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The Effect Of Capital Adequacy Ratio, Efficiency And Liquidity On Rentability In Syariah Banks Owned By The Indonesia Government From 2009 - 2017

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Abstract

The ratio of financial statements to Islamic banks is one of the determining factors in financial health within the bank itself. For this reason, it is necessary to analyze the influence of capital adequacy, efficiency and liquidity on profitability in Indonesian government-owned Islamic banks from 2009-2017. This study aims to model the effect of capital adequacy (CAR), Efficiency (OEOI) and Liquidity (FDR) on Rentability (ROA), then analyze the model, and provide forecasting and structural analysis of the model. Therefore, the method used in this study is the analysis of Vector Error Correction Model which is applied to time series data from the level of CAR, OEOI, FDR to ROA. Based on the specification, estimation and examination of the model, the VECM(2) model was obtained as the best model. The results of the model analysis say that there is a long-term and short-term causality relationship between the levels of CAR, OEOI, FDR against ROA. Then, based on forecasting and structural analysis, it can be concluded that the results obtained are accurate.

Keywords

Capital Adequacy Ratio, Return On Asset, Operational Costs for Operational Income, Finance to Deposit Ratio

INTRODUCTION

Banks as financial institutions are business entities that collect funds from the community in the form of deposits and then redistribute the funds to the public in the form of loans for a certain period of time. Activities to raise funds greatly determine the amount of funds that can be developed by banks planting funds that generate income for the bank (Nazrian and Hidayat, 2012). According to Faradila and Cahyati (2013), the emergence of banks and financial institutions for conventional banks has been applied in Indonesia. So that Islamic experts form Islamic banks which according to law No.10 of 1998 concerning Islamic banks are banks that carry out their business activities based on Syariah principles which in their activities provide services in payment traffic. Syariah principles according to Article 1 paragraph 13 of Law No. 10 of 1998 concerning banking is an agreement based on Islamic law between banks and other parties for depositing funds or financing business activities, or other activities declared in accordance with Syariah, including financing based on the principle of profit sharing (mudharabah), financing based on equity principles (musyarakah), the principle of buying and selling goods with profit (murabahah), or financing capital goods based on the principle of pure rent without choice (ijarah), or by the option of transferring ownership of goods leased from the bank by another party (ijarah wa iqtina).

This Islamic bank is one of the most sought after banks by Indonesian people who are Muslim because Islamic banks adhere to Islamic principles in Islam. Islamic banks do not apply the interest system but implement a profit-sharing system, namely a fund management system in the Islamic economy. The calculation of profit sharing is based on the consensus of the bank and the customers who invest their funds in Islamic banks. The amount of the customer's right to the bank in calculating the profit sharing is determined by a ratio number or the amount of the part called Nisbah (Sari, 2016). Just like conventional banks, Islamic banks must maintain the performance of their financial statements. Analysis of the performance of financial statements can be seen from the level of financial statements between the

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level of capital adequacy (Capital Adequacy Ratio), the level of profitability or return on assets (ROA), efficiency or OEOI (operational costs against historical income) and the level of liquidity or Finance to Deposit Ratio (FDR). According to Nur Gilang Giannini (2013) said that in addition to the available funds, the supply of bank credit was also influenced by bank perceptions of the debtor's business prospects and the condition of the banking system itself, such as capital (CAR), the amount of bad loans (NPL), and Loan to Deposit Ratio (LDR), besides that the profitability factor or the level of profit reflected in Return on Assets (ROA) also affects bank credit. For data on ROA of Indonesian government Islamic banks from 2009 to 2017, Bank BTN Syariah has the highest rate in 2017 of 1.71% compared to other Islamic banks. This means that the BTN Syariah Bank in generating net profit after tax comes from assets owned by 1.71%. The next level of data is the level of capital adequacy. In maintaining this level of capital adequacy, Bank Indonesia issued regulation No.6/10/PBI/2004, about the Commercial Bank Soundness Rating System. Provisions which one of them is regulating capital Minimum Bank (Capital Adequacy Ratio) of 8% (eight percent). Based on government regulations regarding bank soundness general, each bank strives to maintain the value of its Capital Adequacy Ratio in order to maintain the soundness of the Bank. In the implementation of the Indonesian government Syariah Bank remains experiencing fluctuations in the development of capital adequacy.

From the value of the Indonesian government's Capital Adequacy Ratio Syariah period 2009-2017, BRI Syariah Bank where in 2009, BRI Syariah Bank had a CAR value of 17.04% then in 2017 BRI Syariah Bank had a CAR value of 20.63%, this means there is an increase in BRI Syariah Bank CAR value of 3.59%. The third level, which is the level of operational costs for historical income (OEOI), is the level of comparison of operational costs against historical income. This level is used to measure the level of efficiency and ability of banks to carry out their operations, especially credit.

From the value of the level of operational costs against operational income (OEOI) of the Indonesian government Syariah Banks from 2009-2017 observation period, the highest level of OEOI is BRI Syariah Bank where the OEOI level in 2009 was 97.50% to 95.24%. The next level, which is Finance to Deposit Ratio (FDR), states how far the bank is able to repay funds withdrawals made by depositors by relying on financing provided as a source of liquidity.

Based on the description above, the condition of the growth of Islamic banks which is faster than conventional banks requires research on the health of banks, one of which is using indicators of capital adequacy. Therefore, the objectives to be achieved in this study is analyzing the effect of capital adequacy, efficiency and liquidity on profitability of the Syariah Bank owned by the Indonesian government from 2009-2017. This study also examine the relationship of capital adequacy, efficiency and liquidity in the run short and long term to the profitability of the Indonesian government Islamic banks from 2009-2017.

Bank

Based on Law No. 7 of 1992 as amended by Law No. 10 of 1998 concerning banking states: "Banks are business entities that collect funds from the public in the form of deposits and distribute them to the public in order to improve the lives of many people". In terms of benefits or services for the use of funds, both bank deposits and loans can be divided into two, namely (Wahyu, 2016) conventional bank and syariah bank. Conventional banks, which are banks whose activities, both fund raising and fund distribution, provide and impose rewards in the form of interest or a number of rewards in the percentage of funds for a certain period.

Syariah Bank, which is a bank that is in its activities, both collection funds and distribution of funds providing and imposing benefits on the basis of Syariah principles, namely buying and selling and profit sharing. Islamic banks are banks that operate without relying on interest. Bank Syariah can also be interpreted as an optimal financial / banking institution and its products are developed based on the Al-Quran and hadith. There are two meanings, namely Islamic banks and banks operating under the principle of Islamic law. Islamic banks are banks that operate with Islamic law and the procedure for its operation refers to the provisions of the Koran and hadith (Wibisono, 2017).

Return On Assets (ROA)

According to Bilian and Purwanto (2017), ROA is a comparison between profit after tax and total assets in a period. This level can be considered as a measure of financial health. This level is very important and is related to the performance of the bank because we can see the level of business efficiency of a bank from the profits obtained by using its assets. In the framework of the bank's health assessment, BI will give a maximum value of 100 (healthy) if the bank has an ROA of> 1.5%. So that from the statement, the formula in calculating Return on Assets is as follows:

$$\text{ROA} = \frac{\text{Earning Before Tax}}{\text{Average of Total Asset}} \text{ x } 100\%$$

Capital Adequacy Ratio (CAR)

According to Bernardin (2016), the Capital Adequacy Ratio is a level that shows how much the total bank assets that contain risk (credit, participation, securities, bills on other banks) are also financed from and bank's own capital in addition to obtaining funds - dana from sources outside the bank, such as public funds, loans, and so on. According to the Bank Indonesia Circular No. 6/23/DPNP dated May 31, 2004 CAR is formulated as follows:

$$\text{CAR} = \frac{\text{Owner's equity}}{\text{Weighted Assets at Risk}} \text{ x } 100\%$$

Operational Costs for Operational Income

The success of banks is based on a quantitative assessment of bank profitability can be measured using the level of operational costs against historical income. The level of operational costs is used to measure the level of efficiency and ability of banks to carry out their operational activities. The level of Operational Costs to Operating Income is often called the level of efficiency used to measure the ability of bank management to control operational costs against historical income. The smaller this level means the more efficient operational costs incurred by the bank concerned (Fadjar, et. al., 2013).

Financing to Deposit Ratio (FDR)

According to Wibisono (2017) states Financing to Deposit Ratio (FDR) is a tool to measure the extent of the ability of banks to pay depositors' withdrawals which direct funds have been channeled by the bank to the community by means of loans. FDR will show the Bank's ability to channel third party funds collected by the Bank concerned. The Financing to Deposit Ratio formula (Wahyu, 2016) is as follows:

$$\text{FDR} = \frac{\text{Total Financing}}{\text{Total Funds}} \text{ x } 100\%$$

Unit Root Test

According to Sinay (2014), the VECM model is based on data time series that are not stationary but are cointegrated. To check stationary data, a unit root test can be used, with the test statistic used is Augmented Dickey-Fuller (ADF). The formula used to analyze the unit root test using the Augmented Dickey-Fuller formula (Moroke, et. al., 2014) as follows:

$$\Delta Y_t = \alpha + \beta_0 Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + \varepsilon_t$$

Where Δ is the first distinguishing operator; t is time; k presents the number of lags used and ε is the error rate; α and β are limiting models. For the Augmented Dickey-Fuller test includes a constant trend and time. According to Hamilton (1990) for the process of receiving and rejecting hypotheses in the unit root test using Augmented Dickey-Fuller using the assumption that the series follows the autoregressive process by accepting and rejecting the null hypothesis (H_0) based on regression analysis:

$$Z_t = \mu + (f_i\text{-}1)Y_{t-1} + \sum_{j=1}^{p-1} C_j Z_{t-j} + \varepsilon_t$$

where $Z_{t-j} = Y_{t-j} - Y_{t-j-1}$ for j = 0, 1, 2, ..., p-1 and εt are white noise processes. So that the process of accepting and rejecting the null hypothesis in the Augmented Dickey-Fuller analysis becomes:

$$\hat{\tau}_{ADF} = \frac{\hat{\phi}_1 - 1}{se(\hat{\phi}_1)}$$

$se(\hat{\phi}_1)$ is the standard error in ϕ - 1. Rejecting the null hypothesis in the unit root test H_0 : ϕ = 1 is rejected if $\hat{\tau}_{ADF}$ smaller than the value of α at a significant level.

Johansen Co-integration Test
According to Ikudayisi and Salman (2018) and Janzen Sinay (2014: 10) states that for the cointegration test Johansen's cointegration test is used as follows:

$Y_t = A_t y_{t-1} + ... + A_p y_{t-p} + Bx_t + \varepsilon_t$

with yt is se is a vector with k non stationary variables I (1), xt is a vector with d deterministic variables, εt is an error vector. The equation VAR (p) can also be written as

$$\Delta y_t = \prod y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + Bx_t + \varepsilon_t$$

Where

$$\prod = \sum_{i=1}^{p} A_i - I, \qquad \Gamma_i = -\sum_{j=i+1}^{p} A_j$$

For hypothesis testing, trace trace statistics can be used:

$$LR_{tr}(r|k) = -T \sum_{i=r+1}^{k} \log(1 - \lambda_i)$$

and maximum Eigen value test statistics

$$LR_{max}(r|r+1) = -T \log(1 - \lambda_{r+1}) = LR_{tr}(r|k) - LR_{tr}(r+1|k)$$

For r = 0, 1, ..., k - 1
with the hypothesis used is
H_0 : there are r cointegration equations.
At the significance level (1 - α) 100%, $H0$ is accepted if the trace test statistics and maximum Eigen value are smaller than the critical value at α, or $p\ value$ greater than the significance value α.

Model Suitability Test

According to Sinay (2014), the model compatibility test to see serial correlation on the residuals uses the Portmanteau test statistic as follows:

$$Q_h = T \sum_{j=1}^{h} tr(\hat{C}_j' \hat{C}_0^{-1} \hat{C}_j \hat{C}_0^{-1})$$

Or

$$Q_h^* = T^2 \sum_{j=1}^{h} \frac{1}{T-J} tr(\hat{C}_j' \hat{C}_0^{-1} \hat{C}_j \hat{C}_0^{-1})$$

with

$$\hat{C}_i = \frac{1}{T} \sum_{t=i+1}^{T} \hat{u}_t \hat{u}_t' \text{-i}$$

.

This test statistic is distributed $X^2_{(k^2(h-n^*))}$, with n^* state the number of coefficients other than constants in the estimated VAR (p) model. The hypothesis proposed in the model compatibility test is:
H_0: no serial correlation
At the significance level (1 - α) 100%, H_0 is accepted if p $value$ statistics Q for each lag besar is greater than the significance value α. Thus, there is no serial correlation.

Information Criteria

According to Sinay (2014), the selection of order lags can use the following methods:
Akaike Information Criterion (AIC)

$$AIC(p) = \log\det\left(\sum\nolimits_u^{\wedge}(p)\right) + \frac{2_p k^2}{T}$$

Schwarz Information Criterion (SC)

$$SC(p) = \log\det\left(\sum\nolimits_u^{\wedge}(p)\right) + \frac{\log(T) p k^2}{T}$$

With $\sum_u(p) = T^{-1} \sum_{t=1}^{T} \hat{u}_t \hat{u}_t$ is the size of the sample and k is the number of endogenous variables. The lag value p is chosen as the p* value which minimizes the information criteria in intervals 1, ..., p_{max} is observed. The optimum lag is based on the most AIC and SC values small.

Causality Analysis

Sinay (2014), in the modeling of the Error Error Correction Model (VECM) analysis of causality aims to see long-term causality and short-run causality. Analysis of the long-term causality relationship between the independent variables to the dependent variable in VECM modeling can be seen in the coefficients of the error correction term (ECT), which is based on the sign and results of the coefficient significance test using the t test statistic on

the Ordinary Least Square (OLS) method . Meanwhile, for analysis of short-term causality for each variable can use the Granger causality test. The Granger causality test is based on the Wald test statistic which has chi square distribution or test F as an alternative. The hypothesis used is H_0 : There is no Granger causality relationship

Forecasting and Structural Analysis

According to Sinay (2014: 11), the forecasting and structural analysis of VECM bears similarities to forecasting analysis and structural analysis of the VAR model. In VAR modeling the analysis can use impulse response analysis and variance decomposition. Impulse Response analysis aims to see the effect (influence) of each variable (endogenous) if given shock or impulse (shock). Meanwhile, variance decomposition analysis aims to predict contribution of each variable (percentage variance of each variable) caused by changes in certain variables in a system. Like forecasting analysis in general, to determine the accuracy of the forecast results of a model can use the Mean Absolute Percentage Error ($MAPE$):

$$\text{MAPE} = \frac{\sum_{t=1}^{n} \left| \frac{\hat{Y}_t - Y_t}{Y_t} \right|}{n} \text{ x } 100\%$$

RESEARCH METHODS

The research methods in this study formulated several hypotheses as follows: Is there an Influence of Capital Adequacy, Efficiency and Liquidity on Rentability in syariah bank that owned by Indonesia government from 2009 to 2017. Based on the hypothesis formulation, three variables can be formed as follows:

1. Capital adequacy: Capital Adequacy Ratio (CAR)
2. Efficiency: Operational Costs for Operational Income (OCOI)
3. Liquidity: Financing to Deposit Ratio (FDR)
4. Rentability: Return on Assets (ROA)

So that from this study is a case study to analyze the effect of CAR, OCOI and FDR on ROA in the syariah bank that owned by Indonesia bank from 2009 - 2017. Based on the variables that have been formed, then for data sourced from Bank Mandiri Syariah financial statements, Bank BNI Syariah , BRI Bank Syariah and Bank BTN Syariah from 2009-2017. The method used in this study is the VECM (Vector Error Correction Model) method which aims to determine the shape of the four variables above. According to Lexy Janzen Sinay (2014: 12), the procedures in the VECM analysis are as follows:

1. Specifications estimation, and model inspection (Unit root test (sterilization check); Johansen's cointegration test; Model
2. Estimation and Examination
3. Causality analysis
4. Forecasting and structural analysis

The results of data processing carried out in this study using EViews 9 software.

RESULTS AND DISCUSSION

Specifications Estimation And Model Inspection

The first step in conducting the unit root test of the four variables includes data from the government of Indonesia ROA, CAR, OEOI and FDR from 2009-2017. Based on data processing using EViews 9, the output results are as follows:

Table 1. Unit Root Test (Augmented Dickey-Fuller (ADF) test statistic)

Data	CV (α)	Level		1st Difference	
		Stat. ADF	*p value*	Stat. ADF	*p value*
ROA	5%	-2,312365 -2,957110	0,1744	-10,99046 -2,957110	0,0000
CAR	5%	-0,948478 -2,960411	0,7587	-11,44974 -2,957110	0,0000
OEOI	5%	-2,739522 -2,957110	0,0786	-7,880309 -2,957110	0,0000
FDR	5%	-1,153066 -2,957110	0,6821	-13,22417 -2,957110	0,0000

Based on Table1, an analysis can be made that the data on ROA, CAR, OEOI and FDR in the Indonesian government's Syariah Banks from 2009-2017 are data that contain unit roots at the level or not stationary at the level. This can be seen from the unit root test technique that is done, namely the level technique. It is seen that the ADF statistic

value for each variable is greater than α = 5%. This means accepting the hypothesis H0, namely there is a unit root in data or data that is not stationary. Meanwhile, from the results of the first differentiation, it can be seen in the ADF statistic value of each variable smaller than α = 5%, this means rejecting the hypothesis yaitu0, ie data does not contain unit roots or is stationary. Thus, the variables ROA, CAR, OEOI and FDR are non variables first-order stationer.

Johansen Cointegration Test

The cointegration test results using lag 2 (significant lag based on the VAR procedure) from the variables ROA, CAR, OEOI and FDR using static trace and maximum Eigen value statistics can be seen in table 6 and table 7. In table 6 it can be seen that the test results hypothesis by using trace statistics for the hypothesis: H_0: There is no cointegration connection. P value is 0.0000 smaller than α = 5% (Trace statistic value that is 89.93052 is greater than the value of 47.85613 tables at α = 5%). This means that the hypothesis H0 is rejected. Thus, it can be concluded that there is a cointegration equation. For this reason, the next hypothesis is examined.

Table 2. Johansen Cointegration Test

H	Eigen Value	*Trace Statistic*	CV α = 5%	*p value*
0	0,776183	89,93052	47,85613	0,0000
1	0,546901	40,53195	42,79707	0,0620
2	0,311899	14,40770	15,49471	0,0724
3	0,060848	2,071675	3,841466	0,1501

Based on Table 2, the following hypothesis test results will be examined:
H_0: There is a cointegration equation
H_1: There is no cointegration equation
In table 2, it can be seen that the p-value for each hypothesis is 0,000 smaller than the value of α = 5% (trace statistics greater than the critical value at α = 5% for each hypothesis). This means that H0 is accepted. Thus, based on the analysis it can be concluded that the results of the cointegration test using trace statistics indicate that at least one cointegration equation can be formed.

Table 3. Johansen Cointegration Test (Maximum)

H	Eigen Value	Trace Statistic	CV α = 5%	p value
0	0,776183	49,39857	27,58434	0,0000
1	0,546901	26,12425	28,13162	0,0791
2	0,311899	12,33603	14,26460	0,0987
3	0,060848	2,071675	3,841466	0,1501

From the data contained in table 3 it can be seen that the results of hypothesis testing using maximum Eigen value statistics, namely p-value trace statistics for each hypothesis: H_0: There is a cointegration equation and H_1: There is no cointegration equation. The p-value in table 7 shows that there is one cointegration, that is, the p-value of 0.0000 is greater than the value of α = 0.05; this means that H_0 is accepted.

a. Model Estimation and Examination

After conducting a cointegration analysis, it is continued by analyzing the optimum lag selection. The optimum lag selection in VECM can use information criteria, namely Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC). The results of data processing using Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC) analysis for one to eight lags can be seen in table 8. Please note that the use of lags one to eight is due to the principle of parsimony (simplicity of models) in statistical modeling, this is caused by the more lag used, the more the parameter parameters of the model.

Table 4. Information Criteria

Lag	*Akaike Information Criterion* (AIC)	*Schwarz Information Criterion* (SC)
1	20,02776	20,91653
2	18,04871	19,29337*
3	16,29051*	19,66485
4	16,93523	19,40520

In table 4 it can be seen that lag 3 has the smallest AIC value, while lag 2 has the smallest SC value. Thus lag 2 and lag 3 will be used to process the parameter estimation Vector Error Correction Model (VECM). Based on the results of the optimum lag analysis, the VECM equation forms that are estimated are VECM (2) and VECM (3), each with the number of cointegration equations is two. Then the model is examined by selecting the best model between VECM (2) and

VECM (3). Examination of the model is done by using a residual assumption test analysis of the two models, namely the residual serial correlation test as shown in the following table 5:

Table 5. Portmanteau Test on VECM (2) and VECM (3)

Lg	VECM(2)			VECM(3)		
	Stat. Q	*p val*	db	Stat. Q	*p val*	db
1	16,46283	NA*	NA*	15,39711	NA*	NA*
2	36,09632	NA*	NA*	33,28613	NA*	NA*
3	54,29685	0,1345	16	47,66786	NA*	NA*
4	73,48157	0,1564	32	62,66859	0,0165	16
5	86,86297	0,2165	48	78,70373	0,0187	32
6	104,6527	0,2453	64	100,3596	0,0265	48
7	110,1408	0,2675	80	115,5666	0,0365	64
8	124,3054	0,3123	96	136,2712	0,0386	80
9	135,0840	0,3453	112	145,5644	0,0653	96
10	146,2771	0,3564	128	154,4738	0,0754	112
11	156,3912	0,3675	144	165,0873	0,0875	128
12	164,7442	0,3876	160	177,4790	0,0894	144

In table 5, it can be seen that the Portmanteau test results for VECM (2) do not contain serial residual correlation at each lag. Whereas for VECM (3) states that the model contains serial correlation residual in lag 4,5,6,7,8, where lag 3 p-value of Q-statistic for lag is less than significance level α = 5% (meaning reject H0 : no serial correlation). Thus, VECM (2) is better than VECM (3) because there are no residual serial correlations. This means that VECM (2) is the best model.

$$\Delta ROA_t = -1{,}692(ROA_{t-1} - 0{,}075CAR_{t-1} + 0{,}092OEOI_{t-1} - 0{,}040FDR_{t-1} - 4{,}496) - 0{,}308\Delta ROA_{t-1} - 0{,}127\Delta ROA_{t-2} + 0{,}071\Delta CAR_{t-1} + 0{,}095\Delta CAR_{t-2} + 0{,}007\Delta OEOI_{t-1} + 0{,}020\Delta OEOI_{t-2} + 0{,}045\Delta FDR_{t-1} + 0{,}064\Delta FDR_{t-2} + 0{,}082 \quad (1)$$

$$\Delta CAR_t = -1{,}900(ROA_{t-1} - 0{,}075CAR_{t-1} + 0{,}092OEOI_{t-1} - 0{,}040FDR_{t-1} - 4{,}496) - 8{,}562\Delta ROA_{t-1} - 4{,}909\Delta ROA_{t-2} - 1{,}056\Delta CAR_{t-1} - 0{,}318\Delta CAR_{t-2} - 0{,}909\Delta OEOI_{t-1} - 0{,}436\Delta OEOI_{t-2} - 0{,}145\Delta FDR_{t-1} - 0{,}149\Delta FDR_{t-2} - 0{,}198 \quad (2)$$

$$\Delta OEOI_t = -27{,}912(ROA_{t-1} - 0{,}075CAR_{t-1} + 0{,}092OEOI_{t-1} - 0{,}040FDR_{t-1} - 4{,}496) + 1{,}357\Delta ROA_{t-1} + 2{,}230\Delta ROA_{t-2} - 0{,}905\Delta CAR_{t-1} - 0{,}805\Delta CAR_{t-2} - 0{,}237\Delta OEOI_{t-1} - 0{,}096\Delta OEOI_{t-2} - 0{,}776\Delta FDR_{t-1} - 0{,}743\Delta FDR_{t-2} - 1{,}077 \quad (3)$$

$$\Delta FDR_t = -33{,}288(ROA_{t-1} - 0{,}075CAR_{t-1} + 0{,}092OEOI_{t-1} - 0{,}040FDR_{t-1} 4{,}496) - 8{,}166\Delta ROA_{t-1} + 7{,}830\Delta ROA_{t-2} + 3{,}320\Delta CAR_{t-1} + 2{,}288\Delta CAR_{t-2} - 0{,}059\Delta OEOI_{t-1} + 0{,}834\Delta OEOI_{t-2} + 0{,}726\Delta FDR_{t-1} + 0{,}681\Delta FDR_{t-2} + 0{,}836 \quad (4)$$

Granger Causality Analysis for Dependent Variables AROAt

Based on the form of equation (1) of the VECM model (2) above, it is known that the ROA variable has a cointegration equation – 1.692, where the error correction term (ECT) coefficient is negative. Based on the results of data processing using Eviews 9, it was found that for p-value F statistics of 0.000031 less than the significance level α = 5%, which means that the coefficient is significant. Thus, the coefficient of ECT in equation (1) is a significant coefficient and is negative. This means that there is a long-run causality from CAR, OEOI and FDR to the level of ROA in Islamic banks owned by the Indonesian government from 2009-2017. This result is supported by research conducted by Mawardi (2005) which states that CAR has a long-term causality relationship to ROA. According to Lexy Janzen Sinay (2014: 14) to see the relationship of short-run causality in a VECM equation, the Granger causality test was used. The results of the Granger causality test in the first equation of VECM (2) are as follows:

Table 6. Granger Causality Test: Dependent Variable ΔROAt

Excluded	**Chi-sq**	**db**	***p value***
ΔCAR_t	9,512895	2	0,0086
$\Delta OEOI_t$	0,253455	2	0,8810
ΔFDR_t	28,72819	2	0,0000
All	57,61088	6	0,0000

In table 9, an analysis can be made, that is Wald's p-value statistical test.

Variable ΔCARt is 0.0086 smaller than the significant level α = 5%. This means that, rejecting hypothesis H0: there is no short-term causality relationship which means that there is a short-term causality relationship between the level of CAR and the level of

ROA in syariah bank that owned by government of Indonesia from 2009-2017.

For the variable $\Delta OEOI_t$ has a p-value of 0.8810 greater than the significance level α = 5%. This means that, accepting hypothesis H0: there is no short-term causality relationship which means there is no short-term causality relationship between the OEOI level and the level of ROA in syariah bank that owned by government of Indonesia from 2009-2017.

Next for the ΔFDR_t variable has a p-value of 0.0000 less than the significant level α = 5%. This means that, rejecting hypothesis H0: there is no short-term causality relationship which means there is a short-term causality relationship between the FDR level to the level of ROA in syariah bank that owned by government of Indonesia from 2009-2017.

However, if viewed as a whole in equation (1), then there is a short-term causality relationship from the level of CAR, OEOI and FDR to the level of ROA in Indonesian government-owned Islamic Banks from 2009-2017. This can be seen from the value of p-value = 0.0000 smaller than the significant level α = 5%, which means rejecting the hypothesis H0 where this means there is a short-term causality relationship between the levels of CAR, OEOI and FDR to the level of ROA in Islamic Banks owned by the Indonesian government from 2009-2017. This is consistent with the research conducted by Anita Karisma Mastika Permatasari and Dheasey Amboningtyas (2017).

Granger Causality Analysis for Dependent Variables ΔCARt

Based on the form of equation (2) of the VECM (2) model above, it is known that the CAR variable has a cointegration equation – 1,900; where the error correction term (ECT) coefficient is negative. Based on the results of data processing using Eviews 9, it was found that for p-value F statistics of 0,000001 less than the significance level α = 5%, which means that the coefficient is significant. Thus, the coefficient of ECT in equation (2) is a significant coefficient and is negative. This means that there is a long-run causality of ROA, OEOI and FDR against the level of CAR in the Indonesian government-owned Islamic Banks from 2009-2017. This is in accordance with the research conducted by Fenandi Bilian and Purwanto (2017). According to Lexy Janzen Sinay (2014) to see the relationship of short-run causality in a VECM equation, the Granger causality test was used. The results of the Granger causality test in the first equation of VECM (2) are as follows:

Table 7. Granger Causality Test: Dependent Variable ΔCARt

Excluded	Chi-sq	db	*p value*
ΔROA_t	18,23495	2	0,0001
$\Delta OEOI_t$	18,09765	2	0,0001
ΔFDR_t	6,079053	2	0,0479
All	39,01579	6	0,0000

In table 7, an analysis can be made, namely the Wald p-value statistical test.

Variable ΔROA_t is 0,0001 smaller than significant level α = 5%. This means that, rejecting hypothesis H0: there is no short-term causality relationship which means that there is a short-term causality relationship between the level of ROA to the level of CAR in syariah bank that owned by government of Indonesia from 2009-2017.

For the variable $\Delta OEOI_t$ has a p-value of 0,0001 smaller than the significant level α = 5%. This means that, rejecting hypothesis H0: there is no short-term causality relationship which means there is a short-term causality relationship between the OEOI level and the level of CAR in syariah bank that owned by government of Indonesia from 2009-2017.

Next for the ΔFDR_t variable has a p-value of 0.0479 smaller than the significant level α = 5%. This means that, rejecting hypothesis H0: there is no short-term causality relationship which means there is a short-term causality relationship between the FDR level to the level of CAR in syariah bank that owned by government of Indonesia from 2009-2017.

However, if viewed as a whole in equation (2), then there is a short-term causality relationship from the level of ROA, OEOI and FDR to the level of CAR in the Indonesian government-owned Islamic Bank from 2009-2017. This can be seen from the value of p-value = 0.0000 smaller than the significant level α = 5%, which means rejecting the hypothesis H_0, which means that there is a short-term causality relationship between the level of ROA, OEOI and FDR to the level of CAR in a Sharia Bank owned by the Indonesian government from 2009-2017. This is supported by research conducted by Rofikoh Rokhim and Jubilant Arda Harmidy (2013).

Granger Causality Analysis for Dependent Variables ΔOEOIt

Based on the form of equation (3) of the VECM (2) model above, it is known that the OEOI variable has a cointegration equation – 27,912; where the error correction term (ECT) coefficient is negative. Based on the results of data processing using Eviews 9, it was found that for p-value F statistics of 0,000002 less than the significance level α = 5%, which means that the coefficient is significant. Thus, the ECT coefficient in equation (3) is a significant coefficient and is negative. This means that there is a long-run causality from ROA, CAR and FDR to the level of OEOI in the Indonesian government Islamic banks from 2009-2017. This is in accordance with the research conducted by Deden Edwar Yokeu Bernardin (2016). According to Lexy Janzen Sinay (2014) to see the relationship of short-run causality in a VECM equation, the Granger causality test was used. The results of the Granger causality test in the first equation of VECM (2) are as follows:

Table 8. Granger Causality Test: Dependent Variable $\Delta OEOI_t$

Excluded	Chi-sq	db	*p value*
ΔROA_t	0,322428	2	0,8511
ΔCAR_t	8,221816	2	0,0164
ΔFDR_t	40,28180	2	0,0000
All	71,83938	6	0,0000

In table 8, an analysis can be made, namely Wald's p-value statistical test.

Variable ΔROA_t is 0.8511 greater than the significance level α = 5%. This means that, accepting hypothesis H_0: there is no short-term causality relationship which means that there is no short-term causality relationship between the level of ROA to the level of OEOI in syariah bank that owned by government of Indonesia from 2009-2017.

For the variable ΔCAR_t has a p-value of 0.0164 smaller than the significant level α = 5%. This means that, rejecting hypothesis H_0: there is no short-term causality relationship which means that there is a short-term causal relationship between the level of CAR and the level of OEOI in syariah bank that owned by government of Indonesia from 2009-2017.

Next for the ΔFDR_t variable has a p-value of 0,000 smaller than the significant level α = 5%. This means that, rejecting hypothesis H_0: there is no short-term causality relationship which means there is a short-term causality relationship between the FDR level to the OEOI level in syariah bank that owned by government of Indonesia from 2009-2017.

However, if viewed as a whole in equation (3), then there is a short-term causality relationship from the level of ROA, CAR and FDR to the OEOI level in syariah bank that owned by government of Indonesia from 2009-2017. This can be seen from the value of p-value = 0,0000 smaller than the significant level α = 5%, which means rejecting the hypothesis H_0, which means that there is a short-term causality relationship between the level of ROA, CAR and FDR to the OEOI level in syariah bank that owned by government of Indonesia from 2009-2017.

Granger Causality Analysis for Dependent Variables DRFDRt

Based on the form of equation (4) of the VECM model (2) above, it is known that the FDR variable has a cointegration equation – 33,288; where the error correction term (ECT) coefficient is negative. Based on the results of data processing using Eviews 9, it was found that for p-value F statistics of 0,000000 less than the significance level α = 5%, which means that the coefficient is significant. Thus, the coefficient of ECT in equation (4) is a significant coefficient and is negative. This means that there is a long-run causality from ROA, CAR and OEOI to the level of FDR in Islamic banks owned by the Indonesian government from 2009-2017. This is in accordance with the research conducted by Erma Kurniasih (2016). According to Lexy Janzen Sinay (2014) to see the relationship of short-run causality in a VECM equation, the Granger causality test was used. The results of the Granger causality test in the first equation of VECM (2) are as follows:

Table 9. Granger Causality Test: Dependent Variable ΔFDR_t

Excluded	Chi-sq	db	*p value*
ΔROA_t	11,83162	2	0,0027
ΔCAR_t	37,87209	2	0,0000
$\Delta OEOI_t$	4,282536	2	0,1175
All	101,1076	6	0,0000

In table 9, an analysis can be made, that is Wald's p-value statistical test.

Variable ΔROAt is 0.0027 smaller than the significant level α = 5%. This means that, rejecting hypothesis H0: there is no short-term causality relationship which means that there is a short-term causality relationship between the level of ROA to the FDR level in

syariah bank that owned by government of Indonesia from 2009-2017.

For the variable ΔCARt has a p-value of 0.0000 smaller than the significant level α = 5%. This means that, rejecting hypothesis H0: there is no short-term causality relationship which means there is a short-term causality relationship between the level of CAR to the FDR level in syariah bank that owned by government of Indonesia from 2009-2017.

Next for the variable OPOEOIt has a p-value of 0.1175 greater than the significant level α = 5%. This means that, accepting the hypothesis H0: there is no short-term causality relationship which means there is no short-term causality relationship between the OEOI level of the FDR level in syariah bank that owned by government of Indonesia from 2009-2017.

However, if we look at it as a whole in equation (4), there is a short-term causality relationship from the level of ROA, CAR and OEOI to the FDR level in the government-owned Islamic Bank from 2009-2017. This can be seen from the value of p-value = 0,0000 smaller than the significant level α = 5%, which means rejecting the hypothesis H0, which means that there is a short-term causality relationship between the level of ROA, CAR and OEOI on the FDR level in Islamic Banks owned by the Indonesian government from 2009-2017. This is consistent with the research conducted by Kamalia Sani and Maftukhatusolikhah (2015).

Forecasting and Structural Analysis

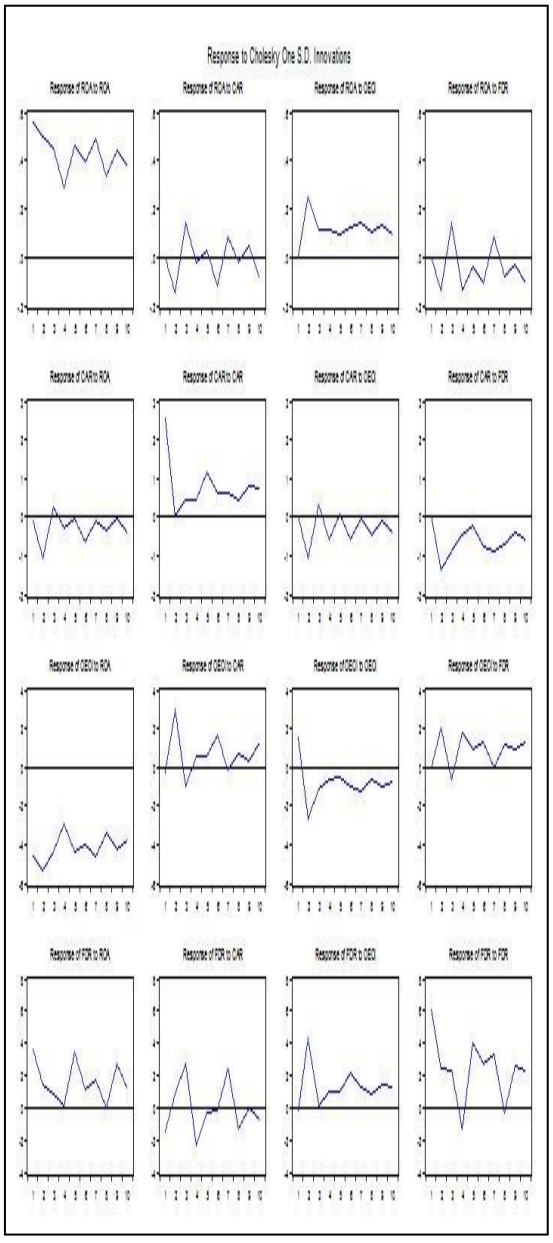
This section will explain about forecasting and structural analysis of forecasting from the VECM model (2). Before discussing the analysis of forecasting results it will be explained in advance about structural analysis which includes the Impulse Response Function (IRF) analysis and variance decomposition. Impulse Response Function (IRF) analysis is the result of impulse-response (IRF) plots where there are nine Impulse Response Function (IRF) plots for the next 10 periods, which explain visually the response (response) of a variable that arises due to shocks (shock / impulse) of one standard deviation both from itself and from other variables.

Impulse Response Function (IRF) Analysis

The Impulse Response Function (IRF) analysis can be seen from the following picture:

From the data shown in Figure 1, it can be seen that the average response to the shocks of each variable is stagnant both positive and negative. For those who have a positive stagnant pattern such as the ROA response to itself which is in a positive area. And for the negative stagnant pattern as possessed by the OEOI level response to ROA that has a negative stagnant pattern.

Figure 1. Impulse Response Function (IRF) Analysis



Forecast Error Decomposition Variance (FEDV)

Analysis of variance decomposition is often referred to as a forecast error decomposition variance (FEDV) analysis. The results of the FEDV analysis for the 10 periods of each variable are as follows table 10:

Table 10. Forecast Error Decomposition Variance (FEDV) for Variable ROA

Period	S.E.	ROA	CAR	OEOI	FDR
1	0,558821	100,0000	0,000000	0,000000	0,000000
2	0,811845	84,65184	3,384199	9,065921	2,898036
3	0,955230	83,07784	4,692889	7,982179	4,247092
4	1,013536	81,77571	4,203757	8,308055	5,712473
5	1,117603	84,10387	3,497573	7,541955	4,856599
6	1,201076	83,38625	4,068939	7,508163	5,036644
7	1,308588	84,01748	3,816091	7,547739	4,618685
8	1,356675	84,19319	3,571419	7,586180	4,649215
9	1,434692	84,87481	3,288029	7,623153	4,214004
10	1,490787	84,75780	3,365720	7,440078	4,436406

Table 10 is a summary of the results of the FEDV analysis for the ROA level of shocks given by each variable including itself. The FEDV analysis that can be taken from table 14 states that in the short term, the third period: shocks to itself result in 83,08% fluctuations in the level of ROA, and shocks to the level of CAR result in 4,69% fluctuations in the ROA level, while the OEOI level results in 7,99% fluctuations in the level of ROA and the FDR rate resulted in 4,25% of the fluctuations in the level of ROA in syariah bank that owned by Indonesia government from 2009-2017. On the other hand, in the long term, on the 10th period; the fluctuations in themselves increased in the ROA level, while the CAR level shock weakened by 3,37% in the ROA level, while the OEOI level weakened by 7,4% in the ROA level and the FDR rate increased by 4.4% in ROA level. Then for FEDV analysis for the level of CAR can be seen in the following table 11 :

Table 11. Forecast Error Decomposition Variance (FEDV) for Variable CAR

Peroid	S.E.	ROA	CAR	OEOI	FDR
1	2,569470	0,21659	99,78341	0,000000	0,000000
2	3,265500	11,06809	61,77981	10,30841	16,84369
3	3,430043	10,58650	57,42224	10,13297	21,85829
4	3,543078	10,62545	55,18360	12,20149	21,98945
5	3,739761	9,555302	59,37204	10,98054	20,09211
6	3,965661	11,24582	55,34150	12,01947	21,39321
7	4,108551	10,53188	53,92738	11,19986	24,34088
8	4,229213	10,53545	52,02640	11,91639	25,52176
9	4,321707	10,11199	53,21140	11,44703	25,22958
10	4,457600	10,44308	52,69517	11,51112	25,35062

Table 11 is a summary of the results of the FEDV analysis for the level of CAR from shocks given by each variable including itself. The FEDV analysis that can be taken from table 15 states that in the short term the third period: the shock to itself results in 10,59% fluctuations in the level of CAR, and shocks to itself result in 57,42% fluctuations in the level of CAR, while the OEOI level 10,13% fluctuations in the level of CAR and the FDR level resulted in 21,86% of the fluctuations in the level of CAR in syariah bank that owned by Indonesia government from 2009-2017. On the other hand, in the long term, on the 10th period; the shock to itself increased its fluctuation in the ROA level of 10,44 in the CAR level, while the CAR level shock against itself weakened by 52,70% in the CAR level, while the OEOI level increased by 11,51% in the CAR level and the FDR rate rose by 25,35% in the CAR level. Then for analysis of FEDV for OEOI level can be seen in the following table 12 :

Table 12. Forecast Error Decomposition Variance (FEDV) for Variable OEOI

Period	S.E.	ROA	CAR	OEOI	FDR
1	4,900021	90,65639	0,256969	9,086645	0,000000
2	8,543111	68,82259	12,25162	13,09900	5,826784
3	9,734143	73,24532	10,39652	11,46934	4,888820
4	10,33510	72,75164	9,542467	10,57479	7,131103
5	11,27413	75,99279	8,237227	9,144431	6,625551
6	12,21335	75,72465	8,966293	8,544613	6,764440
7	13,11041	78,03873	7,804636	8,281893	5,874737
8	13,62512	78,34765	7,481587	7,928540	6,242224
9	14,35411	79,53221	6,808952	7,645938	6,012897
10	14,97808	79,48568	6,961552	7,269908	6,282861

Table 12 is a summary of the results of the FEDV analysis for the OEOI level of shocks given by each variable including itself. The FEDV analysis that can be taken from table 16 states that in the short term the third period: shocks to itself result in 11,47% fluctuations in the OEOI level, and shocks to ROA result in 73,26% fluctuations in the ROA level, while the CAR level results in 10,40% of fluctuations in the OEOI level and FDR rate resulted in 4.89% of the fluctuations in the OEOI level in bank syariah that owned by Indonesia government from 2009-2017. On the other hand, in the long term, on the 10th period; self-shock has increased fluctuations in the ROA level of 79,49 in the OEOI level, while the OEOI level shock against itself has weakened by 7,27% in the OEOI level, while the CAR level has weakened to 6,96% in the OEOI level and the FDR rate weakened to 6,28% at the OEOI level. Then for FEDV analysis for FDR levels can be seen in the following table 13 :

Table 13. Forecast Error Decomposition Variance (FEDV) for Variable FDR

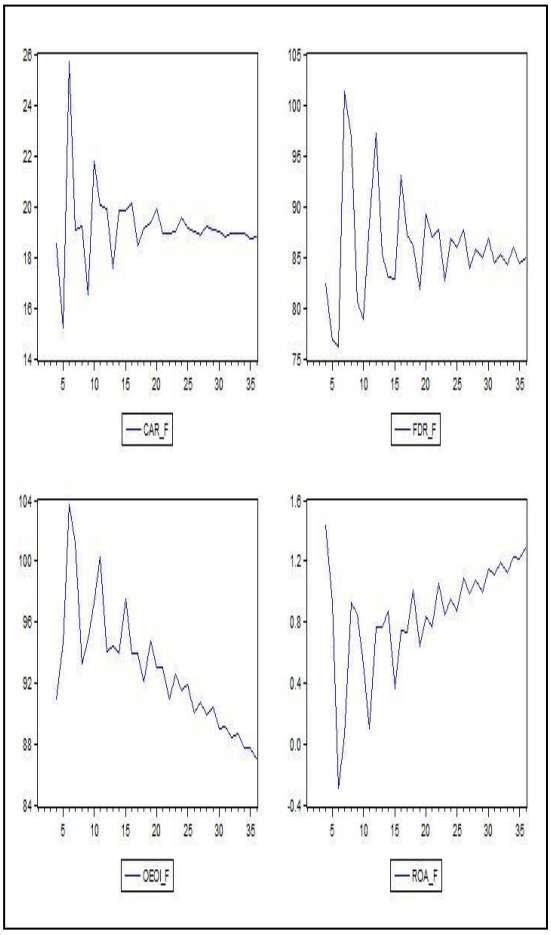
Period	S.E.	ROA	CAR	OEOI	FDR
1	7,21744025	402064	0789830	04963370	46932
2	8,91419019	031793	51809824	0526653	39746
3	9,62443817	0457710	9235320	6637051	36700
4	10,0411515	6874415	2310719	9936249	08787
5	11,3933421	1525311	8812316	3365350	62972
6	11,9419120	1116410	8406417	9969451	05078
7	12,7921719	1765712	9324716	7829751	10799
8	12,8880418	8935613	7406216	9790050	38681
9	13,5164121	3814212	4930616	6105249	51499
10	13,8205521	1066212	2400216	7058749	94748

Table 13 is a summary of the results of the FEDV analysis for the FDR level of shocks given by each variable including itself. The FEDV analysis that can be taken from table 17 states that in the short term the third period: shocks to itself result in 51,37% fluctuations in the FDR level, and shocks to ROA result in 17,05% fluctuations in the FDR level, while the CAR level results in 10,92% of fluctuations in FDR and OEOI levels resulted in 20,66% of fluctuations in FDR levels in the Indonesian government-owned Islamic banks from 2009-2017. On the other hand, in the long term, on the 10th period; the shock to itself increased its fluctuation in the ROA level to 21,11% in the FDR level, while the FDR level shock to itself weakened to 49,95% in the FDR level, while the CAR level increased to 12,24% at the level FDR and OEOI levels weakened to 16,71% in the FDR level.

Forecast Result

The forecast results using VECM (2) for the next 10 periods can be seen in the following figure 2 :

Figure 2. Prediction results for ROA, CAR, OEOI and FDR



From the figure above, it is known that it is predicted that there will be an increase in the level of ROA while the one that experienced a decline is the level of OEOI, besides that it will experience stagnant growth, namely the level of CAR and FDR in the bank syariah owned by Indonesia government from 2009-2017. Based on Figure 2, MAPE values can be obtained from each variable as shown in the following table 14 :

Table 14. Accuracy of forecast results

	ROA	CAR	OEOI	FDR
MA	99,98	100,9	100,3	3185,3
PE	%	1%	8%	4%

Based on Figure 17, MAPE values can be obtained from each variable as shown in table 18. In table 18 it can be seen that the smallest MAPE is the ROA variable. This means that forecasting using the VECM model (2) is more accurate if applied to ROA (Return On Asset).

CONCLUSION

Based on the results and discussion, conclusions can be made as follows. Based on the model specifications (optimum lag analysis) and model checking (residual serial correlation test), the best model for data on CAR, OEOI and FDR to ROA is obtained is VECM (2).

Based on VECM (2), the results of causality analysis are obtained as follows. There is a short-term and long-term causality relationship between the level of ROA as the dependent variable and the level of CAR, OEOI and FDR as independent variables. There is no short-term causality relationship between the level of ROA as the dependent variable with the level of CAR, OEOI and FDR, but conversely there is a long-term relationship between the level of ROA to the level of CAR, OEOI and FDR. There is no relationship between short and long term causality between the level of ROA as the dependent variable with the level of CAR, OEOI and FDR.

Based on the structural analysis of VECM (2), it can be concluded that the response of each variable to the shock that comes from itself is quite significant, due to fluctuations. The response of the level of ROA to CAR, OEOI and FDR is very significant. In general, for future analysis both in the long and the short term, the level of ROA on the levels of CAR, OEOI and FDR significantly influence each other.

The forecast results obtained using VECM (2) are quite accurate, especially for forecasting ROA levels. This can be seen from the MAPE of the level of ROA which shows the smallest percentage number of the four variables.

It is important to know that the level of ROA in Islamic banks owned by the government of Indonesia shows the level of profits achieved by banks in a certain period that are sourced from the total assets they have.

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