

Cost efficiency, innovation and financial performance of banks in Indonesia

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Cost efficiency, innovation and financial performance of banks in Indonesia

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Financial performance of banks in Indonesia

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Abstract

Purpose – This study aims to examine the effect of financial innovation, financial ratios, cost efficiency and good corporate governance on the financial performance of banks in Indonesia.

Design/methodology/approach – The data in this study are in the form of annual financial statements of conventional banks in Indonesia. The effect of cost efficiency, innovation and financial performance of banks in Indonesia is expected to be evident in 2009–2018. The research method used is the panel regression method.

Findings – The results show that financial innovation affects the financial performance of banks. Cost efficiency has a negative effect on the financial performance of banks. Financial ratio, which is proxied by the capital adequacy ratio (CAR) and loan to deposit ratio, has a positive effect on return on assets and net interest margin. Financial ratio, which is proxied by nonperforming loan and equity to total assets, has a negative effect on return on asset and return on equity. Good corporate governance (GCG), which is proxied by the proportion of managerial ownership (PMO), does not affect the financial performance of banks, whereas GCG, which is proxied by the proportion of independent board of directors, has a negative and significant effect on the financial performance of banks in Indonesia.

Practical implications – These results are a warning to bankers and the government to be cautious when formulating a strategy for the financial performance of banking.

Originality/value – Cost efficiency and financial innovation are important for the financial performance of banking. However, the possible impact of cost efficiency and financial innovation in Indonesia does not have a significant impact. The study uses static panel estimation techniques to analyze the data.

Keywords Financial innovation, Financial ratios, Cost efficiency, GCG, Financial performance, conventional banks

Paper type Research paper

Introduction

The banking industry in Indonesia is now experiencing fairly good growth (Anwar, 2019). This is evidenced by the existence of various positive developments in lending. Besides, this is also supported by technological developments so that innovation in banking is one alternative that can improve banking financial performance (Chipeta and Muthinja, 2018). The financial performance of a bank is reflected in the profitability of the bank (Dietrich and Wanzenried, 2011). A bank's profitability includes the bank's ability to generate profits from total assets [Return On Asset (ROA)], the bank's ability to generate profits from total capital [Return On Equity (ROE)] and the bank's ability to generate profits from credit sales [Net Interest Margin (NIM)].

Banking is a very influential sector in the economy (Pratiwi, 2012) because the banking sector plays a very important role both in collecting public funds and in channeling these funds to the public. If the banking financial performance declines, this will have an impact on the economy. The financial performance of banks is reflected in the ability of the banks to generate profits. The higher the ability of banks to generate profits, the better the financial performance of the banks. The financial performance of banks is influenced by several

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factors, such as financial innovation, financial ratios, cost efficiency and good corporate governance (GCG).

According to Tufano (2003), financial innovation is the act of creating and then popularizing new financial instruments, new financial technologies, institutions and markets. The higher the innovations carried out by banks, the higher the financial performance of the banks (Chipeta and Mhinja, 2018). Financial innovation in the banking sector can be seen from the application of automated-teller machines (ATMs), the Internet and mobile banking. Besides, financial innovation can also be seen from the increasing number of ATM networks in banks.

In general, the more innovative a bank is, the more efficient the bank will be (Nizar, 2019). Therefore, cost efficiency is also a very important factor in banking financial performance. The more efficient the bank is in managing its costs, the better the financial performance of the bank (Khalifaturafi'ah, 2018; Dietrich and Wanzenried, 2011). An efficient bank will easily find and manage profits so that its financial performance will improve.

Financial performance is also strongly influenced by financial ratios. In Bank Indonesia Regulation No. 131/PBI/2011 article 2, it is stated that banks are required to conduct bank financial health ratings using the risk-based bank rating approach. A bank is declared healthy, if the liquidity ratio (LDR) financial ratio is $75\% < LDR \leq 85\%$, and it is declared very healthy if the LDR is $\leq 75\%$. Based on the capital, a bank is declared healthy, if $9\% \leq$ capital adequacy ratio (CAR) $< 12\%$, and it is declared very healthy if $CAR > 12\%$. Also, based on the credit risk, or Non Performing Loan (NPL), a bank is declared healthy, if $2\% \leq NPL < 5\%$, and it is declared very healthy, if $NPL < 2\%$. Equity to Total Asset (ETA) is an indicator of bank financial ratios that measure the capital adequacy of banks to support assets that contain or generate risk.

The higher level of capital ratio shows that the bank is safe in managing its capital (Mong and Muazaroh, 2017). The higher the capital, the higher the bank profitability. This means that the capital ratio has a positive effect on bank profitability (Pradhan, 2016). Banks with high capital ratios are expected to provide credit growth and higher profitability.

A LDR is a ratio that measures the extent to which the bank can pay its short-term obligations. Besides, the LDR also shows the ability of banks to repay their depositors and can meet credit demand on time. The LDR shows how liquid banks in using deposits as a source of income to extend credit (Yuksel *et al.*, 2018). The higher the bank liquidity, the higher the bank's financial performance (Sana, 2015).

Unlike liquidity, credit risk, in general, has a negative effect on the financial performance of banks. The higher the bank's credit risk, the lower profitability of the bank because the bank revenue from interest income will be hampered. As a result, the financial performance of the bank will decline (Peling and Sedana, 2018; Khalifaturafi'ah and Nasution, 2016).

Based on the description above, this study investigates the subsequent questions:

- (1) How does cost efficiency affect the financial performance of banks in Indonesia?
- (2) How does financial innovation affect the financial performance of banks in Indonesia?
- (3) How do financial ratios affect the financial performance of banks in Indonesia?
- (4) How does good corporate governance affect the financial performance of banks in Indonesia?

The author is interested in examining the efficiency, innovation and financial performance of banks in Indonesia. The formulation of problem to be examined is whether efficiency, innovation and financial ratios affect the financial performance of banks. The purpose of this study is to analyze the effect of efficiency, innovation and financial ratios on financial performance.

Literature review

Previous literature has focused on explaining the financial performance of banking from internal factors and external factors. Internal factors such as bank-specific (liquidity, credit risk, capital ratio, efficiency, financial innovation and corporate governance) give various effects on financial performance. External factors such as macroeconomic indicators (gross domestic product [GDP] growth, inflation, interest rate, and exchange rate) gives many effects on financial performance. Given the scope of this study, the author offers only a brief review of the literature relevant to the present work.

Anwar (2019) shows that the average cost efficiency of Indonesian banks was likely to incline during 2002–2010. Cost efficiency is the most popular approach to estimate bank efficiency using stochastic frontier analysis (SFA) (Anwar, 2019; Khalifaturofi'ah, 2018).

Three approaches in determining the input and output components in cost efficiency are the production approach, intermediation approach and the asset approach. Hadad *et al.* (2011) show that in the production approach, the input component includes expenses, while the output component includes revenues. In intermediation approach, the banking sector is an intermediary institution that converts financial assets from surplus units to deficit units. In this approach, the input component includes expenses while the output component includes the total loan credit and financial investment assets. The asset approach, the banking sector as a financial institution that provides loans. The asset approach is similar to the intermediation approach, which places assets as output components. Cost efficiency in this study uses an intermediation approach, which views banks as collectors of funds that are then intermediated to loans and other assets (Anwar, 2019).

Al-Jafari and Alchami (2014) find that efficiency using management efficiency has a significant positive effect on profitability. The different results given by Ozili and Uadiale (2017) show that cost efficiency has a significant negative effect on profitability. Khalifaturofi'ah (2018) shows that cost efficiency in Islamic banking has no significant effect on profitability. The first hypothesis of this study is cost efficiency has a positive and significant effect on profitability.

Financial innovation can be defined as a market change for consumers and business debt (Wachter, 2006). Financial innovations in banking are financial innovations in the services, which include the provision of ATMs, mobile banking and Internet banking (Nkem and Ajinma, 2017; Khalifaturofi'ah, 2020). Financial innovation especially in providing ATM has a significant positive effect on profitability (beta and Muthinja, 2018; Le and Ngo, 2020). Chipeta and Muthinja (2018) examine the relationship between financial innovation and bank performance in Kenya banking. Their study confirms that financial innovation in mobile banking and ATM has a significant positive effect on bank performance. Besides, Muia (2013) shows that mobile banking has a positive significant effect on profitability. Gündoğdu and Taskin (2017) examine the relationship between the profitableness of the Turkish banking system and online banking, telephone banking, and credit cards. Their result shows that financial innovation in credit cards has a significant positive effect on bank performance. The second hypothesis in this study is financial innovation has a significant positive effect on profitability.

Messai *et al.* (2015) examine determinants of profitability in the countries of Western Europe during the distress period 2007–2011. Their results show that capital adequacy (Equity to Total Asset (ETA)) is positive and significant on profitability, credit risk (NPL) is negative and significant on profitability approximated by ROA.

Sriyana (2015) also finds that credit risk has a significant and negative effect on profitability. Liquidity using FDR (financing to deposit ratio) has a positive and significant effect on profitability. The different result from the research before is about capital adequacy. Capital adequacy has no significant effect on profitability. But, Pradhan (2016) show that capital adequacy affects positively profitability approximated by ROA.

Khalifaturrofi'ah and Nasution (2016) added the result of their study about the financial performance of banking. Their study shows that capital adequacy (CAR), credit risk (NPL) and liquidity (LDR) have a significant and negative effect on profitability approximated by ROA in conventional banking. While in sharia banking, credit risk has a significant and negative effect on profitability and capital adequacy and liquidity have no significant effect on profitability. The third hypothesis in this study is financial ratios have a significant effect on profitability.

Ozili and Usman (2017) investigate ownership concentration and bank profitability. The result shows that the proportion of managerial ownership (PMO) has a significant and positive effect on profitability approximated by ROA. The different result is given by Sari *et al.* (2011): the PMO has no significant effect on profitability. The proportion of independent board of commissioners (PIBCs) has a significant and negative effect on the bank performance (Tertius and Christiawan, 2015). This result suggests that lower PIBC will make higher profitability. Widyati (2013) examines PIBCs to profitability. The result shows that PIBCs has a significant and positive effect on profitability. The fourth hypothesis in this study is good corporate governance, especially PMO and PIBCs have a significant effect on profitability.

Therefore, the existing literature seems to agree that cost efficiency, innovation and the other bank-specific (liquidity, credit risk, capital adequacy, the PMO and proportion of independent commissioner) have an important role in financial performance. For example from another result, financial innovation can increase economic growth (Bara and Mudzingiri, 2016). From profitability, efficiency and liquidity, banks can show different performances, which can affect banking growth (Salman and Nawaz, 2018).

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Research method

The population in this study is all conventional banks in Indonesia. The research samples taken are ten conventional banks included in BUKU 3 and BUKU 4 (Table 1) because banks in this criteria have an important rules in the economic growth (Nizar, 2019). The data period taken is annual data for the period of 2009–2018. The data used are secondary. The data are

No	Conventional commercial banks	Type of bank	BUKU
1	Mandiri		BUKU 4: Core Capital 40 last IDR 30 Trillion
2	BNI	State-owned	BUKU 4
3	BRI	State-owned	BUKU 4
4	CIMB Niaga	National private- owned (Foreign Exchange)	BUKU 4
5	BCA	National private- owned (Foreign Exchange)	BUKU 4
6	Bukopin	National private- owned (Foreign Exchange)	BUKU 3: Core 40 total IDR 5–30 Trillion
7	BTPN	National private- owned (Foreign Exchange)	BUKU 3
8	Mayapada	National private- owned (Foreign Exchange)	BUKU 3
9	Maybank	National private- owned (Foreign Exchange)	BUKU 3
10	Permata	National private- owned (Foreign Exchange)	BUKU 3

Table 1.
Research sample

Source(s): OJK, 2020

collected from the financial statement published by the Financial Services Authority (OJK). The method of analysis in this study is done using the panel regression method (see Figure 2). Eviews is used to analyze the data and the result of many literature review can be seen in Table 2.

The dependent variable used is banking financial performance, which includes ROA, ROE and NIM. The independent variables used are financial innovation, cost efficiency and financial ratio. Financial innovation includes the dummy variables of financial innovation related to the application of ATMs, Internet and mobile banking as well as the number of ATMs owned by each bank. Cost efficiency is obtained from calculations using the stochastic frontier approach. Financial ratios include CAR, LDR, NPL and ETA (Table 3).

The analysis used in this study includes two methods: the first is the stochastic frontier method to determine the level of cost efficiency in banks and the second is the panel regression method to determine the factors that affect banking financial performance (see Figure 1). There are several techniques or models offered to estimate the parameters of the model with panel data: (1) common effect model. This approach is often known as ordinary least square. This method cannot see the difference between time and between individuals or

Independent variable	Dependent variable	Effect	Citation
Cost efficiency	ROA	Management efficiency → ROA = +	Al-Jafari and Alchami (2014)
	ROE	Cost efficiency → ROA, ROE, NIM = -	Ozili and Uadiale (2017)
	NIM	Cost efficiency → ROA, ROE = x	Khalifaturofi'ah (2018)
Financial innovation	ROA	ATM, POS → ROA, NIM = +	Le and Ngo (2020)
	ROE	Mobile banking → ROA, ROE = +, ATM → ROA = +	Chipeta and Muthinja (2018)
	NIM	Mobile banking → ROA = + Credit Card → ROA, ROE, NIM = +	Muia (2013) Gündoğdu and Taskin (2017)
CAR	ROA	CAR → ROA = +	Messai <i>et al.</i> (2015), Alhempri and Zainal (2016), Pradhan (2016)
	ROE	CAR → ROA = x	Sriyana (2015)
LDR	ROA	LDR → ROA, NIM = +	Messai <i>et al.</i> (2015), Sriyana (2015)
NPL	ROE		
	ROA	NPF → ROA = -	Sriyana (2015), Peling and Sedana (2018), Khalifaturofi'ah and Nasution (2016)
	NIM		
ETA	ROA	ETA → ROA, ROE, NIM = +	Ozili dan Uadiale (2017)
	ROE		
	NIM		
PMO	ROA	PMO → ROA = x	Sari <i>et al.</i> (2021)
	ROE	PMO → ROA = +	Ozili dan Uadiale (2017)
	NIM		
PIBC	ROA	PIBC → ROA = - PIBC → ROA = +	Tertius and Christiawan (2015)
	ROE		
	NIM		Widyati (2013)

Source(s): Processed Data (2020)

Table 2.
Literature review

	Definition	Measurement
<i>Dependent variable</i>		
ROA	Return on Asset/ profit derived from the average total asset	$ROA = \frac{\text{Total return}}{\text{average total assets}} \times 100\%$
ROE	Return on Equity/ profit derived from average total equity	$ROE = \frac{\text{total return}}{\text{total equity}} \times 100\%$
NIM	Net Interest Margin/ profit derived from interest income	$NIM = \frac{\text{total return}}{\text{sales}} \times 100\%$
<i>Independent variable</i>		
Financial innovation	Application of ATMs, Internet banking, and mobile banking at conventional commercial banks during 2009–2017	Dummy 0 = no ATM 1 = with ATM 2 = with ATM and Internet banking or mobile banking 3 = with ATM, Internet banking and mobile banking
Cost efficiency	Number of ATMs Cost efficiency obtained from input of labor costs and interest costs, total credit output, and securities	Output SFA LnATM $TC = a + b1p1 + b2p2 + b3q1 + b4q2$
Financial ratios	CAR = capital adequacy ratio LDR = loan to deposit ratio NPL = non-performing loan ETA = equity to total asset	$CAR = \frac{\text{capital}}{CRAR} \times 100\%$ $LDR = \frac{\text{total loan}}{\text{total deposits(DPK)}} \times 100\%$ $NPL = \frac{\text{non-performing loan}}{\text{total loan}} \times 100\%$ $ETA = \frac{\text{total equity}}{\text{total assets}} \times 100\%$
GCG	PMO = Proportion of Managerial Ownership PIBCs = Proportion of Independent Board of Commissioners	$PMO = \frac{\text{Number of shares owned by management}}{\text{Total shares outstanding}} \times 100\%$ $PIBC = \frac{\text{Number of independent commissioners}}{\text{Total number of commissioners}} \times 100\%$

Table 3. Operational definition and variable measurement

Source(s): Processed Data, 2020

58 does not pay attention to individual dimensions or time. (2) Fixed-effect model. In this model, differences between individuals and between time are reflected through the existence of intercepts that are not fixed. (3) Random effect model. In this model, differences between time and between individuals are accommodated through errors. This technique also takes into account that errors may correlate throughout the time series (see Figure 2).

Results

Table 4 contains descriptive statistics of the research of each variable between 2009 and 2018. In Table 4, the mean value of each variable is higher than the standard deviation (SD) value. This indicates that the variable is homogeneous with a low level of deviation. The PMO is the only variable that has a mean value lower than the SD. A mean value that is lower than the SD value indicates that the data are heterogeneous with a high bias or deviation.

According to Bank Indonesia Circular No. 6/23 / DPNP In 2004, the ROA is declared very healthy, if it is more than 1.5%, ROE is declared very healthy, if it is more than 15% and NIM is declared very healthy if it is more than 3%. ROA with the mean value of 2.39%, ROE with the mean value of 18.03% and NIM with the mean value of 6.25% belong to the very healthy category. This means that the ability of banks to generate profits from average total assets or equity and generate net interest income from average total assets is very good.

Bank Permata had a minimum value of ROA of -4.89% in 2016. This shows that in 2016 Bank Permata suffered losses. Bank Permata's loss on ROA was also in line with the decline

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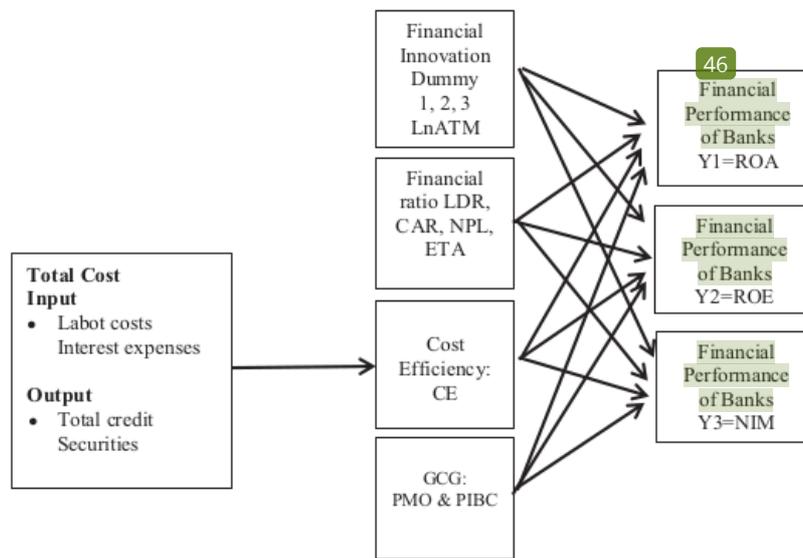


Figure 1. Framework

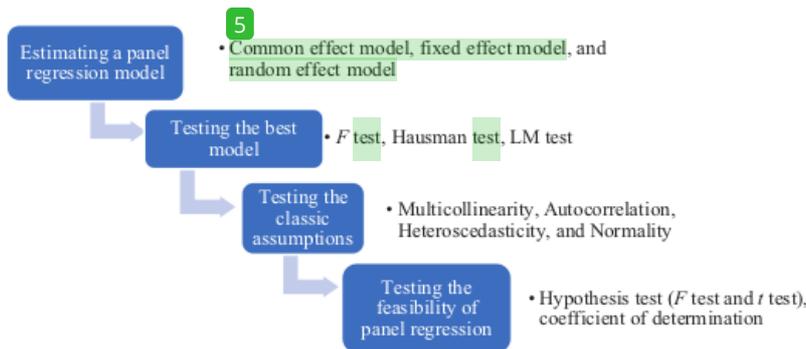


Figure 2. Stages of panel regression process

Variable	Mean	Maximum	Minimum	SD	Observations
ROA	2.394300	5.150000	-4.89	1.492779	100
ROE	18.03200	43.83000	-38.33000	11.22887	100
NIM	6.249400	13.97000	2.830000	2.328846	100
DINV	2.640,000	3.000000	1.000000	0.659354	100
LNATM	7.472,600	10.19000	2.560000	1.953771	100
CAR	16.69120	25.60000	10.25000	3.644236	100
NPL	1.185000	6.370000	0.070000	1.018696	100
LDR	84.21410	97.67000	50.27000	9.165352	100
ETA	11.96620	18.20000	6.280000	2.887331	100
COSTEFF	77.61130	91.66000	59.88000	8.842020	100
PMO	0.385310	4.840,000	0.000000	0.826381	100
PIBC	54.41540	71.43000	33.33000	6.181986	100

Source(s): Processed data, 2020

Table 4. Descriptive statistics of research

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in ROE of -38.33% . Based on the consolidated financial statements, this loss was due to an increase in operating expenses by 73.12% YoY to IDR 5.26 trillion. Besides, Permata Bank's net income also dropped by 1.51% YoY (Yudhistira, 2016).

On the contrary, Bank Rakyat Indonesia (BRI) recorded a profit of 5.15% in 2012. This advantage was due to several factors. First, BRI got quite high net interest income because it focused on micro-business loans. BRI was able to record NIM of 8.1% . This achievement was greater than the other four major banks, such as Mandiri by 5.3% , Bank Central Asia (BCA) by 6.3% , BNI by 4.3% and Commerce International Merchant Bankers Niaga (CIMB Niaga) by 2.1% . However, BRI's NIM was lower than Bank Danamon's achievement or by 9.9% . Second, BRI's credit growth was the highest compared to other large banks. With the highest level of credit growth, BRI was able to maintain a ratio of lending to third-party funds by 89.3% in the first semester of 2013 (Ahniar, 2013).

Financial innovation, which is proxied by dummy variable of innovation, shows that of the total sample data, ten conventional banks had applied at least ATM and Internet banking or mobile banking between 2009 and 2018 (Figure 3). In total, 74% of the 100 observation data of the study samples applied ATM, Internet banking and mobile banking. This means that 74% of banks, from both BUKU 3 and BUKU 4, have applied ATMs, Internet banking and mobile banking in providing facilities for customers. The remaining 16% of banks still applied ATMs and Internet/mobile banking, and 10% of banks only applied ATMs. This means that all banks used as research samples applied financial innovations by using ATMs during 2009–2018. Based on the number of ATMs, the data show that BRI had the most ATM networks on a national scale. Conversely, BTPN had the lowest ATM network of 2.56 or as many as 13 ATMs in 2009. This means that the BTPN's ATM network had not spread in various regions.

The highest cost efficiency of 91.66% was achieved by Bank Permata in 2018. This was due to the ability of the bank to use inputs in the form of labor costs, interest costs and a total cost of IDR 12,273,427,000,000 to produce banking output in the form of total credit given and the number of securities owned by the bank amounting to IDR 106,505,869,000,000. It can be concluded that the company can produce large outputs with certain inputs. This means that PT Bank Permata Tbk was more efficient than nine other conventional banks during the research period of 2009–2018.

The lowest cost efficiency of 59.88% was obtained by BTPN in 2009. This was due to the ability of the bank to use inputs in the form of labor costs, interest costs and total cost of IDR 3,383,461,000,000 to produce banking output in the form of total credit given and the number of securities owned by the bank amounting to IDR 18,844,240,000,000. It can be concluded that the company produces a small output with certain inputs. This means that PT BTPN Tbk was less efficient than nine other conventional banks during the research period of 2009–2018.

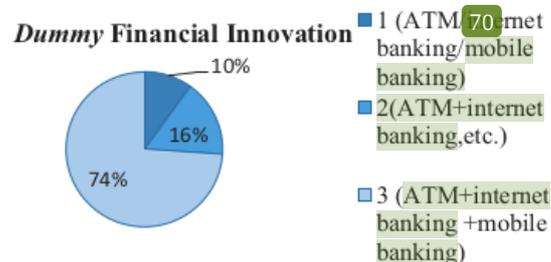


Figure 3.
Dummy variable of financial innovation

Bank financial ratios, which are based on CAR, LDR, NPL and ETA, show that banks are in good condition. The highest CAR of 25.60% was obtained by BTPN in 2016. The higher the CAR, the higher the bank's ability to face the risk of loss. The lowest CAR of 10.25% was obtained by Bank Mayapada in 2014. The minimum standard of CAR ratio set by Bank Indonesia is 8%. This means that the capital of Bank BTPN and Bank Mayapada can cover the risk if there is a loss in credit activities, such as defaults or bad loans.

The maximum NPL of 6.37% was owned by Bank Bukopin in 2017. In 2017, Bukopin Bank's credit risk was the highest compared to all banks included in the study samples. The level of nonperforming loans at Bukopin Bank increased by 128% compared to the previous year. This was due to increased nonperforming loans in the commercial sector. Based on the commercial sector, the mining sector ranked second highest in nonperforming loans after other sectors.

The increase in nonperforming loans in the mining sector was caused by conditions in the mining sector. The prices of mining commodities, such as coal and palm oil, experienced a sharp decline in the second quarter of 2017. This hit company that had proposed financing in the sector, triggering an increase in nonperforming loans. As a result, companies had to make a backup of the profits obtained to prevent greater losses. Besides, Bank Bukopin's ROA also tended to decrease so that the ability to generate returns from assets owned also decreased (Agustio, 2018).

Based on the PMO, the PMO data in each bank is very low. The highest PMO of 4.84% was achieved by Bank Mayapada International in 2018. The proportion of share ownership by directors and independent commissioners of Bank Mayapada International was 4.84% of the total outstanding shares at the end of 2018. Bank Mayapada International had the highest PMO compared to other banks included in the study sample. The lowest PMO of 0.000 was achieved by Bank Permata in 2009–2018 and Bank N²⁴ bank Indonesia in 2009–2018 apart from 2010–2012. This shows that the proportion of share ownership by the directors and board of commissioners of Bank Permata and Bank Maybank Indonesia is 0.00% of the total outstanding shares. Low managerial ownership was also caused by the policy of the two banks that directors and independent commissioners were not allowed to own the shares of Bank Permata and Bank Maybank Indonesia.

The PIBCs is greater than the PMO. Banks with BUKU 3 category (core capital IDR 5–30 trillion) and BUKU 4 category (core capital at least IDR 30 trillion) place more emphasis on the number of independent commissioners rather than giving ownership to management. Independent commissioners are expected to provide monitoring of the policies existing in the banking system. It is expected that the presence of high independent commissioners will make bank performance optimal. BRI had the highest proportion of independent commissioners of 71.43% in 2014. BRI had five independent commissioners out of seven total commissioners. The lowest proportion of independent commissioners of 33% was owned by Bank Mayapada Internasional in 2012 because the company only had two independent board of commissioners out of six total commissioners.

Inferential statistical analysis of research

Table 5 presents data on the best model selection test. The best model for ROA is the common effect model, while the best model for ROE and NIM is the fixed-effect model. However, these models did not pass the heteroscedasticity test. As a result, the best models must be weighted to be able to overcome the problem of heteroscedasticity. The analyzed models are in Table 6.

Based on Table 6, the best model for the dependent variable of ROA is the weighted common effect model, while the best model for the dependent variable of ROE²⁹ and NIM is the weighted fixed-effect model. Next, some hypothesis testing is conducted to determine the

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factors that influence the financial performance of banks, which are proxied by profitability variable.

Based on the *F*-test in the three models, it is known that the probability value of the *F*-statistic is 0.0000. This means that the independent variables, consisting of cost efficiency, financial innovation, CAR, NPL, LDR, ETA, the PMO and PIBCs, simultaneously affect ROA, ROE and NIM. After the simultaneous test using the *F*-test, the *t*-test is then conducted to test the hypothesis on each independent variable. Following is the panel regression model for the dependent variables of ROA, ROE and NIM.

$$ROA_{it} = 7.716172 - 0.111806CE_{it} - 0.294934DINV_{it} + 0.476924LnATM_{it} + 0.042553CAR_{it} - 0.427341NPL_{it} + 0.038687LDR_{it} - 0.10556ETA_{it} + 0.072822PMO_{it} - 0.030481PIBC_{it} + e$$

$$ROE_{it} = 80.77397 - 0.086018CE_{it} + 0.886563DINV_{it} - 3.928697LnATM_{it} - 0.530181CAR_{it} - 3.890729NPL_{it} + 0.60795LDR_{it} - 0.987819ETA_{it} + 0.405646PMO_{it} - 0.166215PIBC_{it} + e$$

Test	ROA	The best model	ROE	The best model	NIM	The best model
Chow test	0.1524	Common effect	0.0000	Fixed effect	0.0000	Fixed effect
Hausman test	0.1317	Random effect	0.0000	Fixed effect	0.0000	Fixed effect
LM test	0.8465	Common effect	0.0000	Random effect	0.0000	Random effect
Selected model	Common effect model		Fixed-effect model		Fixed-effect model	

Table 5.
The best model selection test

Source(s): Processed data, 2020

Variable	Dependent variable: ROA		ROE		NIM	
	Coefficient	Prob	Coefficient	Prob	Coefficient	Prob
Constant	7.716172	0.0000	80.77397	0.0000	23.06259	0.0000
COSTEFF	-0.111806	0.0000***	-0.086018	0.7610	-0.262207	0.0000***
DINV	-0.294934	0.0717*	0.886563	0.3556	-0.389096	0.0000***
LNATM	0.476924	0.0000***	-3.928697	0.1672	0.072736	0.7924
CAR	0.042553	0.0739*	-0.530181	0.0358**	0.073742	0.0135**
NPL	-0.427341	0.0000***	-3.890729	0.0000***	-0.055431	0.1892
LDR	0.038687	0.0000***	0.060795	0.3197	0.060635	0.0000***
ETA	-0.10556	0.0022***	-0.987819	0.0417**	-0.070874	0.1429
PMO	0.072822	0.2536	0.405646	0.5414	0.022515	0.6375
PIBC	-0.030481	0.0022***	-0.166215	0.0025***	-0.025938	0.0000***
R-squared	0.852042		0.911957		0.940217	
Adjusted R-squared	0.837247		0.892392		0.926932	
F-statistic	57.58693	1.173528	46.61159	1.657004	70.77226	1.67701
Prob(F-statistic)	0.00000		0.00000		0.00000	

Table 6.
Weighted panel regression test

Note(s): *** = significant at $\alpha < 1\%$, ** = significant at $\alpha < 5\%$ and * = significant at $\alpha < 10\%$

Source(s): Processed data, 2020

$$\begin{aligned} \text{NIM}_{it} = & 23.06259 - 0.262207\text{CE}_{it} - 0.389096\text{DINV}_{it} + 0.072736\text{LnATM}_{it} \\ & + 0.073742\text{CAR}_{it} - 0.055431\text{NPL}_{it} + 0.060635\text{LDR}_{it} - 0.070874\text{ETA}_{it} \\ & + 0.022515\text{PMO}_{it} - 0.025938\text{PIBC}_{it} + e \end{aligned}$$

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From the ROA model above, it can be interpreted that the constant value is 7.716172, which means that if all the independent variables, consisting of cost efficiency, financial innovation, CAR, NPL, LDR, ETA, PMO and PIBC, are 0, the value of ROA is 7.716172. For the ROE model, the constant value is 80.77397, which means that if all the independent variables are 0, the value of ROE is 80.77397. For the NIM model, the constant value is 23.06259, which means that if all the independent variables are 0, the value of NIM is 23.06259.

For the ROA model, five of nine independent variables [Cost efficiency (CE), Dummy Financial Innovation (DINV), NPL, ETA and PIBC] have a negative effect on ROA. Conversely, the variables of financial innovation, CAR and LDR have a positive effect on ROA. PMO variable has no significant effect on ROA. For the ROE model, the variables of CAR, NPL, ETA and PIBC have a negative and significant effect on ROE, while other variables do not have a significant effect on ROE. The variables of cost efficiency, financial innovation and PIBC have a negative and significant effect on NIM, while the variables of CAR and LDR have a positive effect on NIM. In addition, the variable of financial innovation, which is proxied by LnATM, NPL, ETA and PMO, does not affect NIM.

For the ROA model, the beta value of CE is -0.111806 , which means that if cost efficiency decreases by one unit, ROA will increase by 0.111806 units. For the NIM model, the beta value of CE is -0.262207 , which means that if cost efficiency decreases by one unit, NIM will increase by 0.262207 . CE has a significant negative effect on ROA and NIM, while CE has no significant effect on ROE. Cost efficiency has a negative and significant effect on ROA. This means that if banks reduce their cost efficiency, ROA will increase. Cost efficiency is closely related to whatever costs the bank will incur to produce maximum output. If banks increase their costs, such as labor costs and interest costs, the banks will tend to be less efficient. The results of this study are inversely proportional to the results of research conducted by Widiarti *et al.* (2015), which state that banks that operate more efficiently can realize healthy and sustainable profitability. The difference in this study is because the value of efficiency is very sensitive, depending on the research sample and the choice of the methodology used (Hadad *et al.*, 2011).

Discussion

The samples used in this study are banks with core capital > IDR 5 trillion or in the category of large-scale banks. Large-scale banks tend to be easy to increase their costs. For example, Bank BTN is famous for its high loan interest. If a bank benefits from an increase in loan interest, the bank will have low-cost efficiency (Mongid and Muazaroh, 2017). As a result, this will have an effect on the ROA that continues to increase. Large-scale banks are generally difficult to achieve cost efficiency because it is difficult to make cost savings due to labor costs and interest costs that tend to be large. In addition, large-scale banks are also difficult to coordinate (Alhempri and Zainal, 2016). However, large-scale banks are very easy to get high profits. This is because banks with high financial performance have higher NIM amounts than other banks. In contrast, Ersangga and Atahau (2019) state that large-scale banks are generally more efficient than small-scale banks. It means that the first hypothesis is rejected.

Financial innovation, which is proxied by a dummy variable of financial innovation, has a negative and significant effect on ROA and NIM, but financial innovation has no significant effect on ROE. It means that the second hypothesis is rejected. For the ROA model, the beta value of DINV is -0.294934 , which means that if the application of financial innovation

decreases from applying ATMs, Internet and or mobile banking to only applying ATMs, the ROA will increase by 0.294934. For the NIM model, the beta value of DINV is -0.389096 , which means that if the application of financial innovation decreases from applying ATM, Internet and mobile banking to only applying ATMs, the NIM will increase by 0.389096. In theory, the higher the bank's innovation, the higher the bank's profitability (Chipeta and Muthinja, 2018). From the results of the study, it can be seen that the application of ATM will increase bank profitability. Unlike the case with online banking, such as internet banking and mobile banking, the application of online banking will pose several risks that must be faced by banks. The risk of applying online banking is that banks become fragile because of viruses, malware, hackers and misused access to information (Sakti *et al.*, 2018).

Financial innovation, which is proxied by the dummy variable of financial innovation, is in the same direction as financial innovation, which is proxied by the size of the ATM network. Based on the dummy variable of financial innovation, the more banks expand the application of ATMs only; this will increase ROA and NIM because the application of ATMs will generate noninterest income from ATM services. The bank will get fee-based income from the application of the ATM so that this will affect the amount of bank profitability, such as from ROA and NIM. The greater the application of ATMs in a bank, the greater the bank's profitability (Nizar, 2019).

Based on the number of ATM networks, the number of ATM networks has a positive effect on ROA only. The number of ATMs has no significant effect on ROE and NIM. For the ROA model, the beta value of LnATM is 0.476924, which means that if the ATM network increases by one unit, ROA will increase by 0.476924 units. The greater the ATM network, the higher the ROA. The number of ATMs is a form of banking financial innovation because, with ATMs, it is easier for customers to conduct banking transactions. Banking transactions that can be carried out using ATMs include cash withdrawals and cash deposits. Even with the development of technology, state-owned bank ATMs can now be accessed by other state-owned banks using ATM links. This is a form of the relationship between innovation and efficiency. With the innovation in the use of ATMs, banks will be able to be efficient so that bank profitability will increase (Nizar, 2019).

The CAR has a different effect on each profitability variable. CAR has a positive and significant effect on ROA and NIM. On the other hand, CAR has a negative and significant effect on ROE. For the ROA model, the beta value of CAR is 0.042553, which means that if CAR increases by one unit, ROA will increase by 0.042553 units. For the ROE model, the beta value of CAR is -0.530181 , which means that if CAR decreases by one unit, ROE will increase by 0.530181 units. For the NIM model, the beta value of CAR is 0.073742, which means that if CAR increases by one unit, NIM will increase by 0.073742 units. In general, when the bank's capital adequacy ratio increases, it shows that the bank's ability to provide funds to overcome the possibility of loss risk also increases. This will lead to an increase in bank profitability, in this case, ROA and NIM.

For ROE, an increase in CAR will cause a decrease in ROE. This happens because the increase in bank capital tends to be higher than the increase in profits and the lack of capital optimization. The increase in CAR causes a decrease in ROE due to idle funds. For example, in 2014, some state-owned banks experienced a decline in ROE, such as BRI from 31.19 to 20.49% and Bank Mandiri from 25.81 to 16.23%. Even large private banks such as BCA also experienced a decline from 25.5 to 18.8%. This happened amid an increase in CAR (Sitorus, 2019). For example, the problem with large banks in Indonesia is the lack of encouragement to optimize funds. On the other hand, demand for credit is also considered not large, so banks need to be careful in expanding.

CAR has a positive and significant effect on ROA and NIM. This means that the high level of bank capital adequacy will bring a positive signal to profitability. In this case, the bank will have a reserve fund to be able to meet short-term obligations and to overcome risks that will

occur in the banking system. Therefore, the high level of CAR will bring a positive impact on ROA and NIM. In addition, CAR has a negative effect on ROE, meaning that the higher the CAR, the higher the unemployed funds. This will cause the bank's profit on its equity to be lower.

In general, credit risk (NPL) has a negative effect on the financial performance of banks. In this study, NPL has a negative and significant effect on ROA and ROE, but NPL has no significant effect on NIM. For the ROA model, the beta value is -0.427341 , which means that if the NPL decreases by one unit, the ROA will increase by 0.427341 units. For the ROE model, the beta value is -3.890729 , which means that if NPL decreases by one unit, ROE will increase by 3.890729 units. The existence of nonperforming loans in banks will hamper bank profitability (ROA and ROE). The higher the nonperforming loans in banks, the lower the profits generated by the banks both from the average total assets and from equity. This is because credit or channeling of bank funds to the public is the most important bank revenue. As a result, if there is a disruption in the customers' payment of credit, bank income will be hampered. In other words, the higher the credit risk, the lower the stability of the bank, and this will lead to the lower profitability of the bank (Tan and Anchor, 2016). Therefore, it is necessary to consider the quality of credit channeled by banks to third parties. If credit quality is good, the problem of bad credit will be reduced so that the decline in profitability can be suppressed. In other words, the higher the credit risk, the lower the bank's profitability (Khalifaturrofi'ah and Nasution, 2016; Sriyana, 2015).

LDR is one of the financial ratios that shows the penetration of bank lending from third-party funds owned. Based on the ROA and NIM models, LDR has a positive and significant effect on ROA and NIM. In the ROE model, LDR has no significant effect on ROE. For the ROA model, the beta value of LDR is 0.038687 , which means that if the LDR increases by one unit, the ROA will increase by 0.038687 units. For the NIM model, the beta value of LDR is 0.060635 , which means that if the LDR increases by one unit, the NIM will increase by 0.060635 units. Generally, the greater the distribution of bank credit from third-party funds, the higher the financial performance of banks. This is because the main income of banks is bank lending. If banks can optimize third-party funds received from customers for bank lending, the benefits received by banks will increase. The results of this study are following the results of studies conducted by Khalifaturrofi'ah and Nasution (2016) and Sriyana, 2015, which state that the higher the bank loan disbursement from third-party funds, the higher the profitability of the bank.

Based on the ROA and ROE models, ETA has a negative and significant effect on ROA and ROE. ETA has no significant effect on NIM. For the ROA model, the beta value of ETA is -0.10556 , which means that if ETA decreases by one unit, ROA will increase by 0.10556 units. For the ROE model, the beta value of ETA is $-0.987,819$, which means that if ETA decreases by one unit, ROE will increase by $0.987,819$ units. ETA is the amount of equity from total assets. ETA shows the portion of capital used in financing assets. High ETA can be interpreted that the bank funds most assets with its capital, which also means that the bank does not depend on debt to finance the assets. The greater the portion of a bank's debt, the greater the bank's obligation to pay the debt in the future. Too large liabilities will cause high bank risk so that bank profitability decreases (Choirina and Yuyetta, 2015). From the analysis of financial ratios, the third hypothesis is accepted.

Based on the profitability model that is proxied by ROA, ROE and NIM, the PMO is not affect profitability. The PMO is an element of good corporate governance. The PMO does not affect the profitability of banks due to the very small percentage of managerial ownership in the banks, especially in commercial banks with BUKU 3 and 4. The small PMO is caused by the strong influence of the government, especially for state-owned banks, and the strong influence of owners who do not provide opportunities for management to own more than 30% of shares. The results of this study are also consistent with the results of research conducted

by Sari *et al.* (2021) that managerial ownership does not affect the financial performance of banks.

Based on the profitability model either from ROA, ROE and NIM, the PIBCs has a negative and significant effect on ROA, ROE and NIM. For the ROA model, the beta value of the PIBCs is -0.030481 , which means that if the PIBCs decreases by one unit, the ROA will increase by 0.030481 units. For the ROE model, the beta value of PIBC is -0.166215 , which means that if the PIBC decreases by one unit, the ROE will increase by 0.166215 units. For the NIM model, the beta value of PIBC is -0.025938 , which means that if the PIBC decreases by one unit, the NIM will increase by 0.025938 units. The higher the PIBCs, the lower the profitability. This is because the coordination of large-scale banks is more complicated than that of small-scale banks, so if the PIBCs is high, it will cause quite crucial problems. One problem is that tight supervision and excessive control will cause problems in internal management. The results of this study are consistent with the results of research conducted by Tertius and Christiawan (2015) that the PIBCs has a negative effect on the financial performance of banks.

The PIBCs has a negative and significant effect on ROA, ROE and NIM. This means that the great number of independent commissioners on duty in a bank will encourage increased profitability in the bank. The task of the independent board of commissioners as supervisors and controllers will bring significant changes to banking management. The more independent board of commissioners, the more strict the supervision of the bank so that fraud can also be minimized. This will have a significant effect on profits on total assets and total equity. In addition, the increasing number of an independent board of commissioners will also increase the burden that must be incurred by banks on personnel costs so that this will encourage banks to increase their net interest margin. From the analysis of good corporate governance, especially PMO and PIBC, the fourth hypothesis is accepted.

Overall, cost efficiency, financial innovation, CAR, NPL, LDR, ETA and PIBC have a significant effect on ROA. PMO is the only variable that has no significant effect on ROA. CAR and PIBC have an effect on profitability which is proxied by ROA, ROE and NIM. CAR has a positive and significant effect on ROA and NIM, while CAR has a significant negative effect on ROE. In contrast to CAR, which has different effects on profitability, PIBC has a negative and significant effect.

Conclusion

This study aims to examine the effect of financial innovation, financial ratios, cost efficiency and GCG on the financial performance of banks in Indonesia. Based on the results of research and discussion, it can be concluded that cost efficiency has a negative and significant effect on ROA and NIM but has no significant effect on ROE. Financial innovation, which is proxied by a dummy variable of financial innovation with the application of ATM, Internet and mobile banking, has a negative and significant effect on ROA and NIM but has no significant effect on ROE. Financial innovation, which is proxied by \ln ATM, has a positive and significant effect on ROA but has no significant effect on ROE and NIM. The financial ratio, which is proxied by CAR, has a positive and significant effect on ROA and NIM but has a negative and significant effect on ROE. The financial ratio, which is proxied by NPL, has a negative and significant effect on ROA and ROE but does not affect NIM. The financial ratio, which is proxied by LDR, has a positive and significant effect on ROA and NIM but does not affect ROE. The financial ratio, which is proxied by ETA, has a negative and significant effect on ROA and ROE but does not affect NIM. GCG, which is proxied by the PMO, does not affect ROA, ROE and NIM. GCG, which is proxied by the PIBCs, has a negative and significant effect on ROA, ROE and NIM.

This research implies that this research has not been able to show that financial innovation with the application of the Internet and mobile banking will be able to improve banking

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financial performance. The results of this study indicate that financial innovation, which is shown by the application of ATMs and the number of ATM networks, will be very beneficial for bank profitability. In addition, for banks with BUKU 3 and 4 or categorized as large-scale banks, it is not necessary to increase cost efficiency because it will reduce profitability. To be able to improve financial performance, the financial ratios that should be increased are CAR and LDR, while the financial ratios that should be lowered are NPL and ETA.

The practical implication is that these results give a warning to bankers and the government to be cautious when formulating a strategy for the financial performance of banking. To improve financial performance in banking, the government must be able to establish precise rules and standards regarding the minimum number of independent commissioners. This is because of the greater the number of independent commissioners, the lower the financial performance of banks. In addition, the government through its regulations regarding ATMs can also raise the right standards regarding ATM features to improve banking financial performance. For bankers, to improve financial performance, it is best to reduce costs incurred to create better cost efficiency, improve credit quality to reduce credit risk, increase liquidity and consider capital adequacy.

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The next researchers are expected to be able to add research samples not only state-owned commercial banks and national private-owned commercial banks (foreign exchange) but also foreign banks and joint-venture banks. In addition, it would be more complete to add explanatory variables from macroeconomic indicators. This research is expected to provide input for investors who will save in state-owned banks and private banks. In determining the right banks, fundamentally all banks with BUKU 3 and 4 are already good. Investors are expected to be able to make the right decision both to invest and to owe the bank. For banks, this research is expected to be the right policy material for banking practitioners to improve the financial performance of banks in Indonesia. Based on the results of the study, the financial performance of banks in Indonesia can be improved by increasing financial innovation, such as the application of ATMs by increasing the ATM function. For large banks, increasing cost efficiency is considered inappropriate because it will reduce financial performance. In addition, capital adequacy and liquidity need to be improved to improve bank financial performance. Credit risk, the ratio of equity to total assets, and the PIBCs can be reduced to improve the financial performance of banks in Indonesia.

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