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Abstrak

Inflasi akan mempengaruhi tingkat suku bunga. Ketika inflasi naik maka tingkat suku bunga akan meningkat begitupun sebaliknya, ketika inflasi turun maka tingkat suku bunga akan menurun juga. Tidak seperti negara lain, Indonesia memiliki keadaan yang unik, terkadang meskipun BI Rate turun namun tingkat kredit tidak turun. Jadi, berdasarkan kasus ini, makalah ini mengkaji hubungan Inflasi, Suku Bunga dan Tingkat Kredit. Dengan menggunakan model Vasicek, paper ini mengevaluasi fitting long-term, speed and volatility dari setiap tingkat kredit berdasarkan kategori bank di Indonesia. Kemudian menilai tingkat fluktuasi pada masing-masing bank. Tingkat masing-masing kategori bank sangat fluktuasi namun tidak lebih dari 0,005 dan tidak lebih rendah dari 0,005.

Kata Kunci: Suku Bunga, Tingkat Kredit, Inflasi, Vasicek

Abstract

Inflation would affect to interest rate. When inflation going up, interest rate would be increase too and otherwise, when inflation going down the interest rate would be decrease too. It not like other country, Indonesia has special case, sometime although BI rate going down, the credit rate does not decrease. So, with the case, this paper examines the relationship of Inflation, Interest Rate and Credit Rate. By using Vasicek model, this paper valuates of the fitting long-term, speed and volatility from every credit rate according to bank categories in Indonesia. Then valuate the fluctuation rate on each bank. The rate of each bank categories very fluctuates but no more than 0.005 and no lower than 0.005.

Keywords: Interest Rate, Credit Rate, Inflation, Vasicek

1. Introduction

Inflation is one of the most national issues in every country. It is a macroeconomic indicator which explain the country capability, except interest rate, GDP, oil price, politic and others indicators. It should be important indicator because the volatility of inflation would be affected to Central Bank rate, and when interest rate decrease or increase it should be affect to bank rate or credit rate.

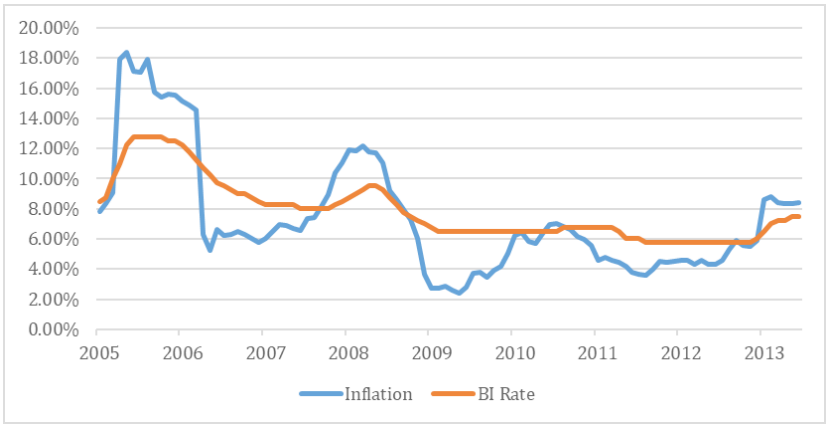


Figure 1.

Inflation Rate and BI Rate, July 2005 to December 2013

Source:

Bank Indonesia

Figure 1 show the relationship between inflation and BI rate which happen on July 2005 until December 2013. It indicate the inflation show high rate on 2005, then fall down on middle of 2006 until 5%, it means that Inflation of Indonesia between 2005 until 2013 has high volatility. Then, on the BI rate, show that the BI rate will follow the inflation. When inflation high, BI rate will shows high rate too. But, BI rate tends to be more stable than inflation rate.

The volatility of inflation rate would be affect to banking credit rate. But, especially in Indonesia, the volatility of BI rate do not affect to banking credit rate. Some time, when BI rate decrease, it contrast with credit rate.

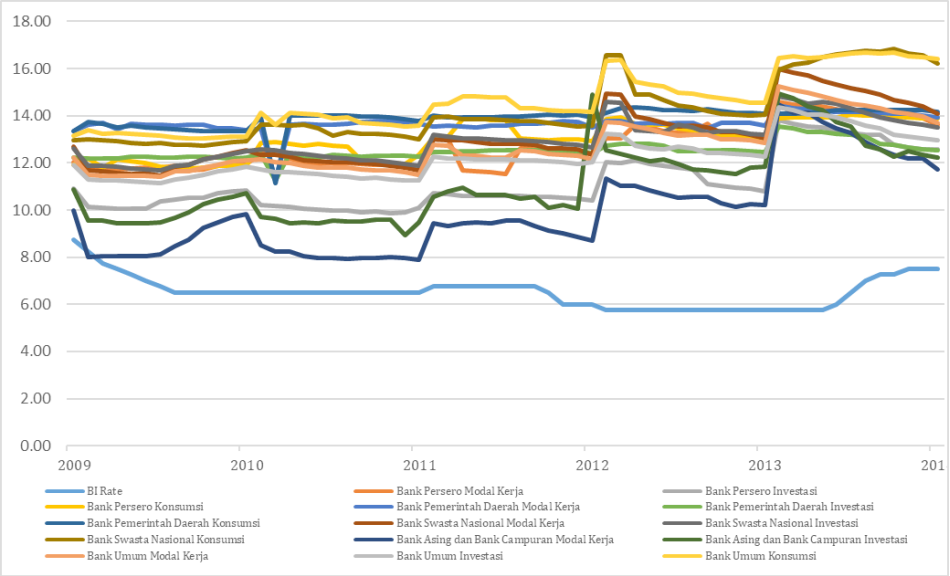


Figure 2.

BI Rate and Credit Rate (Rupiah) According to Bank Categories, January 2009 - January 2014

Source:

Badan Pusat Statistik

According to the graph, between BI rate and banking credit rate indicate that, there is a high spread between BI rate and banking credit rate. It verifies that although inflation decrease and BI rate goes down, the banking credit rate should define the credit rate based on their bank policy.

2. Literature Review

2.1. Inflation

According to Bank Indonesia as the central bank of Indonesia define inflation as the increasing of the common commodity price continuously. The increasing of price means if the increasing of price from a commodity would be affects to price overall commodity. Otherwise, if the decreasing of price affect to decreasing of price overall, it means deflation.

The indicator that often used to determine the inflation is Consumer Index Price (CPI). But, other indicators that should be affects to the inflation growth according to the International Best Practice are Wholesale Price Index and Gross Domestic Product (GDP).

On macroeconomic, inflation is economic growth indicator in a country, which it has important term to determine the interest rate policy that would stimulate country economic based on banking and capital market. It also affect to consumption rate, which Earterly and Fischer (2001) explained that inflation "hurt" the poor people. They found that the high inflation rate tends to decrease the real minimum wage, it would increase the poverty. Hence, Earterly and Fischer declare that inflation must be national concern to a country.

In Indonesia, between 1951 until 1972 the dynamic of inflation should be concern for some researcher, which Bank Indonesia has the important role to determine the inflation target. Aghevli and Khan (1977) developed a dynamic of inflation according to an idea that rate of inflation tend to more increasing that revenue, which the high inflation rate force people to expense the cost or his wealth to be inflation tax. Otherwise, Brum (2000) determined that there is a negative correlation between inflation and CBI (Central Bank Independence) based on covariance structure analysis.

2.2. Interest Rate

Saymeh and Orabi (2003) used Granger Causality to determine that inflation cause interest rate, although each variable is independent variable. Judd and Motley (1991) explain that in controlling the long-run inflation is a monetary policy that should determine interest

rate target. Monetary policy must be control the long-run inflation without increasing volatility of GDP and interest rate.

Then, Bhati and McCrae (2005) research about interest rate parity in Asia Pacific countries by using Co-integrated VAR, explain the relationship between Australian Dollar and Asia Pacific countries. It shown that market economics of emerging country is inefficient and there is lack of parity condition on country risk.

2.3. **Banking**

Bank is a financial institution that people use to saving or lending money and make some benefit of them. Today, bank not only a place for saving or lending money, but also more activities, which people using Bank for transfer or exchange media, and so on. According to Somashekar (2009, p.2) define that bank as a bridge that connect between saver and borrower, where people can lend and/or saving money and take benefit from it. Not only trader in money, bank also have important function that is manufacturer of money.

From Somashekar (2009), bank consists of two types that are Central Bank and Commercial Bank. Where Central Bank having function to control commercial bank and economic policy. However, Commercial Bank as financial institution which provide banking for profit.

3. **Methodology**

3.1. **Modelling of BI Rate and Inflation**

The methodology that used in this paper based on two steps. First, according to Saymeh and Orabi (2003) used Granger Causality relationship to explain that inflation cause interest rate although each variable is independent variable. With the assumption, BI Rate and Inflation would be shown on modeling and forecasting fitted.

Engle (1982) used ARCH model to generalize the forecasting of variance which is not constant. On this model, the mean is zero (0) and the variances conditional on the past is serially uncorrelated with non constant process.

$$\sigma_t^2 = \omega + \sum_{i=1}^{q} \alpha_i \varepsilon^2_{t-i}$$

ARCH model is the simplest model in econometric, but to describe the volatility process of an asset return, it is needed many parameter. Then, Bollerslev (1986) introduced GARCH model as an extension of ARCH model.

$$\sigma_t^2 = \omega + \sum_{i=1}^{q} \alpha_1 \varepsilon^2_{t-1} + \sum_{j=1}^{p} \beta_j \sigma^2_{t-j}$$

3.2. **BI Rate and Credit Rate Maximum Likelihood using Vasicek Model**

On Graph 2 shown that BI Rate influence to Credit Risk. So, with this assumption, by using Vasicek model it should be known how the interest rate movement by using maximum likelihood to the speed of mean reversion (α), the long-run expected value for r (μ), and the instantaneous standard deviation of r or volatility (σ).

Vasicek is the famous model to calculate the interest rate. It is an extended model from HJM model with a single risk factor and a time volatility function. It avoid the certainty of negative yield and eliminate the potentially infinitely large extension factor (Van Deventer, et all, 2005). The model is:

Where:

r = the instantaneous short rate of interest
α = the speed of mean reversion
μ = the long-run expected value for r

σ = the instantaneous standard deviation of r

Z is the standard Wiener process with mean zero and standard deviation of 1. The difference from previous models comes in the drift term, which this stochastic process called as the Ornstein-Uhlenbeck process.

The drift term in the stochastic process proposed by Vasicek pulls the short rate r back toward μ, so μ can be thought of as the long-run level of the short rate. When the short rate r above μ, the first term tends to pull r downward since α is assumed to be positive. And when the short rate r below μ, r tends to drift upward.

By using the assumption that BI Rate affect credit rate, this research use the categories of bank based on Badan Pusat Statistik (BPS) from July 2005 until February 2014, which consist of Bank Persero (Owned Bank), Bank Pemerintah Daerah (Local Government Bank), Bank Swasta Nasional (National Private Bank), Bank Asing dan Campuran (Foreign and Mix Bank), and Bank Umum (Common Bank). Then it sorted by categories for credit rate, which consist of credit rate for working capital, credit rate for investment, and credit rate for consumption.

4. Result

4.1. Developing The Model and Forecasting

The nature of the inflation and BI Rate is heteroscedasticity, as indicate on volatility of variance using GARCH model. Then by using GARCH (1,1) this research examine the forecasting of Inflation and BI rate. The dependent variable is BI Rate and Inflation as independent variable.

Table 1.

BI Rate Model

Dependent Variable: BI_RATE				
Method: ML - ARCH (Marquardt) - Normal distribution				
Sample (adjusted): 2005M08 2011M12				
Included observations: 77 after adjustments				
Convergence achieved after 54 iterations Presample variance: backcast (parameter = 0.7) GARCH = C(4) + C(5)*RESID(-1)^2 + C(6)*GARCH(-1)				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
C	0.003671	0.000451	8.141947	0.0000
INFLATION	0.048118	0.004210	11.42969	0.0000
BI_RATE(-1)	0.905657	0.007718	117.3478	0.0000
Variance Equation				
C	2.50E-07	1.66E-07	1.500483	0.1335
RESID(-1)^2	1.189260	0.401246	2.963918	0.0030
GARCH(-1)	0.139455	0.084578	1.648828	0.0992
R-squared	0.982594	Mean dependent var		0.083994
Adjusted R-squared	0.982124	S.D. dependent var		0.020352
S.E. of regression	0.002721	Akaike info criterion		-9.922259
Sum squared resid	0.000548	Schwarz criterion		-9.739625
Log likelihood	388.0070	Hannan-Quinn criter.		-9.849207
Durbin-Watson stat	0.615356			

The model shown that R-squared is 0.982594 and the probability is 0 or significant. It means that the model has good fitted. Then, the forecasting from this model is shown on

graph below.

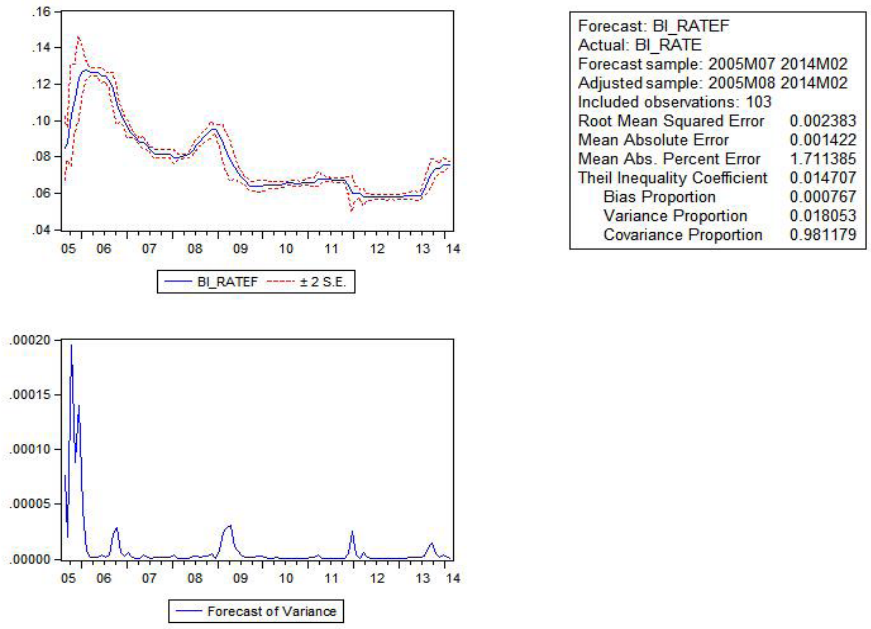


Figure 3.

BI Rate Forecasting

Figure 3 show the BI Rate forecasting which the Root Mean Squared Error (RMSE) is 0.002. RMSE is the value between real data and forecasting data, as lower as better. In this result means the value of error very low.

4.2. Interest Rate Movement on BI Rate and Credit Rate According to Bank Categories

From the Graph 2 show that between BI rate and Credit rate have high spread. Although sometime it should be affect when BI rate decrease, but credit rate still on his value. Then, by using Vasicek model, it should be known how the interest rate moves for each credit risk on every bank categories.

First, by using Vasicek model $dr = a(b - r)dt + \sigma dZ$ the data should be identify to define α, μ, and σ by maximum likelihood. Table 2 show the summary of α, μ, and σ from BI Rate and Credit risk from every bank categories

Bank Categories		Mean Reverting Speed (α)	Long-run Expected Value (μ)	Volatility (σ)
BI Rate		0.0205	0.001	1.042
Bank Persero (Owned Bank)	Working Capital	-0.0105	0.0018	1.3305
	Investment	-0.0105	0.0019	1.6826
	Consumption	-0.0208	0.0338	1.0375
Bank Pemerintah Daerah (Local Government Bank)	Working Capital	-0.001	0.0387	1.525
	Investment	-0.001	-0.029	0.9351
	Consumption	-0.001	0.0191	1.83
Bank Swasta Nasional (National Private Bank)	Working Capital	-0.001	0.0144	2.0083
	Investment	-0.001	0.0136	1.4685
	Consumption	-0.001	0.0092	1.8635
Bank Asing dan Campuran (Foreign and Mix Bank)	Working Capital	-0.0011	0.0048	2.6389
	Investment	-0.001	0.0052	3.025
	Consumption	-0.0011	0.0047	3.491

Table 2.

Summary of the α, μ, and σ by maximum likelihood

Bank Categories		Mean Reverting Speed (α)	Long-run Expected Value (μ)	Volatility (σ)
Bank Umum (Common Bank)	Working Capital	-0.0011	0.005	1.5066
	Investment	-0.0011	0.0045	1.2577
	Consumption	-0.0011	0.0035	1.5734

By maximum likelihood from Vasicek model, the graphs show the parameter 1 (α), parameter 2 (μ), parameter 3 (σ).

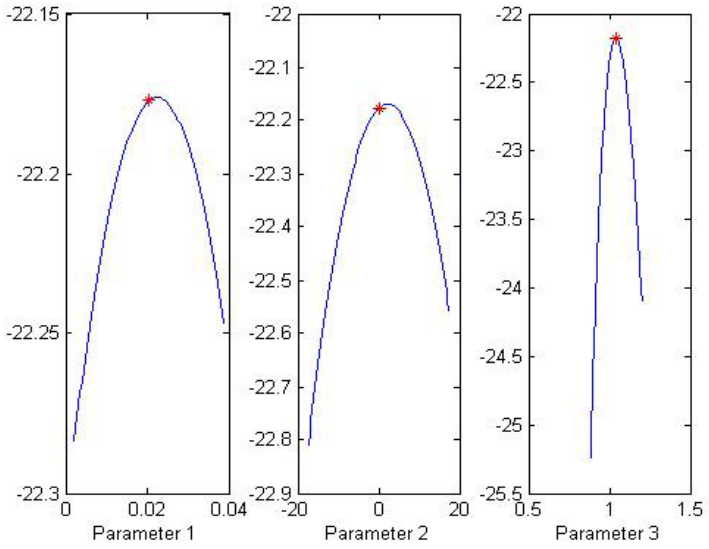


Figure 4.

BI Rate Parameter from Maximum Likelihood

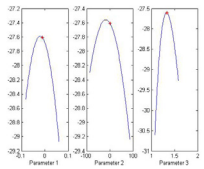
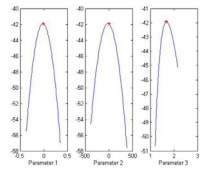
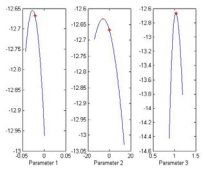
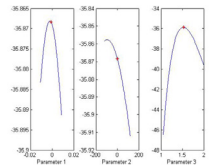
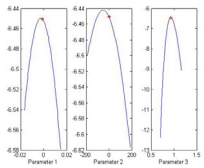
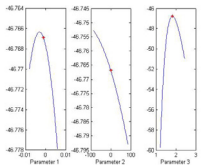
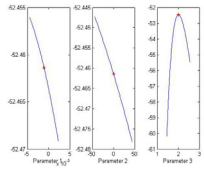
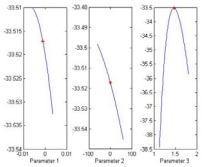
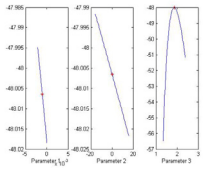
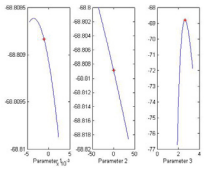
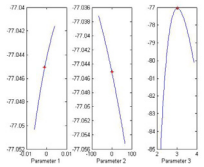
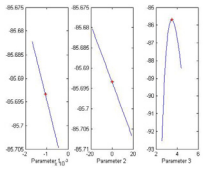
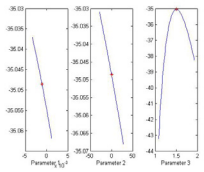
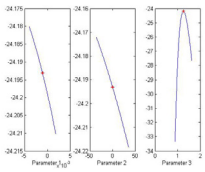
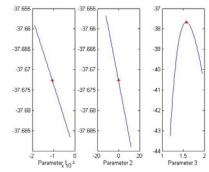
Categories	Working Capital	Investment	Consumption
Bank Persero (Owned Bank)			
Bank Pemerintah Daerah (Local Government Bank)			
Bank Swasta Nasional (National Private Bank)			
Bank Asing dan Campuran (Foreign and Mix Bank)			

Table 3.

Summary of parameter for every bank categories credit risk from maximum likelihood graph

Categories	Working Capital	Investment	Consumption
Bank Umum (Common Bank)			

From α, μ, and σ that have been found, then fit the variable to the Vasicek model to see how the interest rate change. Figure 5 and Table 4 show the interest rate move.

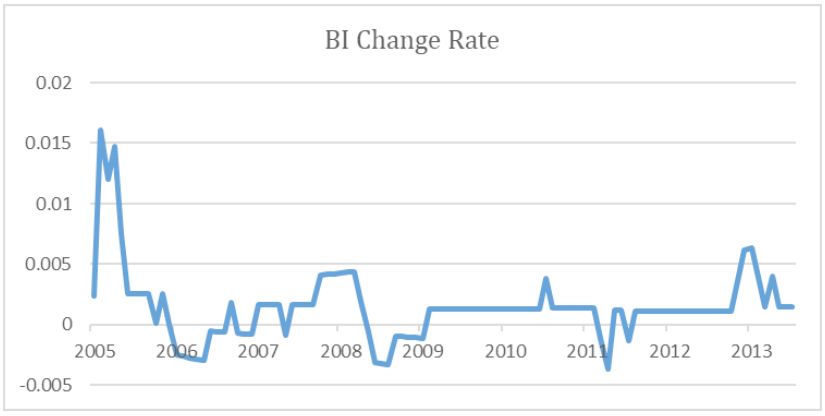


Figure 5.

BI Change Rate

On the Figure 5 and Table 4, it show that the interest rate movement. On Figure 5, the higher BI Rate movement is 0.015 on 2005, its, still higher until middle of the year. But on 2006 until 2013, the BI Rate movement fluctuated between -0.005 to 0.005.

On the Table 4 shows the credit rate change for each bank categories. The significant result is shown on credit rate change for Bank Persero (Owned Bank) consumption credit. The rate has high fluctuation between 0.01 to 0.005. For working capital, the rate was fluctuated on 2011 until 2013 with the highest rate was 0.01 on 2013. For investment credit rate, the highest rate was 0.03 on 2013.

On Bank Pemerintah Daerah (Local Government Bank), the fluctuation of credit rate change between working capital, investment and consumption almost 0, except on the beginning of 2010, the rate fluctuated between -0.01 to 0.02.

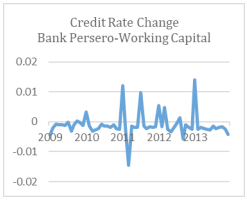
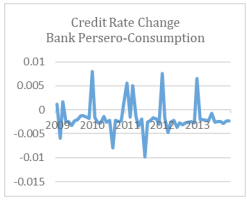
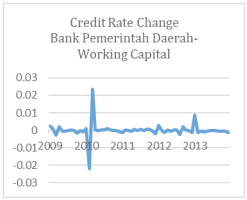
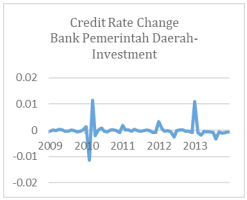
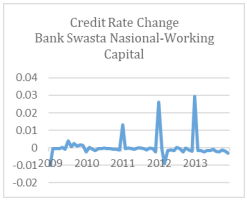
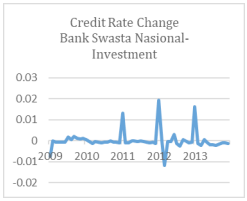
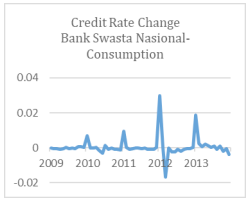
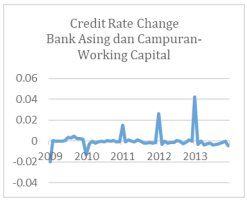
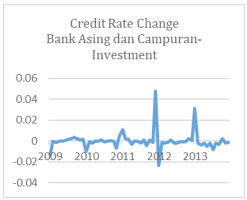
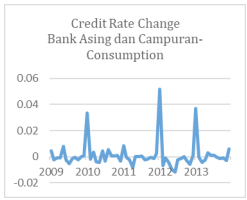
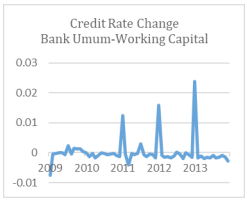
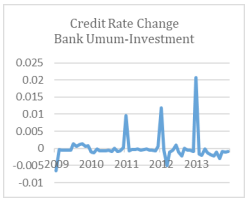
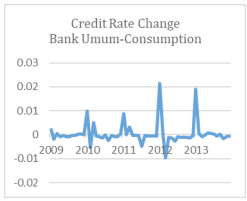
On Bank Swasta Nasional (National Private Bank), the highest fluctuation of working capital was on 2013, than on investment credit the highest rate was 0.02 on 2012, than the highest rate of consumption rate is 0.03 on 2012. On investment and consumption credit rate, after 2012 have high fluctuation, on the next year the rate was decrease.

On Bank Asing dan Campuran (Foreign and Mix Bank), almost on 2009 and 2010 the rate on minus value but the trend is upward, it show the beginning of 2011 is 0.02, than 2012 is 0.03, than 2013 is 0.04. For investment rate, the fluctuation not too high, but only on beginning of 2012, the rate reach 0.05 than decrease at the beginning of 2013 that is 0.03. On the highest fluctuation is Consumption credit rate with the highest rate is shown on the beginning 2012.

Same with other bank, on the beginning of 2011, 2012 and 2013, the rate of working capital and investment of Bank Umum (Common Bank) credit rate is very high. For working capital, the highest rate is on 2013 that is 0.025. Then the highest credit rate of investment is on 2013 that is 0.021. And for consumption rate, the rate very fluctuate with the highest rate is on 2012 and decrease on 2013.

Table 4.

Credit Rate Change According to Bank Categories

Categories	Working Capital	Investment	Consumption
Bank Persero (Owned Bank)			
Bank Pemerintah Daerah (Local Government Bank)			
Bank Swasta Nasional (National Private Bank)			
Bank Asing dan Campuran (Foreign and Mix Bank)			
Bank Umum (Common Bank)			

5. Conclusion

This paper examines the relationship between three variables: inflation, BI Rate and credit bank. BI Rate as the independent variable would be affect to other variables which: inflation and BI Rate have relationship, and also BI Rate with credit bank. When inflation upward the government increase the BI rate, and automatically the credit rate will increase.

The data that is taken from BPS for July 2005 until February 2014 for inflation, BI Rate and categories of banks which consist of: Bank Persero (Owned Bank), Bank Pemerintah Daerah (Local Government Bank), Bank Swasta Nasional (National Private Bank), Bank Asing dan Campuran (Foreign and Mix Bank), and Bank Umum (Common Bank). And from every categories of bank, it have categories for credit rate, that consist of Credit rate for Working Capital, Credit rate for Investment, and Credit rate for Consumption.

By using GARCH (1,1) this paper examine the forecasting of Inflation and BI rate which the dependent variable is BI Rate and Inflation as independent variable. The model show that R-squared is 0.982594 and the probability is 0 or significant. On the forecasting with GARCH (1,1) the value of error fitted or RMSE is 0.002.

Then by using Vasicek model $dr = a(b - r)dt + \sigma dZ$, the data should be identify to fitted α, μ, and σ by maximum likelihood. Then, by using Vasicek model, it should be known how the interest rate moves for each credit risk on every bank categories. The rate of each bank categories very fluctuation but no more than 0.005 and no lower than 0.005.

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Website

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