

Cointegration Of Oil Price, Exchange Rate And Fed Rate To Bank Performance

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Abstract: This research aims to explore Cointegration of Oil Price, Exchange Rate and Fed Rate to Bank Performance. This research uses graph analysis and Dickey Fuller to test cointegration for period data 2008 to 2018. The result is Bank performance which is RAROC and EVA has cointegration with Oil Price, but it does not integrate in long term between Fed Rate and Bank Performance. Exchange and RAROC also cointegrated to RAROC, but it does not cointegrate with EVA.

Index Terms: Bank Performance, RAROC, EVA, Oil Price, Fed Rate, Exchange Rate, Cointegration.

1. INTRODUCTION

Bank in Indonesia become an institution to push all aspect of economy. Based on Data of Central Bank, bank Asset grew by average 12,32% per annum which is from IDR 3,008.85 at the end of 2010 to IDR 8.562.97 at the end of 2019. Credit grew more than asset growth by average of 13.87% per annum that grew from IDR 1,765.84 at the end of 2010 to IDR 5683.76 at the end of 2019. Third party Fund grew less than credit growth by average of 11.03% per annum which grew from IDR 2,338.82 at the end of 2010 to IDR 5998.65 at the end of 2019. This data shows us that banking is very important and government should give big tension to this sector. Research in Bank Performance is still to get big tension and have challenging from regulator, practitioners and society. Bank Performance could be indicated mostly by ROA and ROE. Hasan et.al [16] explored bank performance using ROA and ROE in Indonesia. Hadi et.al [13] studies ROA and ROE in Middle East. Menicucci and Paolucci, [28] investigated determinants of bank profitability using ROA and ROE. Hakimi et.al [14] explore RAO and ROE in Tunisian Banking Sector. Lall [22] used ROA and ROE to measure bank performance Crisis Period in USA. Staikouras and Wood [37] investigated ROA and ROE in European Bank. Hoffmann [17] studies ROA and ROE in USA Banking Industry.

Furthermore, Academician investigated about bank performance, because ROA and ROE do not consider in Risk which is Bank mostly transform the risk to do its operation. Merton and Perold [29] stated that calculating return on capital of bank should consider risk. Zaik et.al [41] stated that RAROC performance measurement system has become a key decision-making tool at Bank of America. Turnbull [39] also suggested RAROC as toll to value bank performance. Baer et.al [2] also explored RAROC as a measurement of bank Performance. Manurung et.al [26] explored Bank Performance using RAROC. Naimy [30] studies RAROC as measurement of Bank Performance in Lebanese Bank. Lima [24] investigated RAROC to become a measurement in Brazil Bank. Petria et.al

[32] discuss Bank performance using RAROC in EU 27 banks systems. Saha et.al [36] explored RAROC as a measurement of Bank Performance in Malaysia. Those researchs indicate that academician try to promote RAROC and EVA as a measurement of bank performance. Oil price become a considering for this research to investigate the contribution to bank performance. Poghosyan and Hesse [33] studies Oil Price and bank performance for Major Oil-Exporting Countries in the Middle East and North Africa. Lee and Lee [23] discussed bank performance and oil price in China. Darko and Kruger [5] studies Determinants of Oil Price Influence on Profitability Performance Measure of Oil and Gas Companies: A Panel Data Perspective. Rotimi and Ngalawa [34] explored Oil Price Shocks and Economic Performance in Africa's Oil Exporting Countries. Effendi [7] studies Oil Prices and Macroeconomic on the Islamic Banking Performance in OPEC Member Countries. Those researchs has contribution to enhance research in Oil price and bank performance. Fed Rate is a macroeconomic variable and external factor in a research that company is unit analysis. Fed Rate is policy rate in USA even some countries use it as also policy rate. Genay and Podjasek [11] and Malik et.al [25] studied impact interest rate to bank profitability. Borio et.al [3] investigated the influence of monetary policy on bank profitability. Ahmed et.al [1] studied Interest Rate and Financial Performance of Banks in Pakistan. Hancock [15] explored Bank Profitability, Interest Rates, and Monetary Policy. Flannery, M. J. [10] investigated Market Interest Rates and Commercial Bank Profitability. This research also discusses cointegration of Fed rate to Bank performance. Exchange rate is a macroeconomic variable that discuss value a currency to another currency. A Country will be said a good economic if their currency will be change to another currency less than one unit. Exchange rate also become a variable to affect the bank performance. Elhussein and Osman [8] studies Exchange Rate fluctuations to bank performance of Sudan. Kemisola et. al [19] explore exchange rate to bank performance of Nigeria. Ngan [31] investigated exchange rate to Vietnam's bank performance. Chamberlain et.al [4] studied Exchange rate to U.S. and Japanese banking institutions. This research also includes exchange rate to discuss cointegration of exchange rate to bank performance. Based on the previous explanation, mostly research in bank performance studies about affect financial ratio, oil price, interest rate and monetary policy on bank performance. There is limited research about cointegration about oil price, Fed Rate and exchange rate to bank performance, so why this research wants to investigate it.

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2. THEORETICAL REVIEW

Bank is an intermediary institution from surplus units to deficit units that manage by some professional to get profit for its operation. As a bank, they collected fund or money from the surplus unit or household and distribute to deficit units or company, and the bank get margin as a return to operate the bank. Bank has four tasks to transform which is value, time, risk and liquidity (Manurung, [27]). Bank needs the high capital to operate it as requirement the banking regulator or central bank of a nation. The Capital of Bank will grow as much as profit that bank be gotten it. Then, the capital of bank could be arranged as follows:

$$\left. \begin{aligned} E_1 &= E_0 + \pi_1 \\ E_2 &= E_1 + \pi_2 = E_0 + \{\pi_1 + \pi_2\} \\ E_n &= E_0 + \{\pi_1 + \pi_2 + \dots + \pi_n\} \end{aligned} \right\} \quad (1)$$

E_1 is capital bank on year – 1 and grow from on year – 0 by profit (π_1) then it grow again by profit on year – 2 (π_2), so total Capital become E_2 as mention in equation (1). Bank could increase their capital through profit ($\pi_1, \pi_2, \dots, \pi_n$) and issue shares to other people or public (Svitek, [38]), and also issue long term debt is known Subordinate Debts (Kleff dan Weber, [21]). Profit of the bank could be calculated as follows:

$$\pi = (1 - T)(r * L - i * D) \quad (2)$$

T = tax
L = Loan
D = Deposits
r = rate of Loan
i = rate of deposits

If $L = (1 - \alpha) * D + E$, which is α as reserve requirement by central bank that it provide by bank (Jiang, [18]). Then, equation (2) could be rewrite (Manurung et.al [26]) as follows:

$$\pi = (1 - T) * [r * \{(1 - \alpha) * D + E\} - i * D]$$

$$\pi = (1 - T) * [r * E + \{(1 - \alpha) * r - i\} * D]$$

$$(\pi/E) = (1 - T) * [r + \{(1 - \alpha) * r - i\} * (D/E)] \quad (3)$$

(π/E) is known as Return on Equity (RoE). If we want to make equation (3) to become (π/A) , is known as return on asset (RoA), Equation 3 could be rewrite as follows:

$$(\pi/A) = (1 - T) * [r * (E/A) + \{(1 - \alpha) * r - i\} * (D/A)] \quad (4)$$

If $E = A - D$, so Equation (4) could be rewritten as follows:

$$(\pi/A) = (1 - T) * [r + \{(-\alpha) * r - i\} * (D/A)] \quad (5)$$

Equation (3) dan (5) are first indicator to see bank of financial performance for practitioners, academician and Regulator. If we want to maximize for each RoA and RoE, then we could

derive first order for equation (3) with (D/E) and equation (5) with (D/A). The second indicator for both academician and practitioner is known Risk Adjusted Return on Capital (RAROC). This RAROC has considered risk to calculate it as follows:

$$RAROC = \frac{\text{Revenue} - \text{Cost} - \text{Expected Loss}}{\text{Risk Required Capital}} \quad (6)$$

Then Klaassen and van Eeghen (2015) arranged the formula of RAROC to become factor of RoE as follows:

$$RAROC = \frac{R - C - EL}{RRC} = \left\{ ROA - \frac{EL}{EA} \right\} * \frac{EA}{TA} * \frac{TA}{RRC}$$

(7)

R = revenue

C = Cost

EL = Expected Loss

EA = Earning Assets

TA = Total Assets

RRC = Risk Required Capital

Based on the Equation (7), Risk, ROA, ratio Expected Loss to Earnings Asset, ratio Earnings Assets to Total Assets are determinant of RAROC. This formula could be expanded to add macroeconomics variable which is to explore in this research

3 METHODOLOGY

3.1. Methodology Research

As mentioned previously, this research wants to explore cointegration Bank Performance with Oil Price and Fed Rate. Bank Performance is measured by RAROC and EVA. Methodology for research objective will use two method which simple method using Graph analysis and statistical analysis method. Graph analysis is a technique to arrange data both variables putting together. If the graph shows both variable together in the short time and until long term, it means both variable to indicate cointegration. The Cointegration introduced by Granger [12]. Understanding Cointegration is stated as follows:

Consider two series integrated of order one, Y_t and X_t , and suppose that a linear relationship exists between them. This is reflected in the proposition that there exists some value β such that $Y_t - \beta X_t$ is $I(0)$, although Y_t and X_t are both $I(1)$. In such case it is said that Y_t and X_t are cointegrated and that they share a common trend (Verbeek, [40], p. 328).

Cointegration also use to investigate equilibrium the two variables in short and long run (Engle and Granger, [9]). There is seven method to test Cointegration (Engle and Granger, [9]). The Significance level and DW-Statistic and Dickey Fuller Test which is tool to test Cointegration as follows:

Table 1: Critical Value Values for Testing for Cointegration

Level of Significance. DW-Statistic Augmented DF t-Statistic

Level of Significance	DW-Statistic	Augmented DF	t-Statistic
1%	0.511		3.77
5%	0.386		3.17
10%	0.322		2.84

Sources: Engle and Granger, [9].

3.2. Data

Data for this research was collected from the company that they published to public in newspaper or their website as mandatory requirement from government and Indonesia Stock Exchange, but macroeconomics data is obtained from Central Bank of Indonesia. Data is annually data that collected for period of 2007 to 2018, that only twenty-five companies have financial statement for the period. Then, Risk Adjusted Return on Capital (RAROC), Economic Value Added (EVA) and Exchange Rate (EX), Fed Rate (FED) and Oil Price (OILP) are calculated that is based data collection. Data OIL Price are transformed to logarithm natural.

4. Analysis and Discussion

This section will divide into two analysis which is Graph analysis and Statistical Analysis.

4.1. Descriptive Analysis

This subsection will discuss descriptive analysis using data of Table 2 at below. Table 2 show the figure of Minimum, Maximum, Average, Standard of Deviation, Skewness and Kurtosis.

Table 2: Descriptive Statistics

	RAROC	EVA	OILP	Fed	EX
Minimum	-15.19%	-547.56	37.04	0.50%	8996.00
Maximum	50.96%	1115.72	98.56	4.75%	14390.00
Average	20.66%	480.77	67.91	1.32%	11629.27
Standard of deviation	21.82%	526.748	22.9724	1.65%	2052.13
Skewness	-0.27754	-0.8161	0.1428	1.8532	-0.1102
Kurtosis	-1.05793	-0.2290	-1.8027	1.8719	-1.7922

Sources: Researcher Process

Then, As mentioned previously, RAROC is a measurement of performance in bank, this ratio have minimum RAROC of -15,19%, maximum of 50.96%, average of 20,66%, and standard of deviation of 21.82% for period of 2008 to 2018. This figure stated that there is a negative of RAROC, and fluctuation of RAROC is very high by figure of standard of deviation of 21.82%. Return also is to high because it was 3 times to government risk rate around of 6% in this period.

EVA is also a measurement of putting money to the company for investment during one period. EVA has minimum of IDR 547.56, maximum of IDR 1,115.72, average of 480.77 and standard of deviation of 526.758. There is a negative result for putting money to the company for investment. It means that there is a probability the result to become negative. The fluctuation of EVA value is to high and the variation will indicate the risk to fund owner in the company. It means that also give us a sign to be carefully for investment.

Oil price has impact to a country, if the country very

depends to this product such as Indonesia and other countries which is produce oil. Oil prices have minimum of US\$37.04 per barrel, maximum of US\$98.56 per barrel, average of US\$67.91 per barrel and standard of deviation of 22.97. This data stated that oil price has high fluctuation for the research period of 2008 to 2018. This figure also has impact to the economics especially for banking industry through their client Fed Rate is a policy rate in the USA Government and business environment. Most countries also use it as policy to their countries. Fed rate has minimum of 0.5%, maximum of 4.75%, average of 1.32% and standard of deviation of 1.65% for period 2008 to 2018. This figure stated that USA government still use low interest to push the economics and also does not like investor to come to in this country. USA Government might be using personal approach to get high fund from high network to enter to USA. Exchange rate is a measurement of how better an economic of a country compared to another country. Mostly developed countries is better than developing countries. Indonesia currency has minimum of exchange rate of IDR 8,996 /US\$1, maximum of IDR 14,390 / US\$1, Average of IDR 11,629 / per US\$1 and standard of deviation of 2,052.13 for period of 2008 to 2018. This figure stated that fluctuation exchange rate is to high. It also means the investor could get capital gain, if they want to trade their money. This exchange rate variable also become a variable in this research to discuss cointegration with bank performance.

4.2. Cointegration

As mentioned previously, this research uses two method analyze cointegration oil price and Fed Rate to bank performance which is simple method and statistical analysis method. Simple method uses Graph analysis. Figure 1 shows plot data or graph of Oil Price and RAROC. In the short term, the line of Oil Price and RAROC are moving together and the middle of period also move together, but they do not move together in the last three years. Then, we conclude that the Oil Price and RAROC move together which is known as Cointegration.

Figure 1: Oil Price and RAROC

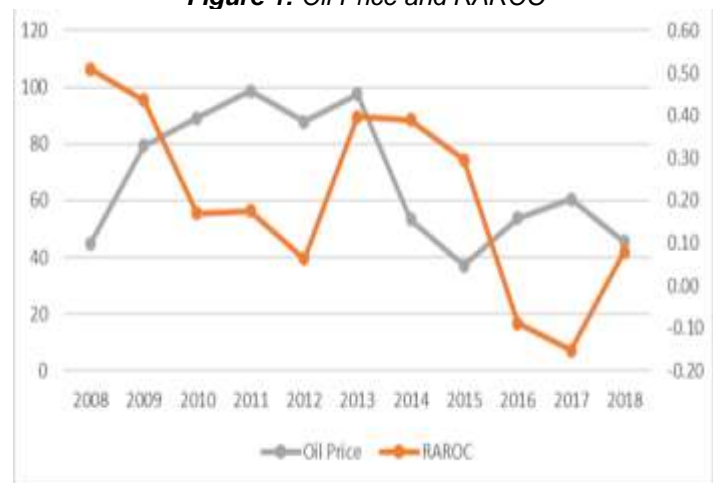


Figure 2 shows plot the data of EVA and Oil price that show moving together from short term to long term. This figure is different with Figure 1. EVA and Oil Price is similarly moving together and there is never opposites position. This research

conclude that Oil Price and EVA has cointegration.

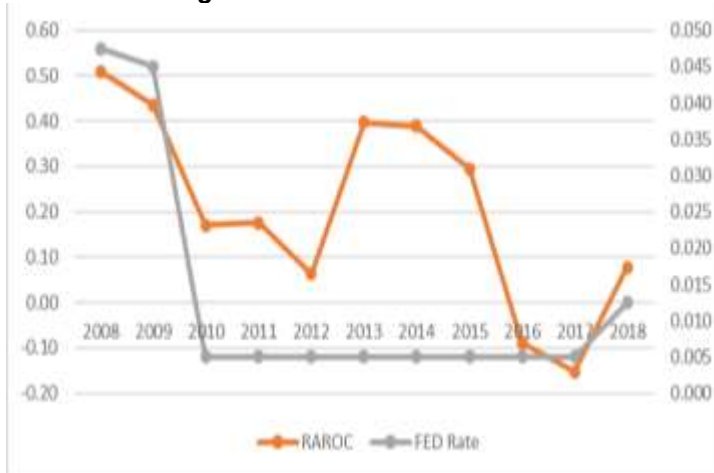
cointegration with bank performance.

Figure 2: Oil Price and EVA



Figure 3 shows plot data of RAROC and FED Rate for period 2008 to 2018. The plot data has moving together for the first five year in the period research and also the moving together in last two years. US Government has decided to flat the Fed Rate for six years. Fed Rate is policy rate to determine by FED, it means that do not empirical data. Even the Fed Rate is flat, RAROC has fluctuation in the middle of research period, this research concludes that the FED rate and RAROC has cointegration for period of research.

Figure 3: Fed Rate and RAROC



Next Figure 4 shows the plot data of EVA and FED Rate, which is similar with Figure 3. In the shorts term EVA and Fed Rate has moving together in the beginning period of research and it also happens is the last two year at the end of research period. In the middle period of research, starting third year, Fed Rate drop the rate to bottom figure of 0.25% and flat until 2017 then increase in the 2008. EVA has fluctuation in the middle of research period. Fred Rate might be similar the moving together, because Fed Rate is as policy rate that it used to stimulus or control the USA Economics. Base on the graph, this research concludes that FED Rate and EVA has moving together which is known as cointegration. Furthermore, this research concludes OIL Price and EVA has

Figure 4: EVA and Fed Rate

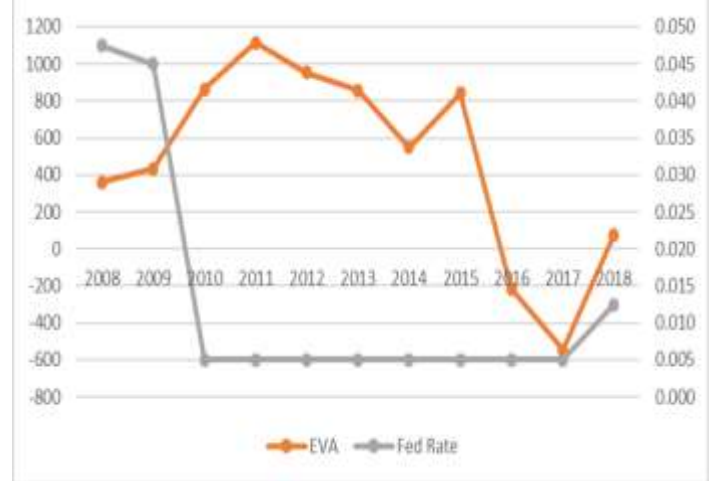


Figure 5 shows the plot data of RAROC and Exchange Rate for period 2008 to 2018. This Figure 5 is similar with Figure 1 and Figure 2 that RAROC and Exchange are moving together in the short even in the long term. It means that RAROC and Exchange cointegrated for period of research of 2008 to 2018. RAROC from 2014 to 2015 does not similar moving with Exchange. But it could be said that RAROC and Exchange rate has cointegration.

Figure 5: RAROC and Exchange Rate



Figure 6 shows the plot data of EVA and Exchange Rate for period 2008 to 2018. This Figure does not similar with Figure 5 and Figure 1 that could be stated different. Some year in the short, the EVA and Exchange Rate move together in same direction. This research conclude that EVA does not have cointegration with exchange. This result similar to Fed rate

and EVA.

Figure 6: EVA and Exchange Rate



Dickey Fuller Test

This section will discuss to test cointegration for Bank Performance with Oil Price and Fed Rate. Engle and Granger (1987) stated that there is seven method to test cointegration. This research only uses Dickey Fuller test which is Augmented Dickey Fuller test. Dickey Fuller test introduce to test stationary data. Level of significant is very important when it compared to the result of this research. We use level of significant of 15%, because business could always use error until to 20% to run it. Dumcic et.al (2014) use alpha for 15% for his research. RAROC and Oil Price significantly cointegrated at level of level of 15%. EVA and Oil Price significantly cointegrated at level of level of 10%. RAROC and FED Rate does not significant cointegrated at level of 15%. EVA and FED Rate also does not significant cointegrated at level of 15%. This result stated that Bank Performance does not significant Cointegrated with FED Rate, because FED Rate is policy rate which data does not empirical. RAROC and Exchange Rate significantly cointegrated at level of significant of 15%. EVA and Exchange rate does not cointegrated at level of significant of 15%. This result is similar with conclusion between FED Rate and EVA.

5 CONCLUSION

This research has strong in research novelty which is cointegration bank performance and Oil Price and FED Rate, because there is no research to discuss cointegration bank performance with oil price and Fed Rate. This research has similar finding in simple method and statistical analysis method. The finding is the bank performance cointegrate to Oil Price and Fed Rate. It means, that Oil price and Fed Rate increase, it will affect bank performance to increase or decrease.

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