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The Benefits of Revenue Diversification on Bank Profitability and Stability: An Empirical Study on Indonesian Commercial Banks

Robertus Setiadi*
Dwi Nastiti Danarsari†

Abstract

The phenomenon of the shift in the traditional business activities of commercial banks, especially in Indonesia, is shown by the increase in the percentage of non-interest income per interest income from 26.1% in 2014 which almost doubled to 51.3% in 2020. This study examines the effect of revenue diversification on bank profitability and stability, while also paying attention to the role of bank capitalization. Using a sample of 86 conventional commercial banks in Indonesia in the 2013 to 2020 observation period, resulting in 602 firm-year observations, the research was carried out using a dynamic GMM data panel. This research finds that direct effect of non-interest income on revenue diversification has a significant positive effect on profitability and stability. However, indirect effect of non-interest income on revenue diversification has a significant positive effect only on risk adjusted ROA. The empirical test results also prove that several bank-specific and macroeconomic variables significantly affect bank profitability and stability as the dependent variable. Overall, there are specific benefits for commercial bank in Indonesia in implementing revenue diversification, even though the benefits cannot be proven at the BUKU 1 banks.

Keywords: profitability, stability, revenue, diversification, commercial bank, capitalization.

I. INTRODUCTION

As a financial institution with an important role, banking system typically has the characteristics of generating profit, tend to be stable, and diversifying income is a requirement for a prosperous economy (Nisar et al., 2018). Like other developing countries, Indonesia also relies on the banking sector as the main financing alternative compared to the capital market.

Based on Indonesian banking statistics vol. 19, disbursement of loans by commercial banks in aggregate in December 2020 reached ±5,548 trillion rupiah, and experienced a growth of 5.88% year on year over the last 5 years. However, the increase in disbursed loans also followed by a trend of increasing non-performing loan (NPL). At the end of 2019, the NPL of banking in Indonesia in aggregate recorded at 2.43% (world bank), higher than the aggregate NPL of the Philippines (1.97%), Malaysia (1.53%), and Singapore (1.30%) in the same period.

* Lecturer. Universitas Prasetiya Mulya, School of Business and Economics, BSD City, Pagedangan, Tangerang, Banten (15339). Phone: +6281901331968. E-mail: robertus.setiadi @lecturer.prasetiyamulya.ac.id.

† Lecturer. Universitas Indonesia, Department of Management Faculty of Economics and Business, Pondok Cina, Beji, Depok, Jawa Barat (16424). Phone: +628129261028. E-mail: dwi.nastiti@ui.ac.id.

Awareness of the importance of banking stability as well as the presence of global financial crisis increased the interest of countries in developing early warning models (Alshubiri, 2017), due to its contribution in sustainable economic development. Several researches tried to explain the determinant of NPL (Boyd & Getler, 1994; Berger & DeYoung, 1997) and Z-Score (Jabra et al., 2017; Ozili, 2018; Yusgiantoro et al., 2019; and Martinez-Malvar & Baselga-Pascual, 2020) as a proxy of banking stability.

Several studies have also focused on internal determinants that affect banking stability proxies (Berger & DeYoung, 1997; Salas & Saurina, 2002; Louzis et al., 2012; Kohler, 2014; Ghosh, 2015; Jabra et al., 2017; and Amuakwa-Mensah et al., 2017) with significance on some of these variables. Some of these internal determinants include bank size, asset growth (AG), cost to income ratio (CIR), equity to total asset (LEV), loans to total asset (LTA), and deposit to total asset (DTA).

In addition to the importance of banking stability, Wu et al. (2020) observes changes in the non-traditional banking business, including technological innovation and management capabilities as banking and regulatory competition intensifies. This phenomenon is followed by the development of banking business lines that generate operating income other than interest, through several activities such as securities brokerage and underwriting, and other services (Meslier et al., 2014).

Although it can be observed that the proportion of non-interest income per interest income in all conventional commercial banks in Indonesia shows a shift from 26.1% in 2014 to 51.3% in 2020 (Indonesian banking statistics vol. 19). However, Wang & Lin (2021) found debate on the benefits of revenue diversification on both banking stability and profitability. While economies of scope theory tried to explain the benefit of diversification (Doumpos et al., 2016), moral hazard hypothesis supports dark side of diversification proposed in Stiroh and Rumble (2006) research.

Doumpos et al. (2016) found that revenue diversification improves the financial capacity of banks, which in particular these benefits can be observed in developing countries rather than developed countries. Apart from similar research in developed countries, there are not many empirical studies in developing countries that have found the benefits of diversification (Sanya & Wolfe., 2011; Nguyen et al., 2012; Meslier et al., 2014; and Ahamed, 2017), nor research that concludes the risk and return trade-off (Wu et al., 2020).

In the context of conventional commercial banks in Indonesia, Bank Indonesia regulates the scope of business activities and opening of office networks in accordance with the core capital regulated in PBI Number 14/26/PBI/2012. The difference in the characteristics and scope of business activities shows in historical data on the proportion of non-interest income to interest income based on the BUKU classification. BUKU 1 banks recorded an average of 11.10%, lower than the average of BUKU 2 (35.10%), BUKU 3 (40.80%), and BUKU 4 (34.70%).

In the context of research in Indonesia, Chen and Budidarma (2021) found that non-interest income has a significant positive effect on bank performance. Similarly, research by Ashyari and Rokhim (2020) found the relationship between income diversification and bank profitability. A significant opposite relationship occurs when income diversification is break down by each non-interest income components such as commission income, trading income, and other income (Lee et al., 2014). In contrast to previous research, this study also considers banking stability factors or risk proxies.

This research aims to test the determinants of banking stability comprehensively according to the perspective of protection against losses described by solvency risk (Ozili, 2018) and profitability which describes banking performance (Nisar et al., 2018). We test

the dependent variables against revenue diversification variables, internal and macroeconomic determinants as control variables, with a sample of conventional commercial banks in Indonesia, with an observation period of 2013 – 2020. Researchers can focus on the context of the Indonesian state considering the different benefits of diversification in banking with different specializations (Lee et al., 2014).

Furthermore, the study will examine the interaction between income diversification and dummies that describe the core capital of banks according to PBI Number 14/26/PBI/2012. Yusgiantoro et al. (2019) carried out similar test, which examines the interaction between the Lerner index and core capital on stability.

The contribution of this research is to add literature related to banking stability, related to efforts to identify sources of financial system fragility, which expected to be an early warning. Furthermore, the author tries to use several proxies of profitability and banking stability as the dependent variable, while at the same time trying to explain the different characteristics of BUKU in Indonesia.

II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Generally, banks have the opportunity to collect customer data as a whole, thus generating opportunities for non-traditional businesses (Elsas et al., 2010). In addition, banks with high operational cost will take advantage of income diversification as a means of economies of scope.

Various empirical studies discuss the pro and cons of income diversification, Doumpos et al. (2016) summarizes the benefits of diversification including economies of scope, increased allocation of resources, potential for lower tax burdens, and the ability to use the company's internal resources to achieve competitive advantage. However, bank can severe losses along with agency problems related to diversification, inefficient resource allocation, and asymmetric information (Elsas et al., 2010).

In the context of banking research, company performance is often described by profitability (Ashyari & Rokhim, 2020) and developed considering risks in the proxies of risk adjusted return on asset (RAROA) (Sanya & Wolfe, 2011; Meslier et al., 2014), while resulting in contradictory empirical conclusions. In addition, stability proxies are also the focus of research (DeYoung & Roland, 2001; Stiroh, 2004b; Stiroh & Rumble, 2006; Chiorazzo et al., 2008; De Jonghe, 2010; Sanya & Wolfe, 2011; Lee et al., 2014; and Abuzayed et al., 2018)

Based on the characteristics and scope of general banking business activities in Indonesia, which are classified based on core capital, banking capitalization is also the focus of attention in this study. Ghosh (2015) stated that the effect of bank capitalization on NPL is still ambiguous. On the one hand, Keeton and Morris (1987) say managers in low-capitalization banks have a tendency to engage in risky loan disbursement, with credit scoring and poor supervision of debtors. On the other hand, "too-big- too-fail" analogy argues that high bank capitalization will actually increase NPLs (Rajan, 1994).

For this reason, the interaction of banking capitalization in the relationship between the effect of income diversification on profitability and stability is the main contribution in the context of research in Indonesia, compared to previous studies.

Several empirical studies have found that diversification has a significant negative effect on performance as measured by profitability. It is possible that increased focus on business activities that generate non-interest income is associated with a decrease in risk-adjusted performance, especially if managers do not yet have specific skills in non-traditional business activities (Stiroh, 2004a). A similar relationship also appears in several studies (Mercieca et al., 2007; Berger et al., 2010; and Maudos, 2017).

However, some studies contradict the findings of the benefits of revenue diversification. Elsas et al. (2010) research proved that diversification can increase profitability, and there are economies of scope in the banking industry. In addition, several empirical studies with similar conclusions are also found in several studies (Sanya & Wolfe, 2011; Ismail et al., 2015; and Ferreira et al., 2019).

Hypothesis 1: revenue diversification has a significant positive effect on profitability.

In terms of stability, there are also contradictions in empirical studies regarding the effect of diversification on banking stability. Several studies have found that diversification has a significant negative effect on stability (DeYoung & Roland, 2001; Stiroh, 2004b; Stiroh & Rumble, 2006; De Jonghe, 2010; and Abuzayed et al., 2018). On the other hand, there are studies that find the benefits of diversification in maintaining banking stability (Chiorazzo et al., 2008; Sanya & Wolfe, 2011; and Lee et al., 2014). Several studies also examine the internal determinants of banking and macroeconomics in influencing banking stability (Boyd & Getler, 1994; Berger & DeYoung, 1997; Salas & Saurina, 2002; Louzis et al., 2012; Ghosh, 2015; Jabra et al., 2017; Amuakwa-Mensah et al., 2017; and Martinez-Malvar & Baselga-Pascual, 2020).

Hypothesis 2: revenue diversification has a significant positive effect on stability.

Research by Keeton and Morris (1987) reveals that managers in low-capitalization banks have a tendency to engage in risky loan disbursement, with credit scoring and poor supervision of debtors. On the other hand, Rajan (1994) research reveals a too-big –too-fail analogy, which argues that high bank capitalization will actually increase NPLs or reduce the level of banking stability. This study will examine the interaction between revenue diversification and dummies that describe banking capitalization as an independent variable such as the model development in the research of Yusgiantoro et al. (2019).

Hypothesis 3: bank capitalization plays a significant role in the relationship between diversification and stability.

III. RESEARCH METHODOLOGY

The author limits the sample period from 2013 to 2020, according to the classification of core capital in PBI Number 14/26/PBI/2012. Classification is done because there are differences in the characteristics of non-interest income in the sample data. Overall, the sample conventional commercial banks in Indonesia have financial report data and are published, with the obligation to prioritize transparency and accountability. In addition, the sample period is focused on the period after 2008, where banks in Indonesia have applied the principles of the Indonesian Banking Architecture, which is a period of banking reconstruction in Indonesia.

The research model uses panel data method (generalized method of moments) as in the study (Ferreira et al., 2019) to overcome the problems of endogeneity, heteroscedasticity, and autocorrelation. Several previous literatures (Stiroh & Rumble, 2006; Sanya & Wolfe, 2011; Kohler, 2014; and Abuzayed et al., 2018) modeled the estimation of banking stability according to the following functions:

Banking Profitability= ∫(Revenue Diversification, Internal Determinants, Macro-economics)

Banking Stability = ∫(Revenue Diversification, Internal Determinants, Macroeco-nomics)

Model 1 (hypotheses 1 & 2 testing) in this study, specifically are as follows:

$$Y_{i,t} = \alpha_0 + \beta_1 Y_{i,t-1} + \beta_2 DIV_{i,t} + \beta_3 BS_{i,t} + \beta_4 MAC_{i,t} + \varepsilon_{i,t} \quad \text{.....} \quad 1$$

In the above equation i refers to conventional commercial banks, while t refers to the year of observation, and $Y_{i,t}$ refers to the banking stability proxy. In addition to banking stability, $Y_{i,t}$ as the dependent variable also represents a proxy for banking performance in the form of returns, namely return on asset (ROA), and risk adjusted returns, namely RAROA; according to the model in several studies (Stiroh & Rumble, 2006; Mercieca et al., 2007; and Ferreira et al., 2019). The dynamic research model also tries to use the variable independent in the form of $Y_{i,t-1}$ which represents the lagged dependent variable.

Furthermore, $DIV_{i,t}$ stands for DIV, Herfindahl-Hirschman Index (HHI), and HHI-FTO. The independent variables in the model specification also include $BS_{i,t}$ and $MAC_{i,t}$, which stands for internal banking determinants and macroeconomic determinants, respectively.

Testing the effect of revenue diversification on bank profitability and stability, the researcher will add a model that examines the interaction of income diversification with dummies that describes the core capital of the bank, specifically Model 2 (hypothesis 3 testing) is:

$$Y_{i,t} = \alpha_0 + \beta_1 Y_{i,t-1} + \beta_2 DIV_{i,t} x BUKU_{i,t} + \beta_3 BS_{i,t} + \beta_4 MAC_{i,t} + \varepsilon_{i,t} \quad \text{..... 2}$$

The variable $DIV_{i,t}xBUKU_{i,t}$ describes the interaction of revenue diversification variables, which includes DIV, HHI, and HHI-FTO with banking capitalization in accordance with core capital classification; in an effort to capture the characteristics of banking capitalization in influencing the dependent variable in the form of profitability and stability. Furthermore, the analysis of the sample is carried out with dynamic panel data (generalized method of moments) as in research (Ferreira et al., 2019) in order to overcome the problems of endogeneity, heteroscedasticity, and autocorrelation.

The variables used in the study are as follows:

Table 1
Variable Definition

Variable	Definition	Data Source/Research
ROA	$\text{ROA} = \frac{\text{Net Income}}{\text{Total Assets}}$	Chiorazzo et al., 2008; Ahamed, 2017; and Nisar et al., 2018
RAROA	$\text{RAROA} = \frac{\text{ROA}}{\sigma\text{ROA}}$	Meslier et al., 2014; Nisar et al., 2018
Z-Score	$\text{Zit} = \frac{(\text{ROA}_{it}+\text{E/A}_{it})}{\text{Average } \sigma\text{ROA}}$	Lepetit et al., 2013
NPL	$\text{NPL} = \frac{\text{Gross NPL}}{\text{Gross Loan}}$	Ghosh, 2015; Ozili, 2018
DIV	$\text{DIVit} = \frac{\text{NIN}}{\text{NTOP}}$	Stiroh and Rumble, 2006; Ferreira et al, 2019
HHI	$\text{HHIit} = 1 - \left(\left(\frac{\text{NIN}}{\text{NTOP}}\right)^2 + \left(\frac{\text{int}}{\text{NTOP}}\right)^2 \right)$	Stiroh and Rumble, 2006; Doumpos et al., 2016
HHI-FTO	$\text{FTOit} = 1 - \left(\left(\frac{\text{FEE}}{\text{NTOP}}\right)^2 + \left(\frac{\text{TRADE}}{\text{NTOP}}\right)^2 + \left(\frac{\text{OTHERS}}{\text{NTOP}}\right)^2 + \left(\frac{\text{INT}}{\text{NTOP}}\right)^2 \right)$	Elsas et al., 2010; Doumpos et al., 2016; Abuzayed et al., 2018; and Ashyari and Rokhim, 2020
Size	Size= ln(Total Asset)	Kohler, 2004; Stiroh and Rumble, 2006; Lepetit et al., 2008; Sanya and Wolfe, 2011; Meslier et al., 2014; Ahamed, 2017; and Abuzayed et al., 2018
AG	$\text{AG} = \frac{\text{Asset}_{it} - \text{Asset}_{it-1}}{\text{Asset}_{it-1}}$	Kohler, 2004; Stiroh, 2004a; Chiorazzo et al., 2008; Meslier et al., 2014; and Abuzayed et al., 2018

To be continued Table 1

Variable	Definition	Data Source/Research
CIR	$\text{CIR} = \frac{\text{Operating Cost}}{\text{Operating Income}}$	Kohler, 2004; Nguyen et al., 2012; and Abuzayed et al., 2018
LEV	$\text{LEV} = \frac{\text{Total Equity}}{\text{Total Asset}}$	Kohler, 2004; Chiorazzo et al., 2008; Meslier et al., 2014; Ahamed, 2017; and Abuzayed et al., 2018
LTA	$\text{LTA} = \frac{\text{Total Loans}}{\text{Total Asset}}$	Kohler, 2004; Stiroh and Rumble, 2006; Chiorazzo et al., 2008; Meslier et al., 2014; Ahamed, 2017; and Abuzayed et al., 2018
DTA	$\text{DTA} = \frac{\text{Total Deposit}}{\text{Total Asset}}$	Kohler, 2004; Abuzayed et al., 2018
INF	Inflation Rate	Bank Indonesia (BI)
GDP	Real GDP Growth	Badan Pusat Statistik (BPS)

IV. RESULTS AND DISCUSSION

Profitability indicators in Table 2 represented by ROA and RAROA show the variation of the data sample in Indonesia. Z-score maximum value of 165.788 indicates a low solvency risks; on the other hand, the greatest risk indicated by a minimum value of 0.745.

Table 2
Descriptive Statistics

Variable	Mean	Median	Max	Min	Stdev
ROA (%)	1.383	1.615	4.960	-15.890	2.050
RAROA	3.082	2.487	18.005	-2.786	3.388
ZSCORE	30.423	24.853	165.788	0.745	22.893
NPL (%)	2.975	2.680	15.820	0.000	2.249
DIV (%)	12.852	8.822	85.060	0.350	11.723
HHI (%)	19.656	16.088	50.000	0.698	12.036
HHI-FTO (%)	20.614	16.475	62.442	0.699	13.285
AG (%)	14.737	9.567	280.738	-29.263	25.708
CIR (%)	86.577	83.905	261.100	0.650	22.303
DTA (%)	69.597	73.368	89.683	0.000	14.358
LEV (%)	17.039	14.754	86.208	2.036	9.140
LTA (%)	63.595	65.627	86.945	0.000	10.206
SIZE	16.735	16.625	21.075	12.350	1.599
INF (%)	3.695	3.130	8.360	1.680	1.990
GDP (%)	4.015	5.020	5.170	-2.070	2.487

Source: processed by author (2021).

We performed Chow test, Hausman test, and Lagrange multiplier test procedures to determine the estimation method for all dependent variable in the study, and concludes that random effect model (REM) estimation method is consistently the best estimation method compared to pooled least square (PLS) and fixed effect model (FEM).

REM estimation method then tested for classical assumption test in order to ensure its best linier unbiased estimator. The Durbin-Watson test found that there was a positive autocorrelation problem in the model with the dependent variables of ROA, RAROA, and Z-Score. Furthermore, to find out the potential for heteroscedasticity problems, the researchers conducted a Panel Cross-section Heteroskedasticity LR test. This test concludes that there is a heteroscedasticity problem, which causes the standard error of regression testing to be less accurate and has the potential to lead to errors in

concluding hypothesis testing.

In relation to the problems of autocorrelation, heteroscedasticity, and potential problems of endogeneity; the author used generalized method of moments panel estimation method involving instrumental variables (IV) as in the research of Arellano and Bond (1991). According to Ferreira et al. (2019), IV expected to be able to mitigate the endogeneity problem in the model.

Furthermore, the researcher tested the Arrelano Bond serial correlation test, and concluded that the overall probability value model on the second order was not statistically significant at the 10% significance level. This shows that there is no serial correlation in the second order estimation model.

Table 3
Model 1 Regression

Dependent Variable: ROA **Coefficient (Standard Error)**			
Variable	**(1)**	**(2)**	**(3)**
ROA (-1)	**0.045****	0.028	0.031
	(0.017)	(0.024)	(0.023)
DIV	**0.024*****		
	(0.007)		
HHI		0.002	
		(0.015)	
HHI-FTO			0.006
			(0.014)
AG	0.000	-0.001	-0.000
	(0.001)	(0.002)	(0.002)
CIR	**-0.094*****	**-0.099*****	**-0.098*****
	(0.004)	**(0.005)**	**(0.005)**
DTA	0.002	0.006	0.006
	(0.011)	(0.014)	(0.014)
LEV	0.015	0.026	0.028
	(0.017)	(0.025)	(0.024)
LTA	**0.033***	0.033	**0.037***
	(0.019)	(0.021)	**(0.021)**
SIZE	**-0.006*****	**-0.007****	**-0.007****
	(0.002)	**(0.003)**	**(0.002)**
INF	**-0.209*****	**-0.184****	**-0.192****
	(0.080)	**(0.093)**	**(0.090)**
GDP	**0.034***	0.026	0.027
	(0.018)	(0.020)	(0.020)
J-Statistic	10.889	12.574	12.584
Prob. (J-Stat)	0.694	0.560	0.559
AR(2) S-Cor	0.596	0.299	0.316

Notes: processed by author (2021), *) significant at 10% level; **) significant at 5% level; and ***) significant at 1% level.

The results of hypothesis testing in Table 3 try to explain the effect of diversification and control variables in explaining profitability, with ROA as the dependent variable. DIV variable gives a positive and significant coefficient value at the 1% level, with a coefficient value of 0.024. In this case, direct effect of non-interest income on revenue diversification has a significant positive effect on bank profitability. However, there was no significant effect of the two indirect revenue diversification variables, namely HHI and HHI-FTO.

Table 4
Model 2 Regression

Dependent Variable: RAROA **Coefficient (Standard Error)**			
Variable	**(1)**	**(2)**	**(3)**
RAROA (-1)	0.143 (0.115)	**0.279*** **(0.157)**	**0.306*** **(0.167)**
DIV	**5.972***** **(2.168)**		
HHI		**9.832**** **(4.305)**	
HHI-FTO			**9.640**** **(4.310)**
AG	0.663 (0.740)	1.071 (0.780)	1.071 (0.798)
CIR	**-5.289***** **(1.862)**	**-5.557***** **(2.047)**	**-5.478***** **(2.092)**
DTA	**-10.046**** **(4.527)**	**-10.547*** **(5.375)**	**-10.503*** **(5.592)**
LEV	-1.065 (7.843)	0.111 (10.392)	0.323 (10.767)
LTA	-2.586 (5.942)	-1.201 (5.938)	-2.350 (6.156)
SIZE	**-1.970***** **(0.600)**	**-1.705***** **(0.610)**	**-1.766***** **(0.633)**
INF	**-39.909*** **(22.257)**	**-57.889*** **(30.629)**	**-62.414*** **(31.869)**
GDP	8.705 (7.220)	11.489 (8.886)	12.497 (9.255)
J-Statistic	12.482	11.093	10.454
Prob. (J-Stat)	0.130	0.196	0.234
AR(2) S-Cor	0.223	0.871	0.886

Notes: processed by author (2021), *) significant at 10% level; **) significant at 5% level; and ***) significant at 1% level.

Table 4 examines the dependent variable RAROA, with positive significant results at the 1% level for equation 1, and 5% level for equation 2 and 3. Therefore, revenue diversification has a significant positive effect on risk-adjusted profitability, according to Hypothesis 1 of the study. These results are similar to studies that found the benefits of diversification in improving banking performance (Elsas et al., 2010; Sanya & Wolfe, 2011; Ismail et al., 2015; and Ferreira et al., 2019).

Thus, we can see the benefits of the revenue diversification strategy applied to conventional commercial banks in Indonesia in increasing profitability in general. Development of non-traditional activities, encouraging banks to obtain economies of scope (Doumpos et al., 2016).

In Table 3, we can observe that the dependent variable lag, namely ROA_{t-1}, has a significant positive effect on ROA at the 5% level in the DIV variable equation. While consistent results have shown in the results of the regression Table 4, which illustrates that $RAROA_{t-1}$ has a significant positive effect on influencing RAROA at the 10% level in the equation 2 and 3.

The internal banking determinants in Table 4 show that the CIR has a significant negative impact on RAROA at a significance level of 1%. These results are also consistent

with Model 1, which shows CIR significantly negatively affects ROA at the 1% significance level. This phenomenon is in line with the research that expects efficient bank to reduce costs while improving the quality of non-interest income (Abuzayed et al., 2018).

Furthermore, firm size as measured by natural log of total asset gives a negative and significant coefficient value at the 1% level in equation 1 Table 3, and 5% level in equations 2 and 3. Consistent results have also shown in Table 4, which shows that the size of the bank has a significant negative effect on the RAROA with a significance of 1% in all equations. Ahamed (2017) illustrates that banks with large sizes have the potential to experience diseconomies of scale in relation to agency costs, costly administrative procedures, and excess operational expenses.

From the examination of independent macroeconomic variables, Table 3 all equation shows that the inflation rate variable gives a negative and significant coefficient value at the 1% and 5% level. Meanwhile, the inflation rate also shows a significant negative effect at the 10% significance level in all equations Table 4. This reflects the higher inflation rate, the lower profitability of commercial bank in Indonesia. In the research of Abuzayed et al. (2018), the author found that a decrease in the inflation rate lead to an increase in bank profitability.

Testing macroeconomic proxies through the independent variable GDP growth, Table 3 equation 1 shows that the GDP growth rate variable gives a positive and significant coefficient value at the 10% level, with a coefficient value of 0.034. This reflects the higher the level of economic growth, the higher the performance of the banking sector in Indonesia, especially as illustrated by the risk adjusted ROA. The research by Ashyari and Rokhim (2020) also found similar results, which found that banking profitability in Indonesia closely related to the GDP growth factor.

DTA variable has a significant negative effect at the 5% and 10% significance in influencing RAROA. In contrast to Abuzayed et al. (2018) who found the benefits of a high DTA ratio which added liquidity and had a positive effect on banking performance; researchers found a significant negative relationship which was also found in the retail-oriented banking sample (Kohler, 2014).

Table 5
Model 3 Regression

Dependent Variable: Z-Score **Coefficient (Standard Error)**			
Variable	**(1)**	**(2)**	**(3)**
ZSCORE (-1)	0.020 (0.042)	0.026 (0.039)	0.028 (0.039)
DIV	-1.327 (4.872)		
HHI		2.371 (4.681)	
HHI-FTO			2.708 (4.335)
AG	**2.174* (1.164)**	**1.972* (1.182)**	1.939 (1.193)
CIR	-4.066 (4.267)	-4.267 (3.525)	-4.025 (3.609)
DTA	0.461 (10.836)	0.166 (12.023)	-0.866 (11.874)

To be continued Table 5.

Variable	(1)	(2)	(3)
LEV	**137.053*** (20.681)**	**135.413*** (20.069)**	**134.947*** (19.877)**
LTA	12.348 (11.483)	8.863 (11.102)	7.877 (11.048)
SIZE	1.120 (1.756)	0.795 (1.826)	0.665 (1.883)
INF	-8.331 (40.393)	-22.789 (39.387)	-24.301 (40.680)
GDP	9.637 (9.486)	12.587 (9.568)	13.029 (9.827)
J-Statistic	18.591	15.934	16.220
Prob. (J-Stat)	0.181	0.317	0.300
AR(2) S-Cor	0.418	0.374	0.373

Notes: processed by author (2021), *) significant at 10% level; **) significant at 5% level; and ***) significant at 1% level.

Table 5 tries to explain the variables that affect the stability proxy as measured by the Z-Score. We found that asset growth had a significant positive effect on Z-Score at the 10% level in equations 1 and 2, with coefficients of 2.174 and 1.972. These results are consistent with the argument that rapid asset growth reflects increased investment and diversification opportunities to increase banking stability (Abuzayed et al., 2018).

The overall diversification proxies namely DIV, HHI, and HHI-FTO do not significantly affect the Z-Score. However, the researchers found that there are internal banking determinants and macroeconomic determinants that can affect banking stability.

The Leverage variable has a significant positive effect in influencing the Z-Score at the 1% level in all equations, with the coefficients being 137.053, 135.413, and 134.947 respectively. Ahamed (2017) argues that banks with strong capital are able to cope with unexpected events and have low solvency risk. In addition, the higher the Equity/Asset ratio becomes an incentive for shareholders to monitor management activities so as not to take excessive risks.

Table 6
Model 4 Regression

Dependent Variable: NPL **Coefficient (Standard Error)**			
Variable	**(1)**	**(2)**	**(3)**
NPL (-1)	**0.286*** (0.068)**	**0.297*** (0.071)**	**0.297*** (0.071)**
DIV	**-0.056*** (0.019)**		
HHI		-0.020 (0.034)	
HHI-FTO			-0.018 (0.032)
AG	0.006 (0.005)	0.004 (0.004)	0.004 (0.004)
CIR	**0.043*** (0.011)**	**0.043*** (0.013)**	**0.043*** (0.013)**
DTA	0.002 (0.025)	0.012 (0.030)	0.013 (0.030)

To be continued Table 6.

Variable	(1)	(2)	(3)
LEV	0.002	0.025	0.025
	(0.037)	(0.042)	(0.042)
LTA	**0.089****	**0.094****	**0.091****
	(0.039)	**(0.040)**	**(0.039)**
SIZE	**0.017****	**0.018****	**0.017****
	(0.007)	**(0.006)**	**(0.006)**
INF	0.076	-0.075	-0.068
	(0.267)	(0.261)	(0.259)
GDP	-0.048	-0.014	-0.014
	(0.044)	(0.043)	(0.043)
J-Statistic	12.498	12.463	12.442
Prob. (J-Stat)	0.566	0.569	0.570
AR(2) S-Cor	0.500	0.425	0.427

Notes: processed by author (2021), *) significant at 10% level; **) significant at 5% level; and ***) significant at 1% level.

Table 6 tries to explain the variables that affect the stability proxy as measured by the NPL. We found that lagged dependent variable of NPL_{t-1} had a significant positive effect on influencing the Z-Score at the 1% level in all equation 1, with a coefficients of 0.286, 0.297, and 0.297 respectively.

Table 6 examines the dependent variable NPL, with negative significant results at the 1% level for the DIV variable equation, with a coefficient of -0.056. However, other diversification proxies, namely HHI and HHI-FTO, do not show significance to the dependent variable, although they show a negative coefficient in equation 2 and equation 3. Hence, the higher the bank relying on non-interest income results in lower solvency risk to answer Hypothesis 2 of the study.

The significance of the direct effect of diversification in influencing banking stability is in contrast to the research of Ferreira et al (2019), which found the significance of the indirect effect of diversification in influencing banking stability. However, several studies have also concluded the benefits of diversification in maintaining banking stability (Chiorazzo et al., 2008; Sanya & Wolfe, 2011; and Lee et al., 2014).

Furthermore, the researcher found that CIR had a significant positive effect on influencing NPL at the 1% level in all equations, with coefficients of 0.043. Thus, operational inefficiency can explain the solvency risk proxy and is consistent with the regression observations in Table 3 and Table 4. In addition, through the SIZE variable, we can observe that natural log of Total Assets has a significant positive effect on NPL at the 5% level in all equations, with coefficients of 0.017, 0.018, and 0.017 respectively, as well as confirming the diseconomies of scale argument (Ahamed, 2017).

Insert Table 7 here.

Referring to Table 6, the Total Loans/Total Asset variable has a significant positive effect in explaining NPL at the 5% level in the overall equation, with coefficients of 0.089, 0.094, and 0.091 respectively. Abuzayed et al. (2018) explain the characteristics of LTA variables that reflect the main business of banking, which can increase profitability (Table 3) while increasing credit risk. Then the LTA variable has an inverse relationship tendency towards banking stability.

Table 7
Model 5 Regression

Dependent Variable: ROA **Coefficient (Standard Error)**				
Variable	**(1)**	**(2)**	**(3)**	**(4)**
ROA (-1)	**0.060*** **(0.015)**	**0.064*** **(0.019)**	**0.049*** **(0.018)**	**0.034*** **(0.019)**
DIV	**0.037*** **(0.008)**	**0.015*** **(0.009)**	0.019 (0.014)	**0.026*** **(0.007)**
DIVxBUKU1	**-0.056*** **(0.016)**			
DIVxBUKU2		0.022 (0.016)		
DIVxBUKU3			0.005 (0.018)	
DIVxBUKU4				0.011 (0.087)
AG	-0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)
CIR	**-0.100*** **(0.005)**	**-0.096*** **(0.004)**	**-0.094*** **(0.004)**	**-0.096*** **(0.004)**
DTA	0.016 (0.012)	0.006 (0.011)	0.002 (0.011)	0.004 (0.011)
LEV	0.001 (0.017)	0.017 (0.019)	0.019 (0.021)	0.014 (0.017)
LTA	0.017 (0.022)	0.032 (0.022)	**0.037*** **(0.020)**	**0.032*** **(0.019)**
SIZE	**-0.008*** **(0.002)**	**-0.006*** **(0.002)**	**-0.006*** **(0.002)**	**-0.007**** **(0.003)**
INF	**-0.279*** **(0.086)**	**-0.228**** **(0.095)**	**-0.218*** **(0.080)**	**-0.219**** **(0.095)**
GDP	**0.066*** **(0.018)**	**0.044**** **(0.021)**	**0.034*** **(0.018)**	**0.034*** **(0.019)**
J-Statistic	7.854	10.217	12.061	11.816
Prob. (J-Stat)	0.896	0.746	0.601	0.621

Notes: processed by author (2021), *) significant at 10% level; **) significant at 5% level; and ***) significant at 1% level.

Table 7 describes the interaction of the DIV variable with bank capitalization in explaining ROA. The interaction diversification variable DIVxBUKU 1 gives a negative and significant coefficient value at the 1% level, with a coefficient value of -0.056. Similar results also found in the HHIxBUKU 1 and HHI-FTOxBUKU 1 interaction.

Insert Table 8 here.

In explaining Hypothesis 3, the researcher finds the role of banking capitalization that plays a role in the relationship between diversification and profitability, especially in BUKU 1 bank. This conclusion contradicts the direct benefits of diversification on profitability, which described in Table 3 and Table 4.

Table 8 describes the interaction of DIV variables with banking capitalization in explaining the Z-Score. The interaction diversification variable DIVxBUKU 1 gives a negative and significant coefficient value at the 5% level, with a coefficient value of -98.115. This conclusion contradicts the overall direct benefits of diversification on stability described in Table 6, particularly in BUKU 1 bank.

Table 8
Model 6 Regression

Dependent Variable: Z-Score Coefficient (Standard Error)				
Variabel	**(1)**	**(2)**	**(3)**	**(4)**
ZSCORE (-1)	**0.890*** (0.237)**	**0.953*** (0.246)**	**1.072*** (0.236)**	**1.007*** (0.242)**
DIV	15.177 (12.022)	-22.762 (24.118)	-17.047 (28.748)	-7.857 (19.311)
DIVxBUKU1	**-98.115** (42.216)**			
DIVxBUKU2		38.278 (31.132)		
DIVxBUKU3			27.755 (26.208)	
DIVxBUKU4				65.134 (156.743)
AG	-0.632 (3.405)	1.243 (3.472)	-2.921 (3.903)	-1.965 (3.611)
CIR	-12.080 (13.495)	-14.511 (13.101)	**-24.697* (14.722)**	-19.794 (13.264)
DTA	22.468 (19.851)	15.986 (23.165)	16.737 (20.745)	18.360 (22.067)
LEV	66.551 (44.783)	78.539 ** (37.383)	33.850 (41.920)	58.739 (36.987)
LTA	27.217 (36.236)	44.283 (33.069)	23.758 (33.653)	30.863 (34.003)
SIZE	-2.338 (4.453)	0.223 (4.314)	-1.635 (4.793)	-2.108 (5.706)
INF	-210.199 (172.601)	-31.822 (183.463)	-93.617 (230.699)	-87.494 (218.042)
GDP	24.278 (43.886)	-27.915 (40.810)	-13.397 (46.618)	-16.452 (46.131)
J-Statistic	6.455	3.112	5.629	4.796
Prob. (J-Stat)	0.596	0.927	0.688	0.779

Notes: processed by author (2021), *) significant at 10% level; **) significant at 5% level; and ***) significant at 1% level.

V. CONCLUSION

This study tries to explain empirically how revenue diversification can affect bank performance and stability within the scope of commercial banks in Indonesia. Overall, this research proves that there are benefits of revenue diversification on enhancing profitability; as DIV has positive significant effect on influencing ROA. Furthermore, all revenue diversification variables show positive significant effect on RAROA as well. This study confirms the benefits of income diversification in improving the financial capabilities of banks in developing countries, as well as enriching references to similar research with samples from developing countries.

In terms of stability, only the DIV proxy, which is non-interest income divided by net operating income, found to have a significant effect with a negative coefficient on

NPL. We can conclude that benefits of non-interest income directly on revenue diversification are more efficient in explaining the decline in NPL levels. The role of diversification in maintaining banking stability has also been found in several studies.

Researchers also pay attention to several control variables that are significant in influencing overall banking profitability. The study concludes that the CIR and SIZE variables significantly negatively affect ROA and RAROA, as well as control variables of LTA, DTA, INF and GDP, which affect banking profitability. Furthermore, the AG and LEV variables significantly affect banking stability, which represented by the Z-Score. Meanwhile, several variables that significantly positively affect NPL include CIR, LTA, and SIZE.

We found contradiction in the interaction variables DIVxBUKU 1, HHIxBUKU 1, and HHI-FTOxBUKU 1 in explaining the dependent variable ROA, which gave negative and significant coefficient values at the 1% levels. This reflects that income diversification has a direct negative impact on BUKU 1 banking performance. This also supported by the diversification of the interaction variable DIVxBUKU 1, which gives a negative and significant coefficient value at the level of 10% in influencing the Z-Score. Hence, besides revenue diversification, commercial banking needs strong bank capitalization in order to improve banking profitability and stability.

The study was limited to an observation period from 2013 to 2020, so we could not observe the impact of COVID-19 further. We recommend further research to expand the banking sample, while exploring various other measures of banking stability, by analyzing each component of non-interest income.

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