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Linkage of Credit on BI Rate, Funds Rate, Inflation and Government Spending on Capital

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Abstract

Linkage of credit on BI rate, funds rate, inflation, and government spending on capital provides evidence from Indonesia. This paper found advance explanation about banks credit as monetary transmission channel and its role on Indonesian economy. We used credit depth as a ratio of banks credit to GDP nominal, to explain the role of credit in Indonesian economy. We developed a VAR model to measure the response of credit to BI rate, funds rate and inflation rate, and OLS method to find out how banks credit response to government spending on capital. This paper revealed bi-direction causality between credit and BI rate, credit and funds rate, and credit and inflation. There is trade-off between credit and BI rate, credit and funds rate, and credit and inflation, but government spending on capital promotes credit depth. We found that Indonesian banking is bank view, allocated their credit based on their performance, not merely on the monetary policy determined by central bank. For bank view perspectives, we analyzed the link between LDR as an indicator of credit channel mechanism to NPLs and CAR. We found that there is no significant effect of CAR to LDR, but has a strong negatively relationship between NPLs to LDR. This evidence indicates that commercial banks in Indonesia allocated their credit do not related to their capital but merely to the quality of their credit portfolio.

Key words : *banks credit, inflation, BI rate, funds rate, government spending on capital.*

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INTRODUCTION

Banks credit has a critical importance on economic growth and highlight circumstances when banks actively spur innovation and future growth by identifying and funding productive investment. The role of banks credit as a growth accelerating factor has made banking intermediary as a good predictor of long-run rates economic growth, capital accumulation and productive improvements (King & Levine, 1993; Levine & Zervos, 1998). For this circumstances, banks credit is inherent to interest rate determined by both the central bank and the commercial banks.

The efficiency of credit creation process is reflected both by its ability to minimize transaction cost and asymmetry information due to the condition of imperfect market information. It is also important to be understood that credit creation is reflected in the degree to which it is able to channel an economy's saving into the most productive uses (Bernanke, 1993; Levine, 1997).

The presumption of traditional macroeconomic analysis is that this credit creation process, through which funds are transferred from ultimate savers to borrowers, works reasonably smoothly and therefore can usually ignored (Bernanke, 1993). In the standard IS-LM model, firm's willingness to invest is determined only by the physical productivity of capital and the real interest rate, which in turn depends on household's desire to save and wealth holders' liquidity preference (Bernanke & Blinder, 1992; Bernanke, 1993; Bernanke & Gertler, 1995, 1999; Mankiw, 2010).

Based on the cost of loanable funds, funds rate is a constraint function for maximizing banking intermediation as credit channel. Furthermore, funds rate represents the response of the commercial banks to the BI rate. In other word, funds interest rate revealed how commercial banks gave short-run response to inflation targeting framework (Bernanke & Blinder, 1992; Bernanke, 1993; Goncalves & Salles, 2006).

Besides funds rate, inflation rate has a strong effect to credit allocation by the banking institution. Inflation rate impedes banks to financing real sectors, and on the other hand, banks credit stimulates inflation due to the increasing of money supplied by banks to the real sectors. Banks credit is a main resource for inflation (Rousseau & Wachtel, 2002; Rother, 2004).

Eventhough banks credit had indirect effect to fiscal policy, their role as a source of economic growth due to their ability to enhance real sectors to higher scale, tell us the explanation that fiscal policy particularly government spending on capital must be combined with banking policy to achieve higher economic growth. Banking institution came to the real sector to financing capital and liquidity to the business entities. Banks credit promotes economic growth through accelerating the escalation GDP components in real sector.

Government spending as an element of GDP is a main source of economic growth. The higher the government spending will result the higher the economic growth. Besides its source stems from tax revenue, and it is always limited, government all over the world often increased their spending through debt in order to achieve higher economic growth (Barro, 1981; Mankiw, 1987; Blanchard & Perotti, 2002; Rother, 2004). The higher the economic growth through government spending on capital will have a stronger effect when banking institution accelerated the scale of the economy by financing the real sectors particularly the business related to the government spending simultaneously.

The remainder of this paper is structured as follows. Section 2 describes method and

summary statistics. Section 3 presents discussion, and our conclusions and policy implications are in Section 4.

RESEARCH METHODS

This paper used data of Indonesian economy over the period of 1990 to 2014 [*http://www.bi.go.id/id/statistik/seki*] from Bank of Indonesia (BI), described the banks credit, and [*http://www.bps.go.id/linkTabelStatis/view/id*] from Indonesian Central Bureau of Statistics (BPS), described Indonesian GDP, nominal and real GDP, unemployment rate and poverty rate. We used econometrics method developed by King & Levine (1993); Levine et al. (2000); Beck & Levine (2004), which described relationship model between credit depth (ratio between banks credit to nominal GDP) and real GDP growth per capita.

Causality between Credit Depth and BI Rate

To investigate the causality relationship between credit depth and BI rate, we use a VAR (Vector Auto-Regressive) model as follows :

$$CRE_t = \alpha_1 + \alpha_2 iBI_t + \alpha_3 \sum_{n=1}^{k} CRE_{t-n} + \varepsilon_{1t} \ \dots\dots\dots\dots\dots\dots\dots\dots\dots. (1)$$

$$iBI_t = \beta_1 + \beta_2 \sum_{n=1}^{k} CRE_{t-n} + \beta_3 \sum_{n=1}^{k} iBI_{t-n} + \varepsilon_{2t} \ \dots\dots\dots\dots..\dots\dots (2)$$

The matrix form of the model is as follows:

$$B_t = \begin{bmatrix} CRE_t \\ iBI_t \end{bmatrix} ; \quad A_0 = \begin{bmatrix} \alpha_{11} \\ \alpha_{21} \end{bmatrix} ; \quad A_1 = \begin{bmatrix} \alpha_{12} \alpha_{13} \\ \alpha_{22} \alpha_{23} \end{bmatrix} ;$$
$$b_t = \begin{bmatrix} b_{1t} \\ b_{2t} \end{bmatrix}$$

or

$$B_t = A_0 + A_1 \sum_{n=1}^{k} B_{t-n} + b_t \ \dots\dots\dots\dots..\dots..\dots\dots\dots (3)$$

where CRE_t is credit depth measured by the ratio of banks credit to nominal GDP at year t, CRE_{t-n} is credit depth at year t-n, iBI_t is BI rate at year t, iBI_{t-n} is BI rate at year t-n and ε is error term. BI rate at year t affects credit depth at year t, moreover, credit depth at year t-n affects BI rate at year t. Refer to equation 3, we found that relationship between credit depth and BI rate is VAR(1) as presented in Table 1.

Table 1. VAR model estimation on the relationship between credit depth (CRE) and BI rate (*i*BI)

Vector Auto-Regression Estimates
Sample (adjusted): 1994 2014
Included observations: 21 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	ΔCRE	Δ*i*BI
ΔCRE-₁	0.916734	0.625497
	(0.11689)	(0.21049)
	[7.84257]	[2.97162]
Δ*i*BI-₁	-1.138631	-0.723766
	(0.12356)	(0.22249)
	[-9.21535]	[-3.25297]
C	-0.279706	0.070850
	(0.69205)	(1.24619)
	[-0.40417]	[0.05685]

The VAR model estimation revealed that there is bi-direction causality between credit depth and BI rate. Estimation model explained that there is negative effect of change in BI rate and credit depth. Increasing in the change of BI rate by 1 bps will decrease the change of credit depth by 1.14 bps. The VAR model explains that increasing of BI rate will directly increase cost of loanable fund interest rate and will decreased credit depth.

Causality of Credit Depth on Funds Rate

To investigate the causality relationship between credit depth and funds rate, we use a

VAR model as follows :

$$CRE_t = \alpha_1 + \alpha_2 iDEP_t + \alpha_3 \sum_{n=1}^{k} CRE_{t-n} +$$

$$\varepsilon_{1t} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$$iDEP_t = \beta_1 + \beta_2 \sum_{n=1}^{k} CRE_{t-n} +$$

$$\beta_3 \sum_{n=1}^{k} iDEP_{t-n} + \varepsilon_{2t} \quad \ldots\ldots\ldots\ldots (5)$$

$$\text{or}$$

$$D_t = A_0 + A_1 \sum_{n=1}^{k} D_{t-n} +$$

$$d_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

where CRE_t is credit depth measured by the ratio of banks credit to nominal GDP at year *t*, CRE_{t-n} is credit depth at year *t-n*, $iDEP_t$ is funds rate at year *t*, $iDEP_{t-n}$ is funds rate at year *t-n* and ε is error term. Funds rate at year *t* affects credit depth at year *t*, moreover, credit depth at year *t-n* affects funds rate at year *t*. Refer to equation 6, we found that relationship between credit depth and funds rate is VAR(1) as presented in Table 2.

Table 2. VAR model estimation on the relationship between credit depth (CRE) and funds rate (*i*DEP)

Vector Autoregression Estimates
Sample (adjusted): 1992 2014
Included observations: 23 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	ΔCRE	Δ*i*DEP
ΔCRE-₁	1.026023	0.935676
	(0.12620)	(0.24264)
	[8.13005]	[3.85621]
Δ*i*DEP-₁	-1.019424	-0.784892
	(0.11326)	(0.21775)
	[-9.00109]	[-3.60453]
C	-0.585415	-0.462878
	(0.66974)	(1.28767)
	[-0.87410]	[-0.35947]

Our VAR estimation model explains that there is negative effect of change in funds rate

and credit depth. Increasing in the change of funds rate by 1 bps will decrease the change of credit depth by 1.02 bps. The VAR model explains that increasing of cost of loanable fund interest rate induced by increasing in funds rate will decreased credit depth, and ultimately, due to the decreasing of money supply to the real sectors, and economic growth will decrease.

The higher the funds rate will inhibit growth rate of the economy and become a detrimental factors for banking intermediary due to the higher risk circumstances both in financial sectors and real sectors. On money view perspectives, the higher the funds rate means that central bank want to reduce money supply to the real sectors. Besides, commercial banks also tend to reduce their intermediary function on purpose because of their liquidity problem that they have to increase their funds rate for getting more current liabilities.

Our VAR model estimation revealed that there is bi-direction causality between credit depth and funds rate. Funds rate affects credit depth significantly, that the low interest rate will affect higher credit depth and promotes higher economic growth. On the other hand, credit depth affects funds rate significantly, that the higher credit depth will simultaneously promote higher economic growth and over time will affect the overheated economy, then the funds rate will be going to rise. As explained above, automatically credit rationing to avoid overheated economy will be occurred by both banks credit and economic growth it-self.

Furthermore, increasing in funds rate is responded negatively by credit depth since the first to third year. It means that funds rate affects directly to credit depth. Meanwhile, the funds rate has 73% contribution to credit depth. This evidence brings us the implication that monetary policy should have made carefully consideration on BI rate

determination to keep economic growth going supported by banks intermediary as credit channel.

Causality between Credit Depth and Inflation

To investigate the causality relationship between credit depth and inflation, we use a VAR model as follows :

$$CRE_t = \alpha_{11} + \alpha_{21} INF_t + \alpha_{31} \sum_{n=1}^{k} CRE_{t-n} +$$

$$\varepsilon_{1t} \quad \dots\dots\dots\dots\dots\dots (7)$$

$$INF_t = \beta_{11} + \beta_{21} \sum_{n=1}^{k} CRE_{t-n} +$$

$$\beta_{31} \sum_{n=1}^{k} INF_{t-n} + \varepsilon_{2t} \quad \dots\dots\dots\dots (8)$$

or

$$I_t = A_4 + A_5 \sum_{n=1}^{k} I_{t-n} +$$

$$i_t \quad \dots\dots\dots\dots\dots\dots\dots\dots (9)$$

where CRE_t is credit depth measured by the ratio of banks credit to nominal GDP at year t, CRE_{t-n} is credit depth at year $t-n$, INF_t is inflation rate at year t, INF_{t-n} is inflation rate at year $t-n$ and ε is error term. Inflation rate at year t affects credit depth at year t, moreover, credit depth at year $t-n$ affects inflation rate at year t. Refer to equation 9, we found that relationship between credit depth and inflation rate is VAR(1) as presented in Table 3.

Table 3. VAR model estimation on the relationship between credit depth (CRE) and inflation rate (INF)

Vector Auto-Regression Estimates
Sample (adjusted): 1992 2014
Included observations: 23 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	ΔCRE	ΔINF
ΔKRE-1	0.772206	2.052563
	(0.11725)	(0.50654)
	[6.58608]	[4.05215]
ΔINF-1	-0.316862	-0.846906
	(0.03804)	(0.16434)
	[-8.32955]	[-5.15326]
C	-0.142478	1.096883
	(0.71243)	(3.07786)
	[-0.19999]	[0.35638]

We also found bi-direction causality. The VAR estimation model give an explanation that change in inflation rate by 1 bps at ΔINF_{-1} will decrease credit depth by 0.31 bps at ΔCRE_t, but change in credit depth by 1 bps at ΔCRE_{t-1} will cause an increasing in inflation rate by 2.05 bps at ΔINF_t. The links between inflation rate and credit depth is Granger causality. Inflation affects credit depth and credit depth affects inflation rate significantly. There is trade-off between inflation and credit depth. Credit depth was impeded by higher inflation rate to promote economic growth in Indonesian economy, on the other hand, credit depth stimulates the higher inflation rate as increasing money supplied to the real sectors of economy.

Effects of Government Spending on Capital to Credit

To investigate the effect of government spending on capital to credit depth, we use OLS model estimation as follows :

$$CRE_t = \sigma_1 + \sigma_2 GOV_t + \mu_t \quad \dots\dots\dots\dots\dots (10)$$

where GOV_t is ratio between government spending on capital to nominal GDP at year t, CRE_t is credit depth at year t, and μ_t is error term. Refer to equation 10, we found the effect of government spending on capital to credit depth as presented in Table 4.

Table 4. OLS model estimation on the effect of government spending on capital (GOV) to credit depth (CRE)

Dependent Variable: ΔCRE
Method: Least Squares
Sample (adjusted): 1991 2013
Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.373941	1.093060	0.342104	0.7357
ΔGOV	4.627450	1.000150	4.626758	0.0001

RESULTS AND DISCUSSION

Bank Indonesia (BI) determines BI rate as a monetary base rate indicating the monetary stance of inflation targeting framework. BI rate becomes base rate for funds and credit rates determination by the commercial banks and some other non-bank institutions (Bernanke & Blinder, 1992; Bernanke, 1993; Romer, 2006; Goeltom, 2007; Goncalves & Salles, 2006; Aghion & Howitt, 2009). As a forward looking tool for macroeconomic situations, BI rate will be immediately responded by banks in short-term time deposit rate determination. As our model estimation explained, increasing on BI rate by one bases point will decrease credit depth by 1.13 bps. It means that increasing on BI rate will stimulate decreasing on credit rate due to the increasing on the short-term funds rate. Moreover, increasing on credit depth will reduce credit supplied to real sectors and hamper the economy to expand. Banks has a negative response to the shock caused by increasing on BI rate since the beginning until the fourth period before it reaches equilibrium (Figure 1). At the beginning period, the source of credit growth stemmed from credit growth itself, but since the second period, the source of credit growth was dominated by the effect of BI rate at 71.8%. Our VAR model estimation explained that relationship between credit and BI rate is Granger causality. Bi-direction causality between credit depth and BI rate has

an implication that BI could be able to promote banks credit expansion or to take credit rationing policy by hampering credit channel significantly.

Due to their role as financial intermediary institution, banks allocated their credit based on private saving they have collected. The higher the funds rate will affect the higher the credit rate. In other word, funds rate particularly on short-term time deposit rate represents the cost of loanable funds and become the most important part to credit allocation activities. Moreover, short-term funds rate indicated banks response to BI rate. On the credit channel mechanism, funds rate is a constraint factor for maximizing credit expansion. Our VAR estimation model explained that there is bi-direction causality between funds rate and credit depth. Both effect of funds rate to credit depth and credit depth to funds rate are Granger causality. Our VAR model estimation also explained that there is negative effect of funds rate to credit depth.

Increasing on funds rate by 1 bps will cause decreasing on credit depth by 1.02 bps. Banks tends to response the increasing of funds rate by increasing credit rate. Causality relationship indicated that cost of loanable funds tends to reduce the role of credit as growth accelerating factor on economic growth. Furthermore, credit depth responded negatively to the increasing of funds rate since the beginning until the third period before it reaches equilibrium (Figure 2). Meanwhile, 73% variance decomposition of credit depth is the contribution of funds rate. This estimation model brings the implication for BI on the aim for monetary stabilization, BI should be able to maintain the ability of commercial banks to keep going as credit channel in order to promote Indonesian economic growth.
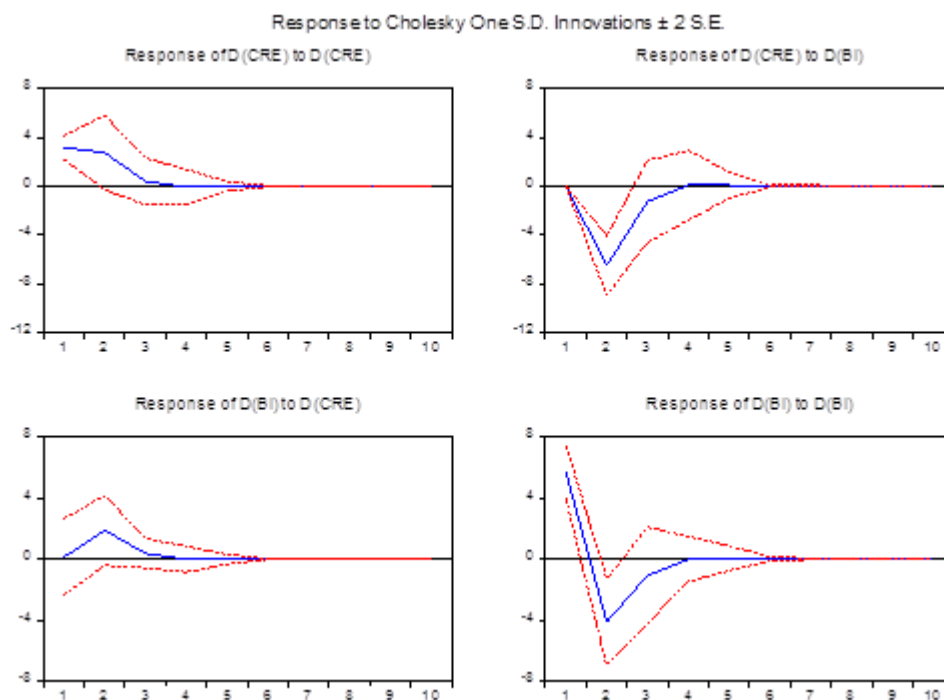
Figure 1. Impulse Response Factor (IRF) on the relationship between credit depth (CRE) and BI rate (*i*BI)

Banks credit as economic growth accelerator supplied money to the real sectors, both for capital and liquidity necessity. Besides BI rate and funds rate, inflation rate also becomes constraint factors for banks in order to their role as credit channel. Due to the increasing money supplied by banks credit, banks credit will also become endogenous variable to inflation rate. Banks credit stimulate inflation in the economy (Barro & Gordon, 1983; Rousseau & Wachtel, 2002; Rother, 2004). Our VAR model estimation explained that there is bi-direction causality between credit depth and inflation.

Credit depth and inflation rate are Granger causality. There is significant negative effect of inflation at period ΔINF$_{-1}$ to credit depth at ΔCRE$_t$ and significant positive effect of ΔCRE$_{t-1}$ to inflation at ΔINF$_t$. Increasing of inflation by one bases point will decrease credit depth by 0.31 bps, but increasing of credit depth by one bases points will also increase inflation rate by 2.05 bps. There is trade of between credit depth and inflation as also occur on the relationship between credit depth to BI rate and funds rate.

Furthermore, inflation is negatively responded by credit depth since the second period before achieving equilibrium state (Figure 3). We found that 23% variance decomposition of credit depth stemmed from inflation, and 60% variance decomposition of inflation stemmed from credit depth. This estimation model brings the implication for BI on the aim for monetary stabilization through inflation targeting framework, BI should be able to maintain ability of commercial banks to keep going as credit channel in order to promote Indonesian economic growth.

As economic growth accelerator, banks credit is inevitably and is an integral part for development of economy to achieving sustain economic growth. Banks credit directly respond to monetary policy but indirectly respond to fiscal policy.
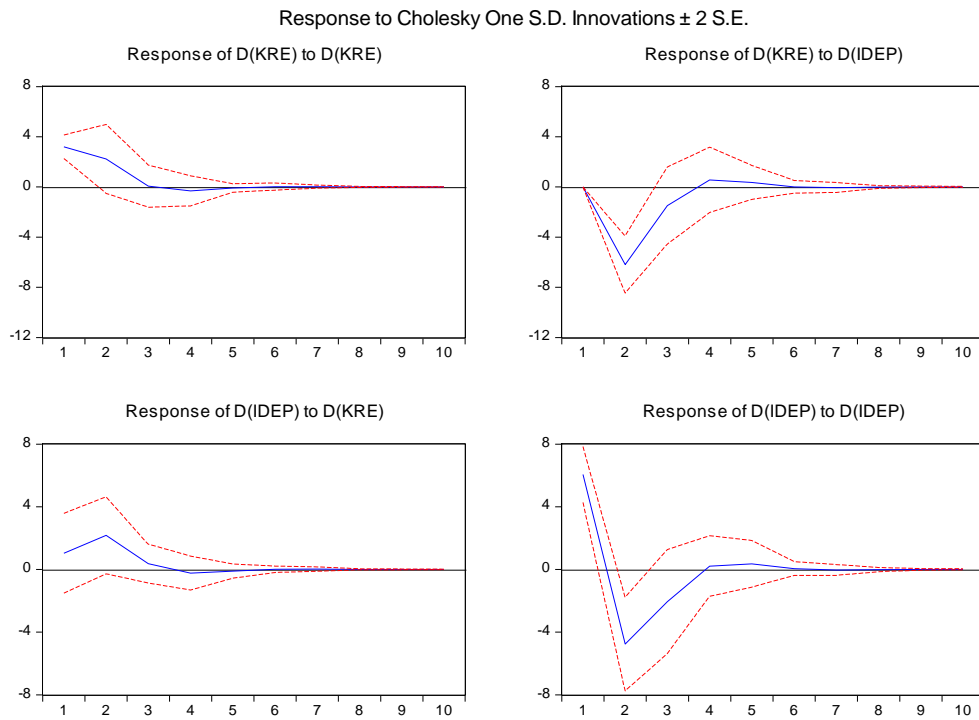
Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 2. Impulse Response Factor (IRF) on the relationship between credit depth (CRE) and funds rate (*i*DEP)

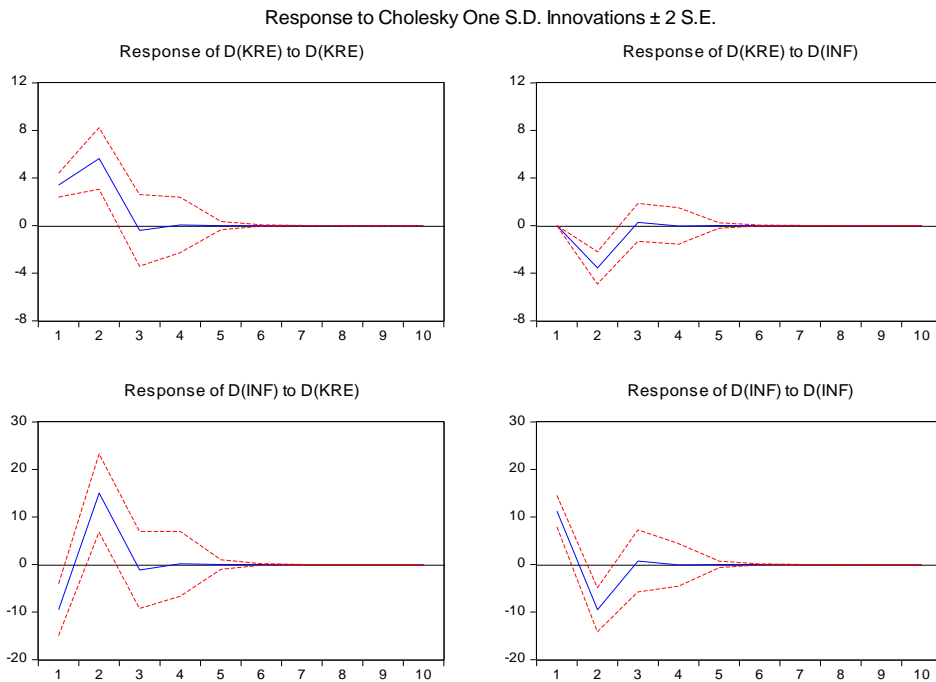Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 3. Impulse Response Factor (IRF) on the relationship between credit depth (CRE) and inflation (INF)

On fiscal policy framework, the main factors for economic growth are consumption, investment, government spending and net export (Blanchard & Johnson, 2013). Moreover, banks credit on monetary transmission channel framework stimulate GDP components

through credit to the real sectors of economy, both for the necessity on capital and liquidity, so that the real sectors could be able to increase their business escalation, productivity and output (Bernanke & Blinder, 1992; Bernanke, 1993; Bernanke & Mihov, 1998; Goncalves & Salles, 2006; Romer, 2006; Goeltom, 2007; Angeloni & Faia, 2013).

Government spending as a part of GDP indicated the government ability for running the economy development. Government spending is related to the government income from tax revenue, and also from government debt when there is fiscal deficit (Barro, 1981; Mankiw, 1987; Blanchard & Perotti, 2002; Rother, 2004). Government spending, particularly on capital expenditure is multiplier to economic growth, and it will be reached higher multiplier effect when banks credit allocated simultaneously to the business entities related to the government spending on capital. Banks credit promote economic growth along with government spending on capital. We found that there is uni-direction causality from government spending on capital to credit depth. Our regression in difference model estimation explained that there is significant positive effect of government spending on capital to credit depth. Increasing of government spending on capital by 1 bps will increase credit depth by 4.62 bps. This high magnitude explained that government spending on capital has ability to reach higher banks performance particularly on credit depth.

Money view theory explained that as a monetary authority, BI could affect aggregate demand through curbing money supply by policy determination affecting the reserve requirement of commercial banks at BI account. Besides, according to credit view theory, BI could also affect aggregate demand

through term and condition of banks credit (Bernanke & Blinder, 1992; Bernanke, 1993; Bernanke & Gertler, 1995; Goeltom, 2007; Bassetto et al., 2015). Furthermore, for transmission channel mechanism, beside money and credit view, Indonesian banks are faced to the turbulence and strong banking competition particularly on funding activity that affect increasing the cost of loanable fund. We said this situation as *bank view*.

Bank view perspective could be also explained by LDR as banks' indicator for credit channel mechanism. As long as NPLs at low level, Indonesian banks will always shed liquidity to the real sectors. For this time being, Indonesian banking activity as credit channel does not depend on their CAR due to the high CAR category present at Indonesia banks. Indonesian banks seem to be easier to find out additional capital due to the development of Indonesian stock market.

There is a distinction between bank view and bank lending channel in Indonesian banking perspectives. When there is credit restriction by the banks their-selves due to their performance according to bank view, bank lending channel restricted banks credit by the rule of BI. NPLs is a priority for Indonesian banks to keep lower. Because NPLs is related to the balance sheet channel, it is reasonable to explain that balance sheet channel is inevitably for banks to implement their role on monetary transmission mechanism (Bernanke & Gertler, 1995). In Indonesian bank perspectives, balance sheet channel is the main element of bank view. It is an advantage to Indonesian economy that the credit rationing will also automatically occur when there is higher NPLs. Increasing in NPLs by 1 bps will affect decreasing in LDR by 6.3 bps. The higher the response of Indonesian banks about NPLs will become a positive effect for economies that the

banks could always keep their performance at a good level. This situation indicated that banks could be able to maintain financial stability and stay away from any systemic shocks related to decreasing on banks credit quality.

CONCLUSION

This paper revealed bi-direction causality between credit and BI rate, credit and funds rate, and credit and inflation. There is trade-off between credit and BI rate, credit and funds rate, and credit and inflation, but government spending on capital promotes credit depth. We found that Indonesian banking is *bank view*, allocated their credit based on their performance, not merely on the monetary policy determined by central bank. For *bank view* perspectives, we analyzed the link between LDR as an indicator to credit channel mechanism to NPLs and CAR. We found that there is no significant effect of CAR to LDR, but has a strong negatively relationship between NPLs to LDR. This evidence indicates that commercial banks in Indonesia allocated their credit do not related to their capital but merely to the quality of their credit portfolio.

Implications of this evidence is that monetary policy for curbing inflation rate has to be designed inevitably with banks credit and the rate of cost of loanable fund. There will be a permanent policy to curb inflation for managing economic growth. However they have long-run linkage, the unity of BI rate, funds rate and inflation, and credit depth needs to be hold in short-run to make sure that economy keep going higher. Based on its role on economic growth, banks credit becomes a main part of sustain development to achieve social welfare.

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