

FUND MANAGEMENT AND THE LIQUIDITY OF THE BANK¹

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Abstract

This paper analyzes the liquidity of the banks, both precautionary and involuntary liquidity. We apply dynamic panel estimation on individual bank data covering the period of January 2002 to November 2011. The result shows precautionary liquidity is more determined by the operation of the bank. On the other hand, the involuntary liquidity is more affected by the financial system condition. Controlling the size of the bank, the effect of the financial system condition and the macro economy is larger for the small banks. Moreover, the monetary policy in the form minimum reserve requirement affects the precautionary liquidity of the small banks; while the central bank rate is less influential to the bank liquidity.

Keywords: Banking, Liquidity, General Method of Moment

JEL classification: G21, G11, C33

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I. INTRODUCTION

Bank is an intermediary institution that accepts from and channels funds to the society. The performance individual banks and the banking system in aggregate will highly depend on how the banks manage their assets and their liability. The banks manage their assets and their liability to gain profit and to raise the company value within some rules. The rules include sufficient liquidity, low risk and sufficient capitals. Therefore, the management of assets and liability are highly related to the bank liquidity. According to Keynes (1936), the three motivations in holding cash or liquidity are for transaction, precaution, and speculation. Furthermore, Edgeworth (1888) with the square root of law of precautionary reserves principle, the liquidity reserve of the bank will increase equivalently to the root of the number of transactions.

Liquidity is vulnerable and can be suddenly drained from a bank. The liquidity problems at one bank can spread to other banks that will eventually pose a systemic risk. A shock can create liquidity spiral that leads to the loss of liquidity and may form financial crisis. Learning from the history, the banking crises lately was mainly due to the liquidity crisis that caused the banks fail to pay their obligations. Within the framework of the financial system safety net (FSSN), as also proposed by Bagehot (1873), the central bank as the lender of last resort (LLR) provides temporary liquidity loans with specific requirements to maintain the stability of banking system. The liquidity assistance is granted especially when the failure of bank may cause contagion effect and lead a systemic risk. Goodhart (1987) states that there is no clear distinction between the condition of illiquid and insolvent, but banks that need liquidity through LLR are suspect to be in the process of becoming bankrupt.

In general, the liquidity reserve of a bank is a guarantee or a precaution over a possible financial penalty due to the increasing withdrawals or an increase in the minimum reserve requirement. Some banks choose a strategy to have excess liquidity to give a signal of strong liquidity to the market. However, excess liquidity may also be interpreted that the banks have a bad liquidity management and is sub optimal on managing their assets portfolio and liabilities.

The excess liquidity can also be the result of poor infrastructure in the payment system and inter bank money market. Di Giorgio (1999) argues that the level of financial system development can be reflected by the participation cost within the financial system. In developed countries, the cost to process information, project evaluation and monitoring of borrowers is relatively low. This allows the banks to manage their liquidity with a relatively low liquidity reserves. On the contrary, the country with poor payment systems and with limited infrastructure on interbank money market tends to complicate the banks in managing their liquidity. This leads them to hold higher liquidity reserve.

In micro-banks, the asset and liability management of banks concerns the aspects of liquidity risk, market risk, trading risk, capital and fund raising, profit target and growth plans. Generally the banks face three types of risk; credit risk (transaction, counterparty, concentration,

and settlement), market risk (interest rate, exchange rate, liquidity), and operational risks (processes, systems infrastructure, human resources). The main focuses in asset and liability management by the banks are liquidity risk, exchange rate, and interest rates. In this case, the optimal liquidity is the liquidity that is able to create optimal revenue and prevent the occurrence of liquidity risk. At macro level, from the central bank perspective, an optimal asset and liability management by the banks is the one that create liquidity in accordance with the target of monetary policy.

Currently, the management of assets and liabilities by the banks in Indonesia indicates a fair amount of surplus liquidity³. This excess is absorbed by the central bank through monetary policy with market or non-market approach. The market operations involve monetary transactions between the central bank and the banks in order to lower or to increase the liquidity in the market. This includes the selling or buying the government securities or Certificate of Bank Indonesia.

In Indonesia, monetary policy tends to be contractionary to absorb the excess liquidity in banking. This condition arises as the consequence of the bail out policy in financial crisis of 1998 when dealing with the bank run within banking system. The non-market approach to the monetary policy is conducted through minimum reserve requirement which dictate the banks to place minimum amount of their funds at central bank.

Ganley (2004) stated that the surplus of liquidity can cause problems for central banks on transmitting his monetary policy. It can also create difficulties for the central bank to intervene the currency market. Moreover, excess liquidity may disturb the balance sheet and the income statement of the central bank. The distortion on monetary policy effectiveness will likely lead to a problem on the financial sustainability of the central bank, particularly when the main instruments for monetary policy is the central bank securities.

The main source of bank liquidity is capital inflows such as long-term foreign investment, short-term portfolio investment, and the fiscal deficit financing. With free foreign exchange regimes, the capital inflow to Indonesia either long-term or speculative, is a significant determinant for national liquidity. Speculative capital inflow is more distortive for the financial system and monetary stability. On the other hand, a long term capital inflow will support the domestic economic growth and job opportunities.

This paper will analyze the impact of banks behavior in Indonesia in accepting deposit and channeling funds on their liquidity. Furthermore, this paper will also identify the determinants of banking system liquidity, and the role of monetary policy on the liquidity management of the bank.

³ Surplus of liquidity occurs when the cash flow on the market exceeds the needs for reserves, (Ganley, 2004). Within market equilibrium, this is an ex ante disequilibrium and tends to be persistent due to autonomous increase of liquidity on central bank.

The next section of this paper provides theoretical background and existing literatures on liquidity. Section three present the data and the research methodology, while section four discussed result and analysis. Section five present the conclusion and close this paper.

II. THEORY

2.1. Determinant of Bank Liquidity

In terms of micro-enterprises, the Bank for International Settlements (2008) defines liquidity as the ability of the bank to finance the asset increase and meet liabilities without incurring losses. Valla, Escorbiac and Tiesset (2006) and Vodova (2011) define liquidity as the ability to meet cash liabilities, and can be distinguished into funding liquidity and market liquidity⁴. Borio (1997, 2001) argues that it is necessary to distinguish between *ex ante* liquidity balance before the central bank intervention and *ex post* after central bank intervention. Edlin and Jaffee (2009) stated that high liquidity is due to the 'credit crunch' or the reluctance of banks to channel the credit.

The development and liquidity conditions are not only affected by the bank's business activities but are also influenced by the money market. With a well functioning money market, the banks can better manage their liquidity and avoid deficiency or excess liquidity. The money market in a country is determined by the market structure, the available instrument, development, regulation, and the market liquidity. The liquidity condition of the financial system will determine the monetary policy taken by the central bank in order to achieve the target of inflation and to maintain the sustainable growth momentum.

The interbank money market (PUAB) or also called interbank call money market is a place for the banks to lend or to borrow funds to keep their liquidity. The transaction is short-term and is used to deal with daily liquidity gap. The PUAB is executed over the counter (OTC) with direct communication among banks through Reuter Dealing Monitoring System (RDMS). The structure of interbank money market in Indonesia tends to be oligopoly and segmented, and is very shallow. This condition makes the banks less flexible in obtaining and allocating optimal liquidity. Most major banks tend to hold excess liquidity and more often serve as a lender. The segmentation in the interbank market creates sub system of money market within them. In this case, the same lender banks and same borrower banks will transact within their group continuously. These conditions led to different levels of counterparty risk and variation across segments including price disparity. Under conditions of tight liquidity, the segmentation of this interbank market tends to be stronger with increasing counterparty risk. This condition tends to encourage interbank rate to increase and the price disparity to widen. In this case, the motivation of banks to not release liquidity grows higher in order to maintain adequate liquidity.

4 A funding liquidity (Valla, Escorbiac, and Tiesset, 2006) is the asset that is ready to be converted into cash to meet liabilities or for operational activity, while market liquidity is defined as the activities of banks in trading assets shown by the ability of banks to sell non-liquid assets.

The structure of the Indonesian financial markets has a very limited instrument of which there is a short-term securities instrument, which is no more than one year, such as commercial paper, certificates of Bank Indonesia, repurchase agreements, banker's acceptances, and certificates in the interbank money market instruments deposit. The ever shallow instrument in PUAB encourages banks to manage short term liquidity by holding onto a limited variation of the instrument. In general, banks tend to have instruments that are highly liquid with low risk like government securities (sovereign), the central bank securities, and other short-term securities. Besides market conditions, various regulations related to risk management and liquidity urges banks to behave in certain way in managing both liquidity and asset and liability portfolios.

The money market is an outlet or the foremost means of most major banks in managing liquidity. The liquidity condition of the bank will be directly reflected in money market both in the volume of transactions and the dynamic of interest rate. The tight liquidity in the banking is marked by the rising interbank rates and the widening spreads between the purchase and the selling price. The tight level of bank liquidity is reflected in the loan rate (borrowing) and financing rate (lending). The indicative rate for interbank market is reflected in JIBOR (Jakarta Interbank Offered Rate), which is the average price of the quotations from the contributor banks. These JIBOR were published through Reuters and Bloomberg and also reported by the bank on daily basis on their daily reports (*Laporan Harian Bank Umum*, (LHBU). In addition to JIBOR, the average price of all banks can be monitored via LHBU on the central bank website.

In Indonesia commercial banks participating in interbank money market possess wide gap in assets and capital. By the end of 2011, the capital of the bank ranged from 0.15 - 54 trillion rupiahs, while their asset ranged from 0.17 trillion to 465 trillion Rupiahs. There are only 7 (seven) banks with asset above 100 trillion rupiah, while banks with assets below 1 trillion rupiahs were 20 banks out of a total of 122 banks.

The results of Vodova's research (2011) indicates that the liquidity of the banks in Czech, measured by several indicators, were positively determined by capital adequacy ratio (CAR), interest rate loans, the nonperforming loans (NPL), and inter-bank rate. On the other hand, the financial crisis, inflation, and economic growth had a negative impact on liquidity. The unemployment, interest rate margins, profitability, and the monetary interest rate do not significantly affect the liquidity of the banks. Vodova measure the liquidity in his study with the ratio of liquid assets (cash, demand deposits at the central bank) to total asset, bank liabilities, and credit line with the other bank's counterparties.

Shen, Chen, Kao, and Yeh (2009) conducted a study to determine the factors of liquidity risk by using panel data from 12 countries. The result of the study indicates that liquidity risk is affected by illiquid assets, external financing, supervision, regulation, and macroeconomics. Liquidity risk is negatively correlated with the performance of the banks in countries with a market-based financial system. On the other hand, in countries with bank-based financial system, the liquidity risk is not associated with the bank's performance.

Saxegaard (2006) states that banks will hold excess liquidity more than precautionary reserve when the economy is in liquidity trap condition. Under these conditions the yield is too low compared to credit intermediation cost, of which the returns from the funds placed at the central bank is better than channeling credit. The result of a study by Aizenman Agenor, and Hoffmaister (2000) indicates that the contraction in credit financing in Thailand after crisis, caused by the phenomenon of supply resulting in involuntary excess liquidity.

Research by Bathaluddin et al (2012) stated that the tendency for the banks in Indonesia to store excess liquidity is influenced by the need for currency fluctuations, economic growth, cost of funds, and significant liquidity lag. The precautionary liquidity in the study was defined as the ratio of the bank funds placed in central bank securities (excess liquidity) to the third-party funds. On the other hand, involuntary liquidity is the residual of the estimated precautionary liquidity. Pontes and Sol Murta (2012) found that excess liquidity occurs due to the weak development of the financial sector where the interbank market is less efficient, a low diversification of financial instruments, and weak credit intermediation due to the expensive costs.

The total liquidity of the banks in aggregate will not change despite the change in the liquidity ratio at bank level. However, these changes affect the composition of liquidity in the presence of excess liquidity. Based on the research conducted by Keister and McAndrew (2009), the amount of liquidity available in the bank is determined by central banks policy and does not reflect their financing behavior. On the other hand, Ganley (2004) argues that some factors that determine the liquidity of banks are beyond the control of the central banks. These include the flow of their reserve to and from central bank, and the amount of money hold by the public.

Aspachs, Nier, and Tiesset (2005) conducted a study on bank liquidity in the UK using quarterly data of individual banks from 1985 to 2003. The results showed that the greater the support of central bank liquidity in the times of crisis, the lower the liquidity reserves held by the bank. Most banks in the UK also tend to do a counter-cyclical liquidity strategy with low liquidity back up when the economy grows. The liquid assets in this study consist of cash, reverse repo, and commercial paper. The dependent variable is the liquidity ratio, which is measured by the ratio of liquid assets to total assets, or the ratio of liquid assets to total deposits. The explanatory variables consisted of Net Interest Margin (NIM), the profit, the credit growth, bank size, the growth of Gross Domestic Product (GDP), and the short-term interest rates. Interest rates and GDP have a strong influence on liquidity, as well as the opportunity for future financing.

On the other hand, Acharya and Merrouche (2010) analyzed the bank demand for liquidity and settlement in UK as well as its effect on the interbank market before and after the sub-prime crisis. The result showed that the bank in UK hold liquidity 30 percent higher after the interbank suspension in August 9, 2007, showing precautionary action. This creates a tight liquidity conditions and created crisis. The increased demand for liquidity by the banks has raised the interest rate and potentially created systemic risk.

Some actions required to reduce the stress and the volatility of interest rate in interbank money market are monitoring, early stress test, recapitalization for the troubled banks, and increase the liquidity above the emergency liquidity reserves. The results of the study by Berger and Bouwman (2009) shows that monetary policy does not have a significant effect on the liquidity for large and medium-sized banks with 90 percent possession of the market liquidity, or above. The monetary policy is instead effectively affecting the liquidity of small banks. In addition, there is no significant difference between the effects of monetary policy during the financial crisis and in normal times.

Henry, Birchwood, and Primus (2010) conducted a study to estimate the demand for precautionary reserves and dynamic impact of involuntary reserve on monetary policy in Trinidad and Tobago, by using the GMM (generalized method moments) and VAR (Vector Autoregression) method. Their results showed that the bank holded excess reserve as precautionary action against liquidity shortages. The spread between lending rates and policy rate negatively affects precautionary reserves of the bank. In addition, the dynamics of involuntary reserves are influenced mainly by fiscal operations. Similarly, a decreasing allocated credit during slow economic growth tended to increase the liquidity of the bank.

Another study conducted by Pontes and Sol Murta (2010) using TSLS (two stage least squares) show that the credit growth, the government securities and the crisis influence the bank liquidity. High lending rate will disturb the bank intermediation, thus causing liquidity accumulation.

2.2. The Role of Monetary Policy

The central bank's monetary policy is implemented to maintain monetary stability in order to control the national liquidity. By implementing liquidity management we expect to attain sustainable economic development. In Indonesia, the central bank sets policy rate (BI rate) as a reference for the market participants.

The instruments of monetary policy currently consist of Certificate of Bank Indonesia (SBI), standing facility of Bank Indonesia, and the minimum reserve requirement (*GiroWajib Minimum*, GWM). Bank Indonesia use SBI and term deposit for open market operation.

The maturity for Certificate of Bank Indonesia (SBI) was initially one month then in 2011 Bank Indonesia extended the holding period to six months. The maturity for term deposits is longer up to nine months. On the other hand, the standing facility of Bank Indonesia set since June 2008 is to fine tune the market operation particularly to control the overnight interest rate (ON) within the interbank money market. This is helpful to keep the ON rate to move around the BI rate (interest rate corridor), hence will ensure the effectiveness of monetary policy transmission through the interest rate channel.

The standing facility consists of deposit and lending facilities with interest rates based on BI rate plus or minus certain spread. When the bank holds excess liquidity, they can deposit their excessive funds in Bank Indonesia using deposit facility; otherwise use lending facility when they face a liquidity shortage. The interest rate corridor originally used symmetrical spread to the BI rate movement. At the end of 2012 the spread between deposit facility and BI rate was -175 basis points, while the spread between lending facilities amounted to +100 basis points from the BI rate.

The non-market monetary policy instruments includes minimum reserve requirement (GWM) rule the banks to place their funds in Bank Indonesia by certain percent of the funds the collect from third parties. Nowadays, the reserve requirement policy is associated with the Loan-to-Deposit Ratio (LDR). The aim is to optimize the use of liquidity by increasing the banking intermediation to support the economic growth. In this case the banks are required to meet the LDR of 78-100 percent, otherwise the central bank will impose additional minimum reserve requirement. The central bank provides time deposit for the bank, which is limited up to 3 percent of their third-party funding. The incentive to deposit their fund is the BI rate minus 2.5 %, therefore will not burden the banks due to their loss of time value of money.

The management of assets and liabilities is very essential to keep the operation of the bank. The liquidity conditions may affect the systemic risk and monetary policy transmission. The uncertain withdrawal by depositors encourages the banks to choose best strategy on asset and liability management to ensure they meet their liabilities. In addition, changes and volatility in interest rates, and the exchange rate will determine the compliance with the conditions capable of fund withdrawal liability, either suddenly or massively simultaneous.

Freixas, Martin and Skeie (2009) conducted a study of the efficiency in the interbank money market fund allocation and the optimal policy of the central bank in the presence of liquidity shock. The results of the research showed that distributional liquidity shock crisis will increase the market segmentation across bank (disparity), and the central bank should lower the interbank rate. The failure to lower interest rates in the times of crisis will worsen the financial stability with the increasing probability of a bank run (simultaneous withdrawals by depositors).

On macro interest perspective, Saxegaard (2006) mentioned the need to distinguish between precautionary excess liquidity with involuntary excess liquidity (excess liquidity that exceeds the precautionary). He found that in Sub-Saharan Africa countries (SSA), banks tend to have excess liquidity that is involuntary due to the underdeveloped financial markets, the lack of credit allocation, and the increasing government deposits at the bank. If a bank has excess liquidity to meet the needs of anticipation (precautionary), the central bank does not need to sterilize the economy since it potentially trigger inflation.

The behavior of the banks in SSA above may indicate a structural problem that causes the inefficient allocation of funds. The involuntary liquidity in general serves as a secondary reserve and is intended to address the possibility of liquidity gap in bank operation or the

likelihood of liquidity shocks. By holding the involuntary liquidity it naturally means the banks pay opportunity cost to obtain income. In this case, Sacerdoti (2005) argues that SSA countries need development of debtor information, accounting and auditing standards, and also legal and regulatory framework. O'Connell (2005) also argues that involuntary excess liquidity will disturb the mechanism of monetary policy transmission. Thus, an understanding of the sources of excess liquidity becomes important to choose optimal monetary policy.

On his study about the pattern of excess liquidity banks in SSA countries above, Saxegaard (2006) used SVAR (Structural Vector Autoregression). He also found the excess liquidity of the banks weaken the mechanism of monetary policy transmission, and leave the monetary authority unable to control the demand within the economy. Slightly in line with Saxegaard, Ganley (2004) also stated that the liquidity absorption operation by the authority tended to use weak monetary instruments such as central banks securities with high interest rates, making it less effective in transmitting their monetary policy. In the long term, this raises important implications for the central bank to finance the rising costs of monetary operations. This condition can seriously affect the income of the central bank and its independency from the government. A continuous loss of the central bank will require government recapitalization.

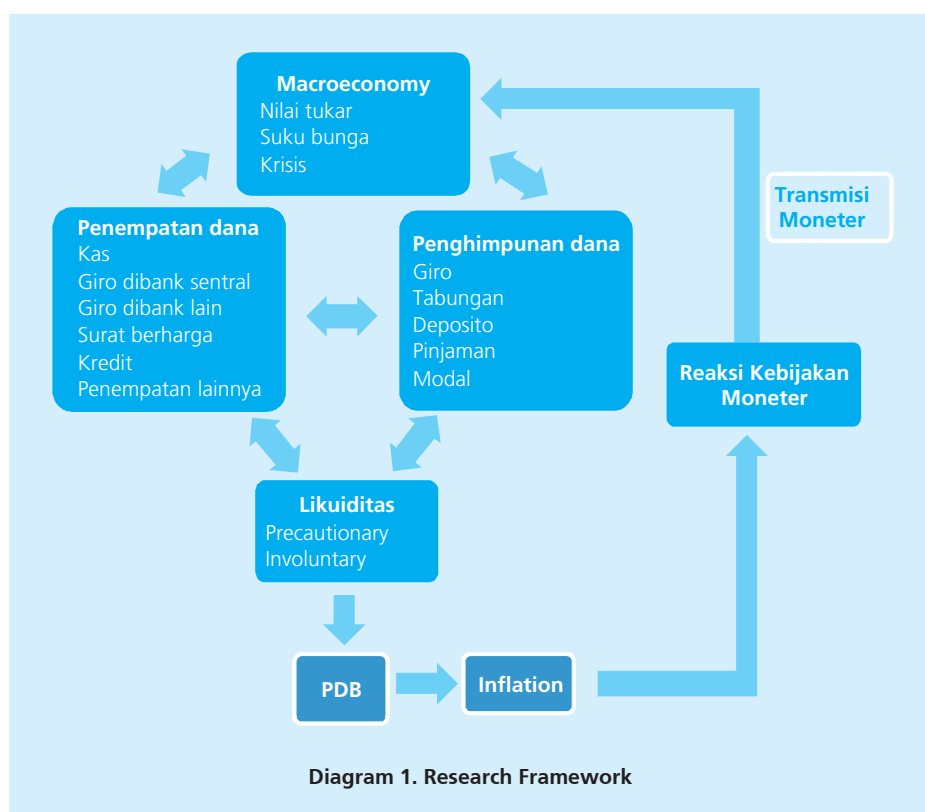
Meltzer (2009) and Feldstein (2009) argue that the increased liquidity can lead to an inflationary pressure with rapid money creation through credit, and the central banks should absorb this excess liquidity. However, Keister and McAndrews (2009) stated that the above phenomena may occurs only when the central bank use a traditional monetary operation framework. Currently, the Federal Reserve gives interest reward on bank liquidity deposited at the central bank, thereby increasing market interest rates and restrain credit growth rate without changing the amount of liquidity. By providing interest for reserves at the central bank, the central bank may control the short-term interest rate which is independent from the level of liquidity; therefore will not create inflationary pressures. In other words, the excess liquidity in the bank does not always lead to inflationary pressures. A study by Bathaluddin, Adhi, and Revelation (2012) using TVAR (threshold vector autoregression) indicates that there has been a regime switching from the low liquidity to the high liquidity in Indonesia in 2005. Additionally, excess liquidity caused ineffective monetary policy on controlling inflation.

Berger and Bouwman (2009) in his research show that monetary policy creates significant effects of liquidity only to small banks. However, there is no significant difference of the impact of monetary policy on liquidity creation during normal condition or crisis.

III. METHODOLOGY

The framework of this research is shown in the diagram below. The business activities of the banks in collecting and allocating fund will affect their liquidity. On the other hand, the liquidity conditions of the bank will affect the economic activity reflected on Gross Domestic Product (GDP), hence the rate of inflation. The actual inflation and inflation expectations will

determine the monetary policy reaction of the central bank on controlling liquidity in order to achieve his inflation target. The policy will influence macroeconomic conditions such as interest rate movements, the exchange rates, and the economic growth. The changes of these macroeconomic measures will be anticipated by the individual banks to choose strategy on collecting and allocating fund. The sources of fund to the banks are demand deposits, savings deposits, time deposits, loans, and capital. On the other hand, the allocation of fund may take the form of cash, demand deposits at the central bank, demand deposits in other banks, securities, loans, and other placements. All the process is inter-related and form continuous cycle.

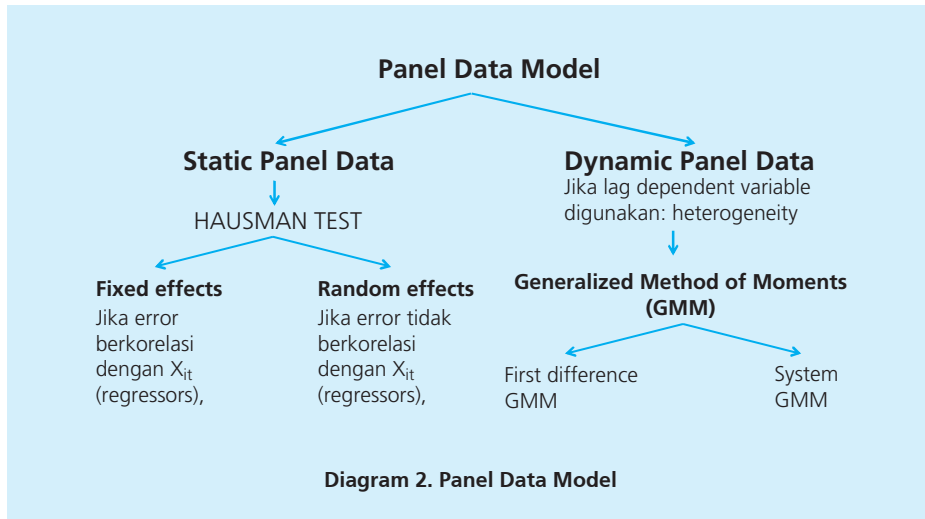


We use monthly data of individual banks from January 2002 to November 2011 published on financial report of banks. The samples include 110 banks from the total population of 122 banks. In this study, the sampling covers only conventional banks, considering that Islamic banks have a different operational activities and different money market. We classify the banks based on asset; large banks with asset above 50 trillion rupiahs, medium banks with asset of 10 to 50 trillion rupiahs, and small banks with asset lower than 10 trillion rupiahs.

Within our sample, the smallest bank had assets above 100 billion rupiahs, following the provision of capital limit of minimum 100 billion rupiahs since 2010. The selection of number

of banks and period of observation meet the requirement that the cross section dimension is larger than the period ($N > T$), which is useful on controlling individual heterogeneity when there are unobservable behavior.

We specify a dynamic panel model and make use the estimation technique of generalized method of moments (GMM). The selection of the best model is based on a panel data modeling framework as shown in the diagram below.



The specification of empirical model for dynamic panel data model is below

$$Y_{it} = \alpha Y_{i,t-1} + \beta X_{it} + \mu_{it} \quad (1)$$

Where Y_{it} is the dependent variable (endogenous), X_{it} are explanatory variables (exogenous), and μ_{it} are the residual. The instrument variable (IV) used is a certain lag of the endogenous and exogenous of variables that are not correlated with the shock at time t . In general, symbols and descriptions are used as variables in Table 1 appendix A.

Our endogenous variable is liquidity and we distinguish between precautionary and involuntary as defined in Saxegaard (2006), Valla et al (2006) and Aspachs et al (2005). Y_{it} is a precautionary liquidity and Y_{2t} is involuntary liquidity. The precautionary liquidity (Y_{it}), is the ratio of the cash plus minimum reserve requirements (RR), plus the placement on Bank Indonesia and other banks (ODD), relative to total assets (TA). We specify the precautionary liquidity to be more determined by the needs of the banks for operational activities.

Each bank needs different liquidity depending on their operation, market segments, and tolerable risks. Based on focus group discussions, some banks consider the minimum

precautionary liquidity to be approximately 2-10 percent. The threshold for liquid to total assets ratio for each bank depends on business operations, historical liquidity needs and risk appetite. The involuntary liquidity Y_{2t} is the ratio between central bank securities (CBSEC) plus government securities (GSEC) and other securities (OSEC), relative to total asset (TA). The deposit of the bank on central bank may take the form of Bank Indonesia certificates, term deposits and bank Indonesia standing facilities. In general, the banks consider the threshold of involuntary liquid asset ratios to be 15-18%.

$$Y_{1t} = \frac{C + RR + ODD}{TA_{i,t}} \quad (2)$$

$$Y_{2t} = \frac{CBSEC + GSEC + OSEC}{TA_{i,t}} \quad (3)$$

To explain the determinant of precautionary and involuntary liquidity, we use the balance sheet component, representing the source and the allocation of the fund, monetary policy, financial system and the macroeconomic condition. We focus more on variables that are considered to affect the precautionary liquidity directly including their business activities. On the other hand, the involuntary liquidity variable is driven more by market conditions and financial systems, as well as the macro economy. We use the empirical specification below:

$$Y_{1i,t} = \alpha Y_{1i,t-1} + \beta_1 RRRATE_t + \beta_2 DT_{i,t} + \beta_3 CREDIT_{i,t} + \beta_4 FSI_t + \beta_5 ON_t + \varepsilon_{i,t} \quad (4)$$

$$DT_{i,t} = \frac{DD_{i,t} + S_{i,t} + TD_{i,t}}{TA_{i,t}} \quad (5)$$

$$CREDIT_{i,t} = \frac{CRED_{i,t}}{TA_{i,t}} \quad (6)$$

where $i = 1, \dots, N$ is the observations and $t = 1, \dots, T$ is the monthly time dimension from January 2002 to November 2011. $Y_{1i,t-1}$ is the lag of the endogenous variable, $RRRATE_t$ is the level of reserve requirement, $DT_{i,t}$ in equation (5) is the ratio of deposits (including demand deposits ($DD_{i,t}$), savings ($S_{i,t}$), and deposits ($TD_{i,t}$)) to total assets ($TA_{i,t}$); $CREDIT_{i,t}$ in equation (6) is the ratio of credit ($CRED_{i,t}$) to total assets ($TA_{i,t}$). FSI_t is financial stability index which represent the pressure on financial system stability both in banking systems and capital markets; the ON_t is the interest rate for overnight interbank money market, and $\varepsilon_{i,t}$ is error term.

The equation for involuntary liquidity (Y_{2t}) is below.

$$Y_{2i,t} = \alpha Y_{2i,t-1} + \beta_1 BIRATE_t + \beta_2 ER_t + \beta_3 CREDIT_{i,t} + \beta_4 FSI_t + \beta_5 CAR_{i,t} + \beta_6 GDP_t + \varepsilon_{i,t} \quad (7)$$

where $i = 1, \dots, N$ is the observations and $t = 1 \dots T$ is the monthly period of January 2002 to November 2011. $Y_{2i,t-1}$ is the lag of involuntary liquidity; $BIRATE_t$ is the interest policy rate; ER_t is the nominal exchange rate, $CREDIT_{i,t}$ is the ratio of loans to total assets, FSI_t is financial stability index, $CAR_{i,t}$ is the capital adequacy ratio or the percentage of minimum bank capital requirement, GDP_t is gross domestic product, and $\varepsilon_{i,t}$ is the error term.

IV. RESULT AND ANALYSIS

4.1. Descriptive Statistics

We outline the statistics of variables used in this study in the Table 2. The high standard deviation of involuntary liquidity shows that liquidity volatility involuntary (Y_{2t}) tends to be dynamic throughout the observation period range, as depicted on Figure 1. On the contrary, the precautionary liquidity tends to have a relatively stable volatility compared to the involuntary liquidity, as indicated with its low standard deviation.

The movement range of precautionary liquidity is relatively lower about 500 basis points. This indicates that involuntary liquidity movements tend to follow the dynamic of the economic situation which move from 1300 basis points (13 percent). At the time of 2005 mini-crisis and the international financial crisis of 2008, the financial stability index (FSI) was above the threshold 2, and involuntary liquidity decreased quite significantly. This indicates that with a liquidity problem in the market, the involuntary liquidity will be used as primary buffer. Banks tend to hold high reserve when the liquidity of the financial system is relatively high, and then use it when the financial system downturn and become more volatile. These behavior are countercyclical to the market liquidity condition.

On the other hand, the volatility of the exchange rate (ER_t) is relatively stable. A significant surge was in late 2008 until mid of 2009 when the global financial crisis occurred due to the subprime mortgage crisis in United States as illustrated in chart 3. The relatively stable exchange rate movement is influenced also by the policy intervention by the Central Bank. Maintaining the stability of the exchange rate is one of central bank target as mandated under the Central Bank Act, in addition to the target on inflation.

Based on Figure 4, the policy rate does not affect the decision of the bank to allocate their fund in central bank. When BI rate decline, the bank keep increasing their placement of funds on central bank.

4.2. Precautionary Liquidity

The estimation result of precautionary liquidity using all banks is good and does not biased upwards or downward (see Table 3 in Appendix D). The Sargan test statistics indicate that the instrument variables (IV) used is valid. The precautionary liquidity of all banks are significantly influenced by previous precautionary liquidity, the minimum reserve requirement ($RRRATE_t$), third-party funds ($DT_{i,t}$), credit ($CREDIT_{i,t}$), financial stability index (FSI_t), and interbank rates (ON_t).

Across bank classification, our estimation indicates that the largest determinant of precautionary liquidity are the level of previous precautionary liquidity, the third-party funds (except for the medium-sized banks), the credit and the overnight rate of interbank market. Banks still consider their historical liquidity conditions in determining the current one, and this is in line with Bathaluddin et al (2012). The positive impact of third-party funds on precautionary liquidity shows that when the third party fund increase, the bank face wider opportunities to allocate funds including to expand their business. The level of allocated credit either in large banks, medium, or small banks, negatively affect the level of precautionary liquidity; which is consistent with Henry et al (2010) and Pontes and Sol Murta (2010).

Money market conditions reflected in overnight interbank rates (PUAB ON) negatively influence the precautionary liquidity. The tight liquidity in the money market, as indicated by the rising interbank rates will reduce the precautionary liquidity of the bank to overcome the difficulty on obtaining liquidity. This is consistent with the results of Vodova (2011) and Acharya and Merrouche (2010). On the other hand, the minimum reserve requirement (GWM) and the financial stability index (FSI) do not significantly affect the precautionary liquidity, except on small banks. This indicates that the non-market monetary policy using minimum reserve requirement only affects the small banks, and is consistent with Berger and Bouwman (2009).

Small banks have limited activities hence will hold limited amount of liquidity reserve. This is the reason why reserve requirement policy significantly affects their liquidity. On the other hand, large and medium-sized banks hold higher liquidity. The amount is large enough to be buffer for their operational activities; therefore a change in GWM will not affect their liquidity. Furthermore, unlike the small banks, the large and medium-sized banks can easily fulfill their liquidity needs from the interbank money market. In addition, when the banks deposit their funds in central bank (maximum 3 percent of total third party funds), the central bank compensate with 2 percent interest rate, and this is higher than the real cost.

Small bank liquidity is also affected by the stability of financial market. Estimation result shows increasing FSI, which indicates a lower stability of financial markets and usually followed by a tight liquidity in the money market, will reduce the precautionary liquidity of the small banks. These conditions show that the resilience of small bank liquidity is strongly depends on the financial system condition, including the capital market.

4.3. Involuntary liquidity

The involuntary liquidity equation in Table 4 Appendix D shows that the involuntary liquidity at all banks is determined by its own lag of involuntary liquidity ($Y_{2i,t}$), the monetary policy rate or BI rate ($BIRATE_t$), the interbank rates (ON_t), the exchange rate (ER_t), credit ($CREDIT_{i,t}$), the capital adequacy ratio ($CAR_{i,t}$), the financial stability index (FSI_t), and the gross domestic product (GDP_t). The increase in interbank rates, exchange rates, and the FSI will reduce the involuntary liquidity of the bank. The estimation on all sample showed that the increase in policy rate will increase the involuntary liquidity of the banks. Generally the banks tend to use their involuntary liquidity as a buffer to maintain liquidity in the event of financial market and financial system shock. It is important to note that the estimation using medium-sized banks does not produce a good equation despite not biased upward or downward. This has been indicated by the Sargan test that the instrument variables used were not valid.

In general, involuntary liquidity largely depends on the previous involuntary liquidity. On large bank sample, the previous liquidity is the only significant explanatory variable. The strong influence of historical involuntary liquidity is in line with Bathaluddin et al (2012). The interbank rates (PUAB) ON significantly affect the involuntary liquidity, except for the large banks. On the other hand, the effect of capital adequacy ratio (CAR) is significant for small bank sample and overall sample. The significance of capital requirement (CAR) on involuntary liquidity is also in line with the study of Vodova (2011).

Using all samples, we find the policy rate has small effect on the bank liquidity. However, this is not the case when we estimate the sample across their size (large, medium, and small banks). The weak impact of the policy rate (BI rate) on involuntary liquidity hold by the bank is in line with Vodova (2012). Policy rate is not the reason for the banks to deposit their fund on central bank. The volume of the placement of the funds in the central bank securities continues to increase, despite of the decrease of the policy rate. In addition, the flexibility of central bank security as liquidity instrument is lower if the maturity of security is longer. The banks may face high liquidity because of the speed of channeling credit is lower then the speed of third party fund increase. On the other hand, the placement of funds in other financial product is still limited due to several limitations to transact in foreign exchange and stock market, as well as under-developed money market instruments.

The exchange rate only affects the liquidity of medium-sized banks, while the interbank rates only affect the liquidity of the medium and small banks. The involuntary liquidity on small banks affected by the lag itself, interbank rates, CAR, FSI, and it shows that the liquidity GDP. The condition of involuntary small banks is also determined by the macroeconomic conditions and macroeconomic finance. The condition systems such as FSI and GDP are only affecting small bank liquidity, in line with the results of the study Aspachs et al (2005).

For the large bank sample, the previous involuntary liquidity significantly affects the current involuntary liquidity. Other variables play minor impact on involuntary liquidity dynamics, which indicates that major banks hold very high liquidity. Good liquidity resiliency of large banks showed their better conditions on liquidity relative to smaller ones, and they tend to be lenders in interbank money market. It is also supported by the fact that major banks are easier in raising funds with lower cost than smaller banks. Furthermore, these large banks are equipped with good infrastructure, networking, and more complete products, as well as better credibility. Within this condition, smaller banks may necessary merger to better maintain their liquidity.

V. CONCLUSIONS

On this paper we divide the liquidity of banks into precautionary and involuntary liquidity. Precautionary liquidity is the ratio between cash plus deposits on central banks and other commercial banks, towards total assets; while involuntary liquidity is the ratio of tradable securities (central bank securities, government securities, or other) towards total assets.

This paper showed that the accumulation and the management of the fund affect the bank liquidity. Across the size of the bank, monetary policy and financial market condition (minimum reserve requirement policy, interbank money market rate, and financial stability index) affect more the precautionary liquidity of small banks. Furthermore, precautionary liquidity generally depends on the operations of the bank, except for the small-sized banks.

The banks tend to use their involuntary liquidity as a buffer for their operational liquidity; this is reflected by the dominant effect of financial market condition on the bank's involuntary liquidity. The monetary policy rate (BI rate) only affects the involuntary liquidity of the medium-sized banks, and not for the large and small ones. Furthermore, the macroeconomic conditions such as financial stability index and gross domestic product, is also only affect the involuntary liquidity of small banks.

Our conclusion above imply the central bank does not need to implement strict liquidity absorption using policy interest rate, since the bank's liquidity depend more on the operating conditions, the capital, the financial system, and the macroeconomic condition.

Our result implicitly show that the banks tend to hold high liquidity involuntarily because of the financial markets in Indonesia is shallow, and because of high uncertainty to get liquidity from the market. Therefore, it is necessary to increase the depth of financial markets to expand liquidity instrument. This will serve as good buffer for the banks and provide them flexibility on managing their liquidity. The banks need to reduce their dependency on central banks, and one way to do this is by reviewing the central bank standing facilities.

On the other hand, small banks have less immunity against the macroeconomic and financial market condition. This implies a necessity for the small bank to merge and to combine their asset, which will help them better manage their liquidity and increase their credibility. From global perspective, this will also help Indonesian banking system to compete in international markets such as forthcoming ASEAN Economic Community, 2015.

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APPENDIX A

Table 1 Variable Description (all variables in the form of logarithm)			
Variable	Description	Data Source	Expected Sign
Endogen Variable			
$Y_{1i,t}$	Precautionary liquidity is a ratio of composite cash (CASH), reserve requirement (RR) and the placing of current account in BI, as well as current account in other banks (ODD) compared to the total assets (TA).	Bank Publication, Bank Indonesia (Processed)	
$Y_{2i,t}$	Involuntary liquidity is a ratio of composite bonds which are ready to be sold in the form of central bank securities (CBSEC), Investment on government securities (GSEC) and other securities (OSEC) compared to the total asset (TA)	Bank Publication, Bank Indonesia (Processed)	
Supported Endogen Variable			
C	Cash	Bank Publication, Bank Indonesia	
RR	GWM Fund and fund on the current account in Bank Indonesia	Bank Publication, Bank Indonesia	
ODD	Account in other banks	Bank Publication, Bank Indonesia	
CBSEC	The investment of bond in Bank Indonesia in the form of SBI, term deposit, and facility of Bank Indonesia	Bank Publication, Bank Indonesia	
GSEC	Investment in government securities	Bank Publication, Bank Indonesia	
OSEC	Investment in other securities	Bank Publication, Bank Indonesia	
TA	Total Assets	Bank Publication, Bank Indonesia	
Exogen Variable			
$Y_{1i,t-1}$	Lag from the endogen of liquidity precautionary variable	Bank Publication, Bank Indonesia (Diolah)	Positive (+)
$Y_{2i,t-1}$	Lag from the endogen of involuntary liquidity	Bank Publication, Bank Indonesia (Diolah)	Positive (+)
$RRRATE_{i,t}$	reserve requirement	Bank Indonesia	Positive (+)
$DT_{i,t}$	Third party fund which consists of total account, saving and deposit	Bank Publication, Bank Indonesia (Diolah)	Positive (+)
$DD_{i,t}$	Account in bank liability	Bank Publication, Bank Indonesia	
$S_{i,t}$	Saving in bank liability	Bank Publication, Bank Indonesia	
$TD_{i,t}$	Term deposit	Bank Publication, Bank Indonesia	
$CREDIT_{i,t}$	Credit Ratio to total asset	Bank Publication, Bank Indonesia	Negative (-)

Table 1
Variable Description (all variables in the form of logarithm)

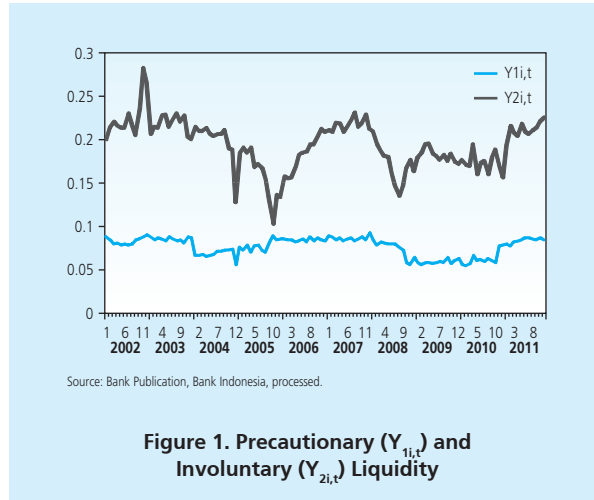
Variable	Description	Data Source	Expected Sign
Endogen Variable			
$CAR_{i,t}$	capital adequacy ratio or the percentage of minimum capital obligatory	Bank Publication, Bank Indonesia	Positive (+)
FSI_t	financial stability index which is the indication of pressure toward the stability of financial system in the form of composite banking index system and capital market	Bank Indonesia	Negative (-)
ON_t	overnight Interest rate of inter-bank money market	Bank Indonesia	Negative (-)
$BIRATE_{.t}$	Monetary policy and central bank interest rate	Bank Indonesia	Positive (+)
ER_t	Nominal exchange rate	Bank Indonesia	Negative (-)
GDP_t	The addition of Gross Domestic	Bank Indonesia	Positive (+)
$\varepsilon_{,t}$	error term of the liquidity equation		

APPENDIX B

All data obtained from the statistic of the Bank Indonesia publication which are longitudinal/monthly panel data from individual of conventional bank, monetary policy, money market and foreign exchange and macro economy from January 2002 to November 2011.

Table 2 Descriptive Variable Statistic					
Variabel	Mean	Median	Maximum	Minimum	Std. Dev.
Dependen Variabel					
$Y_{1i,t}$	-2,74	-2,72	-0,40	-7,06	0,59
$Y_{2i,t}$	-1,99	-1,84	1,50	-14,56	1,00
Variabel Kebijakan Moneter					
$BIRATE_{,t}$	2,17	2,11	2,84	1,79	0,27
$RRRATE_{,t}$	1,78	1,61	2,35	1,61	0,26
Variabel Aset Liabilitas Bank					
$CAR_{i,t}$	3,16	3,00	8,61	-2,12	0,66
$CREDIT_{i,t}$	-0,70	-0,59	1,19	-6,47	0,48
$DT_{i,t}$	-0,46	-0,27	1,43	-10,12	0,67
Variabel Pasar Uang dan Valas					
ER_t	9,13	9,12	9,41	9,02	0,07
ON_t	2,04	1,96	2,75	1,50	0,30
Variabel Makro Ekonomi					
FSI_t	0,21	0,39	0,89	-1,77	0,53
GDP_t	13,70	13,68	14,47	12,96	0,47

Precautionary ($Y_{1i,t}$) liquidity is the ratio between the summation of cash, account in BI and account in other banks and total assets as described in equation (2). *Involuntary* ($Y_{2i,t}$) liquidity is the ratio between securities composite that is ready sold consisting of fund placement in Central Bank in the shapes of securities, government securities and other securities and total assets as described in equation (3). In this graph precautionary and involuntary liquidity are liquidity aggregate.



APPENDIX C

FSI (financial stability index) is composite index in money market consisting of banking and capital market for measuring the durability of financial system. Involuntary ($Y_{2i,t}$) liquidity is the ratio between securities composite that is ready sold consisting of fund placement in Central Bank in the shapes of securities, government securities and other securities and total assets as described in equation (3).

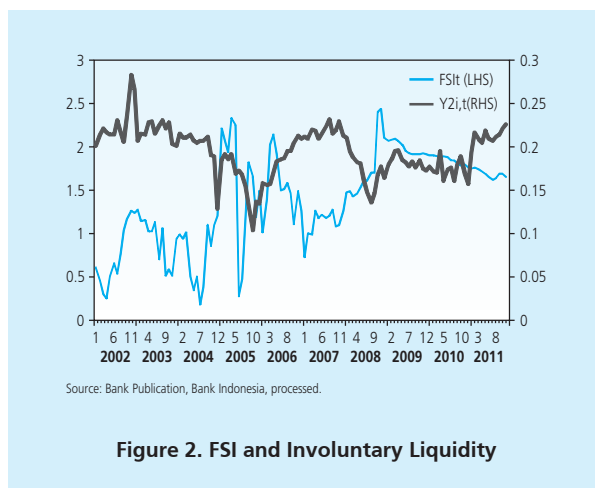


Figure 2. FSI and Involuntary Liquidity

BIRATE_t is interest rate of monetary policy determined by Central Bank in order to an open market operation. ER_t is the nominal of exchange value.

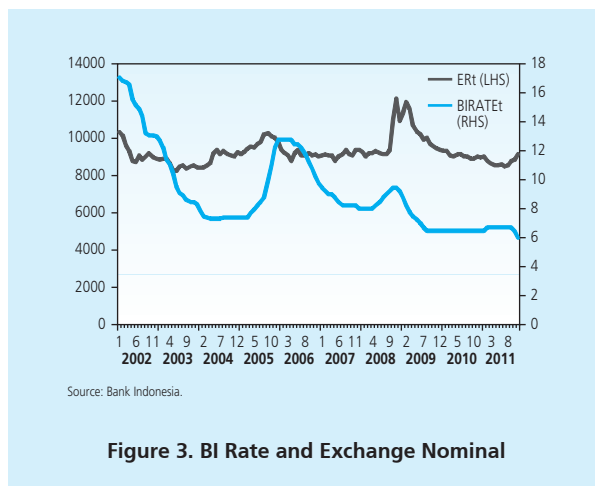
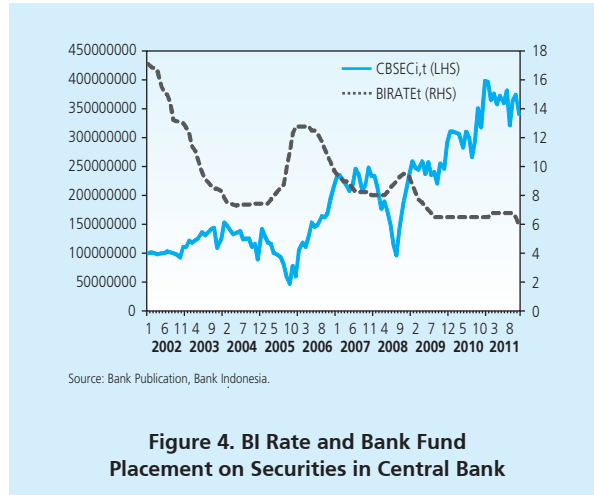


Figure 3. BI Rate and Exchange Nominal

$CBSEC_{i,t}$ is bank fund placement in Bank Central such as in the shapes of term deposit, securities of Bank Indonesia, and facilities of Bank Indonesia. $BIRATE_t$ is the interest rate of monetary policy determined by central bank for the operation of open market.



APPENDIX D

This table shows the result of GMM (generalized method moment) on precautionary liquidity (see table 1. for symbol and variable description). The model of precautionary liquidity follows the equation (4). Instrument of variable (IV) which is used is dependent and independent lag, in which the length of every IV of every model is different to get a significant result. The number of samples for all banks are 110, big bank 17, medium bank 28, and small bank 65, based on the amount of asset. Sampling for the period January 2002 until November 2011 uses the monthly data longitudinal panel.

Table 3				
Determinant of precautionary				
Dependent variable : Liquidity Precautionary ($Y_{1i,t}$)				
Variable	All bank	Big bank	Medium bank	Small bank
	(1)	(2)	(3)	(4)
$Y_{1i,t-1}$	0,87 (300,7)*	0,76 (-5,45)*	0,69 (19,84)*	0,89 (88,53)*
$RRRATE_t$	0,07 (25,69)*	-0,34 (-1,36)	0,18 (1,36)	0,08 (16,75)*
$DT_{i,t}$	0,29 (46,91)*	0,36 (-4,25)*	0,08 (1,27)	0,14 (11,26)*
$CREDIT_{i,t}$	0,07 (42,61)*	-0,08 (-1,68)**	-0,17 (-3,77)*	-0,03 (-4,5)*
FSI_t	-0,03 (-222,5)*	0,0007 (0,08)	-0,008 (-1,12)	-0,02 (-29,36)*
ON_t	-0,03 (-43,73)*	-0,21 (-3,75)*	-0,09 (-1,76)**	-0,03 (-22,04)*
J Sargan test	109,74	12,57	24,19	64,28
(p value)	0,49	0,76	0,67	0,5
Number of Bank	110	17	28	65

Note (*), (**) stands for statistically significant at 1 percent and 10 percent.

This table shows the result of GMM (generalized method moment) to the determinant (see table 1. For symbol and variable description) involuntary liquidity on equation (7). The Definition of involuntary liquidity is in equation (3). Instrument of variable (IV) what is used is dependent and independent lag, in which the length of IV every model is different to get a significant result. Sampling for all banks are 110, big banks are 17, medium banks are 28, and small banks are 65, based on the amount of assets. Sampling is for period from January 2002 to November 2011 by using the monthly data of longitudinal panel.

Table 4				
Determinant of involuntary				
Dependent variable : Liquidity Involuntary $Y_{2i,t}$				
Variable	All bank	Big bank	Medium bank	Small bank
	(1)	(2)	(3)	(4)
$Y_{2i,t-1}$	0,62 (102,32)*	0,79 (5,48)*	0,68 (32,2)*	0,48 (7,29)*
$BIRATE_t$	0,09 (7,52)*	-0,61 (-0,85)	0,19 (2,65)*	0,08 (1,00)
ON_t	-0,15 (-15,93)*	0,51 (0,64)	-0,19 (-2,73)*	-0,30 (-3,50)*
ER_t	-0,36 (-15,19)*	0,17 (0,19)	0,29 (1,92)**	-0,31 (-1,53)
$CREDIT_{i,t}$	-0,20 (-6,77)*	0,14 (0,96)	-0,12 (-1,48)	0,10 (0,73)
$CAR_{i,t}$	0,66 (38,69)*	0,81 (1,45)	0,11 (1,8)***	0,53 (2,15)**
FSI_t	-0,15 (-30,21)*	-0,05 (-1,14)	-0,07 (-1,7)***	-0,08 (-2,57)*
GDP_t	0,37 (29,71)*	0,03 (0,10)	0,03 (0,52)	0,17 (2,62)*
J Sargan test	107,88	7,86	844,4	64,28
(p value)	0,54	0,97	0,00	0,63
Number of Bank	110	17	28	65

Note (*), (**), and (***) stands for statistically significant at 1 percent, 5 percent and 10 percent.

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