in equilibrium long run condition. This is seen based on the F-stat probability value in the Wald test that is greater than 0.05. According to Abduh (2017) if there a rejection to the equilibrium test, it will not change the model's conclusion based on the results of the equilibrium test estimator. Meanwhile according to Shaffer (1994) if the market is assumed to be in a state of disequilibrium, it doesn't mean the panzar rosse estimation model is invalid. This can be said that condition the Indonesian of banking industry was developing in a dynamic development during the observation year. Meanwhile, the group of banks that are in equilibrium long-term, can indicate that every increase input price of production will have a minimum or even no effect on bank profitability (Ventouri 2018).

Competitive Structure of Banking

In estimating the competition structure, this study uses the Panzer Posse model. This approach model analyzes how changes in production input prices can affect firm earnings. In identifying the structure of competition, it is done by adding the significant value of the H-statistical coefficient from a regression equation. The H-statistic coefficient is defined as the total elasticity of the firm's revenue with respect to factor input prices. In Table 4 below, the estimation results of the H-statistic value and the structure of competition formed in the banking industry during the 2014 - 2018 period are obtained.

Based on the results of measurement of H-statistics, both on all samples of commercial banks and by bank group, it shows that most of the production input price variables consisting of LNP1, LNP2 and LNP3 partially have a significant effect on commercial bank earnings with positive coefficients. The estimated statistical values for all samples of commercial banks were obtained from the sum of the input price factor coefficients, namely lnP1 and lnP3 (0.2130 + 0.0381). Meanwhile, the lnP2 coefficient is not included because it is not significant, or is above the specified value. Therefore, the H-statistic value in the sample of commercial banks is between $0 \le H \le 1$ or 0.2511. For the BUKU 1 group the H-statistic value of 0.2641 is obtained from the sum of the coefficients of lnP1 and lnP2. For the BUKU 2 group the H-statistic value of 0.1845 is obtained from the sum of the coefficients of lnP1 and lnP3. For the BUKU 3 group, the H-statistic value of 0.3937 is obtained from the sum of the coefficients of lnP1 and lnP3. Meanwhile, for BUKU 4 bank the H-statistic value of 0.1892 is obtained from the coefficient of lnP3.

Tabel 3. Equilibrium long-term

Commercial Bank	E- Statistic Value	Prob. F-stat (Wald Test)	Market Condition
All Bank	-0.0072	0.0002	Equilibrium short run
BUKU 1	-0.0276	0.0023	Equilibrium short run
BUKU 2	-0.0025	0.4408	Equilibrium long run
BUKU 3	-0.0042	0.0718	Equilibrium long run
BUKU 4	-1.3921	0.2353	Equilibrium long run

Tabel 4. Market Stucture of Banking

Dependent (lnTrev)	All Bank	BUKU 1	BUKU 2	BUKU 3	BUKU 4
lnP1	0.2130***	0.0960***	0.1548***	0.2628***	0.2265
	0	-0.0073	0	0	-0.1727
lnP2	-0.0027	0.1681***	-0.0022	-0.0066	0.1693
	-0.6794	-0.043	-0.7825	-0.6985	-0.2447
lnP3	0.0381***	-0.0048	0.0297***	0.1309***	0.1892*
	0	-0.5294	-0.0015	0	-0.0508
lnEQTA	-0.0018	-0.0034	0.009	-0.0636	-0.3532*
	-0.841	-0.9442	-0.404	-0.1197	-0.0749
lnCredit	0.3041***	0.1708***	0.3380***	0.7126***	0.4686*
	0	-0.0035	0	0	-0.0596
lnBranch	0.0241*	0.0481	-0.0241	0.0561*	-0.0389
	-0.0862	-0.5294	-0.5076	-0.0541	-0.2888
Cons	-1.672	-1.4378	-1.5911	-1.5083	-0.6567
	0	-0.0001	0	0	-0.4245
R-squared	0.9565	0.2618	0.9652	0.9713	0.9681
Adjusted R2	0.9448	0.2085	0.9547	0.9619	0.9454
F-statistic	81.2427	4.9083	92.13	104.0073	42.5548
Prob (F)	0	0.0002	0	0	0
H-statistic	0.2511	0.2641	0.1845	0.3937	0.1892
Number of Banks	79	18	33	23	5
Observation	395	90	165	110	25
Market Structure	Monopolistic	Monopolistic	Monopolistic	Monopolistic	Monopolistic

Referring to Table 5, it is generally known that Indonesian banking operates under monopolistic competition. This can be seen from the H-statistic value obtained between $0 \leq H \leq 1$. It is known that in monopolistic competition an increase in input costs can increase income at a rate lower than the increase in input prices. This is because not all inputs can have a positive effect on income. In other words, in monopolistic market conditions, seen from the behavior of banks in response to changes in input prices, every 1% increase in input prices will increase output income below 1%. Furthermore, in monopolistic competition, there are several characteristics, including relatively many producers selling similar products, product differentiation offered from each bank, in other words a bank that sells products that are different from other banks and are free. Companies can enter (or exit) the market without any restrictions.

Technical Efficiency

In the approach of measurement of technical efficiency, it is conducted with input oriented. Determination of inputs and outputs used is done by an intermediation approach. This is because banks as an intermediary institution converts public savings into investment asset instruments. The input specifications used are labor costs and DPK (Third-party fund), while the output used is credit and interest income. The results of technical efficiency measurements can be seen in Table 6.

In general, it is known that, Banking in Indonesia during the period of 2014-2018 had operated efficiently. This is indicated by the value of technical efficiency less than 1. The average value of the biggest technical efficiency is the bank group with the BUKU 4, with an average efficiency value of 95.8%. Then, it was followed by banks with BUKU 3 of 86.9%, BUKU 2 of 84.2% and BUKU 1 of 68.7%. With this value, it means that banks in Indonesia need to reduce their operational costs in the range of 4.2 to 31.3% to achieve an efficient level. High efficient value in bank in BUKU 4 shows that with the bigger capital, banks tend to operate more efficiently. This is because of the first two reasons, banks with greater core capital have a strong capital ratio. Thus, they are able to deal with various business risks. Second, banks with large core capital have

the ability to budget for great investment funds in technology utilization than to banks with small capital Susilowati (2019). The change in the style of the public who want to transact easily and quickly, can to respond well through the technology used. In addition, technology can also reach all customers so that the services provided are not only limited to branch offices that may have the potential to produce high operational burdens. According to Maryono *et al*. (2018), cash offices resulting from building leases have a negative impact on bank efficiency. Furthermore, Sari and Widaninggar (2018) banks with large assets are able to produce economic of scale. The economies of scale are generated from the ability of banks to provide low costs obtained from the results of expansion and better use of technology, so this can cause operational activities to be efficiently. This result too supports the research

of Putri (2018) which states that banks with large asset ownership tend to have better efficiency performance.

Implication Managerial

The enactment of Bank Indonesia Regulation Number 14/18 / PBI / 2012 is the right step in an effort to create a strong and stable banking. This policy rule encourages all commercial banks to have a good capital scale in facing the dynamics of existing competition. In addition this policy is also an effort to create increasingly competitive competition. It can be seen that banks with large capital scale can create competitive competition. Increasingly competitive competition environment, will encourage each bank to always maintain it's efficiency performance.

Table 5. Interpretation of Panzar Rosse

H- Statistik	Market Structure
H ≤ 0	Monopoly, collusive monopoly or alleged oligopoly variations
0 < H < 1	Monopolistic
H ≥ 1	Perfect Competition
E - Statistik	Market Conditition
E = 0	Equilibrium
E ≠ 0	Disequilibrium

Tabel 5. Technical Efficiency Performance of Banking

Tahun	Buku 1			Buku 2		
	Technical Efficiency	Pure Technical Efficiency (CRS)	Scale Efficiency (VRS)	Technical Efficiency	Pure Technical Efficiency (CRS)	Scale Efficiency (VRS)
2014	0.219	0.335	0.654	0.436	0.485	0.899
2015	0.210	0.271	0.777	0.426	0.534	0.798
2016	0.174	0.268	0.651	0.392	0.462	0.848
2017	0.176	0.246	0.716	0.447	0.531	0.841
2018	0.239	0.350	0.638	0.474	0.574	0.826
Average	0.224	0.294	0.687	0.435	0.517	0.842
Tahun	Buku 3			Buku 4		
	Technical Efficiency	Pure Technical Efficiency (CRS)	Scale Efficiency (VRS)	Technical Efficiency	Pure Technical Efficiency (CRS)	Scale Efficiency (VRS)
2014	0.638	0.742	0.860	0.765	0.808	0.946
2015	0.586	0.683	0.858	0.782	0.810	0.966
2016	0.576	0.673	0.855	0.849	0.890	0.954
2017	0.682	0.772	0.884	0.849	0.890	0.954
2018	0.665	0.751	0.885	0.886	0.915	0.969
Average	0.629	0.724	0.868	0.826	0.863	0.958

CONCLUSION AND RECOMMENDATION

Conclusion

Based on empiric results, it can be concluded that in general, Indonesian banking operates under monopolistic competition. In monopolistic competition markets, the increase in costs will generally lead to an increase in income at a rate lower than the increase in costs. Monopolistic competition conditions to banking industry accordance with to the existing facts, where there are relatively many commercial banks in Indonesia and sell similar products, but with different characteristics from resulting a product with from one bank to each other bank.In terms of efficiency, banks of BUKU 4 had the highest efficiency value of 95.8%, and BUKU 1 had the lowest efficiency of 68.7%. Bank BUKU 4 can to improve efficiency by utilizing existing technological developments, so that these conditions result in larger economies of scale.

Recommendation

In monopolistic competition, it is characterized with the sensitivity of revenue changes to the increase in input costs, it is necessary to have a competitive strategy that is more oriented to customer/customer service. This can be conducted through the development of product innovations that can generate new income. In addition, it is recommended for each bank in Buku 1, 2, and 3 to doing of consolidation. Consolidation activity in addition can to expanding the market also can increase of capital. The greater the capital owned, then the bank will have the ability to invest in banking technology. If the better technology a used, it can reduce operational costs which ultimately banks can operate efficiently.

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