THE IMPACT OF EXCESS LIQUIDITY ON MONETARY POLICY

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Abstract

This paper analyzes the excess liquidity especially on banking industry and its impact on monetary policy in Indonesia. We firstly investigate the determinants of bank behavior on their favor for excess liquidity both for precautionary motive and involuntary. Furthermore we determine the threshold between the low and high excess liquidity regimes. On the next step, this paper evaluates and compares the impact of excess liquidity on monetary policy between the two regimes. The first result shows that the excess liquidity on bank with their precautionary motive is significantly determined by the volatility of money demand, the volatility of economic growth, the bank cost of the bank, and also by the lag of excess liquidity, which conform its persistence. Secondly, using the Threshold-VAR approach, this paper shows the switching regime occurs in 2005 from low to high excess liquidity. Lastly, the excess liquidity reduces the effectiveness of monetary policy on controlling inflation.

Keywords: Excess liquidity, Threshold VAR, monetary policy transmission mechanism.
JEL Classification: B23, E5

I. INTRODUCTION

Excess liquidity in Indonesian banking started since economic crisis 1997. At that time, the worsen condition of national banking due to the high non-performing credit and the decline in public confidence urged the government to provide liquidity supportfor the troubled banks. The aim was to rescue the entire banking system. However, since the government fund was not sufficient, in 1998 Bank Indonesia provided bailout fund, known as Bank Indonesia Liquidity Support *(BLBI),* by Rp 144.5 trillion. Other programsto save the banking system was banking restructuring and recapitalization program. For the latter program, government issued bond for capital participation in 24 banks, to help them meet the capital requirements ruled by Bank Indonesia. These two programs; BLBI and banking recapitalization program, started the era of soaring and persistent excess liquidity in national banking system, until now.

Along with the economic development, the persistency of excess liquidity often creates problems for the central bank and for the economy in general. Excess liquidity can reduce the effectiveness of monetary policy transmission mechanism, especially in affecting demand side to reachthe targeted inflation. In addition, the excess liquidity in banking system will push the central bank to absorb it through monetary operation in forms of SBI auction *(Certificate of Bank Indonesia)*, *Fasbi*, and *FTK*, to eliminate its pressure on financial market.

Nevertheless, when the excess liquidity is very large and persistent, it gives pressure to the sustainability of central bank's balance because central bank should pay interest for banking fund placement in *SBI*, *Fasbi*, or *FTK*. Noted to October 2010, excess liquidity absorbed through Open Market Operation (OMO) reached Rp 381 trillion.

On the other hand, from the bank perspective, the excess liquidity raise the risk of real sector and make them reluctant to distribute their fund to productive loan, and choose to place

Figure 1.1.
Excess Liquidity Absorption via Open Market Operation
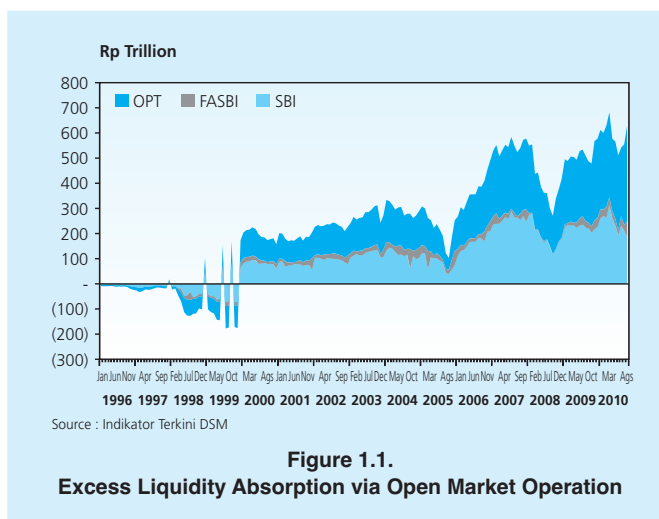
it in monetary instrument. Consequently, the fund for the real sector is limited and even if it is available, the price would be higher.

However, not all excess liquidity portions negativelyaffect the effectiveness of monetary policy transmission mechanism. In certain portion, excess liquidity is useful as a buffer for banking towards the uncertainty of fund withdrawal by customer and exchange rate volatility, influence the banking capital. Within this necessaryportion, excess liquidity is called *precautionary excess liquidity.* The remaining excess liquidity is unnecessary and is potential to give negative impacts for effectiveness of monetary policy. This remaining excess liquidity is called *involuntary excess liquidity.*

Therefore, it is necessary to determine the magnitude of precautionary and involuntary excess liquidity. By having this knowledge, authority monetary can determine how much excess liquidity to absorb through open market operations (OMO).

Empirical research on excess liquidity and its consequences toward the effectiveness of monetary policy are widely available. Saxegaard (2006)[2]is one of the most cited references. Saxegaard underline the necessity to quantify how much excess liquidity needed by banking for precautionary purpose. Using the sample of African countries in Sahara, he found that significant amount of involuntary excess liquidity reducedthe effectiveness of monetary policy transmission in controlling inflation. The reason is better aggregate demand increase the lending rapidly, and then increases the risk of inflation pressure.

Absorbing excess liquidity through OMO is expensive for the central bank. On the other hand, during cyclical downturn condition, stimulating aggregate demand would be ineffective since banking cannot put this unproductive excess liquidity in the form of lending or treasury bills.

Following Saxegaard method(2006), this paper will (i) calculateprecautionary and involuntary excess using banking excess liquidity model; (ii) estimate regime-switching models of monetary policy transmission mechanism, using threshold-VAR to determine the regime period of high and low precautionary excess liquidity.In general, the objectives of this research areto acknowledge the impact of excess liquidity persistency on monetary policy effectiveness; and to give policy recommendation toward excess liquidity persistency condition.

The second session of this paper covers theories and literature studies. The third session covers methodology and data, while the fourth session analyzes the result and analysis. Conclusion will be given in the last session part and close the presentation.

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2 Magnus Saxegaard, IMF Working Paper, WP/06/115: *Excess Liquidity and Effectiveness of Monetary Policy: Evidence from Sub-Saharan Africa.*

II. THEORY

Excess liquidity is the bank reserves deposited in central bank, plus cash for daily operational needs (cash in vaults), minus minimum reserve requirement, (Saxegaard, 2006). In this context, excess liquidity is used by banks as a precautionary, and representing the bank optimization behavior.

The sources of precautionary excess liquidity can be varied. Crisis with high uncertainty and high default risk can be one of them, where banking tends to keep non-remunerated liquid assets as precautionarystrategy (Agenor *et.al,* 2004). Another source of excess liquidity is institutional factor, where under developed interbank money market (IBM) will stimulate bank to increase liquidity for precautionary, since they often find it hard to borrow in emergency situation. Two other sources of excess liquidity are the difficulty on watching their minimum reserve requirement position; therefore the banks will hold reserves above the level set, and also the problems in payment system.

Not all excess liquidity arises from bank precautionary behavior. In a certain condition, excess liquidity owned by banks is neither precautionary nor involuntary. In this involuntary context, *non-remunerated reserves* owned by banks do receive return to balance the opportunity cost when it is held by banks.

Banks prefer holding excess liquidity than giving loan or buy government obligation, especially in a long run. The reason is the economic condition is in liquidity trap. Liquidity trap is a condition where return from banking credit is too small to cover intermediation cost and banks get higher yield in reserves than giving loans. In this condition, expansive monetary policy will only cause increase in excess reserves.

Agenor *et.al.* (2000) developed theoretical model of excess liquid reserves demandby commercial banks, where liquidity and volatility risks of real sector exist. To manage both of these risks, and to determine the amount liquid assets to hold, commercial banks can get fund from interbank money market or from the central bank.

There is one representative commercial bank that collect exogenous fund from third parties (Deposit, *D*). The bank has to determine the amount of non-interest-bearing liquid asset (reserve, *R*) and the amount of interest-bearing non-liquid asset (in credit form, *L*). The balance sheet for this commercial bank is:

$$R + L = D \tag{1}$$

Reserve is needed by banks because liquidity risk exists. A net flow of third parties is random based on density function; $\Phi = \Phi'$. When net outflow from third-party funds (TPF) exceed reserves owned by the banks, $u \geq R$, banks have to bear *illiquidity cost,*proportional to reserve shortage, $\max(0, u - R)$. In illiquid condition, banks have to borrow reserve with penalty

rate *(q)*, which is higher that the loan rate, $q > r_L$. Defining r_D as a deposit rate, the banks profit can be formulated as:

$$\Pi = r_L L - r_D D - q \, max(0, u - R) \tag{2}$$

So the expected profit from the bank is:

$$\Pi = r_L L - r_D D - q \int_R^{u_h} (u - R)\phi(u)du \tag{3}$$

By assumption, loan demand is negatively influenced by interest rates and is proportional to *expected output* (Y^e). Similarly, TPF is proportional to *expected output,* but positively influenced by deposit interest rates*:*

$$L = f(r_L)Y^e, f' < 0 \tag{4}$$

$$D = g(r_D)Y^e, g' > 0 \tag{5}$$

It is also assumed that economic agents determine L and D in the beginning of the period, before a shock in the output. Moreover, there is also demand for cash determined in the end of the period, after a shock in output and liquidity. Banks have to maintain liquid reserve, at certain proportion of third-party fund they owned, with interest rate r. Defining θ as reserve requirement rate and R as total reserve, the excess reserve, Z, is:

$$Z = R - \theta D = (1 - \theta)D - L \tag{6}$$

The balance condition of money market is :

$$C + D = kY \tag{7}$$

where C is currency holding; $k > 0$ is constant reciprocal of velocity; while Y is the realized output.

This model also assumes that demand on cash is proportional to realized output. Specifically, the assumption is as follows :

$$C = c/(1 + c). \, k \, Y \tag{8}$$

Where $c = C / D$. Output and $c. \, k \, /(1 + c)$ is assumed as random based on the following equation :

$$Y = Y^e(1 + \varepsilon), \qquad c.\,k/(1 + c) = \Lambda(1 + \xi) \tag{9}$$

Where ε and ξ are random shocks.

By applying equations (8) and (9), a demand on cash is formulated as :

$$
\begin{aligned}
C &= \Lambda k Y^e (1 + \varepsilon)(1 + \xi) \\
&= \Lambda k Y^e x \quad , (1 + \varepsilon)(1 + \xi) = x \sim N(\mu, \sigma^2)
\end{aligned}
\tag{10}
$$

To fulfill the needs of unanticipated demands for cash, banks can borrow cash followed by interest by q, and take some of the excess reserve (Z). By using equation (6), the expected reserve deficiency is :

$$E \max\left[0,\ C - \left((1 - \theta)D - L\right)\right] \tag{11}$$

Based on equation (11), (4), (5), and (7), we can get the equation for expected profit from banks as follows :

$$\Pi = \left[r_L f(r_L) - r_D g(r_D)\right]Y^e + rR - q\,E \max\left[0, C - \left((1 - \theta)D - L\right)\right] \tag{12}$$

By assumption, the functions and are quasi-concave functions. We can prove the following prepositions (the complete proofs can be seen on Agenor et. al, 2000).
1. The increase of penalty rate (*q*) will increase the deposit interest rates, credit interest rates and excess reserve owned by banks.
2. The increase of output's volatility and liquidity shock causes ambiguous effects to deposit interest rates,'loan'interest rates, and excess reserve. If the initial level of penalty rate is pretty high, the increase of this volatility will also rise up the deposit interest rates, loan interest rates, and excess reserve.
3. The increase of reserve requirement rate will increase the credit interest rates and decrease excess reserve. If the level of volatility is not too high, an increase of reserve requirement rate will increase the deposit interest rates.

Based on the three prepositions above, if the level of penalty rate is high, there will be interrelationship among excess reserve (*z*), penalty rate (*q*), reserve requirement rate (*θ*), and output's volatility and liquidity shock (*σ*) as follows :

$$Z = Z(\overset{+}{q}, \overset{-}{\theta}, \overset{+}{\sigma}) \tag{13}$$

By sorting excess liquidity into the precautionary and the involuntary, we have deeper understandings about their impact on the monetary policy transmission mechanism. On inflationary contexts, involuntary excess liquidity will be released promptly when the aggregate demand side grows stronger. Therefore, the total liquidity in economy will increase rapidly without involving policy rate reduction mechanism (loosen monetary policy), just when the liquidity should be restricted. This triggers the risk of inflation pressure.

Furthermore, when banking has involuntary excess liquidity due to the problem in distributing loan, an effort to increase the demand by decreasing the lending cost would be ineffective. The expansive monetary policy will only increase the excess reserve in banks and not the loan expansion. In contrast, if tight monetary policies are chosen, banks will reduce their unwanted reserve. O'Connell (2005)[3] states that :

> "   *When there is involuntary excess liquidity in the economy in equilibrium, the transmission mechanism of monetary policy, which usually runs from a tightening or loosening of liquidity conditions to changes in interest rates or asset demands and then to economic activity, is altered and possibly interrupted completely. ….*"

On the other hand, monetary policy is expected to be more effective if banks have the precautionary liquidity access. For example, when monetary policy is loosening by decreasing minimum reserve requirement, bank liquidity will rise; hence will increase the allocation for loanwith lower interest rate. On the other hand, when the central bank choosestight monetary policy, banking will reduce their loans to maintain the level of expected excess reserve.

Based on the descriptions above, the analysis on the effects of excess liquidity to monetary policy transmission mechanism requires better understanding on how consistent the policy on reserve requirement is, on driving the excess reserve demand of bank. Moreover, the understanding on the sources of excess liquidity is important to decide what policy should be taken.

There have been a lot of researches about excess liquidity in Indonesia. They focus on different views about source and impact of the excess liquidity. Some of the researches are summarized in the table below.

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3 Stephen O'Connell, 2005, "A Floor and Ceiling Model of U.S. Output," Journal of Economics Dynamic and Control, Vol. 21, pp. 661-95.

Authors	Year	Analysis Method	Result
Table 1.			
Literatures on Excess Liquidity			
Mochtar & Kolopaking	2010	Regression	• The strategy of foreign exchange reserves accumulation could disturb the effectiveness of monetary policy since there will be liquidity expansion by the central bank without any mechanism on the influences of interest rates. • Some of the negative impacts for the action are: - The efforts in controlling inflation are not optimal. - The increasing of exchange value potency as a shock amplifier. - There is a disturbance in the interaction between fiscal and monetary policies.
Saxegaard	2006	Regression, Threshold VAR	• A persistent high excess liquidity will weaken the monetary policy transmission mechanism; hence reduce the capability of central bank to influence demands in economy.
Prastowo & Prasmuko	2008	Qualitative	• There is a large substitutive correlation between the decrease of SBI (Bank Indonesia Certificate) and the delivery of credits in Indonesian banking. • The liquidity of banking depends mostly on the sale of SBI (Certificate of Bank Indonesia).
Widayat, et. al	2005	Qualitative, Accounting	• The volatility of inter-bank interest rates, PUAB) depends on the high excess liquidity, both short-termand relatively permanent one (long term). • The discretionary monetary policy createsuncertainty in prices and the banking liquidity placement.

III. METHODOLOGY

3.1. Estimation of Precautionary and Involuntary Excess Reserve

Following Henry *et.al.* (2010), who use theoretical model of Agenor *et.al.* (2000), we estimate the precautionary excess reserve with the following empirical model:

$$\ln\left(\frac{EL}{D}\right) = a_1(L)\ln\left(\frac{EL}{D}\right) + a_2(L)\ln\left(\frac{RR}{D}\right) + a_3(L)CV_{\frac{c}{D}} + a_4(l)CV_{\frac{Y}{Y_T}} + \quad (14)$$

$$a_5(L)\ln\left(\frac{Y}{Y_t}\right) + a_6(L)r + v_t$$

Where EL is Excess liquidity; $CV_{c/d}$ is Cash/Deposit volatility; D is Deposit; CV_{Y/Y_t} is Output gap volatility; RR is Reserve requirement; Y/Y_t is Output gap; and r is Penalty rate.

We use Certificate of Bank of Indonesia (SBI) owned by bank as the proxy for excess liquidity. This is in line with Prastowo and Prasmoko (2008), which argue that banks prefer to put their excess liquidity in the form of SBI rather than in giral account in Bank Indonesia. We use monthly data as listed on the following table:

Table 2. Data for Precautionary and Involuntary Excess Liquidity Estimation	
Variable	**Source of Data**
Excess Liquidity	Monetary Survey - Volume of SBI which own by banks
Third Party Funds	Monetary Survey
Reserve Requirement	CEIC
Coefficient of variation of Cash to deposit ratio (volatility risk)	Moving average from standard deviation of cash ratio to Deposit (5 month). Cash and Deposit datawere from monetary survey
Coefficient of variation of output from trend	Moving average from standard deviation of output gap (5 month)
Penalty rate	Interest rate PUAB o/n (CEIC)
Output Gap (proxy for demand for Cash)	Outputis represented with Industrial Production (CEIC). Potential output is estimated using HP Filter.

After estimatingprecautionary excess reserve using Equation (13), we proceed to estimating involuntary excess reserve. In this step, we subtract the actual independent variables in Equation (13), which were the proxy for total excess liquidity owned by banks, with the estimated one from Equation (13). In the other words, involuntary excess reserve is estimated with residual from Equation (13) estimation.

3.2. The Impact of Involuntary Excess Reserve on Monetary Policy Transmission

On this step, we test the hypothesis; that the presence of high involuntary excess reserve in banking may weaken the monetary policy transmission mechanism. Following Saxegaard (2006), we use estimated involuntary excess reserve from the first step as a threshold variable in analyzing VAR model, which represent the transmission of monetary policy in Indonesia. In this stage, we allow the possibility for non-linearity in monetary policy transmission caused by deviation of involuntary excess liquidity relative to certain threshold.

We estimate the reduced form two-regime TVAR below:

$$\begin{pmatrix} Y_t \\ M_t \end{pmatrix} = C_i(L) \begin{pmatrix} Y_{t-1} \\ M_{t-1} \end{pmatrix} + \begin{pmatrix} v_{it}^Y \\ v_{it}^M \end{pmatrix}, \text{ untuk } i = 1,2 \tag{15}$$

$$i = 1 \text{ jika } EL_t^{inv} \leq \tau, \qquad i = 2 \text{ jika } EL_t^{inv} > \tau$$

Where v_{it}^Y and v_{it}^M are shock vectors that are not regime dependent, representing non-policy and policy variable respectively; $C_i(L)$ is regime-dependent matrix of polynomial lag from autoregressive parameter; EL_t^{inv} is threshold variable(involuntary excess reserve), which determine the current regime, relative to certain threshold (τ).

As in Bernanke and Milhov (1995), the dependent variables are divided into two groupin reduced form VAR; non-policy variable such as GDP and inflation, and policy variable including nominal exchange rate and BI rate policy. The data we useon this step is explained in Table 3. All variables are transformed into natural logarithm and are de-trended using HP Filter.

Table 3. Data for ThresholdVAR Estimation	
Variable	**Source of Data**
Involuntary Excess liquidity	Estimated from step 1
Output	Industrial production (CEIC)
Inflation (yoy)	Source: DSM
Exchange rate	Source: CEIC
BI rate	Source: DSM

In estimating this reduced form VAR, we apply MSVAR software (Krolzig-1998). The existence of non-linearity in monetary policy transmission mechanism will formally be tested using this program. Furthermore, regime-dependent impulse response will be used to analyze the difference of economics response towards monetary policy shock between the 2 regimes.

Christiano and Echenbaum (1996) argue that one cannot identify the impact of monetary policy shock directly using the reduced form two-regime TVAR model in Equation (14), since the covariance matrix of residual vector is not diagonal. This is because the monetary policy depends on economic condition;hence response of the economic variable reflects the combination effect between monetary policy and other variables which also changethe monetary

policy. To solve this problem, we need to implement restriction in TVAR model. This restriction is obtained by searching matrix A,which fulfill the following conditions:

$$A_i^{-1} \begin{pmatrix} Y_t \\ M_t \end{pmatrix} = A_i^{-1} C_i(L) \begin{pmatrix} Y_{t-1} \\ M_{t-1} \end{pmatrix} + \begin{pmatrix} u_{it}^Y \\ u_{it}^M \end{pmatrix} \qquad \text{for } i = 1,2 \text{ or}$$

$$A_i^{-1} \begin{pmatrix} v_{it}^Y \\ v_{it}^M \end{pmatrix} = \begin{pmatrix} u_{it}^Y \\ u_{it}^M \end{pmatrix} \qquad \text{for } i = 1,2 \tag{16}$$

For $\begin{pmatrix} u_{it}^Y \\ u_{it}^M \end{pmatrix}$ is error vector with diagonal covariance matrix $A_i \sum_i A_i'$.

We need to identify the influence of policy variable shock (policy interest rate), which is not anticipated by other endogenous variable. Bernanke and Blinder (1992) argue that to identify the impact of policy monetary shock without identifyingthe complete model structure, we can assume the policy variable react contemporaneouslyon non-policy variable, but not the other way around. Following this, we use the following restriction:

$$\begin{pmatrix} v_t^{GDP} \\ v_t^P \\ v_t^{Ex} \\ v_t^{M1} \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 \\ a_{31} & a_{32} & 1 & a_{34} \\ a_{41} & a_{42} & 0 & 1 \end{pmatrix} \begin{pmatrix} u_t^{GDP} \\ u_t^P \\ u_t^{Ex} \\ u_t^{M1} \end{pmatrix} \tag{17}$$

IV. RESULT AND ANALYSIS

Following the steps explained before, we estimate the precautionary and involuntary excess liquidity, and measure the threshold using maximum likelihood estimation (MLE) method in MSVAR (Krozlig-1998). This threshold will be our benchmark to classify the excess liquidity regime;the low or the highregime. On the impact of excess liquidity towards monetary policy transmission, we compare the impulse response function of macro variable, between the low and high EL regime.

Firstly we test for the EL persistence, using simple regression model, with the following results:

$$EL_t = 0.99 \, EL_{t-1} + \varepsilon$$

$$(0.01) \, ***$$

$$R^2 = 0.70$$

Since the coefficient of excess of liquidity variable in *t-1* is close to 1, we conclude the excess of liquidity during the observation period is persistent.

## 4.1. Precautionary and Involuntary Excess Liquidity Estimation

Following Henry *et.al.* (2010) and theoretical model of Agenor et.al. (2000), our estimation result for excess liquidity determinant is:

Table 4. Excess of Liquidity Determinant Estimation Result	
Dependent Variabel: Log(EL)	
Variabel	**Koefisien**
Intercept	**- 0.438*** (0.113776)
Log(EL(-1))	**0.864*** (0.070112)
Volatility_CD(-3)	**1.546**** (0.672642)
Rate_PUAB(-4)	**0.007*** (0.004533)
Volatility_IPGap(-4)	**0.002*** (0.000461)
R-Squared	0.74
Prob (F-Statistic)	0.000

Note:
t-Statistic in parentheses.
Level significancy: *** on 1%; ** on 5% ; * on 10%.

Several alternative variable proposed by Henry et.al (2010) including reserve requirement, is not significant for Indonesiancase.Referring to the best estimation result above, all variable (lag EL, cash deposit volatility, PUAB interest rate, and gap output volatility) already have correct signs and statistically significant.

Next, we use the estimation result above to calculate the precautionary excess liquidity, which is needed by banking industry. Following Henry et.al (2010), involuntary EL is calculated as:Involuntary EL = EL Total - ELPrecautionary. The result is presented at Figure 2.

We use this estimated involuntary EL as threshold variable to split the regime in Threshold – Vector Auto Regression (T-VAR) method, using MS-VAR module (Krolzig, 1998) in OxMetrics application.

Figure 2.
Excess Liquidity: Precautionary vs. Involuntary
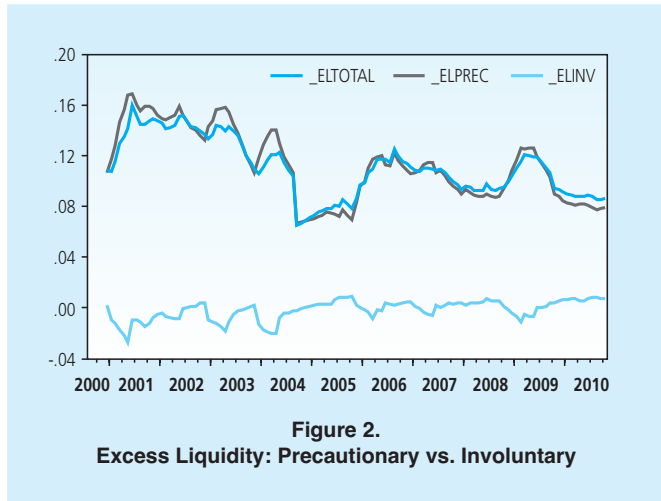
4.2. **Excess Liquidity Threshold and Regime Classification**

T-VAR estimation refers to Saxegaard (2006) and Bernanke and Blinder (1992), using 4 endogenous variables; namely Production Index (GDP proxy), Inflation, Exchange Rate, and BI Rate. Production Index and Inflation variable are non-policy variable, while Exchange Rate and

Figure 3.
Involuntary Excess Liquidity Regime: Low vs. High
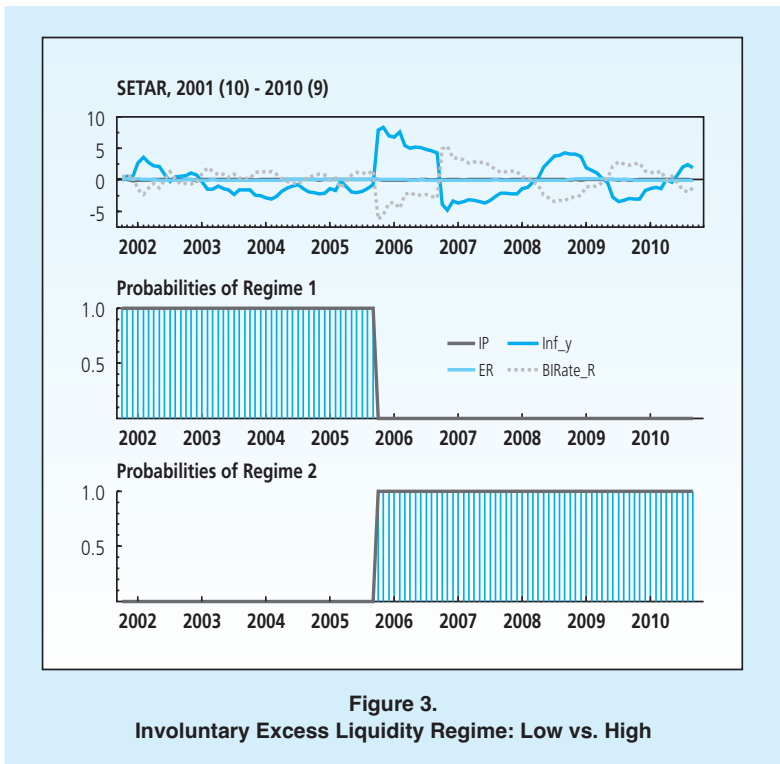
BI Rate variable are policy variable. Again, policy variable react contemporaneously on non-policy variable, but not the other way around. In addition, we adjustthe S-VAR structure by including NFA variable as exogenous variable, to suit the condition for Indonesia.NFA is also policy variable, and potentially affects the exchange rate and inflation.

The result of T-VAR estimation is presented below. Complete result is provided in Appendix A.

We try several lag alternatives (from lag 0 to 8) for the threshold variable (EL variable), and found lag 2to be the best choice because it provide more intuitive result. In addition, it suits the economic condition break in 2005 due to inflation hike, a high BI rate, and reserve requirement policy.

During the period from October 2001 - September 2009, we found two excess liquidity regime; low EL Regime for August 2001-September 2005, and high EL Regime for October 2005–September 2010. Using maximum likelihood estimation (MLE) in MS-VAR module, the estimated threshold is:

Table 5. Estimated Threshold Value with MLE Method	
Estimated Threshold	0.00048870
Rezim Classification	Low 2001:08 - 2005:9
	High 2005:10 - 2010:9
LR Test	237.7847
p-values (adjusted χ2)	[0.0000]

The Likelihood Ratio (LR) above is important to test the linearity of EL threshold within the sample range 2001:8 to 2010:9. According to that result, high LR coefficient value (237.7847) and p-values (below 5%) confirms nonlinearity on EL, hence support our EL regime classification.

4.3. The Impact of Excess Liquidity on Monetary Policy

We use policy rate as the proxy for monetary policy and analyze its effectiveness toward other macro variables such as production index (GDP proxy), inflation and exchange rate. On VAR structure, we evaluate the monetary policy transmission by giving one standard deviation shock (impulse) on BI rate, then compare its impact on the two classified regime. The result is presented below.

Figure 4.
IRF Monetary Policy Transmission: High vs. Low Involuntary Excess Liquidity
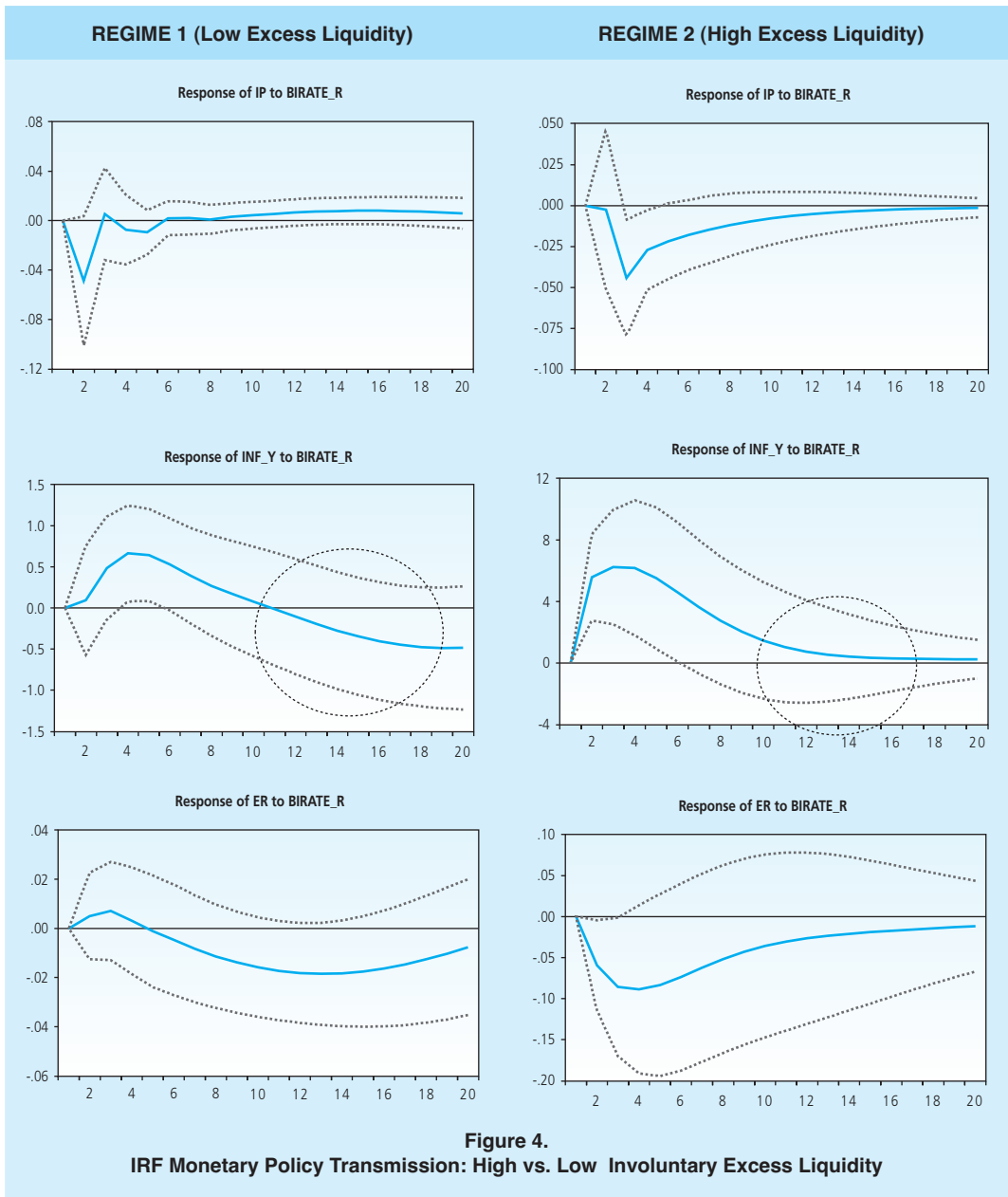
According to impulse-response function above, the increase in BI rate will be transmitted into three macro variables as follow:

a) Towards Index of Production (GDP proxy)

For low and high EL regime, an increase of BI rate by one standard deviation will lower the GDP as expected and is compatible with theory. Though slightly differ, a tight monetary policy will lower Indonesia economic growth, both in low and high excess liquidity regime.

b) Towards Inflation

During low EL regime (left picture), an increase of BI rate will reduce the inflation pressure, which is in line with Inflation Targeting Framework (ITF). Though it needs few lags for the inflation to response the policy rate, the interest-based policy performs fairly well on this regime. Nevertheless, we do not find condition during high EL regime (right picture).

Interestingly, when economic is in high excess liquidity, the monetary policy transmission is not effective to restrains inflation. In fact, in high EL regime, an increase of BI rate is responded with an increase of inflation.

One possible explanation is that over accelerated economic needs to be responded with an increase of BI rate, which reduce the fund on market. However, in high excess liquidity regime, the public fund remains largely available; hence the demand will be relatively higher compared to low EL regime.

This positive relationship between BI rate and inflation require further research. As for current paper, we only focus on comparison between the two regimes, and conclude that the high excess liquidity in economics will lower the effectiveness of BI rate to control inflation.

c) Towards exchange rate

In line with the uncovered interest parity (UIP) theory, the increase of BI rate will raise the value of IDR. An increase of domestic interest rate will make domestic more attractive, therefore increase the demand for IDR. This result applies for both low and high EL regime.

The analysis of impulse response function above is based on SVAR structure with the following endogenous variables: Index of Production, Inflation, Exchange rate, BI rate, and NFA (Net Foreign Assets). As additional analysis and comparison, we specify two alternatives of SVAR structure namely alternative A which only include Index of Production, Inflation, Exchange rate, and BI rate variables, and exclude NFA. However the result of this pure structure from Bernanke and Blinder (1992), give inconclusive result and does not consistent with the theory. Alternative B, we use Non-Performing Loan (NPL) variable to capture the constraint on loan supply. Likewise, this alternative also does not provide conclusive result. We report the complete result for both alternatives on appendix.

In general, we have shown that excess liquidity affect the effectiveness of monetary policy. In high EL regime condition, the impact of BI rate as a monetary policy instrument in order to reach the monetary policy objective (which is low and stable inflation), is relatively lower than in low EL regime. Therefore, several initiative programs of Bank Indonesia related to controlling and managingliquidity are necessary and require further improvement.

V. CONCLUSION

This paper gives several important conclusions. First, the behavior of bank to keep excess liquidity for precautionary is affected significantly by the volatility of cash demand, the volatility

of economic growth, the cost of fund for bank, and the liquidity condition in previous period.

Second, the application of Threshold-VAR (TVAR) method shows that there are two regimes of excess liquidity in Indonesia; the Low EL Regime (2001:08 – 2005:9) and–the High EL Regime (2005:10 – 2010:9). The regime switch occurred in 2005, when there were significant changes in Indonesia economics condition including the increases of inflation, BI Rate, higher open market operation, policy changeon minimum reserve requirement, and also the rise of foreign reserve accumulation in Bank Indonesia.

The policy implication is straightforward. Bank Indonesia needs to control and to direct the high excess liquidity condition. Further endorsement on several existing programs is necessary, including the conversion of SUP (*Surat Utang Pemerintah*) to be tradable, Treasure Single Account (TSA) with Asset Liability Management (ALM), and the use of SPN (*Surat Perbendaharaan Negara*) as monetary instrument.

This paper calls for further research, especially related to structure of SVAR, which only consists of 4-5 variables.The model proposed by Bernanke and Blinder (1992) may be appropriate for developed countries because of the stability of their institutional economics. On the other hand, Indonesia is a transition country, where the policy is often adjusted to economic situation and sometimes to the political situation. Therefore, future study should account for this issue, using the T-VAR method.

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APPENDIX A.
ESTIMATION RESULT OF T-VAR MODEL (LAG 2)

LogLikelihood and estimated threshold for given number of regimes
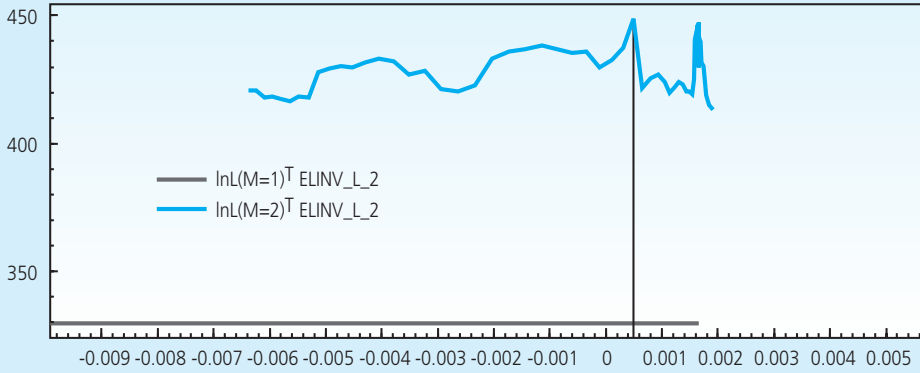
Threshold variable
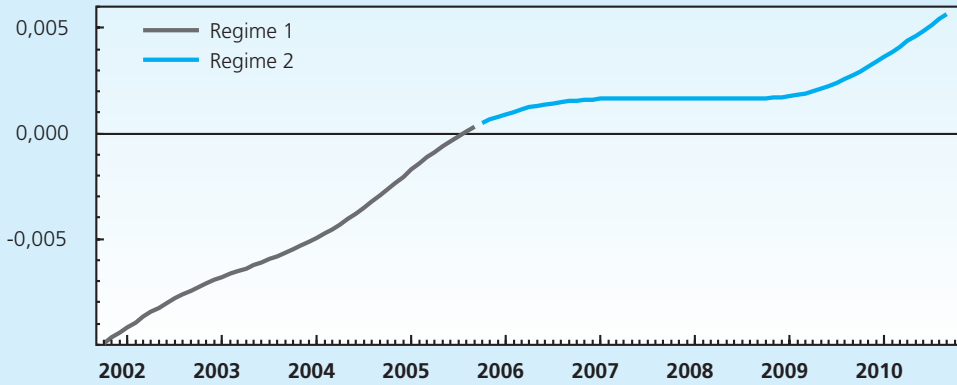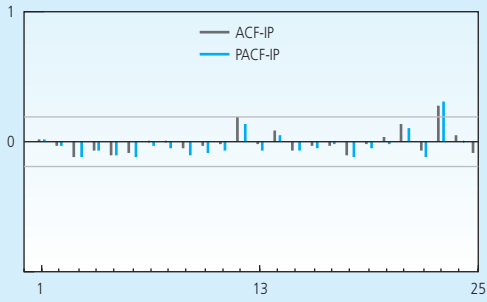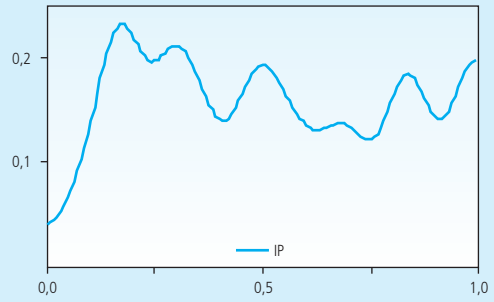
APPENDIX B. IRF SVAR

IRF ALTERNATIVE A: SVAR WITHOUT NFA

REGIME 1 (Low EL)	REGIME 2 (High EL)
Response to Nonfactorized One S.D. Innovations $\pm$ 2 S.E.	Response to Nonfactorized One S.D. Innovations $\pm$ 2 S.E.

Response of IP to BIRATE_R

Response of INF_Y to BIRATE_R
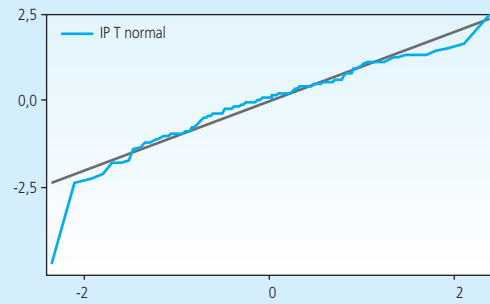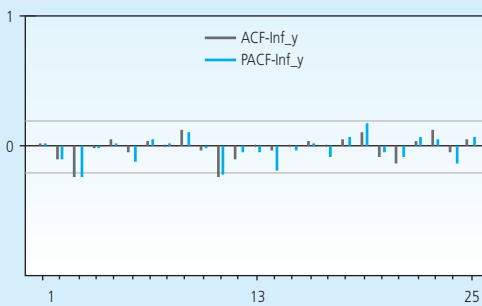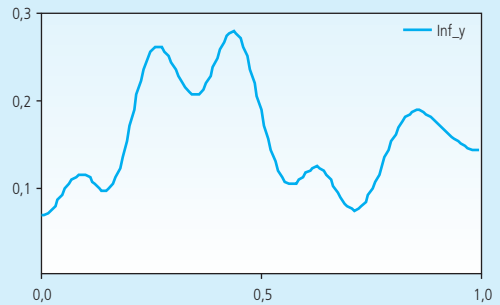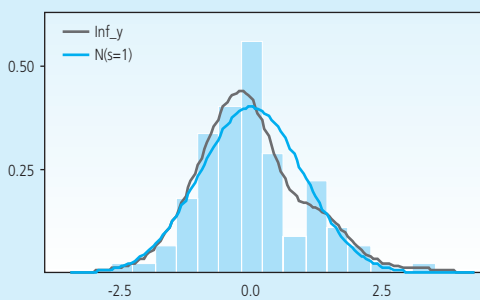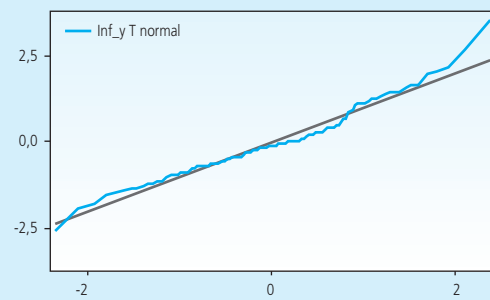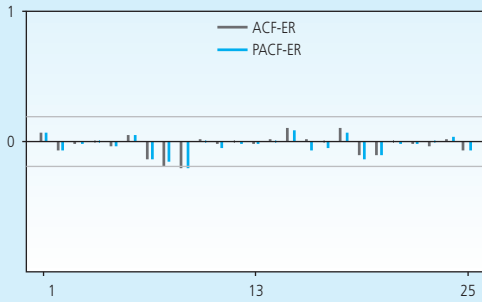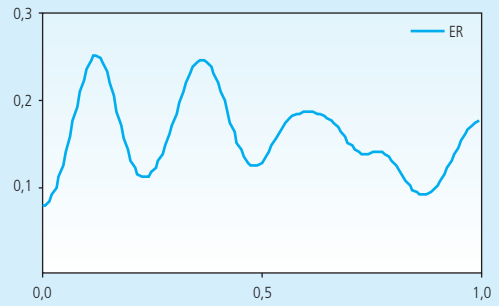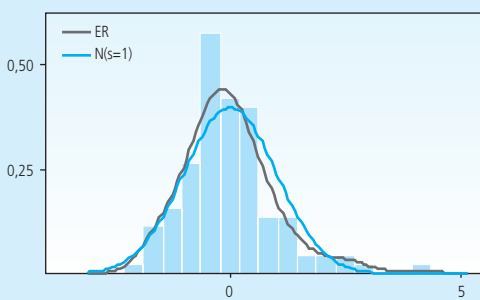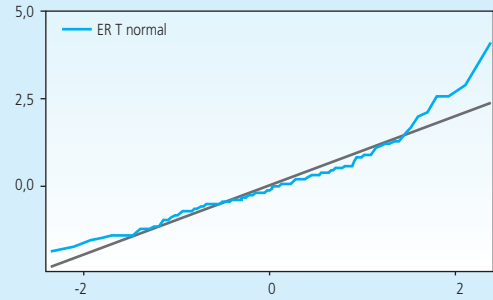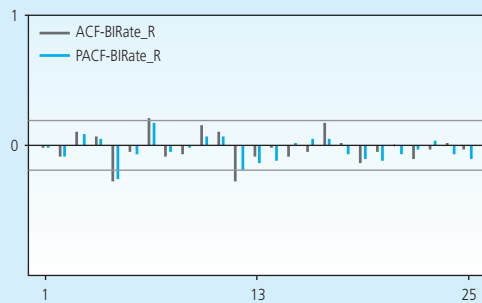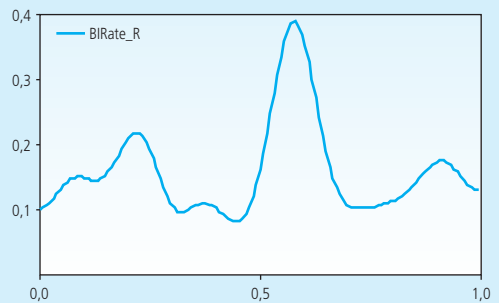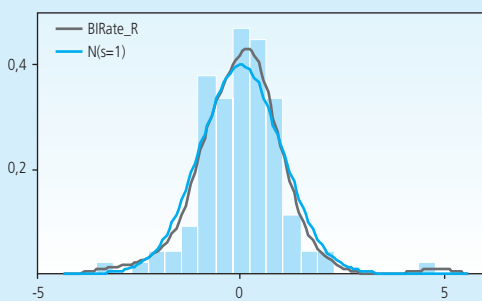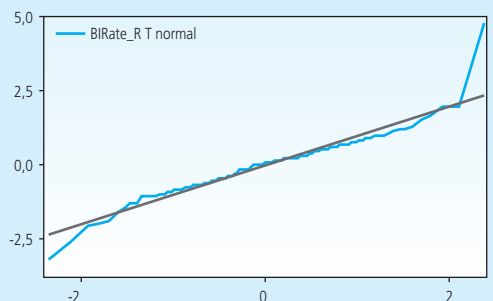
Response of ER to BIRATE_R
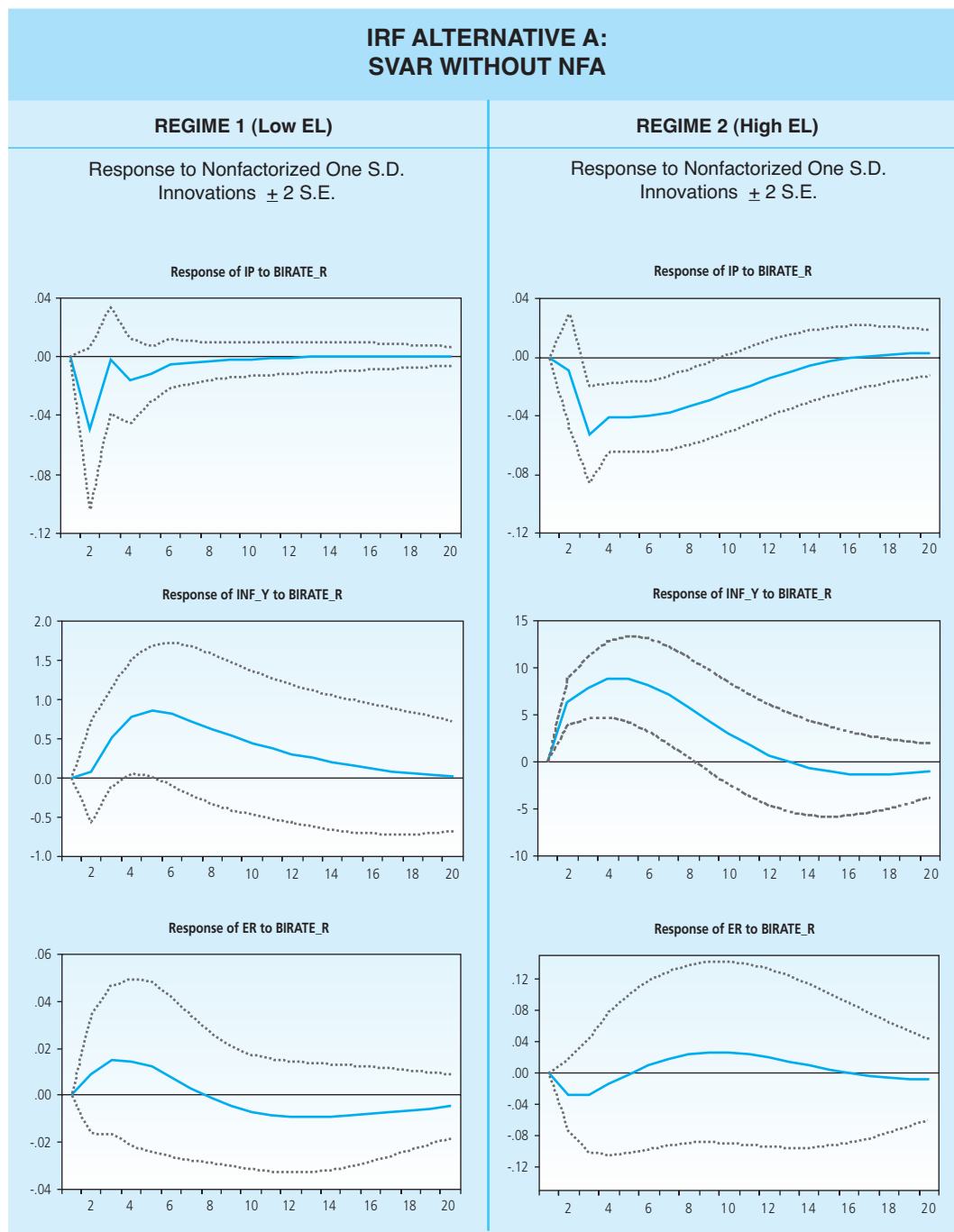
ALTERNATIVE B:
SVAR WITH REPLACING NFA FOR NPL

REGIME 1 (Low EL)	REGIME 2 (High EL)
Response to Nonfactorized One S.D. Innovations $\pm$ 2 S.E.	Response to Nonfactorized One S.D. Innovations $\pm$ 2 S.E.

Response of IP to BIRATE_R

Response of IP to BIRATE_R

Response of INF_Y to BIRATE_R

Response of INF_Y to BIRATE_R

Response of ER to BIRATE_R

Response of ER to BIRATE_R