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Sustainable Development Comparative Analysis on State Banks and Regional Development Banks: Study Case in Indonesia

Aditya Pratama
Departement of Management, Universitas Mercu Buana, Jakarta, Indonesia

Abstract

Increasing human activity has caused a decreasing environmental quality. This condistion will lead to a higher global warming impact. To minimize these negative impacts and improve sustainable living quality, the Indonesian government has a strategic initiative in the form of sustainable financing distribution. Apart from relying on government banks that have the ability to create financial stability, Indonesian government also relies on regional government banks that are capable to create regional financial stability. Referring to the strategy from the Indonesian government, this study will analyze the relationship between state bank financing and regional government banks with the SRI-Kehati sustainable development index. Regression results show that state banks have a relatively higher proportion of sustainable financing for the industrial sector by 13% compared with regional government banks at 11%. However, state banks only contributed 3% for the non-industrial sector compared with the regional government banks which has 6% contribution. In addition, the impulse-response results show that state banks have relatively more negative responses with no significant compared with the regional government banks. In relation to these findings, there is no type of bank that have most influential in building sustainable financing. However, both have their respective virtues in implementing decent sustainable financing if the government not only relies on government regulations and policies. However, ensuring the availability of a sufficient amount of financing and access to bank financing is expected to elevate better sustainable financing.

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Corresponding Author:
Aditya Pratama
(adityap@ahssigma.com)

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1. INTRODUCTION

One reason for the increasing of human activity is the increasing value of the human development index. Appart from this index has benefit to improve human life quality, it is also may have a negative impact in the form of increasing emissions from the industrial sector which will leads to a higher global warming impact (Hernawati, Insani, Bambang, Nur Hadi, & Sahid, 2017; Indrianasari et al., 2020). Apart from an increasing human development index, global warming is also caused by the diminishing condition of large forests in several parts of the world. This highly concerned condition is also confirmed by the highest forest depletion in Southeast Asia (Pearson, Brown, Murray, & Sidman, 2017). Instead of the impact of human activities on these forests, Indonesia, which is located in the Southeast Asia region, is also affected by the declining river quality and has not fully shown any improvement (Bappenas., 2017). due to these environmental problems, currently Indonesia does not have sufficient defense against increasing quantity of Green House Gasses (Indonesia Ministry of Environment and Forestry, 2018). Furthermore, Greenhouse Gas Inventory and Monitoring Report (2018) reports that Indonesia divides five main contributors of Green House Gasses such as the energy sector, industrial process sector, forestry and agriculture, waste and other sources.

To overcome the damage caused by GHG, Indonesia has a number of strategic initiatives that have succeeded in increasing the environmental quality index by 3% from 2013 to 2017

(Bappenas., 2019). However, because sustainable development is an activity that determines the life sustainability, this achievement must always be carried out and continuously improved. To implement the target of enhancing and maintaining the environment, Indonesia has an investment instrument that also functions as a measuring tool for the success of Indonesia's sustainable development value namely the Sustainable Responsible Investment Kehati index or the SRI-Kehati index (Volz, 2015). Apart from functioning as an index that provides an understanding to the public about the existence of an index with environment protection topic (Zulkafli et al., 2016), this joint stock price index has also operated following the workflow and policies from the Indonesian Financial Services Authority (Kehati Foundation, 2018).

There are several factors that provide support to develop the green SRI-Kehati index. Apart from investor contricutions, the index development is also due to the role of bank financial institutions as the company with the best performance among all index members (Kehati Foundation, 2018). However, bank activities also have the potential to have a negative impact if they are not implemented based on sustainable development risk management (Pattinasarany et al., 2018). To implement a better sustainable development actions, banks contribute by conducted their main function which is financing. Financing implementation activities that have sustainable development risk management will have a systemic impact that will trigger other sustainable development innovations (Huang, Liao, & Li, 2019). In addition to these decent benefits, implementation of decent financing will also increase social strength and disaster resilience (Yuan & Gallagher, 2018). Apart from functioning as an investment instrument, a composite stock price index in which there is sustainable development behavior will have a long-term impact on the economic conditions by preventing environmental damage (Asif & Searcy, 2014).

Moreover, a sustainable development index also has benefits as a performance measurement tool for related aspects such as economic (Ordouei, Elsholkami, Elkamel, & Croiset, 2016). Finally, the increasing value of the sustainable development index will have an influence and also incourage the development of other investment medium (Vives & Wadhwa, 2012).

Moving on to the banks role, a bank which have a decent performance is necessary to concuct financial risk management by ensuring the utilization and purpose of financing is in accordance with the regulations and sustainable development policies. However, the Asian region still faces considerable challenges in terms of implementing sustainable financing (Azhgaliyeva & Liddle, 2020), and large banks in Indonesia also yet do not have full awareness in implementing the principles of sustainable development (Volz, 2015). Thus, one way for banks to achieve sustainable financing is implementing strategic initiatives by analyzing potential customers from various aspects in more detail. Furthermore, implementation of this strategic initiatives is also in accordance with the behavior of sustainable financing, where most state banks has been (Boumparis, Milas, & Panagiotidis, 2019). The implementation of this sustainable development behavior is very important because government banks have the ability to create and maintain financial stability in the country (Laeven & Valencia, 2013). Moreover, the amount of financing provided by government banks to the industrial and non-industrial sectors in Indonesia is the largest at 41.42% (Bank Indonesia, 2020).

Refer to the discussion regarding the role of state-owned banks, Indonesia is an archipelagic country with population provinces scattered all over. This Indonesia's specific conditions make regional government banks is one of the government's strategies to reach all levels in the society. Because one of the objectives is to reach a scattered community, local government banks have a specific goal to increase regional economy (Permana & Andjani, 2014). Moreover, regional development banks will affect small to medium enterprises than global companies (Jones et al., 2008). Finally, because the Indonesian government and the central bank supervise all activities and operations of all types of banks including Regional Government Banks, in general the role of Regional Government Banks in creating sustainable financing for small and medium enterprises will be very needed to develop a developing country like Indonesia.

To further investigate, this study visualizes a comparison of the SRI-Kehati index price movements with state banks and regional government banks financing amount. Figure 1 below explains that the index value has the most dynamic movement, followed by state bank financing and regional government bank financing amount. In more detail, state bank and regional government bank financing is seen to have co-movement with the index value, also all variables have continuous overall improvement. Thus, contribution from financing to the sustainable

development index may questioned.

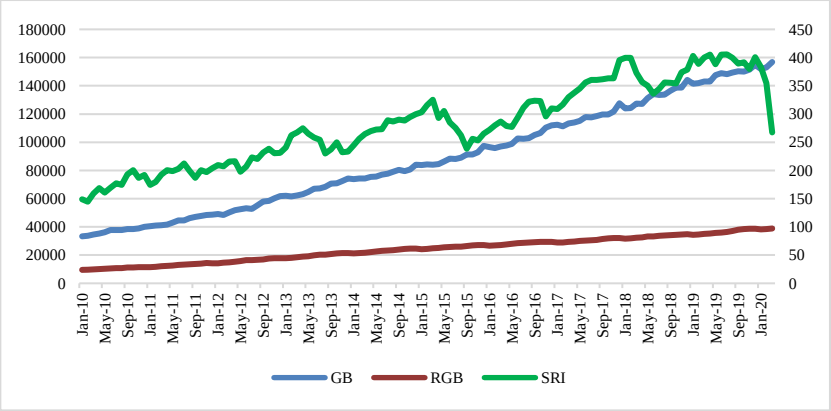

Figure 1. Average GB & RGB financing amount (Billion-IDR) with SRI-KEHATI index closed price (Hundreds-IDR)
Source: Data Processed (2023)

Following up on previously explained background problems, this study will use the Vector Error Correction Model method which integrated with the Impulse Response Function method, hereinafter referred to as VECM and IRF. Utilization of this integrated method is expected to provide a more detailed explanation and cover broader aspects. Following introduction, this study will discuss literature review in the second section. While the third section discusses the methodology, section 4 will discuss research calculation process. Finally, section 5 will discuss conclusions and findings to provide recommendations.

Literature Review

Sustainable financing is considerred as financing that is provided to sectors that not only have objective on economic profits, but also include elements of environmental maintenance (Ng, 2018; Wang & Zhi, 2016). Recently, there are several study that conducted a relationship analysis on bank financing with the sustainable development. However, research that analyzes financing related to the prevention of global warming is a research that is recently being prioritized (Zadek, 2011). Related with this concern, capital financing provided by banks is also considered a strategic initiative that will have a good impact on climate change (Galaz, Crona, Dauriach, Scholtens, & Steffen, 2018). Because the SRI-Kehati is an index that also functions as an investment medium, banks financing will have relationship with sustainable development instruments (Stojanović & Ilic, 2018). Moreover, short-term financing is considered to have a significant influence to the existence of sustainable development investment (He, Liu, Zhong, Wang, & Xia, 2019). Appart from short-term financing and its effects, other investment medium such as green bonds will also have a relatively significant impact on the sustainable development index (Long Finance, 2019). Thus, sustainable development financing strategy is a strategic initiatives used to achieve sustainable development targets (Ibragimov, Lyeonov, & Pimonenko, 2019). Furthermore, the sustainable development index also related with various sectors and aspects as well as financial intermediary institutions (Arias Fogliano de Souza Cunha & Samanez, 2013). Based on the relationship between financing and investment medium or the sustainable development index previously described, all activities conducted by banking are considered as important strategic initiatives in achieving sustainable development goals (Sultana, Shahidullah, & Jahur, 2016).

Turning to the details of the financing target sector, the agriculture sector is a very important sector in a country because it supports sustainability. However, a developing country immature agriculture sector will have less significant impact on sustainable development (Alessa, Zaabi, & Diab, 2018). In addition to these sectors, mining sector operational activities in which there is a priority of environmental preservation will have a decent impact on biodiversity (O. Odeku, 2017). Similar condition may occur in the manufacturing industry sector, significant impact to the environment and the decent brand image obtained when the operational activities are also supporting the environment (Lech, 2017). Turning to a relatively large influential sector, the efficient energy sector has more potential in earning financing (Iazzolino & Gabriele, 2016). In

addition to achieve of sustainable development targets that have been mentioned earlier, company size aspect in the construction sector also determines the success in carrying out sustainable operational activities (Akadiri & Fadiya, 2013). This situation indicates that sustainable financing is relatively easier to realize in the larger construction industry.

In the non-industrial segment, financing from institutions aimed at housing sector will have a decent impact on the sustainable development conditions (Ganiyu, Fapohunda, & Haldenwang, 2017). In the apartment sector, relying only on green environmental aspects is not sufficient to have a positive effect on sustainable behavior (Wilkinson et al., 2013). Relatively limited previous research that discusses green building financing for offices and shop houses. However, conditions that support sustainable development in this sector are currently in demand (Jailani, Reed, & James, 2015).

2. METHOD

Non-stationary is a relatively important financial data behavior where prices are relatively unpredictable. Related with this financial behavior, the VECM method approach is relatively recommended (Pradhan & Bagchi, 2013). Following facilitating non-stationary, VECM is also capable to identify long-term relationship (Kuo, 2016). Moreover, the VECM method also has the advantage of being relatively suitable to implement with the IRF method which have functions to identify responses of observed variables from independent variables that provide impulses (Xu & Lin, 2017). However, because the data used are classified as non-stationary, this study has limitation of not being able to detect short-term systemic relationships using granger-cause method (Li, Zhang, & Yuan, 2019).

Financial research has a number of analysis tools, however, in term of processing must be in accordance with the data behavior that must be identified first. One of the conditions that have to be considered to utilize the VECM method is the presence of a unit-root from stochastic conditions. To determine the existence of these conditions, this study uses the Augmented Dickey-Fuller (ADF) method based on the classic Dickey & Fuller (1981). This method can be done by referring to the empirical formula as follows:

$$\Delta Z_t = \alpha_1 + \alpha_2 t + \alpha_3 Z_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Z_{t-1} + \varepsilon t \quad (1)$$

Equation (1) above has a unit-root result denoted by Z_t. Because financial data of this study uses time series, the t component in above equation functions as a time unit. Thus, the hypotheses generated from the equation are $H_0 : \alpha_3 = 0$ and $H_0 : \alpha_3 \neq 0$. In addition to the use of the ADF initial test method, this study uses Johansen's cointegration assessment to see whether the analyzed data contains non-stationary behaviour (Österholm & Hjalmarsson, 2007). To be able to compare the results of trace statistics and max statistics, first the following equation is written:

$$\lambda_{trace} = -T \sum_{i=r+1}^{n} Log\,(1 - \hat{\lambda}_i) \quad (2)$$

$$\lambda_{max} = -T Log\,(1 - \hat{\lambda}_{i+1}) \quad (3)$$

After the lowest eigenvalue of $\hat{\lambda}_{i+1} \ldots \hat{\lambda}_n$ in both equations is produced, then the presence of stationary or non-stationary can be determined by comparing the value of λ_trace and value of λ_max with each critical value from these equations. After two initial assessments met the requirements, this study uses two additional initial assessment tools to ensure that the data were not indicated autocorrelation and were not normally distributed using the Lagrange-multiplier (LM) and Jarque-Bera (JB) analysis. The equation of the two assesment can be written with:

$$LM_s = (T - d - .5)\, ln\left(\frac{|\widehat{\Sigma}|}{|\widetilde{\Sigma}_s|}\right) \quad (4)$$

$$JB = \frac{n}{6}\left(\frac{\hat{\mu}_3}{\hat{\mu}_2{}^{3/2}}\right)^2 + \frac{n}{24}\left(\frac{\hat{\mu}_4}{\hat{\mu}_2{}^2} - 3\right)^2 \quad (5)$$

$$= \frac{n}{6}\left(\sqrt{b_1}\right)^2 + \frac{n}{24}\,(b_2 - 3)^2 \quad (6)$$

Equation (4) above has the number of samples marked with T and the augmented value marked with d. While maximum likelihood and augmented VAR Σ values are written with $\hat{\Sigma}$ and $\tilde{\Sigma}_s$, s can be filled with zero if the s component has no value (Davidson & MacKinnon, 1993) -10. After conducting the auto correlation assessment and the result is not autocorrelated, then the JB method based on classic Jarque & Bera (1980) -19 in equations (5) and (6) above can be implemented. This equation has the number of sample marked by k. While $\hat{\mu}_k$ can be written with $\sum_{j=1}^{n}\left(X_j - \bar{X}\right)^k/n$, and the $\bar{X}$ component can be adjusted to $n^{-1}\sum_{j=1}^{n} X_j$. Proceed to equation (6) where $\sqrt{b_1}$ and b_2 function as skewness and kurtosis samples, then VECM can be implemented if the results are not normally distributed. After the data behavior has been identified, then the VECM equation can be implemented by first describing the Vector Auto Regression (VAR) equation as follows:

$$\Delta y_t = v + A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + \epsilon_t \qquad (7)$$

While the basic VAR equation has a $K \times 1$ vector for each Δy_t and v component, components $A_1 \ldots A_p$ functions as a parameter with $K \times K$ followed by an error correction term ϵ_t. Proceed to the next phase, if the value of the covariance matrix and ϵ_t in equation (7) above is zero, then the VECM equation can be written with:

$$\Delta y_t = v + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \, \Delta y_{t-1} + \epsilon_t \qquad (8)$$

Because equation (8) is an equation derived from equation (7), then v and ϵ_t components have the same function. However, the Π component can be adjusted to $\sum_{j=1}^{j=p} A_j - I_k$, and Γ_i can be described by $-\sum_{j=i+1}^{j=p} A_j$. According to this explanation, and because this research processing is divided into four processes, the VECM equation for this study can be written with:

$$\Delta sr = v + \sum_{i=1}^{p} \Gamma_1 \, \Delta ag + \sum_{j=1}^{p} \Gamma_1 \, \Delta an + \ldots + \sum_{n=1}^{p} \Gamma_1 \, \Delta ae + \sum_{o=1}^{p} \Gamma_1 \, \Delta ac + \epsilon_t \qquad (9)$$

$$\Delta sr = v + \sum_{i=1}^{p} \Gamma_1 \, \Delta ah + \sum_{j=1}^{p} \Gamma_1 \, \Delta af + \ldots + \sum_{n=1}^{p} \Gamma_1 \, \Delta av + \sum_{o=1}^{p} \Gamma_1 \, \Delta ao + \epsilon_t \qquad (10)$$

$$\Delta sr = v + \sum_{i=1}^{p} \Gamma_1 \, \Delta bg + \sum_{j=1}^{p} \Gamma_1 \, \Delta bn + \ldots + \sum_{n=1}^{p} \Gamma_1 \, \Delta be + \sum_{o=1}^{p} \Gamma_1 \, \Delta bc + \epsilon_t \qquad (11)$$

$$\Delta sr = v + \sum_{i=1}^{p} \Gamma_1 \, \Delta bh + \sum_{j=1}^{p} \Gamma_1 \, \Delta bf + \ldots + \sum_{n=1}^{p} \Gamma_1 \, \Delta bv + \sum_{o=1}^{p} \Gamma_1 \, \Delta bo + \epsilon_t \qquad (12)$$

After the VECM equations for all parts shown in equations (9) to (12) above is described, this study uses the IRF simulation method as stated in Mills (2019) -26 to analyse each variable sustainable development behaviour. Still referring to the basic VAR equation in equation (7) above, the lag can be adjusted by writing the following equation:

$$A(B) = I_n - A_1 B - \cdots - A_p B^p \qquad (13)$$

The condition of the polynomial matrix component B in equation (13) above will be adjusted to the Vector Moving Average (VMA) equation as follows:

$$y_t = A^{-1}(B) u_t = \Psi(B) u_t = u_t + \sum_{i=1}^{\infty} \Psi_i \, u_{t-i} \qquad (14)$$

$$y_t = \sum_{i=0}^{\infty} (\Psi_i S) \, (S^{-1} u_{t-1}) = \sum_{i=1}^{\infty} \Psi_i^0 \, v_{t-i} \qquad (15)$$

The two equations above have several explanations. First, Ψ_i in equation (14) can be written as $\sum_{j-1}^{i} A_j \, \Psi_{i-j}$. However, if the value of $i < 0$, then Ψ_0 is the same as I_n. Second, equation (15) is the normalized recursive adjusted equation of equation (14). Third, the value of Ψ_i^0 in equation (15) is equal to $\Psi_i S$. Finally, if there is an impulse from y_r to y_s in $\psi_{rs,0}^0, \psi_{rs,1}^0, \psi_{rs,2}^0 \ldots \psi_{rs,n}^0$ order in the two equations above, then the impulse response component can be written with $\psi_{rs,i}^0 = e_r' \Psi_i S e_s$. Because this adjustment has an e_s vector with $n \times 1$ dimension with a sequence of events, then the process is defined as an Impulse Response simulation process.

Enhancing the IRF method explanation, this study uses additional method of Forecast Error

Variance Decomposition (FEVD) to provide more understandable analysis. Reffering to Lanne, M., & Nyberg, H. (2016), based on equation (7) and the VMA equation (14) (15), the FEVD equation can be written with:

$$\gamma\imath j(h) = \frac{\sum_{l=0}^{h} IRF_{ij}^{2}(l)}{\sum_{\imath=1}^{K}\sum_{l=0}^{h} IRF_{ij}^{2}(l)}\ , \imath j = 1, \dots, K, \qquad (14)$$

3. RESULTS AND DISCUSSION

There are several aspects that causes global warming in Indonesia such as the energy, agriculture and other sectors (Volz, 2015). Based on these aspects, this research will analyse the performance and impact from all 4 state banks and 26 local government banks industrial and non-industrial sector financing from with the the SRI-Kehati index price from 2009 to 2019. Utilization of SRI-Kehati as a comparative variable in this study is because this index is in line the Indonesian financial services authority roadmap (Kehati Foundation, 2018), as well as a first step to implementing sustainable development in the future (Volz, 2015).

To clarify the of variables utilization from the entire time series data, table 1 below presents the overall annotations of the variables which divided into four parts based on industrial and non-industrial sectors from the two bank types. Next, the results of the descriptive statistics presented in table 2 inform that the overall variables have increased value. Apart from being an early indication of co-movement, such situation is also an early indication of a mutually influencing relationship. Furthermore, although there are several negative correlation values in the two segments of state banks and local government banks presented in table 3 and table 4, in general the resulting values are positive. However, the regional government bank segment shows some positive correlation values that are not as large as those produced by state banks. This result is an early indication that regional government bank financing has a relatively smaller contribution than state-owned banks.

Table 1 Variable Annotation

Sections	Var	Annotation
Government bank industrial sector financing	Δsr	Indonesia Sustainable and Responsible Investment Index
	Δag	Agriculture sector financing
	Δan	Mining sector financing
	Δam	Manufacture sector financing
	Δae	Energy sector financing
	Δac	Construction sector financing
Government bank non-industrial sector financing	Δsr	Indonesia Sustainable and Responsible Investment Index
	Δah	Housing financing
	Δaf	Flat / Apartment financing
	Δas	Shophouse financing
	Δav	Vehicle financing
	Δao	Other government financing
Regional government bank industrial sector financing	Δsr	Indonesia Sustainable and Responsible Investment Index
	Δbg	Agriculture sector financing
	Δbn	Mining sector financing
	Δbm	Manufacture sector financing
	Δbe	Energy sector financing
	Δbc	Construction sector financing
Regional government bank non-industrial sector financing	Δsr	Indonesia Sustainable and Responsible Investment Index
	Δbh	Housing financing
	Δbf	Flat / Apartment financing
	Δbs	Shophouse financing
	Δbv	Vehicle financing
	Δbo	Other government financing

Source: Data Processed (2023)

Table 2. Descriptive Statistics

Section	var	mean	std,dev	min	max
Sustainable development index	Δsr	275,3295	77,02625	131,93	405,65
Government bank industrial sector financing	Δag	127,9336	64,33149	38,943	245,005
	Δan	36,71436	10,07802	12,213	55,507
	Δam	186,7588	71,15892	90,625	305,452
	Δae	53,82944	31,91455	8,727	119,611
	Δac	67,02647	42,62755	16,921	160,309
Government bank non-industrial sector financing	Δah	155,9184	75,92191	44,035	291,636
	Δaf	47,0769	140,004	1,224	828
	Δas	80,93347	207,6883	1,02	938
	Δav	22,79137	9,115047	5,614	42,201
	Δao	202,9827	75,79518	99,568	344,315
Regional government bank industrial sector financing	Δbg	9,758854	2,957666	3,386	14,79
	Δbn	389,3721	403,4769	1,02	992
	Δbm	6,283854	2,35586	1,702	11,518
	Δbe	39,19307	176,5838	1,188	913
	Δbc	17,87913	8,087536	6,91	38,763
Regional government bank industrial sector financing	Δbh	17,34667	4,550558	9,444	22,823
	Δbf	367,1643	140,4685	1,063	857
	Δbs	425,7561	181,8215	61	719
	Δbv	468,9431	45,16587	338	658
	Δbo	184,2692	69,01278	68,704	303,641

Source: Data Processed (2023)

Table 3. Government Bank Correlation Table

x/y	Δag	Δan	Δam	Δae	Δac	Δah	Δaf	Δas	Δav	Δao	Δsr
Δag	1,0000										
Δan	0,6776	1,0000									
Δam	0,9905	0,7087	1,0000								
Δae	0,9752	0,6183	0,9516	1,0000							
Δac	0,9728	0,5802	0,9484	0,9671	1,0000						
Δah	0,9928	0,6835	0,9798	0,9738	0,9800	1,0000					
Δaf	-0,3803	-0,5575	-0,3840	-0,3992	-0,3187	-0,3975	1,0000				
Δas	-0,4646	-0,6663	-0,4755	-0,4764	-0,3886	-0,4831	0,7397	1,0000			
Δav	0,9726	0,6940	0,9695	0,9384	0,9569	0,9787	-0,370	-0,449	1,000		
Δao	0,9731	0,5565	0,9535	0,9657	0,9825	0,9683	-0,340	-0,407	0,951	1,000	
Δsr	0,9470	0,7031	0,9333	0,9284	0,9055	0,9477	-0,445	-0,516	0,912	0,907	1,000

Source: Data Processed (2023)

Table 4. Regional Government Bank Correlation Table

x/y	Δbg	Δbn	Δbm	Δbe	Δbc	Δbh	Δbf	Δbs	Δbv	Δbo	Δsr
Δbg	1,0000										
Δbn	−0,1542	1,0000									
Δbm	0,9452	−0,0185	1,0000								
Δbe	−0,4304	0,1436	−0,3740	1,0000							
Δbc	0,8136	0,0776	0,8973	−0,2650	1,0000						
Δbh	0,8185	0,1943	0,8403	−0,3052	0,7284	1,0000					
Δbf	0,1391	0,2516	0,1866	0,1481	0,1726	0,3256	1,0000				
Δbs	0,7169	0,0133	0,6385	−0,3972	0,4172	0,8638	0,2064	1,0000			
Δbv	0,3598	0,0419	0,4021	−0,0292	0,3615	0,3809	0,0476	0,2455	1,0000		
Δbo	0,8960	0,1444	0,9621	−0,3303	0,9162	0,8790	0,1943	0,6402	0,3653	1,0000	
Δsr	0,8637	0,1231	0,9136	−0,3549	0,8654	0,7959	0,1485	0,5680	0,3708	0,9477	1,0000

Source: Data Processed (2023)

After identifying the dynamics of value movement which is also an early indication of the relationship that occurs between the observed variables, this study will conduct several initial assesment to ensure that the data is suitable for VECM processing. Apart from the ADF method, this study also uses Johansen's cointegration to help ensure that the resulting output does not deviate (Danish, Wang, & Wang, 2018). The ADF test results presented in Table 5 below show that in general the data is classified as non-stationary, marked by the ADF and PP values being greater than the critical value. Appart from non-stationary, the results from the Johansen's cointegration

test in table 6 below also identify the cointegration results. However, to ensure utilyzing VECM, this study uses two additional initial assesment, namely LM and JB which are presented in Tables 7 and 8 below. The test results show that the probability results of LM and JB do not show a significant number so that the data is not contain autocorrelation and is not normally distributed. By referring to the four results, VECM can be applied afterward.

Table 5. ADF-PP Unit Root Test

Section	Variable	ADF	Critical	PP	Critical
Government bank industrial sector financing	Δsr	-2,272	-3,147***	-1,978	-3,146***
	Δag	-3,061	-3,447**	-3,117	-3,446**
	Δan	-2,161	-3,147***	-2,726	-3,146***
	Δam	-3,194	-3,447**	-3,947	-4,031*
	Δae	-2,534	-3,147***	-3,002	-3,146***
	Δac	-1,585	-3,147***	-1,23	-3,146***
Government bank non-industrial sector financing	Δsr	-2,272	-3,147***	-1,978	-3,146***
	Δah	-2,059	-3,147***	-2,226	-3,147***
	Δaf	-3,954	-4,034 *	-3,766	-4,033*
	Δas	-2,973	-3,147***	-2,935	-3,147***
	Δav	-2,308	-3,147***	-2,023	-3,147***
	Δao	-1,621	-3,147***	-1,917	-3,147***
Regional government bank industrial sector financing	Δsr	-2,272	-3,147***	-1,78	-3,146***
	Δbg	-1,748	-3,147***	-1,74	-3,146***
	Δbn	-1,967	-3,147***	-2,596	-3,146***
	Δbm	-1,747	-3,147***	-3,33	-4,031*
	Δbe	-3,609	-4,032*	-2,581	-3,146***
	Δbc	-4,006	-4,032*	-3,728	-4,031*
Regional government bank non-industrial sector financing	Δsr	-2,272	-3,147***	-1,978	-3,146***
	Δbh	-1,164	-3,147***	-1,17	-3,147***
	Δbf	-4,004	-4,034*	-3,971	-4,033*
	Δbs	-0,876	-3,147***	-0,702	-3,147***
	Δbv	-3,308	-3,147***	-3,023	-3,147***
	Δbo	-2,465	-3,147***	-2,437	-3,147***

Source: Data Processed (2023)

Table 6. Johansen Co-Integration Result

Segment	Rank (r) of null	Eigenvalue	Trace	Critical	Max	Critical
Government bank industrial sector financing	r = 0	.	103,967	94,15	39,987	39,37
	r ≤ 1	0,273	63,980*	68,52	21,579	33,46
	r ≤ 2	0,158	42,4	47,21	16,531	27,07
	r ≤ 3	0,123	25,869	29,68	12,533	20,97
Government bank non-industrial sector financing	r = 0	.	229	94,15	157,113	39,37
	r ≤ 1	0,715	71,886	68,52	28,938	33,46
	r ≤ 2	0,206	42,948*	47,21	18,817	27,07
	r ≤ 3	0,139	24,13	29,68	15,579	20,97
Regional government bank industrial sector financing	r = 0	.	101,548	94,15	41,76	39,37
	r ≤ 1	0,306	59,788*	68,52	33,012	33,46
	r ≤ 2	0,251	26,776	47,21	13,421	27,07
	r ≤ 3	0,111	13,354	29,68	9,742	20,97
Regional government bank non-industrial sector financing	r = 0	.	98,764	94,15	37,791	39,37
	r ≤ 1	0,282	60,972*	68,52	26,512	33,46
	r ≤ 2	0,207	34,459	47,21	18,48	27,07
	r ≤ 3	0,149	15,979	29,68	12,865	20,97

Source: Data Processed (2023)

Table 7. Lagrange-Multiplier (LM) Assessment

Segment	Lag	chi²	prob
Government bank industrial sector financing	1	28,548	0,807
	2	26,433	0,997
Government bank non-industrial sector financing	1	52,609	0,337
	2	53,037	0,322
Regional government bank industrial sector financing	1	30,514	0,727
	2	30,425	0,731
Regional government bank non-industrial sector financing	1	30,766	0,716
	2	42,518	0,211

Source: Data Processed (2023)

Table 8. Jarque-Bera assessment

Segment	var	chi²	prob
Government bank industrial sector financing	all	210,21	0,000
Government bank non-industrial sector financing	all	7688,985	0,000
Regional government bank industrial sector financing	all	150,21	0,000
Regional government bank non-industrial sector financing	all	1135,124	0,000

Source: Data Processed (2023)

There are several VECM outputs, however, this study will analyze two principal outputs which are considered relatively important to observe the relationship between variables, such as proportion and the long-term relationship. The VECM regression test results in Table 9 below identify that industrial sector financing significantly influences the dynamics of the sustainable development index, although the proportions are relatively small of 13% and 11% for state banks and regional government banks. Appart from large banks still have less attention to sustainable development (Volz, 2015), this finding is also in accordance with conditions where state banks is capable to control a country financial stability (Laeven & Valencia, 2013), as well as the regional government banks performance that are not as significant as other commercial banks (Herdhayinta & Supriyono, 2019). Proceed to the non-industrial sector, the VECM results indicate that the financing from the two types banks is relatively insignificant with a smaller proportion compared with the industrial sector. The description of the VECM regression results indicates that the two type banks still do not have sufficient sustainable development behavior. This conditions may occure because Indonesia is newly developed in sustainable development which started in 2005 and only one government bank and one regional government bank signed a commitment to sustainable development (Volz, 2015).

Appart from providing less financing proportion to the index, financing also does not show a long-term relationship to the index. This result is indicated by the absence of significant values and negative coefficient values at the L1 and L2 levels which are presented in Table 10 below. However, the absence of a long-term relationship in this process does not indicate unfavorable results, however, financing that affects the sustainable development index in Indonesia is short-term financing. Thus, the financing provided is relatively in accordance with the conditions where the type of financing that has a significant relationship to sustainable development is short-term financing (He et al., 2019). Related with these two findings, government banks and local government banks in Indonesia have implemented strategies according to their segmentation but are still deemed ineffective.

Table 9. VECM Regression Assessment

Section	equation	rmse	R^2	chi^2	p.val
Government bank industrial sector financing	Δsr	11,1014	0,1329	17,31929	0,0006
	Δag	2480,26	0,3199	53,16173	0,0000
	Δan	3291,53	0,0604	7,257859	0,0641
	Δam	6531,38	0,0856	10,57677	0,0142
	Δae	3988,51	0,1644	22,22916	0,0001
	Δac	1964,41	0,3220	53,65932	0,0000

Government bank non-industrial sector financing	Δsr	11,7187	0,0338	3,952097	0,2667
	Δah	3083,66	0,3720	66,9443	0,0000
	Δaf	209,892	0,2184	31,57081	0,0000
	Δas	52,4754	0,6211	185,2226	0,0000
	Δav	715,895	0,1363	17,83333	0,0005
	Δao	5671,99	0,1511	20,12067	0,0002
Regional government bank industrial sector financing	Δsr	11,2095	0,1159	14,81966	0,0020
	Δbg	423,976	0,0707	8,601177	0,0351
	Δbn	101,541	0,0669	8,105359	0,0439
	Δbm	267,056	0,1741	23,81489	0,0000
	Δbe	255,639	0,0279	3,247292	0,3550
	Δbc	1462,43	0,1259	16,27261	0,0010
Regional government bank non-industrial sector financing	Δsr	11,5483	0,0617	7,429425	0,0594
	Δbh	444,967	0,1393	18,28458	0,0004
	Δbf	128,454	0,0817	10,04953	0,0181
	Δbs	17,8081	0,0784	9,610307	0,0222
	Δbv	32,368	0,2148	30,91456	0,0000
	Δbo	1107,01	0,7579	353,7008	0,0000

Source: Data Processed (2023)

Table 10. VECM Long Term Assessment

Δsr	**level**	**coef**	**std.err**	**z.val**	**p.val**	**conf.Interval**	
Government bank industrial sector financing	L1	-0,10068	0,02883	-3,49	0,000	-0,15720	-0,04417
	L2	0,00053	0,00025	2,09	0,036	0,00003	0,00103
Government bank non-industrial sector financing	L1	-0,00509	0,01149	-0,44	0,658	-0,02762	0,01744
	L2	-0,00005	0,00011	-0,46	0,646	-0,00028	0,00017
Regional government bank industrial sector financing	L1	-0,00287	0,02632	-0,11	0,913	-0,05447	0,04871
	L2	-0,00110	0,00150	-0,74	0,462	-0,00406	0,00184
Regional government bank non-industrial sector financing	L1	-0,05671	0,02954	-1,92	0,055	-0,11461	0,00118
	L2	-0,00035	0,00066	-0,53	0,594	-0,00164	0,00094

Source: Data Processed (2023)

Following the VECM regression analysis and long-term relationship analysis that have been implemented, next is to examine the roles formed between financing from government banks and local government banks with the sustainable development index using formative and reflective IRF analysis. While the formative analysis will analyze the sustainable development response index that occurs if the impulse is provided by state banks financing and regional government banks financing, reflective analysis will look at the financing responses from the existence of the sustainable development index. The two directional IRF simulation presented in Figure 3 and Figure 4 below reveal that there are more negative responses in state banks than regional government banks with a total of 10 to 7. Furthermore, from 7 negative responses, Δbf, Δbs and Δbo give a significant negative impulse on Δsr , and Δsr also causes Δbf to experience a significant decrease. Apart from these significant negative results, the local government bank segment also had a significant positive contribution as found in the impulse of Δbh which caused Δsr to increase significantly and the presence of Δsr which was able to significantly increase the Δbh and Δbv values. The IRF reflective results of this study are also in accordance with the conditions in which the green index is related to various sectors (Arias Fogliano de Souza Cunha & Samanez, 2013), and the green index will stimulate other sustainable findings (Vives & Wadhwa, 2012).

There are several important notes that can be drawn from the state banks IRF simulation. First, agribusiness sector financing does not provide a positive impulse to the index and the existence of the index has not been able to increase the demand for government bank agribusiness sector financing. Apart from this finding is in accordance with the conditions which developing countries immature agriculture sector does not have a significant impact on sustainable development (Alessa et al., 2018), this condition may also be caused by high demand yest not accompanied with access to finance (SIIA, 2017), although the Indonesian Ministry of Agriculture in Indonesia's Ministry of Agriculture Regulation (2019) has regulated the agriculture sector

operational activity must be accompanied by paying attention to environmental impacts. In addition, energy sector financing also generates a negative impulse response because clean and renewable energy requires relatively high costs and a more flexible implementation (ADB, 2016). Apart from these factors, the use of coal is still the dominant source of energy used (Ministry of National Development Planning, 2019). Turning to the non-industrial sector financing, vehicle financing and other non-industrial financing, state banks also identified a negative impulse response. This is due to the relatively large number of non-bank financial institutions accommodating the financing of the consumptive sector and resulting in a lack of risk management layer for sustainable financing originating from banks. In addition, this finding is also consistent with the condition in which banks still do not pay more attention to sustainable development (Volz, 2015).

In order to avoid misguided conclusions and recommendations, it should be noted that the smaller influence composition from regional government banks cannot be the only conclusion that state bank financing has better sustainable financing. To clarify, the IRF simulation results of this study show that out of a total of 40 IRF simulations divided into two parts, 23 of them had positive responses and 17 of them had negative responses with the composition of 10 from the state bank segment and 7 from regional government banks. In addition, the IRF simulation of the local government bank segment identified significant response results that is unidentified on state banks. This finding indicates that regional government banks have other benefits as differentiators from state banks priorities. In more detail, the findings of the negative impulse response in the construction sector financing of regional government banks indicate that the allocation of financing in regional areas has smaller size construction industry players compared with the city, while only large construction companies are able to carry out construction operations which in accordance with the principles of sustainable development (Akadiri & Fadiya, 2013). Apart from the construction sector, the apartment financing sector also indicated a significant negative impact. There has been relatively small amount of recent Indonesia apartment financing discussion. However, lack of regional domestic investment activities is one of the economic development constraints causes which will result in unsustainable growth (Wurtandani et al., 2005). Based on these findings, the availability of financing amount is also an important aspect for the regional government bank sustainable financing development.

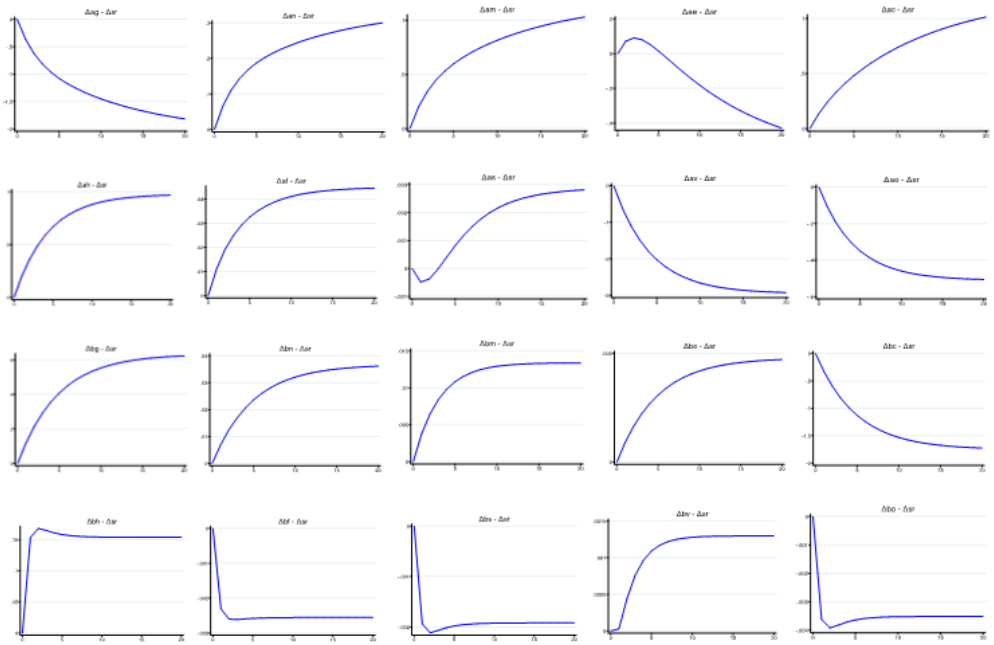

Figure 2. IRF Formative Simulations
Source: Data Processed (2023)

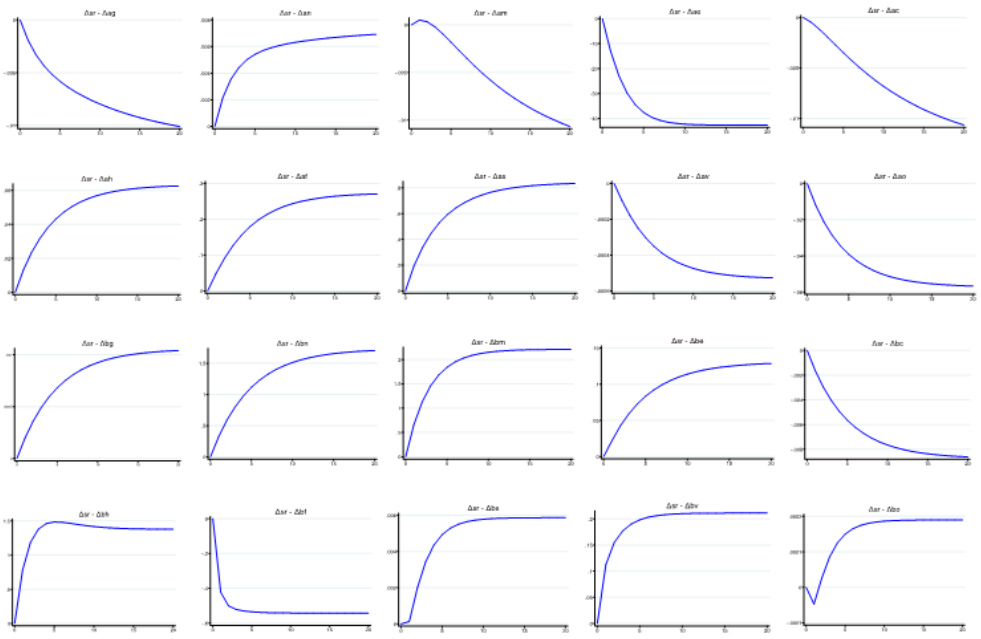

Figure 3. IRF Reflective Simulations
Source: Data Processed (2023)

4. CONCLUSION

In order to identify and analyze the relationship between financing and index, this study notes some important findings from the main processing results previously discussed. Although correlation results show that most of the observed variables are positive, results from the VECM regression process identify that financing influence proportion from banks to the dynamic index is relatively low. Next, the regression results also show that in general state banks have the ability to support sustainable development in a larger scope. However, the impulse response findings show that the state banks has more negative responses. Thus, these findings indicate that there are no type of bank that provide most influential in building Indonesia sustainable financing. However, each bank has a specific function and priority in channeling financing. It should also be noted that the long-term relationship absence proves that the two types of banks have implemented short-term financing strategies, which are believed to be one of the strategies that have a significant effect in influencing sustainable development. However, their implementation in Indonesia is still considered ineffective and inefficient which is indicated by the need to access bank financing as well as the availability of sufficient financing funds to support the required technology.

Following up on the findings previously discussed, this study will propose several recommendations in order to create better Indonesia sustainable financing. First, related with the two types of banks identified as having their respective priorities in creating sustainable financing, the government is expected to reconfirm the responsibilities of the two types of banks by regulating more specifically through laws and policies regarding the financing business competition and target market segmentation. Second, in addition to regulations and sustainable development policies, the central bank is expected to pay attention to other sustainable financing supporting factors, such as financing amount availability support sustainable development technology investment by providing more short-term green banking products and other short-term green investment options. Complementing sustainable financing amount availability, access to bank financing is also an important factor that must be followed up by expanding the network and market segmentation so that both types of banks can implement sustainable financing without overlapping each bank type target markets. Apart from these two recommendations, the government is also expected to consider the availability of a sustainable development index or other green segment index as a trigger for sustainable development activities and innovations in Indonesia. Thus, the recommendations of this study are expected to be used as a reference to build better sustainable financing performance in the future.

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