Liquidity Coverage Ratio Forecasting on Indonesia 19 Commercial Banks: Comparative Analysis among State-owned, Private, and Foreign Banks in period 2008 – 2013

Alifa Mentari Putrinda, and Achmad Herlanto Anggono

Abstract—the research aims to reveal the pattern of Liquidity Coverage Ratio banks in foreseeable six years by paying attention deeply to risk variance of Liquidity Coverage Ratio and compare the predictable pattern Liquidity Coverage Ratio within three areas, such as state-owned, private, and foreign banks in Indonesia. Therefore, GARCH is used to model and forecast by using data of state-owned, private, and foreign banks LCR in Indonesia. The data obtained from the monthly financial reports of 19 commercial banks in Indonesia from 2008 – 2013. This research will conduct a six-year forecast of LCR. The findings show that state-owned bank volatility is steady with a decreasing value and the private and foreign bank volatility will increase but still remains stable. The LCR forecasting result shows that state-owned and private bank tend to go down while foreign bank tend to increase.

Keywords—Basel III, Forecasting, Liquidity Coverage Ratio, GARCH

I. INTRODUCTION

BANK of International Settlement established a committee called Basel Committee on Banking Supervision. In 2010, Basel Committee issued new minimum standards regarding capital and liquidity as a further action to strengthen the Basel II, which is called Basel III. In Basel III, the committee introduced new liquidity standards, which are Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NFSR).

In fact, in Indonesia, the LCR based on Basel III requirement in Indonesian Banks has not implemented yet, State-owned, private, and foreign banks show different patterns of LCR. References [1] study the assessment of the future performance and resilience of Sharia banking industry to the liquidity withdrawals. The study found a liquidity mismatch possibility in the future, if the conditions of irregular demand for liquidity and liquidity runs happen.

Based on the previous study and the LCR phenomenon in Indonesia, this research aims to reveal the pattern of Liquidity

Alifa Mentari Putrinda is with the School of Business and Management, Institut Teknologi Bandung, Jawa Barat, 40132 Indonesia (corresponding author's phone: +62 81282123677; e-mail: alifa.mentari@sbm-itb.ac.id).

Achmad Herlanto Anggono is with the School of Business and Management, Institut Teknologi Bandung, Jawa Barat, 40132 Indonesia (e-mail: achmad.herlanto@sbm-itb.ac.id).

Coverage Ratio banks in foreseeable six years by paying attention deeply to risk variance of Liquidity Coverage Ratio and compare the predictable pattern Liquidity Coverage Ratio within three areas, such as state-owned, private, and foreign banks.

II. LITERATURE REVIEW

A. Liquidity

Liquidity is the ability of a bank can pay increases in asset and meet obligations as they come due, without incurring unacceptable losses [2]. Depositors have the right to withdraw their money anytime. Bank need to provide a sufficient amount of cash, not too much or less, if it is less then the depositors might not withdraw their money and if it is too much then there will be too much cash that is not use or called unproductive asset. Both situations can cause the failure of a bank.

Liquidity risk is a core aspect to a bank and financial intermediaries. Liquidity risk is the possibility of bank cannot pay its obligation in the due date because of lack ability to turn asset into cash and lead to some looses [3]. Liquidity risk happens when bank decided to end a loan of a borrower, but the borrower cannot pay, this situation make bank has no cash for its other businesses, then when depositors want to withdraw bank cannot provide any cash [4]. Reference [5] studied the liquidity of state owned, private, and foreign banks. The study shows that foreign commercial banks are more liquid than state owned commercial banks and private commercial banks and foreign commercial banks show the most profitable among the other two. The previous research is use as a baseline to compare the liquidity of state-owned, private, and foreign banks in Indonesia.

To measure the liquidity position of a bank, there are several ways. Recently, Basel III has published a key to build a more resilient banking industry, by measuring the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR). LCR aims to improve the short-term resilience of a bank's liquidity risk profile by making sure that bank has adequate High Quality Liquid Asset to survive in a one-month financial stress [6]. NFSR aims to improve the resilience with a longer time period and create additional incentives for banks to pay

its activities with steadier funding [6]. In this research, the standard for funding liquidity used as a tool measurement is only Liquidity Coverage Ratio. LCR will be officially introduce on 1 January 2015 with minimum requirement 60%, then it will be gradually increase 10% each year until it reach 100% on 1 January 2019.

LCR will give advantage to banking industry to be able to control crisis from financial and economic stress. LCR has two components, such as High Quality Liquid Asset (HQLA) and total net cash outflows. High Quality Liquid Asset (HQLA) is asset that should be liquid in 30-day period and survive in market during financial stress [6]. Total net cash outflows as the total expected cash flows minus total expected cash inflows in 30 days period [6].

B. Generalized Autoregressive Conditional Heteroscedasticity

In financial time series, the data often occur in volatility clustering, which shows a high fluctuation and followed by a stable condition [7]. There are numbers of models that can be use to model and forecast volatility. ARCH and GARCH models are the most common use. ARCH stands for Autoregressive Conditional Heteroscedasticity. ARCH is a model that describes how the variance of errors happen without assuming the variance is [8].

Different from ARCH that uses the short-term change in volatility to forecast, GARCH consider the long-run change in volatility to forecast. GARCH is model that can use conditional variance as the dependent upon previous own lags and the previous is tighter and aavoids over fitting than ARCH model [8].

One of the advantages of GARCH is able to use it to model the volatility of a data in a certain period. Those financial time series that show a volatility clustering will most likely use GARCH model, like stocks prices, commodities, exchange rates, inflation rates, and risk estimation.

Reference [9] studied assessment and explanation of liquidity risk model at danger with LaR four models, such as two econometric groups, ARCH and GARCH, and two risk assessment groups, MA and EWMA. The result shows that liquidity time series of bank have large fluctuation shocks in spread time and negative in some periods. One of the important result shows that the increase of time period will decrease the accuracy of risk forecasting. The GARCH model also represents a more efficient model than the other models.

III. METHODOLOGY

A. Data Collection

The data population is the Liquidity Coverage Ratio of all state-owned, private, and foreign banks in Indonesia. The data used in this research is obtained from monthly financial report of 19 commercial banks in Indonesia period 2008 – 2013 [10]. The samples that are use for state-owned bank are PT. Bank Rakyat Indonesia (PERSERO), Tbk, PT. Bank Mandiri (PERSERO), Tbk, PT. Bank Negara Indonesia (PERSERO), Tbk, PT. Bank Tabungan Negara (PERSERO), and PT. BPD Jawa Barat dan Banten. For the private bank, the samples use

are PT. Bank Mega, Tbk, PT. Bank Bukopin, PT. Bank Danamon Indonesia, Tbk, PT. Bank Internasional Indonesia, Tbk, PT. Bank OSBC NISP, Tbk, PT. Bank Permata, Tbk, PT. Bank Central Asia, Tbk, PT. PAN Indonesia Bank, Tbk, and PT. Bank CIMB Niaga, Tbk. There are five banks that are used for foreign bank samples, such as Citibank N.A, The Bank of Tokyo-Mitsubishi Ltd, PT. Bank Sumitomo Mitsui Indonesia, PT. Bank DBS Indonesia, and PT. Bank Mizuho Indonesia.

B. Liquidity Coverage Ratio

To estimate the liquidity resilience of state-owned, private, and foreign banks in this research, the ratio that is used is Liquidity Coverage Ratio, which is calculated by using the equation (1) below.

$$LCR = \frac{\text{High Quality Liquid Assets}}{\text{Total net liquidity outflows}} \times 100\% \qquad (1)$$
$$\text{over 30-day time period}$$

Where

High Quality Liquidity Asset (HQLA) is asset that has to be liquid in market in 30-day period. In this research, the bank accounts used for HQLA are cash, placement to Bank Indonesia, and interbank placement.

Total net liquidity outflows over 30-day time period is the total net cash outflows as the total expected cash flows minus total expected cash inflows in 30 days period. The bank accounts are current account, saving account, and time deposit.

C. Forecasting Procedures

There are four steps in the forecasting procedures, such as determine the GARCH equation, conduct the regression with eViews, gather the regression result, and forecast the LCR for the next six years. To conduct this research, we will use GARCH (1,1) model. Below is the equation for GARCH (1,1). The equation (2) is mean equation and the equation (3) is variance equation.

$$Y_t = X_t^{'}\gamma + \varepsilon_t \qquad (1)$$

$$\sigma_t^2 = \omega + \alpha\,\varepsilon_{t-1}^2 + \beta\,\sigma_{t-1}^2 \qquad (2)$$

Where:

Y_t : Mean equation

$X_t^{'}\gamma$: Exogenous variable

ε_t : Error term

σ_t^2 : A one-period ahead to estimate the variance based on the history data, past variance

ω : Constant term

$\alpha\,\varepsilon_{t-1}^2$: The volatility in the previous period, measured as the lag of the squared from mean equation (ARCH term)

$\beta\,\sigma_{t-1}^2$: Last period's forecast variance (GARCH term)

The LCR ratios will be regressed with econometric software named as EViews. To estimate what is the best fit of GARCH equation by seeking a significant coefficient measurement of

regression result by using the p-value, which is 5%. The substance output from the regression is mean variance, which will be transforming to standard deviation as a baseline to forecast the Liquidity Coverage Ratio. Forecasting will utilize the historical LCR as an average LCR $\pm$ standard deviation and then will come up with upper and lower LCR. This forecasting will predict six years ahead of Liquidity Coverage Ratio for each bank.

IV. DATA ANALYSIS

All the Liquidity Coverage Ratio of 19 banks is regressed with EViews and showed a statistically significant p-value using GARCH (1,1).

A. State-Owned Bank

1. PT. Bank Rakyat Indonesia (PERSERO), Tbk

The volatility of PT. Bank Rakyat Indonesia Liquidity Coverage Ratio will be going down in the first year and remains stable for the following year. The liquidity risk is also predicted to be stable after a surged in the beginning of the forecasted year.

The forecasting of the LCR shows a fluctuation with a downward trend in the beginning. In the middle of 2015 until 2018 there will be some high fluctuations from 0.15 to 0.35 and at the end of the six years period, the LCR is relatively calm.

2. PT. Bank Mandiri (PERSERO), Tbk

Liquidity Coverage Ratio volatility of PT. Bank Mandiri will experience a decreasing value and then the volatility remained steady after one-year period.

The forecasting of LCR shows a downward and upward. The downward reach its lowest point in the beginning of 2016 and then it start to increase until 2019.

3. PT. Bank Negara Indonesia (PERSERO), Tbk

The PT. Bank Negara Indonesia Liquidity Coverage Ratio volatility will face a decline in the beginning of the first year then the volatility is relatively steady. The liquidity risk will also face a similar condition, where the risk is relatively steady from the first quarter of the forecasted first year. However, in the first year the liquidity risk will rise drastically before it become steady.

The PT. Bank Negara Indonesia LCR forecasting shows an upward trend from 2014 until the beginning of 2018. The fluctuation shows repeated fluctuations from 2014 – 2018. It will start with a calm volatility and follow by a high fluctuation. The calm volatility will occur around six months and the high fluctuation will happen for almost a year. In the middle of 2018, the LCR will experience a downward trend.

4. PT. Bank Tabungan Negara (PERSERO)

The volatility of PT. Bank Tabungan Negara Liquidity Coverage Ratio will be low in the beginning and increase slowly then in the middle of the first year it will start to become stable. The liquidity risk will increase gradually in the first year and start to become stable from the second year period.

In 2014 until the late of 2015, the LCR forecast is quite stable but it will drop in the beginning of 2016 and gently start to increase until 2019. In the upward trend, the fluctuation is

quite calm until the end of 2017. Start from the beginning of 2018, the upward trend will be filled with a high fluctuation until 2019.

5. PT. BPD Jawa Barat & Banten

The future volatility of PT. BPD Jawa Barat & Banten LCR in the next six-year will be low at the beginning and gradually become higher in the end of six year period. The liquidity risk will increase significantly in the first year then it will be relatively stable until the end of period. Even though the volatility is predicted to be higher, the liquidity risk of BJB will be relatively stable.

The prediction of PT. BPD Jawa Barat & Banten LCR in 2014 – 2019 shows a downward trend. In the first year, the LCR is relatively stable. It will start to fluctuate around 0.2 to 0.6 and decline in two years later.

B. Private Bank

1. PT. Bank Mega, Tbk

PT. Bank Mega Liquidity Coverage Ratio volatility is lower in the beginning of the first year and slowly increase and remains steady until the next six years. The liquidity risk will rise in the half of first year and remains steady until the next six years.

PT. Bank Mega LCR will face an upward trend from the beginning of 2014 until the beginning of 2016. It will increase approximately 0.4 point from its lowest point. In the middle of 2016 until 2019, there will be some fluctuations with smaller volatility compared in 2015.

2. PT. Bank Bukopin

PT. Bank Bukopin Liquidity Coverage Ratio volatility shows a decreasing value with a steady volatility. The liquidity risk will drop in the first six months and remains stable in six years ahead.

Overall, PT. Bank Bukopin LCR forecast shows a downward trend. It will reach the lowest point in the first quarter of 2016. There will also slightly increase in 2016 – 2017 and decline again in the beginning of 2018. In 2018 – 2019 the LCR shows a relatively stable condition.

3. PT. Bank Danamon Indonesia, Tbk

The Liquidity Coverage Ratio volatility of PT. Bank Danamon Indonesia will be stable in the next six years. The liquidity risk will also experience a similar condition except in the first quarter of the first year, where the risk plummeted before starting to remains steady.

The LCR forecasting of PT. Bank Danamon Indonesia shows a relatively steady condition. There are some ups and downs with a relatively small volatility. The LCR is forecasted to happen around 0.1 until 0.3 in the next six years.

4. PT. Bank Internasional Indonesia, Tbk

The volatility of Liquidity Coverage Ratio in BII will slightly incline over the time and it will remain stable right after.

The forecasting of LCR in BII shows an upward trend and reaches its highest point in the middle of 2019. Unfortunately, the forecasting shows a decline in the end of 2019.

5. PT. Bank OSBC NISP, Tbk

PT. Bank OSBC NISP Liquidity Coverage Ratio will start with a low volatility and gradually increase until it become

steady in 2009. The liquidity risk will predicted to go up in the first six months and relatively steady until six years ahead.

The LCR forecasting for PT. Bank OSBC NISP mostly shows a relatively stable condition, except in 2014 – 2015, which shows a big increase about 0.3 point and drop again to the starting point in the late 2015.

6. PT. Bank Permata, Tbk

The volatility of Liquidity Coverage Ratio in PT. Bank Permata shows a low volatility in the beginning and starts to increase slowly and remains constant until the next six years. The liquidity risk will gradually increase from the first year and start to remain stable from the second year.

The LCR forecasting for PT. Bank Permata shows three big fluctuations in the next six years. The first one will occur in the late of 2014 until the end of 2015. The second one will occur from 2017 until 2018. The last one will happen in 2018 – 2019.

7. PT. Bank Central Asia, Tbk

The volatility of Liquidity Coverage Ratio of PT. Bank Central Asia will be low in the beginning of the first year and it will become higher overtime until the next six years. The liquidity risk also shows the same result, where it will gradually increase until six years ahead.

PT. Bank Central Asia will experience a downward trend of LCR for the next six years. First it will slightly increase until the late of 2015 and drop to its lowest point in the beginning of 2016. It will start to increase again in 2017 and gradually decrease until the end of 2019.

8. PT. PAN Indonesia Bank, Tbk

The volatility of PT. PAN Indonesia Bank Liquidity Coverage Ratio will be low in the beginning and increase in the middle of the first year. Starts from the second year, the volatility will slowly become lower again. The liquidity risk will fall from the first year until the next six years.

In 2014 until the beginning of 2017, PT. PAN Indonesia Bank forecasting LCR shows some high fluctuations. It starts with a high fluctuation in 2015 and followed by a lower one in 2017. In 2017 – 2018, the LCR shows a decline with a small fluctuation. The LCR will remain steady in 2019.

9. PT. Bank CIMB Niaga, Tbk

PT. Bank CIMB Niaga Liquidity Coverage Ratio will experience an increase in its volatility but remains stable from the middle of the first year. The liquidity risk of PT. Bank CIMB Niaga shows a downward trend overall.

The forecasting of PT. Bank CIMB Niaga LCR shows an upward trend. The fluctuations will remains relatively constant over the years.

C. Foreign Bank

1. Citibank N.A

Citibank N.A Liquidity Coverage Ratio will experience a high volatility of Liquidity Coverage Ratio starts from the middle of 2008 and remains stable for the next six years. The liquidity risk will rise drastically in the first quarter of the first year and remains stable for next six years.

Overall Citibank N.A forecasting LCR shows an upward trend. The volatility of the LCR shows a relatively similar in each fluctuation.

2. The Bank of Tokyo-Mitsubishi Ltd

The volatility forecast of Bank of Tokyo-Mitsubishi Liquidity Coverage Ratio will be low in the beginning and then starts to increase. In the second year, it will be predicted to remains steady until the next six years. The liquidity risk mostly will remain steady with an increase start in the beginning of the first year.

Mostly, Bank of Tokyo-Mitsubishi Ltd LCR forecasting shows a downward trend until the beginning of 2019. It will reach its lowest point in the late of 2016. Start from the beginning of 2019, the LCR shows an upward trend.

3. PT. Bank Sumitomo Mitsui Indonesia

The volatility of PT. Bank Sumitomo Mitsui Indonesia Liquidity Coverage Ratio will shows an increase but remains stable in most of the year. The liquidity risk will increase in the beginning of the first year and stay stable over the years.

PT. Bank Sumitomo Mitsui Indonesia LCR forecasting pattern shows an upward trend starts from 2016. However, in 2014 the LCR will going down until it reach its lowest point in the beginning of 2015 before it starts to experience its upward trend.

4. PT. Bank DBS Indonesia

The volatility of PT. Bank DBS Indonesia Liquidity Coverage Ratio will increase and remains steady over the years. The increase of the volatility will occur in the first six months. The liquidity risk shows an increase in the first year and remains stable for the next years.

The forecasting of LCR in PT. Bank DBS Indonesia shows an upward trend in 2014 – 2015 and reaches its highest point in the late of 2015. It will start to drop in the late 2016 and remains relatively stable until 2019.

5. PT. Bank Mizuho Indonesia

The volatility of Liquidity Coverage Ratio in PT. Bank Mizuho Indonesia shows an upward trend. The volatility will increase over the years. The liquidity risk will also experience the same trend. It will show an ascending trend in the next six years.

The forecasting of LCR in PT. Bank Mizuho Indonesia shows an increasing trend from 2014 until the middle of 2017. The peak point will happen in the middle of 2017 then it start to fall down until the beginning of 2019 and slowly start to incline until the end of 2019.

D. Comparison between state-owned, private, and foreign banks

In order to compare the three types of bank, we make an average from each Liquidity Coverage Ratio forecast and assume that the average will represent the Liquidity Coverage Ratio forecast for each type as a whole.
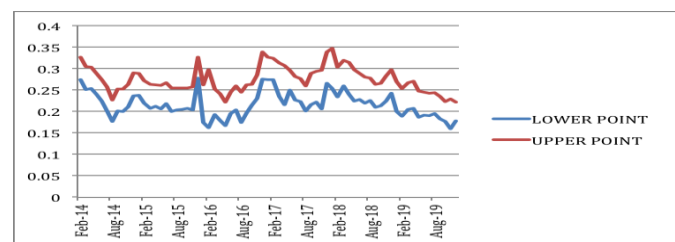

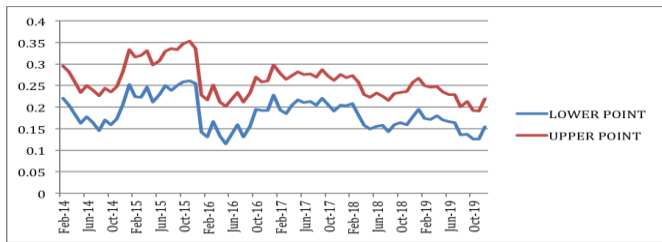Fig. 1 State-Owned Bank Liquidity Coverage Ratio Forecast

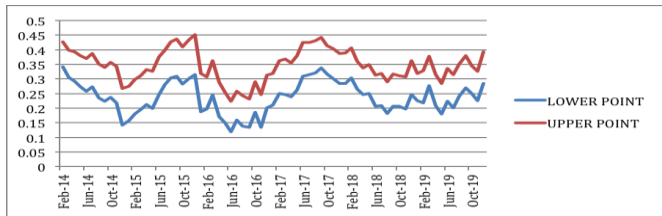Fig. 2 Private Bank Liquidity Coverage Ratio Forecast

Fig. 3 Foreign Bank Liquidity Coverage Ratio Forecast

The forecasting of Liquidity Coverage Ratio in state-owned bank types will experience a downward trend in the next six years. Fluctuations will occur from 2014 until 2018 then it will start to go down until 2019.

In the private bank type, the liquidity coverage ratio forecast will start with a high swing from 2014 until 2016. The LCR will start to become stable from 2016 – 2018. However, in 2019, the LCR will tend to slightly decline.

The forecast of Liqudity Coverage Ratio in foreign bank has a cycle that is repeated in approximately every two years, for example in 2015 until 2016 and it will be repeated in 2016 to 2018. In 2019, the LCR forecast in foreign bank tend to grow up.

V. CONCLUSION

From the data analysis, the state-owned bank shows the volatility remains steady with a decreasing value in the beginning and the liquidity risk also remains steady with an increase in the first year period. The forecasting of Liquidity Coverage Ratio in state-owned bank shows a downward trend with a high volatility.

Besides, in private bank the volatility of this category mostly shows an increase in the volatility but remain stable for most of the years. Mostly the liquidity risk in private banks is remains stable but there are different of increases and decreases each bank. The forecasting of Liquidity Coverage Ratio in private bank shows a big swing in the first two years and then tends to decline until 2019.

The foreign bank shows different pattern, the Liquidity Coverage Ratio volatility shows an increase and remains stable over the year. The liquidity risk also indicates an increase in this sector and followed by a stable risk. The forecasting of foreign bank Liquidity Coverage Ratio shows repeated cycles and tends to increase at the end.

REFERENCES

[1] Ismal, Rifki, *The Management of Liquidity Risk in Islamic Banks: The Case of* Indonesia, Durham: Durham University, 2010.

[2] Bank for International Settlement, *Principles for Sound Liquidity Risk Management and Supervision*. Switzerland: Bank for International Settlements Press & Communication, 2008.

[3] Baxter, R. Ashle, *Prudential Liquidity Standards in Asia*. San Fransisco: Asia Focus, March 2011.

[4] Hubbard, G. R, *Money, The Financial system, and the Economy.* New Jersey: The Addison Wesley Series in Economics, Person Education Inc, 2002.

[5] Hossain, Mohammad Mokter., *Liquidity and Profitability Study of State Owned Commercial Banks (SCBs), Private Commercil Banks (PCBs), and Foreign Commercial Banks (FCBs) – Bangladesh Perspective*, Thailand: Asian Institute of Technology, May 2012.

[6] Bank for International Settlement, *Basel III: A global regulatory framework for more resilient banks and banking systems*. Switzerland: Bank for International Settlements Communications, 2011.

[7] Gujarati, *Basic Econometrics, Fourth Edition*, The McGraw-Hill Companies, 2004, pp.856.

[8] Brooks, C. *Introductory Econometrics for Finance*. Cambridge: Cambridge University Press, 2008, pp.

[9] Shams, Mirfeiz Falah., Kordlouie, Hamidreza., Bandeh, Mohsen., Naghshineh, Nader., *Assessment and Explanation of Bank's Liquidity Risk Forecasting Model Using of Liquidity at Risk Case Study: Agricultural Bank*, International Business Research Vol. 6, No. 10, 2013.

[10] *Condensed Financial Statement*, Retrieved July 2014, from Bank Indonesia:http://www.bi.go.id/en/publikasi/laporan-keuangan/bank/umum-konvensional/Default.aspx.