



Management Behaviour Testing: Relationship of Non-Performing Loan and Operational Efficiency Ratio in the Indonesia Banking Sector

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ABSTRACT: This paper aims to build on previous research conducted by Berger and DeYoung (1997) on management behavior in the context of the Indonesian banking industry in 4 different ownership cluster by looking the nexus of NPL ratio and bank operational efficiency which specifically proxied by the non-interest expense/non-interest income in the Indonesian banking industry. This paper is the first to look at the management behavior framework in the Indonesian banking system using the approach of operational efficiency, to the best of the author's knowledge. This study also aims to give useful insights for regulators in order for them to recognize the real challenges in the banking industry, which might help Indonesia's banking growth. All datasets were gathered from the Indonesia Banking Statistic Reports, which were collected in quarterly basis from January 2010 to September 2021. The OLS estimation in the granger causality approach were focusing on examining the first two hypotheses: the bad management and bad luck hypotheses. According to the findings, authors found that each of bank cluster in the Indonesian Banking System behaved differently regarding the association between the problem loans and operational efficiency and found sensitive to the lags included in the model. In summary, the bad management, skimping and bad luck hypotheses were found in separately in the 4 different bank cluster models. These findings might bring insights to regulators to act differently towards the different bank cluster in order to create precise regulations that are relevant and in accordance with the current behaviour.

KEYWORDS: Bad Management; Bad Luck; Indonesian Banking; Management Behaviour; Non-Performing Loan; Operational Efficiency.

1. INTRODUCTION

The banking industry has become one of the most influential industries and plays a significant role in the macroeconomic system. Many shocks that happened in the past came from the turbulence in the financial system, hence this attracts many researchers in conducting research in the certain strain. Economic turmoil events for instance the Asian and Global Financial Crisis showed that the bank and other financial institutions should be given more attention and supervision in order to mitigate the happening of a domino effect or create systemic destruction for non-financial industries.

These crises have given the governments and regulators worldwide a specific lesson at a very high price. As many banks have gotten into their fate in the 1990s, it has become an urge for regulators to figure out what indicators that might forecast the bank failures. Major driver identification in assessing bank failures is vital for the authorities in charge of banking supervision, as the ramification for an economic policy varies dramatically depending on the source of the failure. (Berger and DeYoung 1997) identified two major strands that receive the most attention from economists and researchers. The first strand focuses on banking efficiency, while the second focuses on the issue of loan disbursement issues that occur in banks, which is commonly referred to as non-performing loans (NPL). Bonin et al. (2005) persuade bank regulators to concentrate more on the improvement of cost-efficiency by intensifying bank manager education and higher foreign ownership, as a matter that it has a positive relationship with bank efficiency through transfer knowledge mechanism. The importance of transparency is mentioned by Nier (2005) that the disclosure of off-balance sheet items and risky management operations should also be emphasized in order to promote banking stability and limit the occurrence of crises. Studies in developed countries have also highlighted the importance of improved banking efficiency in minimizing bank failures Barr et al. (1994). Hence, it is critical to comprehend bank operations and the aspects that influence their efficiency. Supported by its long legacy in literature, analyzing bank efficiency levels remains essential from both a macroeconomic and a microeconomic perspective, especially in emerging countries. The banking efficiency issue is very critical microeconomic-wise, as there is an increasing level of competition and the presence of international banks, making the downsizing of underperformed banks would be an important agenda. On the other side, the efficiency of the banking industry has an enormous



impact on the intermediary cost as well as maintaining stability of the banking system as it might create systemic impact for the macroeconomic perspective.

Acting as financial intermediaries, banks have become the main institution in distributing the economic welfare, one distinct reason being as the credit disbursement agent to the business owners. As the investment level at the country-level increase, the need for credit or loans for expansion is inevitable, which provide a potent indicator of a growing economy. However, banks should take deeper consideration on the disbursement process, as it might potentially create another problem, such as a lower-than-average level in the credit quality. Abid et al. (2014) consider NPL ratio as the proxy of the post-credit disbursement risk in the banking system. Many financial crises are also characterized by gradual increase levels of NPL ratio that might affect the stability of the banking system (Thalassinos et al., 2015; Amin et al., 2019; Ashraf & Butt, 2019; Khan et al., 2020). This adds up to the idea that financial crises are particularly more relevant in emerging countries because they stifle economic growth because bank loans play a majority part in an investment project. NPL ratio, according to Louzis et al. (2012), could be used to foresee when a financial crisis will arise. Previous research from Ghosh (2015) also associated NPL with the banking crisis and can be utilized as portents of a financial crisis, among other indicators. Ari et al., (2020) also found that an increased level of NPLs is linked to the post-crisis depressions severe condition. In the crisis's circumstances, which followed by greater and unresolved NPL ratios, economic output is consistently lower than in crises with low NPLs. Consequently, as several research in the field of banking stability were focused on how deep these factors are affecting bank failures, understanding the causal relationship between NPL and operational efficiency level is crucial for regulators to be deepened in determining the causality of bank failures, especially when it is linked to the context of banking management behaviour. Although the challenges within these two distinct categories may appear to be unrelated and unconnected, multiple past studies have shown a link between them, Wheelock & Wilson (1995) also discovered that banks with inefficient operational condition are having greater possibility to collapse.

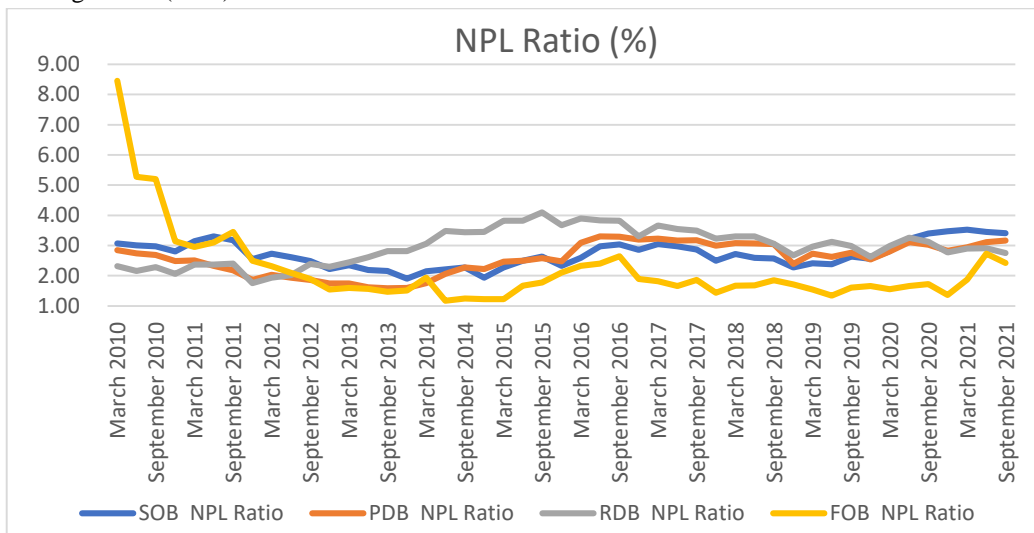
Berger & DeYoung (1997) "Problem Loans and Cost Efficiency in Commercial Banks" is one of the most motivating studies, with their framework called "Management Behaviour". They found that both relationships between Efficiency and NPL existed in the sample of US commercial banks. According to the Management Behaviour framework, these frameworks develop 4 different hypotheses. Relationships among the non-performing loans, bank's operational efficiency, and bank capitalization might form the bad management, bad luck skimping behaviour and the moral hazard hypotheses. Many subsequent studies and research had also been conducted with mixed results. Another extensive study from Williams (2004) found inconsistent with Berger & DeYoung (1997) findings in among European Banks sample from 1990 to 1998, with only bad management hypothesis is supported. Rossi et al., (2005) found there is a confirmation in the bad luck hypothesis but no bad management hypothesis in 9 Central and Eastern European Countries (CEEC) banks, while Koutsomanoli-Filippaki & Mamatzakis (2009) found the robustness with Rossi et al., (2005) when studying 27 European Union members from 1998 to 2006. Reddy (2011) investigate management behaviour in the Indian commercial banks during the period of post-reform. No evidence of skimping was found, with the least capitalized banks supporting the existence of moral hazard behaviour. Podpiera & Weill (2008) tried to unveil the extensive literature of first three hypotheses of management behaviour in the context of the Czech Banking industry, concluding that the research supported the bad management hypothesis as the deterioration in bank efficiency precedes the increase in NPL. Concludingly, previous research has shown that management quality and external factors relating to NPL ratios, bank operational efficiency and capitalization are all variables that have significant impact on banks stability.

In the midst of the 1998 and 2008 Indonesian financial crises, some banking institutions began to fail in their commitments owing to inadequate loan portfolio monitoring and appraisal of the borrower. This leads to the spirit of reformation in the Indonesian Financial System, which led to the creation of "Otoritas Jasa Keuangan" (henceforth, OJK) or the Indonesia Financial Authority. Separation in several regulatory activities happened, including bank supervision, which has been taken out from the Central Bank and integrated into this new entity. One particular ratio in the banking industry that has been supervised by the regulators is the bank efficiency ratio formulated from non-interest expense divided by the non-interest income ("Beban Operasional divided into Pendapatan Operasional" henceforth, BOPO). Hence, in the Indonesian context, proxying the operational efficiency ratio using this ratio could be an alternative for research purposes. This proxy is also similar with the prior study conducted by Hays et al. (2009), which explored the relevance of evaluating banks' performance using the same efficiency ratio. This distinct ratio is reported monthly by all of Indonesia's conventional banks, with the regulator dividing the data into 4 different bank clusters: State-Owned Banks; Private Domestic Banks; Regional Development Banks; and last, Foreign-Owned Banks. Furthermore, this research aims to



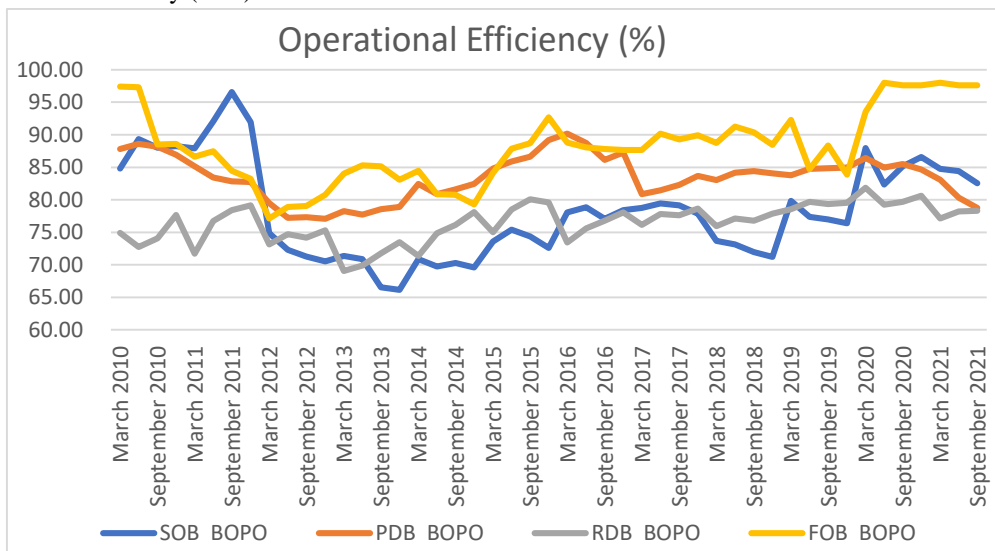
investigate the bank efficiency variable in the 4 different bank clusters in Indonesia using a different technique than DeYoung and Berger's X-efficiency ratio concept. Benthem (2017) also conduct the same measure of bank operational efficiency in Management Behaviour and later found the bad management and bad luck were exists, as well as the skimping behaviour in the subsample of the most efficient banks.

Graphic 1. Non-Performing Loans (NPL) Ratio of 4 different bank clusters in Indonesia



Source: Indonesia Banking Statistic Reports, Author's process.

Graphic 2. Operational Efficiency (EFF) Ratio of 4 different bank clusters in Indonesia.



Source: Indonesia Banking Statistic Reports, Author's process.

As a part of extensive literature, the authors expand the research on the relationship between nonperforming assets (NPLs) and bank efficiency across banks with various ownership arrangements, particularly in Indonesia. Mixed results were found regarding this area of research. Altunbas et al. (2001) found that bank ownership condition affects the banks business model and its efficiency, giving insights to regulators on how one ownership model is considerably more efficient than banks that have relatively different ownership, especially when regulator needs to assess the variances in the characteristics of efficient and inefficient banks. Williams (2004) found that when a separation of control and ownership does exists, the principal-agent difficulties arise, which



explains why banks under various ownerships behave differently and cause the volume of shares traded and ownership rights transferred determines the relationship between ownership and efficiency. Hence, both previous researches inspire the author the urge to use the ownership proxy. Where more thorough study has been undertaken, it has become clear that certain concerns pique the interest of academics, despite the fact that there is still potential for improvement in the context of performing a comparable work on a regional basis, particularly in emerging markets, where India is the only emerging market this research has been undertaken. As a result, there is still a geographical gap in the particular banking issue that has to be addressed through more study.

Berger et al. (2000) implied that foreign-owned banks performed poorly compared to the private domestic banks in developed countries, while Bonin et al. (2005) found the opposite result when conducting the same research in developing countries. Berger et al. (2005) identified foreign ownership effect in banking is higher in the context of credit disbursement decision as well as improving the banking competitiveness system (Claessens and Laeven 2004). By investigating the relationship of NPL ratio and bank operational efficiency, identifying Management behaviours in the Indonesian banking industry will be tested into specific 4 different ownership similar like Reddy (2011), based on the data cluster provided by the Indonesian regulator. The objective of this paper is an extensive study of the Management Behaviour Framework generated by Berger & DeYoung (1997) by examining the bank operational efficiency and identifying management behaviours in the Indonesia Banking Industry. As a result, this research gives a more thorough picture of the health of the banking industry in Indonesia following the regulatory transitional periods and possibly bring insights for Indonesia banking regulator in controlling the bank behavioural management to minimize credit risk and improve bank's efficiency.

The following is the outline of the paper. Section 1 consists of the introductory statement and the background of the study. Literature review and related previous studies are presented in Section 3 cover the data characteristics and methodological approach, whereas all the empirical results and findings in the Indonesian Banking Industry are developed in Section 4. Finally, in section 5 the authors present the conclusion of the paper.

2. LITERATURE REVIEW

2.1. Bank Efficiency

There are several ways for determining how well banks work or how efficient they run their business. Bank operational efficiency levels might depend on the internal and external factors entitled to them. Cutting and controlling expenses while maximizing resource usage are critical variables in the banking performance. In the case of measuring efficiency non-banking institutions, there are several ways to be used, such as common financial ratios like Return on Asset (RoA) and Return on Equity (RoE). However, when measuring banks' efficiency levels, a different approach is applied. Several of the approaches of efficiency ratio are the stochastic frontier approach (Berger & DeYoung, 1997; Williams, 2004; Podpiera & Weill, 2008) and the Data Envelopment Analysis technique (Giokas and Athanassopoulos 2000). Meanwhile, several previous studies e.g. Hays et al. (2009), Prasad & Espinoza (2010), Louzis et al. (2012) and Benthem (2017) proposed using the non-interest expense to non-interest income as an alternative to measure the operational efficiency ratio. This ratio might be able to explain the capability of the banks to conduct their operational activities since the lower the operational efficiency ratio, the more efficient banks are in managing their operating expenses. The operational efficiency ratio (EFF) is proxied by BOPO in Indonesia context as stated in the Circular Letter No. 15/7/DPNP/2013 issued by the Central Bank of Indonesia. Hence, the non-interest expense/total operating income method will be used in this work. The BOPO technique has a different interpretation in establishing bank efficiency level due to the different proxy in the operational efficiency factors. While a higher X-efficiency ratio score indicates that the bank is more efficient. The BOPO ratio, on the other hand, has the inverse meaning: the greater the BOPO ratio, the lower the bank's efficiency.

2.2. Non-Performing Loans

Acting as financial intermediaries, banks are exposed to a specific risk, the credit risk. This aforementioned risk has been a major concern to be overtake in the banking industry. It is commonly defined as the chance of a borrower failing on a loan pledge in the financial industry. This credit risk often takes the form of the NPL ratio (Hajja 2020). The NPL to total loans ratio is an indicator of bank credit quality, this ratio is defined as mortgages which are overdue for more than 90 days (Reddy 2011). Podpiera & Weill (2008) also define the proxy of ex-post credit risk in banking using the NPL ratio. They argued that the flow of bad debt might reflect bank instability and credit quality. There has been a span of research trying to understand the root cause that affects non-performing loans. Ari et al. (2020) found that during financial crises, NPLs are often greater and more variable than during



normal times. Given the intense correlation between NPL magnitudes with the economic growth after crisis, it is critical to recognize the determinant variables that stimulate the amplitude of the NPL ratio. Previous literature conducted also confirmed that rising NPL might depress the credit growth and cause impairment in the bank's balance sheet (Kalemli-özcan et al, 2018).

2.3. Management Behaviour Framework

This paper uses the assumptions suggested by Berger & DeYoung (1997) based on the intertemporal association between bank operational efficiency and NPL Ratio using the Granger Causality Framework. These 2 variables can explain 2 hypotheses under the Management Behaviour Framework that has been widely observed. The perception of causation differs amongst them, and it is very crucial to note that the relationship might be bidirectional.

The first hypothesis is "Bad Luck". According to the "Bad Luck" Hypothesis, any external shocks that causing a negative impact to the bank's stability and performance, indicated by the increasing level of NPL ratio, can be referred as bad luck condition. The increasing level of NPL forced the bank to increase the monitoring and evaluation expenses, that lead to a lower ratio of efficiency. Hence, the greater ratio of NPL might reduce the banks' operational efficiency level. Thus, the "Bad Luck" hypothesis expected to find a negative association between bank operational efficiency and NPL ratio. A lower bank efficiency to be a sign of poor managerial circumstances, which might lead poorer efficiency condition and later would be predicted to result in a higher level of NPL ratio. Hence, the hypothesis of Bad Management is expecting a negative sign of relationship ratio is also likely to happen. Additionally, these variables could also explain the prediction of an alternative hypothesis which have an opposite direction from the Bad Management hypothesis, the skimping hypothesis. The main concept is based on a condition where bank is in a trade-off condition between short term goal in operational costs with the bank's credit performance. The amount of time and money spent on underwriting and monitoring the loans has an influence on both the operational cost efficiency and credit quality. The skimping behaviour might come from the reduction in underwriting and monitoring cost of borrower, which create a condition the bank seems efficient and leave the future loan problems later, since NPL ratio might not create a burden in short term aspect. As a result, a higher level of bank operational efficiency might lead to a rise in the level of NPL ratio, indicating a positive association between NPL and bank efficiency in this scenario.

2.4. Empirical Findings in Management Behaviour

There are several preceding studies in context of Management Behaviour with mixed results. The first substantial paper mentioning about this issue was conducted by Berger & DeYoung (1997). From the year of 1985 to 1994, a huge sample of the United States commercial banks was studied and being analyzed for the association between loan quality, bank cost efficiency, and the bank capital factor. The percentage of NPL to total loans was used to gauge loan quality. A stochastic frontier technique is used calculate the cost efficiency for each bank. Apparently, they found that both bad management and bad luck hypothesis were existed within the observable period. Another extensive study from Williams (2004) found inconsistent with Berger & DeYoung (1997) findings in among European Banks sample from 1990 to 1998, with only found that bad management hypothesis was supported in the study. Rossi et al. (2005) found there is a confirmation in the bad luck hypothesis but not the bad management in 9 Central and Eastern European Countries (CEEC) banks, while Podpiera & Weill (2008) findings only support the bad management hypothesis in the Czech banks sample between 1994-2005. Koutsomanoli-Filippaki & Mamatzakis (2009) found a bad luck hypothesis confirmation when studying 27 European Union members from 1998 to 2006, confirming the results found by Rossi et al. (2005). Zaini et al., (2010) found the bad management evidence in Malaysia and Singaporean banks, while Fiordelisi et al., (2010) using the Granger-causality techniques in a panel data investigated the sample of banks in European Union zone. They discovered that reducing efficiency increases a bank's future risk proxied by NPL ratio, implying that bad management hypothesis is supported. Tabak et al. (2011) and Louzis et al. (2012) both found the same results in different countries (Brazil and Greece), confirming the bad management hypothesis, as the bank operational efficiency fostering the increase of NPL ratio, while Reddy (2011) found both bad luck and bad management in the Indian Commercial Banks. In summary, bad luck and bad management hypotheses were supported in both country and bank specific researches, reflecting the inefficiency fostering the higher level of NPL ratio. Henceforth, it is projected that this study might support the evidence and will have similar outcomes within the sample of Indonesian banking sector, especially with various kinds of ownership.



3. DATA & METHODOLOGY APPROACH

3.1 Data Description & Variable Explanation

This paper uses the time series and quarterly data from the Indonesia Banking Statistics published by Indonesia Financial Authorities. The observable variables are NPL and operational efficiency with several control variables added in each equation following (Berger & DeYoung (1997), the Equity Capital (CAP) Ratio and Risk Weighted Assets (RWA) Ratio. The CAP ratio is a ratio of bank capital factor that measures the bank's financial resiliency in absorbing the loan loss caused by a diverse loan portfolio mix, while RWA ratio is a proxy for controlling the bank risk factors. Gross Domestic Product (GDP) Growth is included as one of the control variable since several previous research found that macroeconomics indicator such as GDP had an impact on NPL and Bank Efficiency (Williams, 2004; Hasan et al., 2009; Louzis et al., 2012; Messai & Jouini, 2013; Anastasiou et al., 2016; Hajja, 2020; Shi et al., 2021). Though, the main differences that it will be tested on the aggregate data of 4 different bank clusters: State-Owned Banks; Private Domestic Banks; Regional Development Banks; and last, Foreign-Owned Banks in Indonesia from the period starting January 2010 to September 2021 with total 47 observations for each bank cluster.

3.2. Econometric Model

Using the Granger Causality Test, this study was inspired by Berger & DeYoung (1997) framework. The Granger causality might be used to show a variety of bank management behaviours. DeYoung and Berger's fundamental application of this method is that the lags of the independent variables could Granger-cause the dependent variable (Rossi et al., 2005). The dependent variable, on the other hand, are evaluated for Granger-causality not only with another independent variables, but also with their own own lagged values. For each variable, tests are run in both directions. The former value of the independent variables is more important than their current value. However, the significance of the aggregate of coefficients is the main importance. The significance and signs of the coefficients reflect the correlations between variables. Testing the extension findings of bad management and bad luck hypotheses in the Indonesia Banking Industry using BOPO as proxy of Operational Efficiency and NPL ratio as observable variables. The estimate formula for the Granger Causality Framework test is as follows:

$$(1) NPL_{i,t} = f_1(NPL_{i,lag}, EFF_{i,lag}, CAP_{i,lag}, RWA_{i,lag}, GDP_{i,lag}) + e_{1i,t}$$
$$(2) EFF_{i,t} = f_1(NPL_{i,lag}, EFF_{i,lag}, CAP_{i,lag}, RWA_{i,lag}, GDP_{i,lag}) + e_{1i,t}$$

The model construction is based on each dependent as well as independent variables' lagged value to measure it. In this method, changes in the left-side variable at time t are Granger-caused by the lagged values of the determinant and control variables at certain delays. Equation (1) is used to test the bad management as well as skimping hypotheses, respectively, with initial positive summary of the coefficient would support the bad management hypothesis, while the negative lagged coefficients summarized might imply the presence of skimping behaviour. Equation (2) is related to the bad luck hypothesis testing, where the positive summary of coefficient reflects the existence of the bad luck in the observable variables. Because of the different approach to measure the operational efficiency, the signals of the bad management, skimping, and bad luck hypotheses are inverted, compared to the majority research that has been analyzed. The expected sign of the relationship between NPL ratio and operational efficiency is negative, as higher ratio in the operational efficiency indicates lower efficiency, while the opposite meaning is prevailed when using X-efficiency ratio, as the higher ratio the better the efficiency level. The similar relationship for bad luck hypothesis is constructed based on the bad management hypothesis, with inversed dependent variable. Using partial approach of previous research conducted by Berger & DeYoung (1997) and Williams (2004), which tested all four hypotheses in management behaviour issues, the authors attempt to adopt the concept of Podpiera & Weill (2008), which limits the investigation to the relationship between two variables following data characteristics, the non-performing loan ratio or NPL Ratio and the bank operational efficiency ratio (EFF) with the equity capital to total asset ratio (CAP ratio), risk-weighted asset (RWA) ratio and Gross Domestic Product (GDP) ratio treated as control variables in the equation estimation. Furthermore, due to the data characteristics, the moral hazard hypothesis testing is unavailable to be tested in the aggregate data level since the characteristics of using subsample test would only be optimal to be tested in the bank-level data.

4. EMPIRICAL RESULTS & DISCUSSION

This section will present the preliminary descriptive statistics and the Granger Causality Test conducted for each sample of bank cluster data. The summary statistics for NPL and EFF as well as CAP and RWA as control variables were shown in Table 1. The



Foreign-Owned Bank (FOB) cluster has the highest mean of Operational Efficiency Ratio, which around 88.15%, indicates that banks in this cluster are less efficient than banks in other clusters. It is also interestingly found that FOB has the lowest NPL ratio among other bank clusters by 2.19%, this means that FOBs are having relatively better credit quality. The CAP ratio of FOB is doubled than other bank clusters of 0.35%, which can be articulated that the foreign banks are more capital intensive than others. The Risk Weighted Assets (RWA) ratio of FOB are also higher, indicates that assets hold by the FOB are riskier than others. This initial finding reveals that foreign ownership in a bank has a detrimental impact on operational efficiency, supporting Yildirim & Philippatos (2007) that found foreign banks are tend to be less efficient relatively compares to the private domestic and state-owned banks. The argument implies that regulatory agencies in developing nations should closely monitor the bank with foreign ownership.

Table 1. Summary Descriptive Statistic

Bank Cluster	N (Total Samples)	Non-Performing Loans (%)		Operational Efficiency Ratio 'BOPO' (%)		Capital Ratio		Risk Weighted Assets Ratio	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Regional Development Banks	47	2.97	0.60	76.47	2.93	0.11	0.01	0.55	0.05
Private Domestic Banks	47	2.57	0.53	83.45	3.45	0.16	0.02	0.70	0.03
Foreign-Owned Banks	47	2.19	1.27	88.14	5.72	0.35	0.07	0.74	0.06
State-Owned Banks	47	2.71	0.43	78.32	7.41	0.13	0.02	0.69	0.03

Source: Authors' Analysis

In testing the intertemporal relationship, we conduct the concept of Granger Causality Framework where each of the left-side variable that will be regressed with all the lagged values of right-side variables, including the lags of the left-side variable itself. The Equation (1) was estimated for checking the Bad Management and Skimping Hypotheses while the Equation (2) was estimated for the Bad Luck Hypothesis. Both equations were re-estimated for each of the 4 different bank clusters subsequently. F-test procedure recommended by Williams (2004) were conducted in order to find the proper number of lags for each equation. We found that for each bank cluster has different lags. They also distinct forms of intertemporal model of management behaviour, whereas the significance level of the computed coefficient is affected by the delays in the model, respectively. For the Equation (1) lag 6 were chosen for the RDB and FOB clusters, while the lags included for the PDB and SOB were 2 and 3, orderly. Table 2 showed the OLS estimation of Granger Causality with NPL as the dependent variable for each bank cluster.

Table 2. OLS Estimation of Granger Causality tests in NPL Equation

Variables	Regional Development Banks	Private Domestic Banks	Foreign-Owned Banks	State-Owned Banks
Lag	6	2	6	3
Constant	0.006433	0.010655	-0.000668	0.010581
NPL-1	-0.849944	0.003631	0.437099	-0.000320
NPL-2	-0.432517	0.418718	-0.045691	0.146932
NPL-3	-0.129736	-	-0.275878	-0.007927
NPL-4	-0.018511	-	0.012278	-
NPL-5	0.129601	-	0.136843	-
NPL-6	-0,116115	-	0.240575	-
NPL-Total	-1.417222	0.422349	0.505226	0.138685
EFF-1	0.009675	0.030285	-0.049080	0.008213
EFF-2	-0.000614	0.002107	0.041493	0.005958
EFF-3	-0.017953	-	0.074096	0.001657
EFF-4	-0.021114	-	-0.059952	-



EFF-5	-0.000130	-	0.036689	-
EFF-6	-0,015958	-	-0,013980	-
EFF-Total	-0.046094	0.032392	0.029266	0.015828
R2	0.912994	0.507836	0.87300	0.665135
R2 (adj.)	0.586720	0.358695	0.45200	0.479100
N adjusted	39	40	40	43

Source: Authors' Analysis

We found that each of bank cluster in the Indonesian Banking System behaved differently regarding the association between the problem loans and operational efficiency. The PDB and SOB clusters confirm the bad management hypothesis, supporting the several results found from the previous studies like Berger & DeYoung (1997); Williams (2004); Podpiera & Weill (2008); Fiordelisi et al. (2010); Tabak et al. (2011); Louzis et al. (2012); Dimitrios et al. (2016); Benthem (2017); and García-Alcober et al. (2019). For the PDB and SOB clusters, a decrease of 1% efficiency leads to an increase of 0.0324 and 0.0158 over the three quarters in NPL Ratio, which has a relatively minor economic impact to each of bank cluster. However, unlike most of the previous literatures, the intertemporal relationship of RDB cluster were inversed, concluding the existence of skimping behaviour. The economic effect of an increase of 1 % in EFF variable on NPL Ratio is 0.0461 over the 6 quarters of period. This specific outcome is parallel with the finding of Altunbas et al. (2007) in European banks, while Benthem (2017) emphasizes the finding confirmed especially when they were testing the subsampe of the most efficient banks. The significantly negative lagged operational efficiency of RDB suggests that the decreasing operational efficiency might catalyst the increase of NPL ratio, supporting the premise of that credit quality is worsening because of the poor loan portfolio management. implying that a better operational efficiency might cause an increase in the NPL ratio in the future.

In general, according to the results of bad management behaviour, estimation of the PDB and SOB banks are both found positively related with significancy levels at 99%, inferring to badly managed bank reflecting a low-quality management, which may weaken the operational efficiency level. As a result, the non-performing loan ratio would increase. While the RDB bank, unlike the PDB and SOB clusters, were proven having a skimping behaviour in the range of 1% level. One main consideration that might justify skimping behaviour is that the behaviour of C-level management of RDBs are keen to impress their local stakeholder by showing an adequate bank performance, as evidence of the success indicator during their leadership tenure. This supports the creation of trade-off scenarios between short-term goal in cost efficiency and future risk-taking behavior (Fiordelisi et al., 2010; Ozili, 2019) in order for banks to appear more efficiently by spending fewer or minimal cost for credit screening, monitoring and evaluation process, which later might compromise the bank risk when the problem loans arise as a following consequence.

We found that the estimation of Foreign-Owned Banks (FOB) cluster is statistically insignificant, which later explain the changes in bank operational efficiency does not Granger cause in NPL ratio for FOB cluster and can be seen as evidence of the absence of bad management behaviour. This particular finding was quite unusual as the FOB cluster data describe that they have the least efficient level of operational efficiency. However, suprisingly they also have the lowest NPL ratio compared to other bank clusters. One might be a possible justification is that the capital intensiveness in the FOB bank clusters could be proven in absorbing the shocks in NPL. Further investigation in the root-cause factors should be conducted. Overall, those above estimation results and significancies are subject to the lag implied into the model.

Table 3. OLS Estimation of Granger Causality test in EFF estimation

Variables	Regional Development Banks	Private Domestic Banks	Foreign Banks	State-Owned Banks
Lag	6	6	1	2
Constant	0.086284	0.052440	0.406155	-0.506013
NPL-1	-3.556469	1.790700	1.887765	4.861659
NPL-2	-0.854695	-2.466404	-	13.09844
NPL-3	3.475029	-0.126530	-	-



NPL-4	-0.003983	-1.334254	-	-
NPL-5	-2.023668	-3.883880	-	-
NPL-6	3.120206	3.727012	-	-
NPL-Total	0.156420	-2.293356	1.887765	-
EFF-1	-0.183348	-0.321658	-0.273168	-0.098830
EFF-2	-0.047954	0.025582	-	-0.243334
EFF-3	-0.869318	0.333625	-	-
EFF-4	0.042817	0.037123	-	-
EFF-5	-0.067237	-0.027115	-	-
EFF-6	-0.518491	-0.350979	-	-
EFF-Total	-1.643531	-0.303422	-0.273168	-0.342164
R2	0,951723	0,628435	0,219406	0,400174
R2 (adj.)	0,770683	-0,610116	0,11933	0,218408
N adjusted	39	40	45	44

Source: Authors' Analysis

The bad luck hypothesis was tested using Eq. (2), shown in the Table 3. Lag 6 was chosen for the RDB and PDB based on the F-test procedure, while lag 1 and 2 were chosen for the FOB and SOB clusters, confirming the presence of bad luck in the banks that are owned by the regional and central governments with 99% and 95% significance level. This is suggesting that an increase of NPL ratio caused by exogenous shocks will Granger-cause a decrease in the bank operational efficiency, the higher level of NPL ratios might forced banks to spend more on managing additional loan portfolio monitoring and evaluation cost, triggering a lower efficiency level (Berger and DeYoung, 1997). The economic effect of bad luck in RDB were relatively small, with an increase of 1% in the NPL Ratio as a cause of exogenous shock might increase decrease the bank operational efficiency level by 0.1564 over 6 quarters. The different economic effect was shown in the SOB cluster where the increase is quite significant, with an increase of 1% in NPL ratio because of exogenous shocks pointedly decrease the operational efficiency by 17.960 in only 2 period of observation. This significant change might have possible explanation in support to the Berger & DeYoung (1997) which explain banks with relatively larger asset, manage to be keener to take risks in loan distribution, otherwise their Loan-to-Deposit Ratio (LDR) will be slightly low. Misra & Dhal (2010) similarly support the idea that banks with greater asset were likely to have higher NPL ratio. The particular state becomes more complex especially for government-owned banks, as they correspondingly have the obligation to disburse loan in broader scope of borrower that might compromise the credit quality. The condition might cause a greater operational inefficiency due to higher maintenance and monitoring costs because of wider coverage of credit portfolio. The result shows that the exogenous factors are one of the most important determinants in explaining the fluctuation of NPL ratio, reflecting that government-owned banks are heavily influenced by economic volatility and other unexplained factors outside the estimation. This finding confirms the previous results of Berger & DeYoung (1997), Williams (2004); Rossi et al. (2005), Podpiera & Weill (2008), Koutsomanoli-Filippaki & Mamatzakis (2009); Reddy (2011); Makri et al. (2014); Nguyen & Quadt (2016); and Thinh & Thu (2020).

On the other side, findings for the PDB and FOB bank clusters found that it is statistically insignificant in testing the bad luck hypothesis, resulting that there is no Granger cause effect of the NPL ratio to the bank operational efficiency ratio. In these 2 latest clusters, the not significant signs exhibit the exogenous shocks do not Granger cause the bank operational efficiency level. The bad luck hypothesis is mainly related to the repercussions of the increasing trend of exogenous and unexpected shock that might cause rising NPL ratio to the bank operational efficiency level, with no regard of the bank's senior managerial skills in preventing the occurrences. Senior management will be expected to add some extra monitoring cost when the level of NPL ratio is deteriorated because of the abovementioned shocks, thus will lower the bank operational efficiency ratio.

5. CONCLUSION

The main purpose of this study is to reveal the intertemporal relationship between bank operational efficiency and NPL ratio in the 4 different Indonesian bank clusters; Regional Development Banks (RDB), Private Domestic Banks (PDB), Foreign-Owned Banks



(FOB), and the State-Owned Banks (SOB). In summary, our major results were diversified for each bank clusters. The results found strong statistical evidence to support the bad management hypothesis in PDB and SOB bank clusters, while the results in the FOB cluster was statistically insignificant. Nevertheless, unlike any major results, the RDB cluster estimation result has indicated that skimping behaviour occurred. In testing the bad luck hypothesis, our result provides a clear support of the existence of bad luck in the RDB and SOB clusters because positive relationship between operational efficiency and NPL ratio was found in both clusters while the 2 other clusters statistically insignificant in capturing the bad luck hypothesis.

This aforementioned study findings have several contributions and practical implication for practitioners as well as regulators. For practitioners, it could be a reflection as the behaviour would only be capture by this specific study, while regulators can create regulations that are relevant and in accordance with the current behaviour. Findings in bad management suggests that Indonesian policy makers should put more prudent supervisory on improving the bank's efficiency ratio by monitoring their recruitment process, stricter assessment, fit and proper test to the C-level management and its minus one, identify and control high-cost operational area, as well as formulating robust indicator in minimizing or preventing any potential fraud that might increase the problem loans. The skimping behaviour bring insights to the regulators and researchers to consider loan portfolios and monitoring performance cost, which might affect the operational efficiency level, as one of important aspect in preventing the projected growth in NPL ratio. One current homework for regulator is to disseminate better understanding for the bank managers on the necessity of having prudent monitoring in order to achieve financial stability in the long term (Fiordelisi et al, 2010). The presence of bad luck hypothesis infers that revenue stream diversification and restraining bank's exposure to riskier asset is urgently needed to be done by the poslicy makers. These policies might prevent banks exposed to the external shocks. We also recommend the practice of relaxation policy from Indonesian regulators should the banking system experiencing distress from external events that could potentially rise the NPL ratio. Following Benthem (2017), we also suggest the better application in advanced regulation, e.g., Basel III and strict monitoring to the bank compliance of the applied regulations. Finally, bank regulators should ensure that banks' lending practices are thoroughly supervised, as well as conducting active monitoring of the financial intermediation in the country level and assessing its vulnerability towards economic external shocks.

Despite the several breakthrough findings of Management Behaviour in the context of Indonesia banking system, authors note that there are several limitations of this research. To begin, authors only investigate at the first two hypotheses of the management behavior idea owing to data characteristics. The authors did not evaluate skimping and moral hazard behaviors since they require multi-bank data, and authors are concentrating on reviewing the particular aggregate data given by the regulators. Secondly, given several previous studies use different proxy in problem loans and operational efficiency, authors only explore NPL ratio as the sole proxy of the credit risk and BOPO as the proxy of bank's operational efficiency. Last, since this paper only focus on how external shocks could disturb the NPL ratio, it does not address and identify what kind of external factors that trigger the shocks. This paper is a novelty since it is the first to look at the Berger & DeYoung (1997) management behavior framework in the Indonesian banking system using the approach of operational efficiency, to the best of the knowledge of the authors. Furthermore, this paper provides several recommendations for further research. Authors might suggest comparing these behaviors in the Indonesian banking industry to those in other developing nations as well as well-established countries, in order to uncover factors that impact bank's managerial behavior in different economic circumstances. Second suggestion from authors come from the application of variable proxies could be conducted on this topic, e.g using the stochastic frontier as proxy of efficiency to see if the results are consistent with this paper. In the context of dynamic analysis, the implementation of different statistical method, e.g., Vector Auto Regression (VAR) is viable to provide more insights. A multi-step study employing aggregate and panel data using bank level data as a proxy to examine skimping and moral hazard behavior in the Indonesia banking sector might also be another proposal for future researchs.

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