THE INFLUENCE OF MONETARY POLICY (BI RATE) ON PROFITABILITY OF COMMERCIAL BANKS IN INDONESIA

Lia Amaliawiati
Faculty of business management
Widyatama University
lia.amaliawiati@widyatama.ac.id

Edi Winarso
Faculty of economy
Widyatama University
edi.winarso@gmail.com

ABSTRACT

One of the monetary policy of the Central Bank Indonesia interest rate is called BI rate (Bank Indonesia Rate), changes in the BI rate will affect the money market interest rates, deposit rates and lending rates although the mechanism of monetary policy is in the process requires time (time lag).
BI rate effectively influence the performance of the bank. Determination of interest rates either by bank management is one of the keys to success in obtaining bank profits (profitability by using ROA and NIM).
This study aims to: (1) analyze how the effects of changes in the BI rate to the level of bank profitability (ROA and NIM), (2) How long does it take (time lag) changes effective BI rate will significantly influence the level of profitability, and (3) what variables affect the profitability of the conventional banks. Analytical techniques that will be used in this study is multiple regression is to obtain an overall picture of the relationship and influence between the dependent and independent variables.

The object of research is the profitability of conventional commercial banks listed on the Indonesia Stock Exchange since November 2005 (the year from the enactment of the BI rate) through October 2012 using data times series monthly. Determination of the sample is using simple random sampling. Methods of analysis using multiple regression analysis based on secondary data, and to determine the accuracy of the model tested on some classical assumptions underlying the regression models include the test for normality, multicolinearity, and autocorrelation heteroscedasticity.

BIRate has negative effect on ROA and showed a statistically significant number, but BI Rate did not show a statistically significant rate by setting the standard error of 5% on NIM and has negative direction. Influential BI Rate to ROA is happened with 1 month time lag, meanwhile BI Rate was not having an effect on the NIM with 1 month time lag. Based on the semi-partial correlation coefficients, BIRate very great influence in determining of ROA ranks, meanwhile Operational Cost to Operational Income (OCTOI) is great influence to determine of NIM, while BI Rate ranks last of the NIM

Keywords: BI Rate, Loan Rate, LDR, CAR, OCTOI, NPL, ROA and NIM

1. Background

The aim of Bank Indonesia (Central Bank) as it is said in continent No.3/2004 item 7 is to reaching to take care of the stability of rupiah exchange, for obtaining that Bank Indonesia (BI) has three obligation, one of them is to keep monetary policy with any kind of facility which can be used, such as: open market operation, discount policy, or keep interest level, keeping minimum obligation deposit, credit management.

The final aim of monetary policy in Indonesia is to keep and to care of stability of rupiah ezchane rate which one of them reflected from low inflation level and stable for reaching the aim BI keeps BI rate

policy as an instrument the main policy for influencing the economic activity, mechanism of BI rate changing can happen through inter action between central bank, banks, fund sector, and real sector. Operationally, monetary policy reflected by keeping interest rate policy (BI rate) is hoped, it will influence interest rate of money market, deposit rate, and credit rate of bank especially in general bank which runs interest system as the price (conventional principle of general bank).

BI can use for monetary policy expansively through decreasing the rate to encourage economic activity, if the economic is fatigue, the decreasing of BI rate can decrease credit rate so the demand of credit from company and household will increase, the decrease of credit rate will also decrease the capital of company to do investing, this will increase the consumption of the activity so that economic activity is getting better. On the contrary if the depression of inflation is getting higher, BI will response by increasing BI rate to slow down economic activity which is faster so it decreases inflation depression.

Transmission mechanism of monetary policy works and needs time (time lag). If the bank sees the economic risks is high enough, the response of the bank to the increasing of BI rate is usually very low, also if the bank is consolidating to make the capital better, the decreasing credit rate and the increasing credit is uncertain responded by increasing credit. In the side of demand, the decreasing credit rate is also uncertain responded by the increasing demand of credit from society if the prospect of economic is fatigue.

The bank rate can become cost of fund which should be paid for money keeper, but in the other side it can also be income which is received by the bank because of credit giving. The difference between credit rate and saving rate is called interest spread, the value will negative if saving rate is bigger than credit rate, and on the contrary it will be positive if credit rate is bigger than saving rate. This rate difference become a biggest profit at conventional bank, the good keeping rate of the bank management is one of the keys success of the bank in getting profitability and next it will influence the bank performance, the good performance bank is hoped to increasing trusteeship of the society to the bank itself and it will make the system better as a whole. On the other side the performance bank can be also as a standard of the health of the bank.

The profitability is one of indicator valuable of the healthy level of general bank, the measure of the profitability used by BI (SE BI No. 13/24/DPNP Oct 25th, 2011) is the Return On Assets (ROA) and Net Interest Margin (NIM). Return On Assets (ROA) is used to measure the company activity in resulting profitability by using for active which is had. In this case, ROA is the ratio between profit before tax to the approximate total assets, the bigger of ROA determine the better of performance bank, because the return level is getting better if ROA increase so the company profit will increase too. Net Interest Margin (NIM) is used for measuring the capability of bank management in arranging productive active to result net income interest rate. The net income interest rate is gotten from the income interest rate minus expense interest rate.

Table 1. Devepoling of BI rate, deposit rate, credit rate, ROA and NIM in 2005 untill 2011

	BI Rate (%)	deposits interest rate(%)	Loan interest rate(%)	ROA (%)	NIM (%)
2005	12,75	10,35	15,66	2,55	5,63
2006	9,75	11,63	15,10	2,64	5,80
2007	8,00	8,24	13,01	2,78	5,70
2008	9,25	10,34	13,99	2,33	5,66
2009	6,50	9,54	12,55	2,60	5,56
2010	6,50	7,63	11,86	2,86	5,73
2011	6,55	6,84	11,69	3,33	5,91

Source : Bank Indonesia

Table 1. shows BI has changed BI rate from years to years which shows the decreasing, the decreasing of BI rate has decreased interest general bank as deposit rate, and credit rate. The decresing of BI rate, deposit rate, and credit rate begins 2005,2006, and 2007 shows the increasing ROA to 2,55%, 2,64%, and 2,28%, meanwhile in 2008 BI rate is raised up and the value of ROA decreases to 2,33%, after 2008 BI rate is decreased again and ROA increases, but in 2011 ROA is increase as well as increasing in BI rate.

NIM value based on table 1. Shows when BI rate is decreased from 2005 – 2007, NIM value increases from 2005 – 2006 but it decreases in 2007, then BI rate is increased to be 9.25% in 2008 and it is decreased again until 2010 but NIM value decreases until 2010 and then it increases in2012 when BI rate is increased.

Based on the changing BI rate to the changing of ROA and NIM it fluctuates, it means when BI rate is decreased it is not always responded by increasing of ROA and NIM, on the contrary when BI rate is increased, ROA and NIM is not also decreasing.

2. Problem Identification

Due to background, the problem will be examined in this research is:

1) How the effects of changes in the BI rate to the level of bank profitability (ROA and NIM)
2) How long does it take (time lag) changes effective BI rate will significantly influence the level of profitability
3) What variables affect the profitability of the conventional banks. Analytical techniques that will be used in this study is multiple regression is to obtain an overall picture of the relationship and influence between the dependent and independent variables.

3. The Aim of Research

1) Knowing the effects of changes in the BI rate to the level of bank profitability (ROA and NIM)
2) Knowing how long take (time lag) changes effective BI rate will significantly influence the level of profitability
3) Knowing what variables affect the profitability of the conventional banks. Analytical techniques that will be used in this study is multiple regression is to obtain an overall picture of the relationship and influence between the dependent and independent variables.

4. The Utility of Research

1) Theoritically : Developing of the implication of monetary policy (keeping rate level) to the performance bank
2) Practically : In bank sector it can be used for the basic to make policy decision financially for increasing the working when central bank announces monetary policy especially BI rate.
3) Academically : This research is hoped to give literature contribution in the field of the bank and can encourage the developing the science of bank financial

5. Literature and Hypothesis Development

BI Rate Definition

BI rate is policy rate reflects the behave or stance of monetary policy which is kept by Bank Indonesia announce the public.

BI Rate Function

BI rate is announce by governor Board of Bank Indonesia every meeting of governor board monthly and it is implemented to the operation of monetary which is done by BI through to liquidity of arrangement in money market to reach operational target of monetary policy. The operational target of monetary policy is reflected to the developing of the rate of money market interbank overnight (PUAB O/N). The movement of PUAB rate is hoped, it will be followed by the developing of deposit rate and in the return the credit rate of the bank with condition of other factors in economic, when the economic is fatigue, BI can use monetary policy which is expansive through the decreasing the rate to encourage economic activity. The decreasing of BI rate will decreasing credit rate so the demand of credit from company and household will increase, the decreasing of credit rate will also decreases cost of capital of company to invest, and this will increase consumption activity and investment so economic activity will be more desire and is seen from the bank side it will increase bank performance (Bank Indonesia).

BI Rate Monetary Policy

Bank Indonesia has the aim to reach and to take care of stability of rupiah exchange, the aim is said in UU No.3, 2004 item 7 about BI, this means the rupiah exchange is the stability to the price of things and service reflected in inflation. To reaching that aim, since 2005 BI has keep the framework monetary policy with inflation as the aim target of monetary policy (Inflation Targeting Framework). In operational, BI has a rights to do the monetary policy through the keeping monetary target (such as money supply or interest rate) with the main aim of keeping inflation target which is kept by government. Operationally, monetary policy is reflected by keeping the rate policy (BI rate) which is hoped it will influence money market rate and deposits rate and bank credit rate, the changing of this rate as he result will influence output and inflation (Bank Indonesia).

The changing of BI rate become one of the factor for the bank to determine the price of interest which is ordered to the public. The interest rate can influence the will and the interesting of public to invest their money to the bank through products which are ordered. The effect of the bank itself is the more money interested by the public to the bank, it will increase the capability to spread money in credit so it is hoped. It will increase the income of interest and then it will increase the profit of the bank, so it influence also to the bank performance which is the interest as the main factor of income.

Bank Performance

Bank performance can be meant as a result which is reached a bank in managing the sources belongs to the bank effectively and efficiently for reaching the aim which is right by management or the bank performance can be used for analysing the management has arranged the bank efficiently, productively and good planning. The technic used knowing information of bank performance by arranging the ratio based on the written post to the report financial. As suitable as the decision has been made, there is some ratio which should be obliged to take care by industry of bank which has an aim the healthy of the bank can be kept, beside that in order to pay attention for the principal of prudential. The level of the healthy central bank which operates effort activity conventionally is arranged by BI in SE BI No.6/23/DPNP Mei 31st 2004. The mark of the bank healthy includes capital, assets quality, management, profitability, liquidity, and market risk.

Financial Ratios

The measure of financial ratio to determine bank performance is:

A. Return On Assets (ROA)

   Ratio is used for measuring the company capability in effort to reach the profit by using active which is belonging to ROA as one of the ways to mark the effectively in using active the company in resulting profit. The higher of ROA it means the company is more effective in using active to result profit.

B. Capital Adequency Ratio (CAR)
CAR is an indicator from the welfare of capital of a bank which aims to keep the continuing the effort solvability. The setting of the capital which is good enough is the important thing to balance the dependable from the public source, in other hand, CAR in the ratio of bank performance to measure the capital belongs to the bank to effort active which result risk, such as credit which is given.

C. Operational Cost to Operational Income (OCTOI)
The operational cost is the cost which is come out by the bank in running effort activity especially like interest cost, market cost, employee cost, and other operational cost.
The income operational cost is the main income bank which is gotten from the placing of fund in the form of credit and other operational. The smaller of OCTOI shows more efficient of the bank in doing effort activity

D. Net Interest Margin (NIM)
NIM is used for measuring profit level or bank profit to productive active which is comparation between net interest income to approximate productive active. The net interest income is gotten from the interest income minus interest cost. Productive active counted is productive active which is a result of interest (interest bearing assets), so to keep a good NIM it needs to look at the change interest rate. The increasing profitability to chain to the chain interest rate as suit as NIM that is the difference rate income minus by interest cost.

E. Non Performing Loan (NPL)
NPL means debitur including 3, 4, 5 from credit group, that is substandard, doubtful, loss. The higher operational scale of the bank so the more decreasing the aspect of controlling, so NPL is higher or credit risk is higher (Wisnu Mawardi, 2005). NPL reflect credit risk, the smaller of NPL cause the smaller of credit risk is which is obliged by the bank. The good NPL is under 5%

F. Loan to Deposits Ratio (LDR)
LDR is a ratio which measures the bank capability to effort financial obligation which has been afforded. Based on LDR it will know how far the effort of management do the placing the fund. LDR is accounted from the comparation between totally credit with deposit. Total credit meant credit saving, giro, and time deposit (not include interbank). The best LDR standard is up to 85%, to get optimum LDR the bank should keep NPL.

Recently Research

The profitability is the measurement of bank performance in managing the effort and it is the end of the result which is gained by management from every policy and it can be used for decision making. Ratio is used for measuring profitability level at this research is the measure of profit which is used by Bank Indonesia (written BI No. 13/14/DPNP Oct 25th 2011) it is ROA and NIM. The valuable of bank profit is influenced by some factors such as down below:

1. Molyneux & Thrnton (1992), dan Demirguc-Kunt & Huizinga (1999) has e prove empirically, it shows the high of interest rate significantly will influence to the bank profit high and positive relation, but Naceur (2003) shows it has negative relation between interest rate and bank profit.
2. The research by Syahru Syarif (2006) shows variable CAR partially and NPL has an influence and significant to the NIM variable, meanwhile ROA and LDR does not have influence significantly to the NIM variable, in simultaneously CAR, NPL, OCTOI, ROA and LDR variable has influenced positively significant to the NIM variable.
3. The research by Ponttie Prasnanugraha P (2007), ROA is influenced by CAR, NPL, LDR, OCTOI, and NIM

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4. The research by Febriana Dwijayanthy and Prima Naomi (2009) said that BI Rate does not have an influence to the bank profit with the variable of another independent is inflation rate and exchange rate
5. The research by Bambang Sudiyanto (2010) said that Deposit, CAR, has positive and significant to the bank performance (ROA). Operational cost (OCTOI) has a negative and significant to the bank performance (ROA), meanwhile LDR has positive and not significant to the bank performance (ROA)

The Relationship between BI rate, CAR, LDR, OCTOI, NPL and ROA and with NIM

A. The relation of BI Rate, Deposit Rate, Loan Rate with ROA and NIM
   The keeping BI rate is done by central bank (BI) has an aim in other that the interest rate (both of deposit rate and loan rate) in economic has also changed as it changes in BI rate. The changing of interest rate is done by bank management will influence interest income and interest cost so it will influence the net profit for the bank which does efforts conventionally. If BI rate is decreased, the credit will be decreased and will increase credit demand from public, than the rate income increases so the bank will get benefit or in other words will increase profitability (ROA and NIM increase).
B. The relation of CAR with ROA and NIM
   The capital is the most important factor for the bank in developing effort and collect un profit risk or the failures in reaching profit, the higher of CAR will be the higher bank capability in paying un profit risk and the higher the bank will effort the need of liquidity so the higher customer trust level to the bank. The higher CAR shows the credit flow optimally so it will increase profit, and the end it will increase the value the ROA and NIM.
C. The relation of LDR with ROA and NIM
   The measuring to measure liquidity is LDR, that is how the deposit of bank is flown for credit. The higher of the cost flowing in credit is relative compared to the public saving in a bank will consequently influence how the risk is obliged by bank but it will probably be bigger the bank in getting credit rate (with the bank assumption can flow credit effectively) so the bank profit will increase, so the higher LDR, the higher ROA and NIM is
D. The relation of OCTOI with ROA and NIM
   OCTOI is the tool for determining whether bank management use for all products factor effectively or efficiently. OCTOI is the comparation between operational cost and operational income. The smaller of OCTOI value will show the bank efficiency in running effort so it is hoped, the profit bank increase (ROA and NIM)
E. The relation of NPL with ROA and NIM
   NPL is the probability risk the bank will get un profit as the cause of credit is not paid by the debitur. NPL show the capability of bank collectability in collecting credit which has been flown. NPL is percentage of the credit number which has a problem (with the criteria substandard, doubtful, loss). The smaller NPL value, it shows credit has been given effectively and will come profitable so the profitability value will increase (ROA and NIM increase)
F. The relation of NIM and ROA
   NIM reflect market risks which occurs because there is a movement of market variables, where it can loss the bank. The bank which effort conventionally is influenced by the rate risk, the rate risk is measured by the difference between saving rate minus by credit rate which is given or the difference between the cost saving rate totally minus by credit cost totally which has been known by NIM will get bigger to benefit the result of bank effort or in other words, NIM increase it will increase ROA.

Based on the theoretically framework explained before, it is formed the specific of profitability model with the econometric formula:

$ROA = a_o + a_1 BIRate + a_2 Dep\ Rate + a_3 Loan\ Rate + a_4 LDR + a_5 NIM + a_6 OCTOI + a_7 CAR + a_8 NPL$ ……(1)

$NIM = a_o + a_1 BIRate + a_2 Dep\ Rate + a_3 Loan\ Rate + a_4 LDR + a_5 OCTOI + a_6 CAR + a_7 NPL + a_8 ROA_t$ …..(2)

Hipothesis from this research is :

H_1 : BI Rate, OCTOI, and NPL has influenced negatively to ROA and NIM

H_2 : CAR and LDR has influenced positively to ROA and NIM

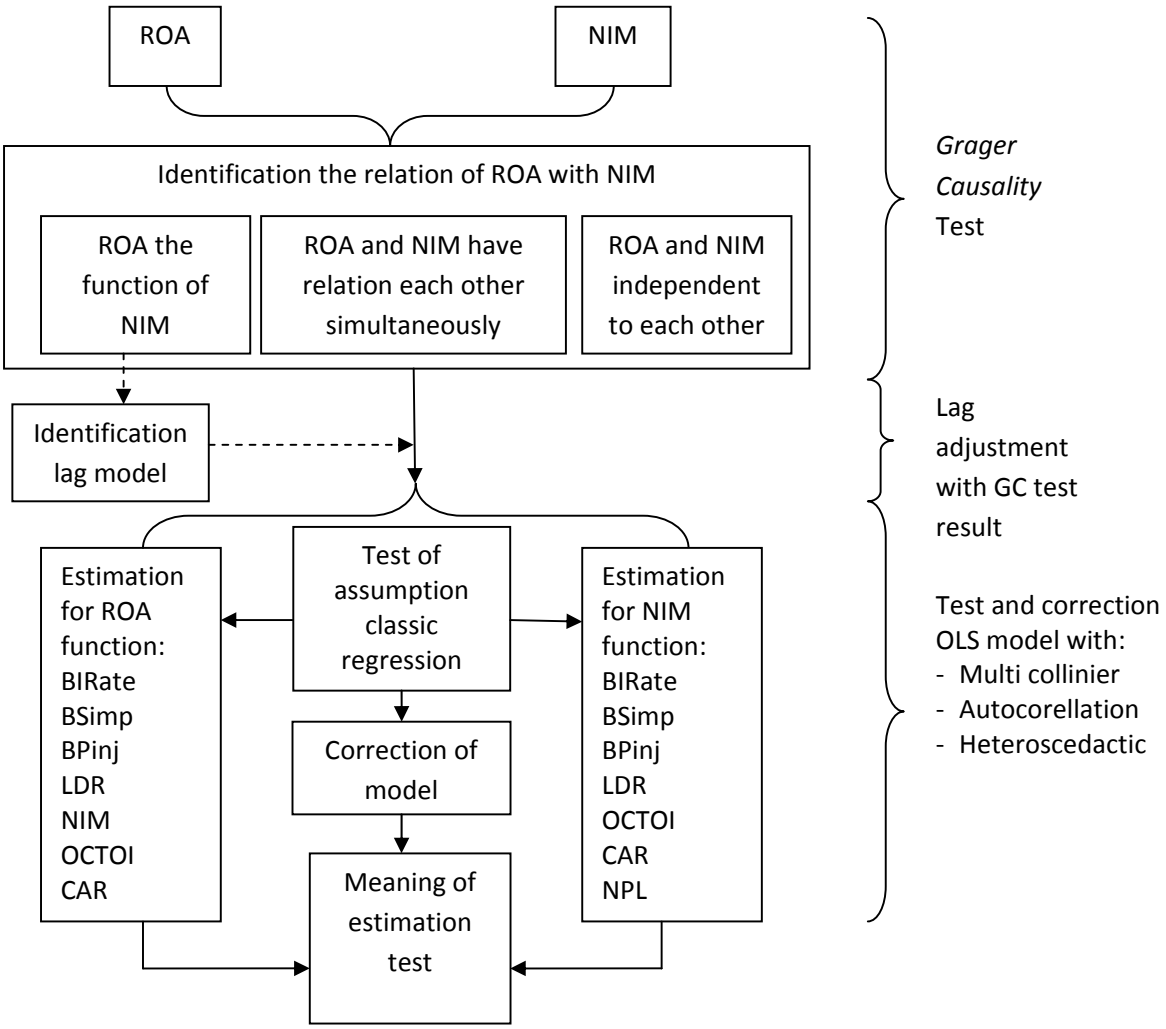
H_3 : NIM has influence positively to ROA

6. Methodology

6.1. Research Design

This research use the method of hypothesis testing empirical study that is hypothesis test which is kept and explained both of consistent and un consistent with theory and research before by using theory alternative which is present.

As suitable as the problem formula and the aim of research, it is arranged research design as below:



Picture 1. Analysis Method Scheme

The explanation of analysis method scheme is:

A. Before profitability model (ROA and NIM) is estimated, granger causality test did before to verify the assumption of relation between ROA and NIM, after it is estimate it will get 4 probability with the result . (Gujarati, 2009) that is:
   1. There is one way causality from ROA to NIM which is indicated significantly to all variables of ROA model
   2. There is one way causality from NIM to ROA which is indicated significantly to all variables of NIM model
   3. There is a simultaneously between ROA and NIM
   4. ROA and NIM is independent to each other

B. After it is clear the relation between ROA and NIM so ROA model and NIM model can be estimated, there are some probable estimation which suits with the result of granger causality test, that is:
   1. Both of model are estimated use for two stage least square (TSLS) if there is relation of two way or simultaneous between ROA and NIM
   2. Each of estimation model partly use for ordinary least square (OLS) procedure if one of the two probability as found:
      1. ROA and NIM is independent to each other, ROA does not influence NIM and NIM does not influence ROA.
      2. ROA influence NIM or NIM influence ROA

3. It is estimated done by ROA and NIM made by using OLS as below:

$$ROA_t = a_o + a_1 BIRate_{t-?} + a_2 Dep\ Rate_t + a_3 LoanRate_t + a_4 LDR_t + a_5 NIM_t + a_6 OCTOI_t + a_7 CAR_t + a_8 NPL_t \quad \ldots\ldots(3)$$

$$NIM_t = a_o + a_1 BIRate_{t-?} + a_2 Dep\ Rate_t + a_3 LoanRate_t + a_4 LDR_t + a_5 OCYOI_t + a_6 CAR_t + a_7 NPL_t + a_8 ROA_t \quad \ldots\ldots(4)$$

   The model (3) is another form model (1) and model (4) is another form from model (2). The difference is formula (3) and (4) is variables of $BIRate_{t-?}$ which influences ROA and NIM. This is because of monetary policy is effective come out by central bank in influencing bank performance which needs time lag. Some lags is needed until monetary policy is effective known significantly from BI rate variable to ROA and NIM

4. To strengthen analysis from the test of estimation, this research is completed by assumption validation which belongs to OLS. This test has a chain with there is or no multicolinerity, heteroscedasticity, and autosorellation. (Gujarati,2009 and Wing Wahyu, 2011)
   1. Multicolinier means inter dependent variables which belongs to perfect correlation or approach to perfect (high correlation coeficient or approach to 1)
      To detect multicolinier in the model there are some ways such as:
      - To detect t-stat and F ratio if R2 is high and F ratio is high, meanwhile a big part or all coefficient regression is not significant (t-stat is very low)
      - Between two independent variables has high coefficient or the high coefficient correlation independent variables is different from regression coefficient .
      - Making regression model inter dependent variable if regression coefficient is significant, so in the model there is multicolinier

      There are some alternatives in missing the problem of multicolinier in the model, that is:
      - Missing one or some variables in the model which has high correlation
      - By aditing data
      - By transforming variables, variables value is backward one year

2. Heteroscedasticity means variables in the model is not the same to all observation, in other words, heteroscedasticity occurs in the form large residual if observation is bigger. Detecting of heteroscedasticity use park test, white test, glejser test, spearmen correlation test or others.
   There are some alternatives in missing the problem of heteroscedasticity in the model, that is:
   - If the variant and residual is known, so it will use weighted least square (WLS method).
   - If the variant and residual is not known, so it will use for white method
   - Using transformation method
3. Autocorrelation, means there is correlation inter member of sample which gets down based on time. To detect autocorrelation in the time of regression model, which is done by Durbin-Watson test of counting d (describing coefficient DW). The value of d will be in about 0 – 4, if $d < d_l$ it means there is positive autocorrelation, if $d_l<d<d_u$ and $4-d_u<d<4-d_l$ it means does not detect there is autocorrelation or not, if $d_u<d<4-d_u$ means there is no autocorrelation; if $d>4-d_u$ there is negative autocorrelation.
   The way to overcome autocorrelation is :
   - If the structure of correlation is known, to overcome this by doing transformation to model, this method is often called generalized difference equation.
   - If correlation structure (ρ) is not known, so overcome this by using the value residual estimated e_t to miss correlation factor, the counting is done by iteration untul getting the value of which is not consist of the autocorrelation problem.

5. The next step is to do hypothesis test by approaching test of significance which includes individual significance (t-test) and simultaneous significance (F-test), test of significance is done by comparing the value of statistic counting which is gotten from the result of estimation with statistic value which belongs to table interval confidence (Gujarati,2009), mathematiccaly, statistical testing of the hypothesis is formulated as follows:
   1. Testing the significance of individual parameters (student-test)
      This test want to see whether the individual effect of each independent variable on the dependent variable (both in ROA and NIM model), the test procedure is as follows:
      - Testing individual for ROA model
        H0: a1 ≥ 0 means BIRate does not influence negative to ROA
        H1: a1 <0 means BIRate has negative influence to the ROA
      - Testing individual for NIM model
        H0: a1 ≥ 0 means BIRate does not influence negative NIM
        H1: a1 <0 means BIRate has negative influence to the NIM

   2. Significance testing parameters simultaneously (F-test)
      The test of independent variables simultaneously is also done to know whether that variables together statistically has a role significantly, At he test is done by test F as follows:
      A. Testing hypotheses about the whole free variable effect on ROA simultaneously.
         H0: a1 = a2 = a3 = a4 = a5 = a6 = a7 = a8 = 0 means that all independent variables does not influence on ROA together
         H1: at least one of independent variable has influence on ROA together
      B. Testing hypotheses about the whole independent variable influence on NIM simultaneously.
         H0: a1 = a2 = a3 = a4 = a5 = a6 = a7 = 0 means that all independent variables does not influence on NIM together
      C. H1: at least one of independent variable has influence on NIM together.

6.2. Operationalization of variables

A. Return On Assets (ROA)

ROA is the ratio of profit after tax or Net Income After Tax to totally assets, with the following :

$$ROA = \frac{Net\ Income\ After\ Tax}{Total\ Asset}$$

Total assets are used to measure a bank's ROA is the sum of productive assets such as the placement of securities (such as Certificates of Bank Indonesia, Money Market Securities, placement of the shares of other companies, placement in Call Money or Money Market), and placement in the form of loans (consumer loans and productive both to the individuals and institutions or companies).

B. Net Interest Margin (NIM)
Ratio Net Interest Margin can be calculated as follows:

$$NIM = \frac{Net\ Interest\ Income}{Credit\ Outstanding}$$

Net interest income derived from interest income minus interest expense. Productive assets is the placement of assets by the bank will result in benefits such as placing to other banks, securities, investments, and loans.

C. Adequency Capital Ratio (CAR)
CAR is measured from the ratio of capital to risk weighted assets (RWA), using the following formula:

$$CAR = \frac{Individual\ Equity}{RWA}$$

Individual equity is derived from the company (bank), which consists of paid up capital, undivided profits and reserves of the bank formed. While the calculation of the amount of Risk Weighted Assets (RWA) is done by calculating the weighted sum of the values of assets which are used as a factor weighing estimate the magnitude of risk inherent in each element of the bank's assets.

D. Operating Cost to Operating Income (OCTOI)
OCTOI is the ratio of operating expenses to operating income. Operating costs are costs incurred by the bank in connection with its principal business activities (such as interest expense, labor costs, marketing costs and other operating costs). Operating income is the main income of the bank's interest income earned from the placement of funds in the form of credit and other operating income, with the formula:

$$OCTOI = \frac{Biaya\ Operasional}{Pendapatan\ Operasional}$$

E. Non Performing Loan (NPL)
Non Performing Loan (NPL) is one of the measuring from business risk ratio indicates the extent of credit risk problems that exist in a bank, by using formula:

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$$NPL = \frac{Credit\ Problem}{Totally\ Credit}$$

Credit Problem is a kind of debtor which includes 3, 4, and 5 the debtor substandard, doubtful and loss.

F. Loan to Deposit Ratio (LDR)

LDR is calculated from the ratio of total loans to deposits. Total loans in question are loans granted to third parties (excluding loans to other banks). Third party funds in question, among other demand deposits, savings and time deposits (excluding inter-bank), with the formula:

$$LDR = \frac{Loan}{Deposit}$$

6.3. Sample and data collection method

The population in this research is a commercial bank operating in Indonesia, sampling is a sampling technique of determining sampling is a sampling (census) where all members of population is used for sample which means used the same sample population. All Samples are taken from the business activities of commercial banks in Indonesia conducted by Bank Indonesia. The larger of the sample size approaches the population, the smaller the chances of generalization error and reverse the smaller number of samples away from the population, the greater the generalization error (Sugiyono, 2001).

The data required in this study is a secondary data are monthly time series data (from Oct 2005 to Oct 2012), the data obtained from Bank Indonesia (Indonesian Banking Statistics, Monthly Report).

7. Result of the Research

7.1 Testing granger causality

The results will be preceded by granger causality test to confirm statistically how the relationship between ROA and NIM, testing research using EViews software tools, the calculation of granger causality test in EViews can be summarized as follows :

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
NIM does not Granger Cause ROA	85	2.06040	0.1550
ROA does not Granger Cause NIM		2.25148	0.1373

As seen the hypothesis of granger causality test between ROA and NIM (hypothesis null. $\beta_{11} = 0$ and $\beta_{21} = 0$ for the first equation, and the null hypothesis null $\beta_{12} = 0$ and $\beta_{22} = 0$ to the second equation) both accepted, it is resumed there is no relation between NIM and ROA, it means NIM does not granger cause ROA and ROA does not granger cause NIM, or that ROA does not affect NIM, NIM does not affect ROA, So it will be estimated using ordinary least square (OLS) procedure.

7.2 Estimation Model ROA and NIM

The transmission of monetary policy takes time (time lag) to have an impact on bank operations, so the researchers modified the variable BI Rate by 1 period for ROA and NIM models. The results of ROA and NIM estimation equation as follows:

ROA = -6.4858 + 0.1408*BIRATE(-1) + 0.4807*LOANRATE - 0.4315 *DEPRATE + 0.0565*LDR + 0.006*OCTOI

p-value (0.0003) (0.0213) (0.0001) (0.0000) (0.0000) (0.0378)

+ 0.02175*CAR - 0.0690*NPL **.....(3)**
(0.5053) (0.2740)

R^2 = 64,18 F_{STAT} = 19.71 (prob F) = 0,0000) DW_{STAT} = 1.28

NIM = 6.329 + 0.0738 *BIRATE(-1) + 0.0688 *LOANRATE - 0.1030*DEPRATE - 0.0129 *LDR
p-value (0.0000) (0.1469) (0.4824) (0.1254) (0.1427)

+ 0.0089*OCTOI - 0.0535*CAR - 0.0442*NPL **.....(4)**
(0.0008) (0.0632) (0.4042)

R^2 = 46,00 F_{STAT} = 3.86 (prob F) = 0,0011) DW_{STAT} = 1.22

7.3. Test and Repair Deviation Linear Regression Assumptions

A. autocorrelation

Determination autocorrelation in the model is comparing value between DW_{TABEL} and DW_{STAT}. can be seen in the table below:

H_o is rejected, there is a positive autocorrelation	Can not be decided	H_o is accepted, there is no autocorrelation	Can not be decided	H_o is rejected, there is a negative autocorrelation

	dl	du	2	4-du	4-dl	4
0	1,453	1,831		2,169	2,547	

Not only DW_{STAT} ROA equation but also DW_{STAT} NIM equation include rejected H_o region (1.28 to ROA and 1.22 to NIM) it's means that the data contained positive autocorrelation, to fix that models was used generalized differenced equation with put into elements of the autocorrelation (ρ) of each variable (dependent variable and the independent variable) in each model. The results of ROA and NIM estimation equation after avoid autocorrelation as follows:

ROA = 10.2179 - 0.0802*BIRATE(-1) - 0.5203*LOANRATE + 0.1899*DEPRATE - 0.0283*LDR
p-value *(0.0001)* *(0.3777)* *(0.0051)* *(0.1035)* *(0.0575)*

+ 0.0043 *OCTOI - 0.0182*CAR + 0.1603*NPL **.....(5)**
p-value *(0.0425)* *(0.4360)* *(0.0293)*

R^2 = 73,48 F_{STAT} = 25.98 (prob F) = 0,0000) DW_{STAT} = 2.16

NIM = 6.9165 + 0.0115*BIRATE(-1) - 0.0403*LOANRATE + 0.0096*DEPRATE - 0.0154*LDR
p-value *(0.0031)* *(0.8701)* *(0.7932)* *(0.9242)* *(0.2237)*

+ 0.0082*OCTOI - 0.0201*CAR - 0.0208*NPL **.....(6)**
p-value *(0.0006)* *(0.4349)* *(0.7671)*

R^2 = 46.00 F_{STAT} = 0.06 (prob F) = 0,0000) DW_{STAT} = 2.105

B. Multicollinearity

In the ROA equation there are four of the seven independent variables were not significant which can be seen from the p-value greater than 5% as well as the NIM equations there are six independent variables were not significant from 7 independent variables, so it is suspected that both ROA equation and NIM equation occur multikolinier problems in the estimation equation.

The way to know which variable causes kolinier by calculating the correlation between independent variables, the results obtained by the large value of the correlation between the independent variables are as follows table 2 and table 3:

Table 2. Testing Correlation Equation Kolinier ROA and NIM

	BIRate	DEPRATE	LOANRATE	LDR	NPL
BI Rate	1,00000	0,91329	0,91256	-0,78869	0,91170
DEPRATE	0,91329	1,00000	0,93228	-0,67241	0,79803
LOANRATE	0,91256	0,93228	1,00000	0,84806	0,92350
LDR	-0,78869	-0,67241	0,84806	1,00000	-0,90352
NPL	0,91170	0,79803	0,92350	-0,90352	1,00000

We can see at the Table 2 that there is a high correlation between the DEPRATE and BIRate with a correlation coefficient of 0.91 as well as with LOANRATE and BIrate, besides that there is also a high correlation between the NPL and LOANRATE, and also between the variables NPL and BIRate so that there is a problem suspected multikolinier among these variables.

To determined multikolinier between independent variables by using Variance Inflation Factor (VIF) or Tolerance (1/VIF), if the variables no contained multikolinier, the value of VIF have around one, but if an independent variable VIF value of ten or more is said to occur collinearity strong among the independent variables (Dedi Rosadi, 2012). Using Eviews tolerance values obtained from the ROA equation as shown in the following table:

Table 3. VIF of apparent regression ROA and NIM

Variable dependen	R^2	TOL = 1- R^2	VIF = 1/TOL
Y (regresi utama)	0,66	-	-
BIRate	0.95	0.05	20
DEPRATE	0.98	0.02	50
LOANRATE	0.98	0.02	50
LDR	0.89	0.11	9
OCTOI	0.39	0.61	0.016
CAR	0.81	0.19	0.05
NPL	0.96	0.04	25

We can see from the calculation of VIF in Table 3. there were four regression model whose value is greater than 10, so we can conclude that strong kolinieritas between independent variables (DPRATE, BIRate, LOANRATE and the NPL), and to fix the problem multikolinier researcher just throw DEPRATE variable of the model on the reason tbecause DEPRATE has already represented by LOANRATE to

declare changes interest rates in the economy, while the variable BIRate and NPL not throw because this research wanted to know how the effect of changing the value BIRate to ROA and NIM

C. Heteroskedastis

To detect heteroscedastis will use the White test with regress by the square of the regression equation residuals (e^2) with the independent variables, the results of the regression ROA and NIM Equation are as follows:

ROA = 10.2178 - 0.0802*BIRATE(-1) - 0.5203*LOANRATE - 0.0283*LDR - 0.0044*OCTOI
p-value (0.0001) (0,0377) (0,0051) (0,0416) (0,0349)

+ 0.0182*CAR + 0.1603*NPL .....(7)
p-value (0,0974) (0.0293)

R^2 = 0.73 F_{STAT} = 25.98(Prob F = 0,00) DW_{STAT} = 2.16

NIM = 6.9164 - 0.0115*BIRATE(-1) - 0.4036*LOANRATE- 0.0154*LDR - 0.0082*OCTOI
p-value (0.0031) (0.0870) (0.0793) (0.2237) (0.0006)

+ 0.2019*CAR + 0.2208*NPL .....(8)
p-value (0.0434) (0,0761)

R^2 =0.56 F_{STAT} = 16.06(Prob F = 0.00) DW_{STAT} = 2.10

After repair heteroscedasticity, we can see there are a little change in the estimated coefficients of the regression ROA and NIM, These equation (equation (7) and (8)) that will be analyzed further.

7.3. Results and Discussion

Identifying the relationship between ROA and NIM using granger causality test, the hypothesis as follow:

1. ROA is not determined by NIM
2. NIM is not determined by ROA

By setting the level of standard error 5%, the value of F test is 0.1373 for the first hypothesis and 0.1550 for the second hypothesis, the value showed that the first and second hypothesis is accepted, means ROA is not determined by NIM and NIM is not determined by ROA

In the case of using ROA profitability, not all regressors have a direction consistent with the hypothesized

a. BIRate variables have negative direction and appropriate with hypothesized when the central bank decrease interest rate (BIRate) will be followed by interest rates (LOANRATE) decreasing in a public bank, so that situation can influence to increase demand for credit and the finally will increase income of the bank (increasing profitability), by setting the standard error 5% showed a statistically significant number (ρ value 0.0373) mean BIRate negative effect on ROA, the coefficient shows a value of 0.0802 means if BIRate reduced 1 percent could rose ROA 0.0802 percent.

b. LOANRATE variables have negative direction and appropriate with hypothesized when the bank decrease interest rate of credit so the demand for loans is expected increase, so that income from loans will rise and also will rise the profitability of the bank, the regression coefficient of 0.5203, which means

when the bank decrease interest rate of credit 1 percent will increase ROA by 0.5203 percent, and the statistics show significant numbers (ρ value 0.0051) mean LOANRATE negative effect on ROA

c. LDR variable has a negative direction and inconsistent with the hypothesized, coefficient value of 0.0283 it means when LDR increase 1 percent cause ROA decrease 0.0283 percent and showed a statistically significant value of (0.0416) or below 5%, although not approriate with the direction of LDR hypothesized but negative effect on ROA, and implies that the commercial bank were not effective in contributing loans to the public.

d. Variable OCTOI has a negative direction in appropriate with the hypothesized, it means when OCTOI down will be up ROA with regression coefficient of 0.0044 which means when ROA fell 1 percent will increase ROA by 0.0044 percent of its value even though statistics show a small but significant (ρ value 0, 0349), the small value of the regression coefficient indicates that banks are less efficient in managing their operational activities.

e. The variable CAR has a positive direction with appropriate the hypothesized, indicating when CAR increases will rise ROA by the regression coefficient of 0.0182 which means that CAR increase 1 percent will rise ROA by 0.0182 percent, a statistically only significant at standard error rate of 10 percent but with a standard error rate of 5% CAR is not significant to the ROA, it indicates that banks have not been able to take advantage of operating capital.

f. NPL variable has a positive direction and not appropriate with the hypothesized but significant at a 5% standard error (ρ value 0.0293) with a regression coefficient of 0.1603 which means that every 1 percent decline in NPLs would decrease ROA by 0.1603 percent, and conversely every 1 percent increase in NPLs will increase ROA by 0.1603 percent, with the condition showed that banks in Indonesia can still improve ROA although with a high NPL suspected source of profits not only from credit but also another source such as fee income base.

In the case of profitability using NIM, not all regressors have a direction consistent with the hypothesized

a. BiRate variable has a negative direction and appropriate with the hypothetical, it means when the central bank decline interest rate (BIRate) will decrease interest rates (LOANRATE) of the commercial bank so that will result increased demand for credit and commercial bank expected to increase income from lending rates and finally will influence to profits (NIM increased), by setting the error rate of 5% showed a statistically insignificant numbers (ρ value 0.0870) means BIRate does not effect of the NIM but significant (effect) on the standard error rate of 10 percent, the researcher suspect BIRate can influence indirectly affect of bank profits because there is a time lag to be able effectively for bank profits, BIRate coefficient shows a value of 0.0115 which means if BIRate down 1 percent lead NIM rise 0.0115 percent.

b. LOANRATE variable has negative direction and appropriate with the hypothesized means when the bank decline interest rate of credit is expected will increase the demand for loans so that the interest income from loans increased and will further enhance the profitability of the bank, the regression coefficient of 0.4036, which means when the bank decline interest rate of credit 1 percent would raise the NIM at 0.4036 percent, and the statistics show that the numbers were not significant (ρ value 0.0793) and only significant at the 10% standard error rate

c. LDR variable has negative direction and appropriate with the hypothetical, the value of coefficient of 0.0154 which means that when the LDR increase 1 percent so that NIM will decrease by 0.0154 percent and showed a statistically insignificant value of (0.2237) or above 5%, in this case shows that the banks loans to the public is not a lot to contribute to the bank's profit, it also shows that there are many banks not optimized source funds from the public.

d. Variables OCTOI has a negative direction and appropriate with the hypothetical, means when OCTOI down will rise the NIM and regression coefficient of 0.0082 which means when ROA fell 1 percent will

increase NIM by 0.0082 percent although its value is small but shows a statistically significant (ρ value 0 , 0006), meaning OCTOI effect on NIM, the small value of the regression coefficient indicates that banks are less efficient in managing their operational activities.

e. The variable CAR has a positive direction and appropriate with the hypothesized , it means when CAR increases will improve NIM with regression coefficient of 0.2019 which means that CAR increase 1 percent will increase by 0.2019% of NIM, the statistically significant at the 5 percent standard error by p-value of 4.34 percent, meaning that the CAR effect on NIM. Commercial banks in Indonesia has leveraged its capital pliers well.

f. NPL variable has a positive direction that is inconsistent with the hypothesized and not significant at the 5% standard error rate (ρ value 0.0761) with a regression coefficient of 0.2208 which means that every 1 percent decline in NPLs would lower NIM for 0.2208 percent, and conversely every 1 percent increase in NPLs will increase NIM at 0.2208 percent, with the condition showed that banks in Indonesia can still improve NIM although with a high NPL suspected source of profits not only credit but also another sources such as fee income base.

Based on the semi-partial correlation coefficient calculation, we obtained the following figures:

Table 4. Semi-Partial Correlation Equation ROA

Model	Korelasi Semi Parsial
BIRate	-0.614
DEPRATE	-0.586
LDR	-0.531
NPL	0.518
CAR	0.221
OCTOI	-0.149

The coefficient indicates that a variable BIRate highest influence in determining the value of ROA, while the smallest in determining ROA is CAR

Partial correlation coefficient for NIM shown in table 5.

Table 5. Semi-Partial Correlation Equation NIM

Model	Korelasi Semi Parsial
OCTOI	-0.554
LDR	-0.404
CAR	0.340
DEPRATE	-0.339
NPL	0.328
BIRate	-0.303

Based on the coefficients above were the greatest influence in determining the value of NIM is the OCTOI, while BIRate ranks last

Variable BIRate as the main focus in this study proved to be a variable that determines the value of ROA but not the most decisive variables NIM

7.4. Conclusions and Recommendations

A. conclusion

Based on the research and discussion that has been done, we can discribe the following conclusion:
1. BIRate has negative effect on ROA and showed a statistically significant number, it means that when the central bank declined interest rate (BIRate) the commercial bank profitability as measured by ROA is increasing, and would be otherwise if the central bank raised BIRate.
2. BI Rate has negative direction on NIM, but did not show a statistically significant rate by setting the standard error of 5%, which means if the central bank down the BI Rate will raise NIM but the increase is very small (less significant) and only significant at 8.7% level
3. Influential BI Rate to ROA in equation (7) is happened with 1 month time lag meanwhile the BI Rate was not having an effect on the NIM with 1 month time lag in Equation 8.
4. Based on the semi-partial correlation coefficients, BIRate very great influence in determining of ROA ranks compared the other independent variables in the equation (7), meanwhile for equation (8), OCTOI is great influence to determine of NIM, while BI Rate ranks last of the NIM

B. suggestion

Advice can be given in this study were:
1. Central Bank Policy in achieving its goal to stabilize the rupiah to keep the inflation rate in the country usually by raising interest rates (BIRate) should consider the impact on the banking sector because when the interest rate (BIRate) is increased it will reduce the profitability of banks.
2. The decision makers at banks should pay attention to changes in BIRate especially when the central bank raised BIRate because it will down the profitability (ROA) of commercial banks significantly and changes BIRate great influence in determining the ROA.
3. Need further research of NIM by including other independent variables, considering the value of the adjusted R-square is only 56% which means 44% are influenced by other factors .

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