Migration Letters

Volume: 21, No: 3, pp. 333-347

ISSN: 1741-8984 (Print) ISSN: 1741-8992 (Online)
www.migrationletters.com

Interbank Market Beyond Liquidity Coinsurance: Evidence from Indonesia

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Abstract

This study aims to examine the advantage of the interbank market beyond the need for a short-term liquidity coinsurance. More specifically, using monthly data of Indonesian banking between December 2014 to June 2023, we examine the impact of interbank lending to the credit supply and the non-bank funding through autoregressive distributed lag (ARDL) model. This study finds that the long-term interbank lending could attract the bank borrowing from the external investors and boost the credit supply to customers, although it has no significant impact for other funding source, particularly the issued securities. Conversely, the short-term interbank lending has no impact toward the credit supply nor the non-bank fundings. The results are consistent for all commercial banks' core capital categories, including the small-size, the medium-size and the large-size banks. The novel aspect of this work is the segregation of lending maturities between the long-term and the short-term interbank loans and differentiate its impacts, particularly to the credit supply and the non-bank funding. The study proves the function of interbank market beyond the liquidity coinsurance and supports for the interbank market for diversification motives.

Keywords: *Diversification, liquidity, interbank market, credit supply, non-bank funding.*

1. INTRODUCTION

In contrast to the market-based countries which directly channel the financial resources from the investors to the borrowers, a bank-based country relies heavily on banking as a main funding channel (Bats & Houben, 2017). Additionally, bank is not readily substitutable as their services are essential to the real economy, particularly the payment and the settlement systems. Therefore, bank in the bank-based countries play main role in the distribution of liquidity from and to the real economic sectors. Bank also play an indirect intermediation role through the interbank market to re-distribute the liquidity. A bank with low liquid asset may utilizes the interbank market as an alternative source of funding to fulfil their liquidity needs, known as a liquidity coinsurance (Allen & Gale, 2000; Freixas et al., 2011; Castiglionesi at al., 2014).

As a bank-based country, Indonesian interbank market has several unique characteristics. First, despite the interbank market size is shallow, the interbank market size is significantly above the variations of deposits and credit supply that are persistent over the time periods. Total interbank assets, including the short-term interbank call money and the long-term bilateral interbank loans, are accounted to about 2 to 5 times larger than the

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standard deviations of monthly credit to customers. Meanwhile, the interbank liabilities are accounted to around 3 to 10 times larger than the standard deviations of monthly deposits. Figure 1 display the dynamic of standard deviations of deposits and credit to customer, as well as the interbank market. Second, the proportion of the long-term interbank assets to the total interbank asset are substantially expand from approximately 5 percent in 2010 to more than 25 percent in 2020, though it slightly drops during 2021-2023 period as depicted in figure 2. Third, the total interbank assets are persistently higher than the interbank liabilities that are accounted to around 150 to 200 percent. In addition, the average banks' capital buffers are much higher than the minimum capital requirements pursued by the central bank which should be sufficient to overcome the deposits and the credit fluctuations. These facts suggest that the function of interbank market as coinsurance against the short-term liquidity risk is not easily reconciled with the actual market data.

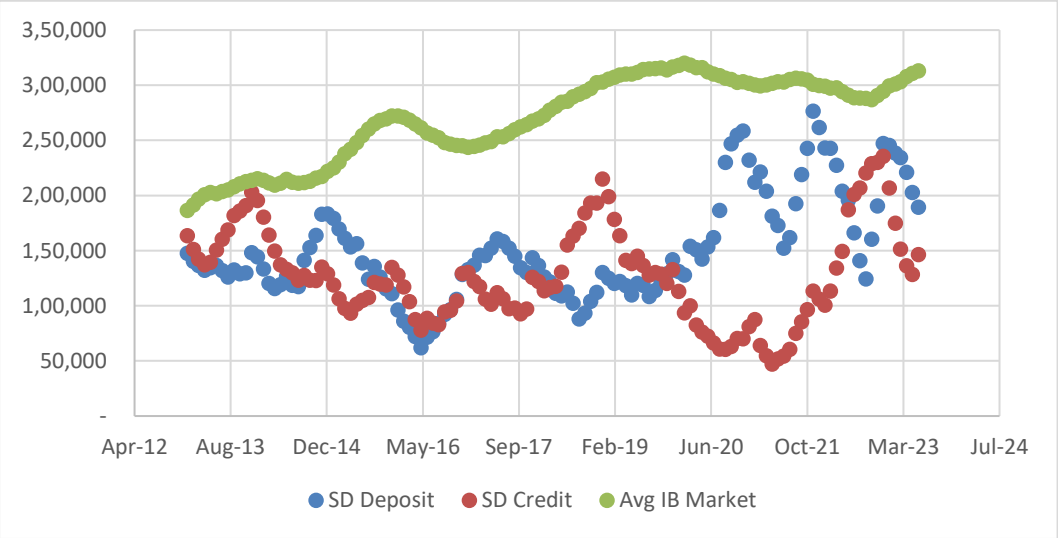

Figure 1. Interbank market and the standard deviation of deposits and the credit supply

The Y-axis value in million rupiah. The average value of the interbank market, the standard deviation of deposits and the standard deviation of credit to customers are calculated based on the 12 months rolling windows.

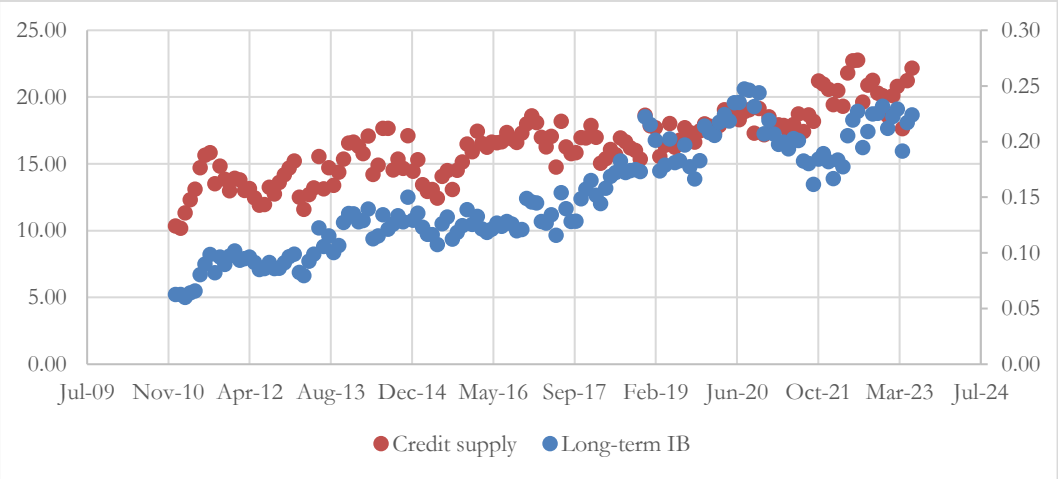

Figure 2. Credit supply and long-term interbank lending dynamics

The left Y-axis display the ratio of credit supply to total interbank assets, while the left Y-axis display the ratio of long-term interbank lending to total interbank assets.

Motivated by the above unique characteristics, this study shed the light on the advantage of the interbank market beyond the liquidity coinsurance by examining diversification theory of Dietrich and Hauck (2020). More specifically, this study aims to examine the impact of interbank lending to the credit supply and the non-bank fundings as a part of key indicators for the existence of the diversification motives in the interbank lending. First, because the interbank market plays central role in the re-distribution of liquidity among banks, does the interbank market drive the real sectors' liquidity through the credit supply? Second, because the interbank market does not create the liquidity (Allen & Gale, 2000), does the interbank market affects the non-bank fundings to increase the liquidity?

Using Autoregressive Distributed Lag (ARDL) model, the results suggest that the long-term interbank lending are positively and significantly affect the credit supply to customers. The result also suggest that the long-term interbank lending is positively and significantly affect the non-bank borrowing. However, the interbank lending has no impact toward the other non-bank funding, namely the securities issued by bank as one of the external investors funding channels. The results are consistent for all commercial banks' core capital categories, including the category 2 (small size banks), the category 3 (medium size banks) and the category 4 (large size banks). Conversely, the short-term interbank lending has no impact to the credit supply nor the non-bank borrowing and the issuance of securities. The results support for diversification theory of the interbank market (see Dietrich and Hauck, 2020), more specifically its relevant for the long-term interbank lending.

The novel aspect of this work is the segregation of the interbank lending into two types of maturities, namely the short-term and the long-term interbank lending. The study empirically examines which the maturities are significantly boosts the credit supply and the non-bank borrowing. This study also contributes to enrich the interbank market literatures in several ways. First, to the best of our knowledge, this study is pioneering in an empirical examination for the new-introduced theoretical model of the diversification motives for the interbank lending beyond the interbank market as a liquidity coinsurance, particularly provides the evidence from Indonesia banking. Second, the study also reveals that the interbank lending maturities have different economic impacts. The long-term interbank lending is associated with the real bank intermediation role to the real economic sectors through the credit supply and the borrowing from external investor. Meanwhile, the short-term interbank lending has no direct impact to the credit supply nor the funding from the external investors. Considering the long-term and the short-term interbank lending have different economic impacts, government policy relevant to the interbank market should takes into account the interbank lending maturities.

2. LITERATURE REVIEW

Banks play a central role in the distribution of liquidity to and from companies, households and the government, as well as the financial market. In carrying out its activities, bank bears the risk of maturity transformation by issuing the short-term deposits for the long-term investments (Allen & Carletti, 2010). Therefore, the function of bank is also to channel the risks, known as risk intermediaries, such that the risk of one institution will affect the risk of other institutions and the bank itself. A financial pressure of the borrower in the real sectors will cause liquidity pressure on the banking sector as the lenders. If the bank could not mitigate the pressure, the liquidity problems may affect the other banks and the real sectors.

Bank as a risk intermediaries offer risk management products by absorbing the risks arising from each customer transactions and the bank earns rewards for managing the risks (Allen & Saunders, 2010). Banks have a superior ability to measure and manage the risk exposures to themselves and their customers, either by shifting the risk to the market or by absorbing the risk into the bank's inventory. Bank investment activities, such as

credit issuance and interbank loans, in essence, are transferring the risk of creditors (companies, households, governments or other banks) into the bank. In some circumstances, banks are also essentially transfer at least in a part of their asset risk to the depositors, to other banks through the interbank loans, as well as to other financial institutions and the investors through various forms of the financial innovation (e.g., credit default swaps, asset backed securities, etc.). Despite banks have a better ability to manage risk than other institutions, improper risk assessment by a bank may cause financial system failure, i.e., when the aggregate risk is higher than the financial system's ability to bear the risk (Allen & Saunders, 2010).

Traditionally, capital buffer is beneficial to overcome a bank risk from the variations of the short-term deposits and the other funding sources against the long-term maturity investments. However, the high capital buffer elevates capital cost imposed by lenders through a high interest margin. Indonesia as one of emerging market countries characterized by a high capital buffer, therefore it requires high interest margin (Bustaman et al., 2017). The high interest margin in Indonesian banking is also driven by the market power of the large-size banks that in turn reduce the banking competitiveness (Trinugroho et al., 2014). A low banking competition encourages banks to have a high capital ratio and the liquidity hoarding, which ultimately decrease the interbank market liquidity (Acharya et al., 2011). In addition, Acharya et al. (2011) also suggest that the tendency of bank to accumulate a cash is positively correlated with the difficulty to obtain the external funding and the severity of crisis which are generally occurs in the countries having a relatively low capital market to GDP ratio. A low total banking liquidity is also imply low interbank money market that in a spiral way will further encourages bank to hold a high capital ratio (Bhattacharya & Gale, 1987). Since the high capital ratio lead to a high capital cost, bank will expect a higher profit that further encourages bank to invests more in the risky assets (Allen & Gale, 2005). A higher proportion of risky assets increase the bank risks which require to be managed by among other things through a risk diversification.

Alternatively, a bank may utilize the interbank market as a complement to the capital buffer imposed by regulatory requirements such that the liquidity problems arising from a funding fluctuation could be mitigated while minimizing the cost of capital. Allen and Gale (2000) argue that a strong interbank market has an advantage as coinsurance against liquidity risks. Because they are jointly absorbing the liquidity shock, it reduces the probability of default for the interbank borrowers. When the interbank market is robust, a bank with low liquidity may obtain funding from the interbank market to fulfil their liquidity needs. In this regard, the interbank market play an important role in the distribution of liquidity of surpluses banks to the other banks with a liquidity deficit. Therefore, we could assert the interbank market as a common capital buffer, particularly for the diversifiable liquidity risks (Castiglionesi at al., 2014). Therefore, bank’s capital could be minimized such that the cost of fund would arguably low but they still have a capability to encounter the liquidity problems.

The liquidity coinsurance theory of the interbank market has been widely accepted (e.g., Allen & Gale, 2000; Freixas et al., 2011; Castiglionesi at al., 2014). However, Indonesian banking shows that the total interbank assets are persistently larger than the deposits and the credit variations. If the function of the interbank market is merely beneficial to overcome the short-term liquidity needs, the average size of the interbank market should be maintained just around the standard deviations of the deposits and the credit dynamics. Because a borrowing from the interbank market is costly, a bank would rationally borrow as minimum as possible to cover the short-term liquidity fluctuations. In addition, the proportion of the overnight market that predominantly covers the bank cash fluctuations is shrinks, while the longer-term lending is increasing in recent years. Whereas, the longer-terms lending should not necessary in term of the liquidity coinsurance. Furthermore, the position of the interbank assets is substantially larger that the interbank

liabilities that are persistent over the time periods. Note that the interbank market as the focus of this study is characterized as the assets and the liabilities at the same time; the interbank asset represents the lenders' side view, whereas the borrowers' side is captured as liabilities. Therefore, we conjecture from the net position of the interbank assets compared to the interbank liabilities that the interbank market is not only driven by the liquidity problems. Accordingly, a pure liquidity coinsurance theory is not easily reconciled. Other explanation suitable to these phenomena as an integral part of the interbank market studies are needed.

To answer the above questions, we may relate to Dietrich and Hauck (2020) whose suggest that the interbank market have a benefit for risk diversification that in turn will govern the amount of liquidity in the market. In their model, the interbank lenders determine the amount of lending to other banks in accordance with joint equilibrium of the costs and the benefits of the diversification. In this study, the diversification benefit is referred to as the improvement of access to the external funding sources, while the cost is referred to as a loss for granting loans to other banks. This proposition is supported by Bluhm et al. (2016) whose find that the interbank market dynamic is significantly explained by the innovations of the aggregate non-bank exposures. They concluded that their findings support for the role of interbank market beyond the liquidity coinsurance, particularly the interbank market as stacking bank leverages as being proposed by Moore (2011). The theory should also be suitable for the interbank market analyses as a complement to the strong interbank network as a liquidity coinsurance for needy banks, particularly it is relevant for the bank's asset side analyses.

Following the theoretical setup adopted from Dietrich and Hauck (2020), we conjecture as the following. First, higher the interbank lenders' endowment led to lesser dependent on the external investors to maintain their credit supply. This notion suggests that a higher of the interbank lenders' endowment implies lower interbank market supply. This proposition is also supported by Castiglionesi at al. (2014) whose suggest a negative correlation between the bank capital and the interbank market. Second, higher the interbank borrowers' endowment requires lower interbank rate, hence increases the marginal cost of diversification. This notion suggests that higher the interbank borrowers' endowment implies lower interbank market. Third, higher the risk of the interbank lenders' business loans implies higher financial constraint for the interbank lenders to maintain their credit volume. However, it has unclear sign for the interbank market, since there are two different effects. The interbank lenders have to lend more to intensify their diversification benefit to be able to attract external funding and hence increase the interbank; however, it would require to reduce the interbank rates to attract the interbank borrowers that implies higher marginal cost for the interbank lenders and thus reduce the interbank market. This notion suggests that if the diversification benefit is substantial, the interbank market drives the external funding. Fourth, the aggregate supply of business loans is positively affected by the interbank market. The increase in the credit supply is promoted by the interbank lenders due to diversification benefit, as well as by the interbank borrowers that dependent on the interbank market. Fifth, a breakdown of the interbank market will affect the interbank borrowers' credit supply, and more pronounce for lower borrowers' endowment.

Furthermore, the interbank lending maturities should also become a crucial part in the analysis. The interbank lending maturities may have different impact to the bank's risks and eventually toward the systemic risk, more specifically related to the network-based measures. The long-term interbank loans may be utilized as a funding source for the credit supply to customers, hence the long-term interbank market would highly correlated with the real economic sectors that are generally having longer-term maturities. Bluhm (2018) suggest that interbank markets tend to have a longer lending maturities which could beneficial for a bank to manage funding and the interest rate risks. Therefore, it allows bank to considerably increase the credits to the real economy. Bluhm et al. (2016)

found that the interbank lending maturities tend to increase over time in Germany and suggest that the interbank loan maturity bucket is associated with underlying client book.

Because the interbank lending maturity matters, we take into account the interbank lending maturities and bring into the above theoretical framework. Therefore, the diversification benefits should particularly be associated with the longer-term interbank market, such that it would allow a bank considerably increase the credit supply to the real economy. Building from the above theoretical model, we derived several hypotheses to be tested empirically.

Hypothesis 1: Long-term interbank lending drives external fundings.

Interbank lenders may diversify their business loan risks through the interbank market to attract external investors. If the benefit of diversification is higher than its cost, a bank may lend to the interbank market. Therefore, the interbank market drives the external fundings, more specifically the long-term interbank lending drives the non-bank borrowing.

Hypothesis 2: Short-term interbank lending may not drive external fundings.

External investors are associated with the longer-term maturities, more specifically if we compare with the short-term interbank market. Therefore, the short-term interbank lending may not positively affect the non-bank borrowing.

Hypothesis 3: Long-term interbank lending drives credit supply to customers.

The aggregate supply of business loans is positively affected by the interbank market, particularly the long-term interbank market. The increases in credit supply are promoted by the interbank lenders due to diversification benefits, as well as augmented by the interbank borrowers that rely on the interbank market. This proposition is evidently supported by Bluhm et al. (2016) whose find that the inflow of non-bank deposits is positively associated with the interbank lending exposures. Meanwhile, the outflow of non-bank loans increases the interbank borrowing.

Hypothesis 4: Short-term interbank lending may not drive credit supply to customers.

Refer to Bluhm et al. (2016) whose suggest that the interbank loans maturity bucket is associated with underlying client book, the credit supply to customers is not necessarily associated with the short-term interbank asset. It because, the credit supply to customer has generally a long-term maturity.

3. METHOD

a. Empirical model

In this work, Autoregressive Distributed Lag (ARDL) model is selected to capture the dynamic relationship for the timeseries data as proposed by Pesaran, Shin and Smith (2001). Compare to VAR or VECM models that need all variables to be in the same order, ARDL is best fit for mix of variables with I(1) and I(0), and it is still applicable for both I(1) or I(0) (see Pesaran, Shin and Smith, 2001; McNown, Sam and Goh, 2017). This model is in particular depict a causal relationship among the two variables, both in the long-run and the short-run causalities, that is also efficient for small sample size (Pesaran, Shin and Smith, 2001).

Gujarati (2004) stated that the relationship between dependent variable and independent variables in economy are rarely instantaneous. Therefore, the variables often contain autocorrelation. There are 3 main reasons: First, Psychological reasons; Change in the price or the income do not instantaneously change the people habits. In addition, the economic agents are often do not realize whether the change is permanent or temporary. Second, Technological reasons; The equilibrium among economic factor prices is not

contemporaneously occur. Because, the equilibrium needs a time. Third, Institutional reasons that may prevent the economic agent to change rapidly, e.g., contractual terms and administrative that may hinder firms for switching from one to other sources or from one investment form to other forms, long-term saving, etc. Therefore, relationship between the timeseries should be modelled with involving the lags.

To answer the research question as argued in the hypotheses of how the interbank market drive non-deposit fundings and the credit supply, we use ARDL model as depicted below.

In order to analyze the short-run dynamics and the long-run relationship among the variables of interest, we use ADRL cointegration test as equation 1.

$$\Delta Y_t = c + b_{11}Y_{t-1} + b_{21}X_{t-1} + \sum_{i=1}^{p} a_{1i}\Delta Y_{t-i} + \sum_{i=1}^{q} a_{2i}\Delta X_{t-i} + \text{Control} + \varepsilon_t \quad (1)$$

Where,

$$\text{Control} = b_{31}Z1_{t-1} + b_{41}Z2_{t-1} + \cdots + \sum_{i=1}^{r} a_{3i}\Delta Z1_{t-i} + \sum_{i=1}^{s} a_{4i}Z2_{t-l} + \cdots$$

Level equation

$$Y_t = c + \sum_{i=1}^{p} a_{1i}Y_{t-i} + \sum_{i=0}^{q} a_{2i}X_{t-l} + \text{Control} + \varepsilon_t \quad (2)$$

Where,

$$\text{Control} = \sum_{i=0}^{r} a_{3i}\Delta Z1_{t-i} + \sum_{i=0}^{s} a_{4i}Z2_{t-l} + \cdots$$

To test the hypothesis 1 and 2, Y stands for the non-bank borrowing as a proxy for the external investors. Meanwhile, X stands for the interbank market assets. We regress the non-bank borrowing with the interbank lending that have longer-term maturity to test the hypothesis 1 and the interbank placement as a proxy for the short-term interbank lending to test the hypothesis 2. We conjecture that the long-term interbank lending positively affects the non-bank borrowing, while the short-term interbank lending does not positively affect the non-bank borrowing. Additionally, we also test for other funding source, more specifically in the form of securities issued by banks as a complementary.

Furthermore, to test the hypothesis 3 and 4, Y stands for the credit supply to customers. While, X stands for the interbank market assets. Similarly, we also segregate the interbank market into the long-term maturities to test the hypothesis 3 and the short-term maturities to test the hypothesis 4. We conjecture that the long-term interbank lending is positively and significantly affect the credit supply to customers. Meanwhile, the short-term interbank lending does not significantly affect the credit supply.

In the model equation, we put control variables to ensure there is no omitted variable in the model. Because bank distributes the liquidity to and from companies, households and the government, as well as the financial market by issuing the short-term deposits for the long-term investments (Allen & Carletti, 2010), we need to put deposits as well as bank capital (equity) as control variables. We conjecture that higher the deposits and the equity imply higher capability to supply credit to customer and lower need for the non-bank borrowing. In addition, we also put economy wide variable because the credit supply and the external investors (non-bank borrowing) are also affected by economic conditions. The market index (IDX composite index) is used as a proxy for the economy wide condition. Higher the index implies better economic condition. This proxy is used, because it could be measured in a similar data frequency with the main variables. We do not used other economy wide risk variable to avoid multicollinearity. This assumption is essentially having a similar spirit with efficient market hypothesis which suggested that all available information are reflected in the equity market prices (Fama, 1970).

To ensure the ARDL model selections are robust, we use eviews software as the following procedure. First, we perform unit root test to ensure there is no series integrated in order 2, then we do the regression for each specification with pre-selected lag estimates. We start the lag from 1 to 12. Second, we do the residual diagnostics with the serial correlation test using Breusch-Godfrey Serial Correlation LM Test, and the heteroskedasticity test using Breusch-Pagan-Godfrey test. We also test for stability by means of the CUSUM test and the Ramsey RESET test for omitted variables. All of these tests use 5% of significant level. Third, we do re-selection of the lags until all the test are within the criteria. Finally, we select the lag of ARDL model with the best Akaike Information Criterion accordingly.

b. Data

We collect monthly data of the aggregate interbank assets, credit supply and non-deposit fundings, deposits and equity from Indonesia Banking Statistics between December 2014 to June 2023 published by Financial Service Authority of Indonesia (OJK). The data cover for commercial banks with three banks' core capital categories, i.e., bank category 2, 3 and 4. We exclude Islamic banking, commercial bank with category 1 and the rural banks in the analysis. The bank category 2, 3 and 4 consist of banks with the core capital between 1-5 trillion rupiah, 5-30 trillion rupiah and above 30 trillion rupiah respectively. We collect the market index (IDX Composite Index) from Refinitiv Eikon, www.eikon.refinitiv.com.

4. RESULT

To test our hypotheses, we perform the regressions using ARDL model in accordance with the aforementioned procedure for each specification. All of the specifications are controlled with the deposits, the equity and the market index. After a series of residual diagnostics, including the serial correlation check using Breusch-Godfrey Serial Correlation LM test, the heteroskedasticity test using Breusch-Pagan-Godfrey, as well as the stability check by means of the CUSUM test and the Ramsey RESET test, we select an appropriate model based on the best AIC criterion for each specification. All of the tests are concluded at 5% of significant level. Using the monthly aggregate data of the interbank loan as a proxy for the long-term interbank asset, the interbank placement as a proxy for the short-term interbank asset, the non-bank borrowing, the deposits and the equity, we present the regression results. Note that the long-run relationships are mainly based on the joint F-statistic with upper bound value, I(1) at 10% level of significance. If the joint F-test is statistically significant, we conclude that the long-run elasticity is exist, then we evaluate the significance level of each coefficient based on corresponding t-statistic. Conversely, when the F-test is not statistically significant, we conclude that all of the long-run coefficients are not significant. Furthermore, we conduct the Wald test to evaluate the short-run elasticity for each variable.

Table 1. Effect of interbank market to the external borrowing

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Constant	*14371*	*5689*	*-4640*	*-25500*	*-20343*	*6671*
	(10383)	*(7677)*	*(9533)*	*(25082)*	*(12935)*	*(6368)*
Long-run dynamics:						
Interbank loan	*-13.74*		*6.62***		*0.19*	
	(81.55)		*(2.75)*		*(0.15)*	
Interbank placement		*-1.08*		*0.70*		*-0.04*
		(2.07)		*(0.87)*		*(0.04)*

Deposits	*0.94*	*0.64*	*-0.34****	*-0.35*	*0.04*	*-0.02*
	(5.02)	*(0.68)*	*(0.11)*	*(0.31)*	*(0.03)*	*(0.03)*
Equity	*-4.09*	*-4.06*	*1.45***	*2.36***	*0.06*	*0.33****
	(21.23)	*(4.14)*	*(0.55)*	*(1.05)*	*(0.14)*	*(0.11)*
Market index	*-31.8*	*102.7*	*13.09*	*10.76*	*0.14*	*-3.07****
	(259.3)	*(92.3)*	*(8.75)*	*(20.03)*	*(1.90)*	*(1.07)*
Short-run dynamics:						
Δ(Interbank loan)	*2.41***		*-5.67*		*1.10***	
			(10.40)		*(0.53)*	
Δ(Interbank placement)		*0.01*		*0.26***		*1.01*
		(0.02)		*(0.11)*		*(1.12)*
Δ(Deposits)	*-0.17****	*-0.09****	*0.88*	*0.23*	*-0.04*	*-0.39*
	(0.04)	*(0.03)*	*(0.70)*	*(0.22)*	*(0.05)*	*(0.47)*
Δ(Equity)	*0.69****	*0.50****	*-1.38*	*0.30*	*0.12*	*0.61*
	(0.15)	*(0.16)*	*(1.14)*	*(0.64)*	*(0.17)*	*(0.61)*
Δ(Market index)	*-19.45****	*-27.42****	*5.35*	*3.89*	*4.65*	*2.80*
	(5.82)	*(5.62)*	*(9.40)*	*(5.02)*	*(3.92)*	*(3.32)*
ECT(-1)	*-0.048****	*-0.062****	*-0.218****	*-0.100****	*-1.085****	*-0.85****
	(0.008)	*(0.011)*	*(0.037)*	*(0.026)*	*(0.314)*	*(0.137)*
Adj. R-square	*0.9379*	*0.9343*	*0.9766*	*0.9702*	*0.9223*	*0.8958*
F-statistic	*23.30*	*26.11*	*99.36*	*91.78*	*18.50*	*22.38*
DW-statistic	*1.9471*	*2.1089*	*2.1613*	*2.1177*	*2.1927*	*1.8701*
Adj. N Observations	*91*	*91*	*93*	*93*	*91*	*93*

Table 1 display the regressions summary of the non-bank borrowing toward the interbank lending with all control variables. The coefficients in the table describe total elasticity of the non-bank borrowing toward the change of corresponding variables. Specification 1, 3 and 5 feature the long-run and the short-run elasticities of the non-bank borrowing toward the interbank loan as a proxy for the long-term interbank lending of the large-size, the medium-size and the small-size banks respectively. Meanwhile, specification 2, 4 and 6 feature the elasticities of the non-bank borrowing toward the interbank placement as a proxy for the short-term interbank lending for the large-size, the medium-size and the small-size banks respectively.

Table 2. Effect of interbank market to the issued securities

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Constant	*-817*	*5947*	*15679****	*9689***	*15816****	*32429****
	(4194)	*(4273)*	*(4265)*	*(4584)*	*(5195)*	*(6519)*
Long-run dynamics:						
Interbank loan	*0.960**		*-2.014**		*0.286*	
	(0.500)		*(1.061)*		*(0.170)*	
Interbank placement		*-0.494*		*0.338***		*0.004*
		(1.086)		*(0.147)*		*(0.015)*
Deposits	*-0.030*	*-0.233*	*-0.215****	*-0.103***	*-0.018*	*-0.013*
	(0.032)	*(0.200)*	*(0.048)*	*(0.044)*	*(0.026)*	*(0.008)*

Equity	*0.224*	*1.407*	*0.698****	*0.053*	*-0.025*	*-0.001*
	(0.172)	*(1.032)*	*(0.208)*	*(0.161)*	*(0.135)*	*(0.047)*
Market index	*-0.300*	*-15.711*	*4.652*	*12.327****	*-0.916*	*-2.663****
	(6.848)	*(14.785)*	*(4.688)*	*(4.674)*	*(1.413)*	*(0.817)*
Short-run dynamics:						
Δ(Interbank loan)	*-0.533*		*-0.204***		*-1.967**	
	(2.871)		*(0.093)*		*(1.025)*	
Δ(Interbank placement)		*0.242*		*-0.052***		*-0.176*
		(0.169)		*(0.024)*		*(0.122)*
Δ(Deposits)	*0.113*	*0.041***	*-0.008*	*-0.012***	*0.130**	*-0.037*
	(0.391)	*(0.018)*	*(0.008)*	*(0.005)*	*(0.065)*	*(0.025)*
Δ(Equity)	*-0.149*	*-0.109*	*0.225****	*0.225****	*-0.053*	*-0.015*
	(0.745)	*(0.069)*	*(0.054)*	*(0.050)*	*(0.331)*	*(0.129)*
Δ(Market index)	*-15.192*	*0.875*	*0.472*	*-2.281**	*6.556**	*-8.838*
	(50.952)	*(3.890)*	*(0.459)*	*(1.222)*	*(3.418)*	*(5.353)*
ECT(-1)	*-0.183****	*-0.065****	*-0.101****	*-0.114****	*-0.63****	*-1.013****
	(0.057)	*(0.018)*	*(0.022)*	*(0.023)*	*(0.139)*	*(0.177)*
Adj. R-square	*0.9779*	*0.9826*	*0.9580*	*0.9617*	*0.8184*	*0.8337*
F-statistic	*125.37*	*160.39*	*251.76*	*227.32*	*9.36*	*11.98*
DW-statistic	*1.9531*	*1.9599*	*2.0778*	*2.0447*	*1.9684*	*1.8722*
Adj. N Observations	*91*	*97*	*100*	*100*	*91*	*93*

Note: Standard errors in parentheses. * p < 10%, ** p < 5%, *** p < 1%.

Additionally, Table 2 display the regressions summary of the issued securities toward the long-term and the short-term interbank lending as a complementary for test of non-bank borrowing. Similarly, the coefficients in the table describe total elasticity of the issued securities toward the change of corresponding variables. Specification 1, 3 and 5 feature the long-run and the short-run elasticities of the issued securities toward the long-term interbank lending of the large-size, the medium-size and the small-size banks respectively. Meanwhile, specification 2, 4 and 6 feature the elasticities of the issued securities toward the short-term interbank lending for the large-size, the medium-size and the small-size banks respectively.

Table 3. Effect of interbank market to the credit supply

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Constant	*70147**	*-74692*	*33754*	*24399*	*86597****	*136992****
	(35889)	*(46391)*	*(42492)*	*(57886)*	*(2194)*	*(31333)*
Long-run dynamics:						
Interbank loan	*11.64****		*-48.24*		*6.46****	
	(3.09)		*(104.46)*		*(1.54)*	
Interbank placement		*31.32*		*2.87*		*2.72****
		(162.4)		*(9.0)*		*(0.56)*
Deposits	*-0.44***	*2.71*	*-1.53*	*-0.73*	*0.09*	*-1.49****
	(0.17)	*(17.82)*	*(2.43)*	*(2.54)*	*(0.16)*	*(0.46)*
Equity	*4.83****	*-32.39*	*0.73*	*-9.04*	*1.62***	*9.97****
	(0.91)	*(200)*	*(8.81)*	*(23.04)*	*(0.78)*	*(2.21)*

Market index	*62.2*	*3172*	*549*	*795*	*-24.0***	*-92.4****
	(49.4)	*(16898)*	*(892)*	*(1243)*	*(9.4)*	*(23.1)*
Short-run dynamics:						
Δ(Interbank loan)	*6.28***		*4.28****		*3.06*	
	(2.60)		*(1.52)*		*(1.99)*	
Δ(Interbank placement)		*0.06*		*0.07*		*-1.81****
		(2.18)		*(0.17)*		*(0.55)*
Δ(Deposits)	*0.97****	*0.26*	*0.10*	*0.15*	*1.01**	*1.33****
	(0.21)	*(0.32)*	*(0.10)*	*(0.10)*	*(0.53)*	*(0.23)*
Δ(Equity)	*-0.63*	*2.63**	*2.40****	*2.37****	*4.46***	*-0.57*
	(0.69)	*(1.37)*	*(0.36)*	*(0.39)*	*(2.03)*	*(0.75)*
Δ(Market index)	*-36.6**	*-100.9**	*-54.1****	*-54.9****	*-11.36*	*26.5***
	(20.4)	*(51.7)*	*(15.2)*	*(16.3)*	*(8.58)*	*(10.3)*
ECT(-1)	*-0.16****	*-0.01****	*-0.023****	*-0.023****	*-0.237****	*-0.233****
	(0.027)	*(0.002)*	*(0.005)*	*(0.005)*	*(0.045)*	*(0.034)*
Adj. R-square	*0.9987*	*0.9987*	*0.9761*	*0.9729*	*0.9887*	*0.9927*
F-statistic	*2766.99*	*1197.46*	*338.46*	*324.42*	*374.15*	*260.50*
DW-statistic	*2.2028*	*1.9072*	*2.1794*	*2.1691*	*1.9415*	*2.1676*
Adj. N Observations	*96*	*91*	*100*	*100*	*95*	*93*

Note: Standard errors in parentheses. * p < 10%, ** p < 5%, *** p < 1%.

Finally, Table 3 display the regression summary of the credit supply to customer toward the long-term and the short-term interbank lending. Similarly, the coefficients in the table describe total elasticity of the issued securities toward the change of corresponding variables. Specification 1, 3 and 5 feature the long-run and the short-run elasticities of the credit supply toward the long-term interbank lending of the large-size, the medium-size and the small-size banks respectively. Meanwhile, specification 2, 4 and 6 feature the elasticities of the credit supply toward the short-term interbank lending for the large-size, the medium-size and the small-size banks respectively.

5. DISCUSSION

To investigate whether a bank borrowing from the external investors is driven by the long-term interbank lending (hypothesis 1), we regress the loan received by bank from the external investors with the long-term interbank lending proxied by the interbank loan assets. Meanwhile, the hypothesis 2 is exercised by the regression with the short-term interbank lending proxied by the interbank placement assets. The regression summary results to test the hypothesis 1 and 2 are displayed on Table 1. Additionally, we also regress the issued securities with the long-term and the short-term interbank lending as depicted on Table 2 to test for other source of funding. We hypothesize that the long-term interbank lending is positively affect external fundings, while the short-term interbank lending does not positively affect the external fundings. The confirmation of hypothesis 1 requires the coefficient of the long-term interbank lending is positive and statistically significant in the long-run or the short-run ARDL model. Meanwhile, the confirmation of the hypothesis 2 requires most of the coefficients of the short-term interbank lending do not statistically significant or it has a negative coefficient.

The specification 1 on the Table 1 suggests that the short-run coefficient of the long-term interbank lending for the large-size bank is positively and statistically significant. Similarly, the specification 5 suggests a positive coefficient of the long-term interbank lending for the small-size bank in the short-run model. Meanwhile, the specification 3 suggests a positive coefficient of the long-term interbank lending for the medium-size bank in the long-run ARDL model. Those coefficients are statistically significant at the 5% significant level. The results support for the hypothesis 1 that the long-term interbank lending drives the external funding. On the other hand, the specification 2 and 6 suggest that neither the short-run nor the long-run ARDL coefficients of the short-term interbank lending of the large-size and the small-size banks are statistically significant. However, the specification 4 suggests a positive coefficient of the short-term interbank lending for the medium-size bank in the long-run ARDL model with the 5% significant level. This result may be relevant with the Dietrich and Hauck (2020) model that the low endowment banks require external investors to maintain their credit supply. Despite it vary across the bank sizes, the results support for the hypothesis 2 that the short-term interbank lending may not drive the borrowing from the external investors.

In contrast to the effect of the long-term interbank lending toward the bank borrowing from the external investors, Table 2 suggests that the long-term interbank lending does not necessarily drive the other funding, particularly for the securities issued by banks. The specification 1 of the Table 2 suggest that the long-term interbank lending of the large-size bank has a positive impact toward the issued securities in the long-run model at the 10% significant level. Instead, specification 3 and 5 suggest a negative coefficient for the long-term interbank lending toward the issued securities for the medium-size and the small-size banks respectively. Despite it vary across bank sizes, however this finding may support for diversification motives of the long-term interbank lending, more specifically for the large-size banks. Meanwhile, specification 2 and 6 suggest that the short-term interbank lending for the large-size and the small size banks are not statistically significant toward the issued securities. Although the specification 4 suggests a positive impact of the short-term interbank lending toward the issued securities in the long-run ARDL model, it has a negative impact in the short-run model. The findings could not conclude the interbank market as a driver for the issued securities which often utilized as an alternative funding source.

Finally, the specification 1 on the Table 3 suggests that the coefficient of the long-term interbank lending of the large-size bank is positively and statistically significant, both in the long-run and the short-run model. The specification 3 suggests a positive coefficient of the long-term interbank lending for the medium-size bank in the short-run model. Meanwhile, the specification 5 suggests a positive coefficient of the long-term interbank lending for the small-size bank in the long-run model. All of those coefficients are statistically significant at the 1% to 5% significant level. The results support for the hypothesis 3 that the long-term interbank lending drives the credit supply to customers. On the other hand, the specification 2 and 4 suggest that neither the short-run nor the long-run ARDL coefficients of the short-run interbank lending of the large-size and the medium-size banks are statistically significant. Meanwhile, the specification 6 suggests a positive coefficient of the short-run interbank lending for the small-size bank in the long-run model but has a negative coefficient in the short-run model. The coefficient is statistically significant at the 1% significant level. Despite it varies, the results support for the hypothesis 4 that the short-term interbank lending does not statistically drive the credit supply to customers.

In overall, the findings support for diversification motives of the interbank market, particularly for the long-term interbank lending. If there is a benefit of diversification, bank may lend to other banks to diversify the idiosyncratic risk to attract external investors (Dietrich and Hauck, 2020). Therefore, interbank lending drives the external fundings, more specifically the long-term interbank lending drives the non-bank funding,

that in turn boost the credit supply to customers. This finding is also relevant to the notion of the longer-term interbank market has a benefit for bank to manage funding and the interest rate risk (Bluhm, 2018). Remember that the external investors are associated with longer-term maturities. Overall, this finding supports for the function of interbank market beyond the liquidity coinsurance.

6. CONCLUSION

This study aims to examine the interbank market beyond the liquidity coinsurance in Indonesian banking. More specifically, we analyze the impact of interbank lending to the credit supply and the non-deposits fundings. We segregate the interbank loans into two types of maturities, namely the short-term and the long-term interbank lending. The rationale is that the interbank lending maturities significantly have different purposes and risk consequences. The longer-terms interbank loan could be utilized to manage funding risk as well as the interest rate risks that allow bank to increase credit to customers (Bluhm, 2018). Meanwhile, the short-term maturities may be relevant for liquidity coinsurance to absorb the liquidity shock. Therefore, we hypothesizes that the long-term interbank lending could attract non-bank investors and ultimately boost the credit supply to customers.

Using ARDL model, we analyze monthly data of Indonesian banking between December 2014 to June 2023 to examine the impact of interbank lending to the credit supply and the non-deposits fundings, both for the short-term and the long-term interbank lending. The results suggest that the long-term interbank lending is positively and significantly affect the credit supply to customers. The result also suggests the long-term interbank lending that are positively and significantly affect the overall non-bank borrowing as a proxy for external investors. However, the interbank lending has no effect to the funding for the issuance of securities which should also relevant for external investors through the financial market. The results are consistent for all commercial banks' core capital categories, including category 2 (small size banks), 3 (medium size banks) and 4 (large size banks). Conversely, the short-term interbank lending has no impact to the credit supply nor the non-bank borrowing and the issuance of securities. The results support for the diversification theory of the interbank market (Dietrich and Hauck, 2020), that more specifically relevant for the long-term interbank lending.

Our findings connect with other interbank market literatures as the following considerations. First, refer to the empirical results, the interbank lending maturities have different impact to the credit supply. The long-term interbank market has a higher contribution to the real economic sectors through the credit supply. Therefore, the borrower banks may invest in a stacking way as the proportion of borrowing maturities and put in the relevant bucket in order to manage risks (Bluhm et al., 2016). The rationale is that the long-term and the short-term interbank lending carry different risks. Second, this study result suggests that the short-term interbank lending is not significantly affecting the credit supply and the external borrowing, however the short-term interbank market may be relevant for the short-term liquidity coinsurance as being proposed by Allen & Gale (2000). The rationale is that the short-term lending is easily adjusted against economic conditions. Considering the long-term and the short-term interbank lending have different behavior and the economic impacts, government policy relevant to the interbank market should takes into account of the maturities differentiation.

This study has several limitations and need for further extensions. First, this study utilized aggregate data of the interbank market, credit supply and the non-deposit funding which may does not reflect each bank idiosyncratic. More specifically, this study could not assess the interbank market from the demand and the supply sides separately. For further extensions, the idiosyncratic variables of the interbank borrowers and lenders may feature new insight to the interbank market maturities, size and its effect to the credit supply and

the non-deposit fundings. Second, this study is also relevant with the role of the interbank market as stacking bank leverages as proposed by Moore (2011). This theory should be suitable for the interbank market analysis to complement the strong interbank network as liquidity coinsurance for needy banks and the systemic risk. For further studies, it may combine the interbank market as stacking leverage and the function of the interbank market for diversification motives.

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