"Interest rate spread determinant based on the interdependency relationship between a bank's loan rate and time deposit rate"

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INTEREST RATE SPREAD DETERMINANT BASED ON THE INTERDEPENDENCY RELATIONSHIP BETWEEN A BANK'S LOAN RATE AND TIME DEPOSIT RATE

Abstract

This study analyzes the factors responsible for the lower net interest rate at commercial banks located in Indonesia, Thailand and the Philippines. Data were collected from 35, 10 and 13 commercial banks in Indonesia, Thailand, and the Philippines, respectively, from 2012 to 2020 using the Fixed effect model. The Simultaneous Equation Model was used to analyze the macroeconomic factors and banks' specific characteristics towards Loan and Time Deposit rates. The result showed that macroeconomic factors, such as the inflation rate, significantly affect loan and time deposit rates in these countries. In Indonesia, bank competition should be reduced and banks' stability should be higher to minimize Net Interest Margin Spread (difference between Loan Rate and Deposit Rate). In the Philippines, banks should increase their capital and liquidity. So, they will be more confident and prudent in lowering their NIM. Thailand's banking industry has unique characteristics with high monopoly power. The bigger and greater the market share, the larger the interest rate spread on customers. Therefore, regulators in each country need to consider these important variables when making decisions on lowering the net interest rates by banks to enhance social welfare.

Keywords	interest rate spread, commercial banks, financial institutions, financial services
JEL Classification	G20, G21

INTRODUCTION

The major revenue of banks comes from the differences between loan and deposit rates, which has a significant impact on economic growth. For instance, countries with lower interest rates experience higher economic growth due to efficient management. A higher interest rate is a sign of inefficiency, leading to more loan related problems and higher operating costs (Calice & Zhou, 2018). According to Islam and Nishiyama (2016), an increase in NIM spread leads to a higher default rate, negatively affecting a country's economic growth. The underdeveloped financial system tends to have high and low lending and deposit rates, respectively. Therefore, in such cases, the market has to accept rates by that uncompetitive and inefficient banking system (Owusu-Antwi et al., 2017).

These three countries such as Indonesia, Thailand & Philippines were chosen because they were badly affected by the Asian financial crisis from 1997 to 1998 and successfully recovered immediately after the crisis was over (Ahmad & Matemilola, 2013). In 2010, they adopted the Basel II banking system consisting of three main pillars, namely minimum cap-

ital requirements, supervisory review, and market discipline (Manlagnit, 2015), Based on Worldbank Data, developing countries around the world still adopted Basel II until 2020. In order to assess the readiness of banks in Indonesia, Thailand & Philippines towards Basel III implementation in the future, this study is expected to identify the factors that can contribute to lowering NIM spread (Powell, 2004).

Lerner (1981) said there is a strong positive relationship between higher spread and increased default rate. The rise in interest rate attracts a lot of debate in both public and policy forums (Owusu-Antwi et al., 2017).

1. LITERATURE REVIEW AND HYPOTHESES

This study is in accordance with some determinant factors proposed by Gambacorta (2008), Lerner (1981), and Angbazo (1997). According to them, the Macroeconomic factors that influence banks loan rates are GDP, Inflation and Money Market Interest Rates. The good economic condition increases the number of business expansions and projects with positive values of NPV, thereby leading to a rise in the demand for credit. Gambacorta's (2007) study showed a positive relationship between GDP and inflation towards loan interest rates. This is related to the increase in the money market rate, leading to a rise in the opportunity cost of other financing firms (Kashyap et al., 1993; Angbazo, 1997; Angori et al., 2019). Furthermore, lending becomes more attractive and leads to increasing loan demand and, finally, loan interest rates (Gambacorta, 2008). Different perspective comes from Ivakhnenkov et al. (2021) and Owusu-Antwi et al. (2017), there was a negative relationship between GDP per capita and loan rate, but a positive relationship between inflation rate and loan rate in Ukrainian banks.

Beside Macroeconomic factors, Institutional & Regulatory (I&R) factors are the main drivers of interest rate spread across the world. Saunders and Schumacher (2000) state that I&R factors accounted for 60% determinants of Net Interest Margin. This is supported by Jorgensen (2013) that a bank's micro factors in Brazil had a more critical impact on the interest rate spread compared to macro-factors. Several micro factors are a bank's specific characteristics, such as size, whether there is any effect regarding the size of the banks towards their ability to charge loan rate. Small banks tend to pay higher premiums, because the market perceives them to be riskier. According to Rajan and Petersen (1994), small

banks charge higher interest rate on lending. Islam and Nishiyama (2016) stated that banks with better liquidity positions charge a higher interest rate on loans. Conversely, those with low liquidity and low capital pay a higher premium by cutting their interest rate on loans with a rise in deposit rates. This is because the market perceives them to be riskier and exposed to asymmetric information problems. According to Gambacorta (2008), these types of banks are less able of shielding their credit in the case of monetary tightening. Banks need to be more capitalized to enhance solvency level. The more liquid the bank is, the more solvent it is likely to be (Oino, 2021).

Banks with less capacity tend to protect their deposits by increasing their interest rates and decreasing the loan interest rate. From the customer's perspective, the lower the capital, the higher the deposit rate needed to mitigate liquidity risks. In addition, the lower the capital, the less lending activity they provide due to the decrease in equity. Therefore, the interest rate on loans decreases and widens the spread (Gambacorta, 2008; Peek & Rosengren, 1995; Kishan & Opiela, 2000; Van den Heuvel, 2002). Banks with a larger amount of deposit tend to charge lower loan rates to balance their funds. Higher deposit can insulate a bank's cost of fund from exogenous shocks. In return, banks can protect their borrowers against exogenous shocks by offering lower loan rates (Berlin, 1999). Berger and Udell (2018) stated that the longer the banks' relationship, the lower the loan rate, because banks should maintain this long relationship with good reputable borrower. This relationship is represented by the Credit Relationship. Bank assets (loans to customers) have a longer maturity than liabilities (deposits from customers). This maturity mismatch between assets incurs costs to reduce profit and expose banks to interest rate risk. Therefore, banks reduce lending and

spread their interest rate when the equity is low. This maturity mismatch condition is represented by Bank Capital Chanel.

Credit Risk or Bad Loans variable captures the risks of lending. Banks with higher credit risk have to borrow emergency funds at high cost (Ahokpossi, 2013). But, Akinlo and Owoyemi (2012) find a different result from Argentina and Peru's banks. Their study showed a negative significant impact of Non-Performing loans on the interest spread.

Herfindahl Index, or Market Concentration, captures market competition in each country. Higher market concentration means lower competition, and vice versa. The higher the market concentration, the wider the net interest spread due to market leaders' monopoly power. Therefore, HHI is likely to be positively and negatively related to interest loans and deposit rate loans (Berger & Hannan, 1989). Arping (2017) stated that deposit and lending activities of banks are non-separable and interrelated due to agency friction. A lower interest rate on loans has a positive effect on decreasing NPL probability. However, in a competitive market it leads to a higher interest rate on deposits, which makes banks more eager to invest in risky assets to buffer the deposit burdens. Arping (2017) also stated that a highly competitive market leads to higher deposit interest rates and lower loan rates. Therefore, the relationship between deposit and lending interest rates depends on the market concentration. This led to the reason for using the interaction between Deposit Interest Rate with Herfindahl Index.

One of new variables added to this study is Z-Score. Z-score can completely predict the sign of possible bankruptcy and proved it fits better to Thailand stock market as an emerging market (Meeampol, 2014). Z-score is believed to have an impact on the loan rate because it can represent banks' individual risk. According to Li and Malone (2016), Z-score captures banks' individual and systemic risks. This approach is consistent with banks' risk profile and its measure that need to change through time because banks' lending behavior follows a strong procyclical pattern as time passes. A lower value of Z-score indicates higher bank risks because it represents stability.

1.1. Time deposit interest rate

Several variables have been classified into two different categories such as Macroeconomic factors and a Bank's Specific Factors. From the macroeconomic perspective, they are capable of influencing time deposit rate, such as Market Rate, GDP and Inflation. Good economic growth is indicated by higher GDP. GDP and inflation are in line or in the same direction. Inflation is typically highly related to the market rate. This is because changes in deposit interest rates are highly affected by market interest rates. Therefore, inflation and deposit interest rates are expected to have a positive relationship (Bikker & Gerritsen, 2018).

Increased market interest rate volatility leads to higher reinvestment and refinancing risks (Maudos, 2017). Consequently, banks need to charge a higher interest margin to mitigate those risks. Therefore, increased volatility of the money market rate (σ) leads to a rise in the deposit rate (Kok & Werner, 2006; De Graeve et al., 2007; Antão, 2009). Market concentration or HHI is another possible determinant used to set deposit interest rates. Two hypotheses were proposed by Bikker and Gerritsen (2018) on market concentration. First, higher market concentration leads to lower competition and increased net interest spread (Higher Loan Rate and lower Deposit Rate). Therefore, there is a negative relationship between market concentration and deposit interest rate. Second, based on Efficiency Hypothesis, an increase in efficiency makes banks set a more competitive price with a higher deposit rate. Based on the efficiency hypothesis, there is a positive relationship between market concentration and deposit interest rate (Gropp et al., 2014). Last variable from Macroeconomic factors is Stock Market Stress. Market under pressure represents a proxy for difficult access of funds by banks. This condition forces banks to offer a higher interest rate on deposits to increase demand.

Bank Specific Characteristics such as Capital Adequacy Ratio above the minimum regulatory indicate a bank's creditworthiness. The larger the bank's capital, the greater its ability to absorb losses on loan portfolios. This means that the probability of default is expected to be lower in banks with larger capital. Well capitalized banks with less risky assets may pay lower premium than their riskier

competitors (Kiser, 2004; Claeys & Vennet, 2008). Based on Williams (2007), CAR can represent Banks' Managerial Risk Aversion. His study towards Australian Banks proved that higher CAR leads to higher margins. Therefore, a negative relationship is expected between a Bank's Capital Ratio and deposit interest rate. Another bank specific factor that needs to be investigated is Size. Arguments on 'too Big to Fail' exist because government rescues large troubled banks, therefore, they are regarded safer by depositors. Hence, large banks offer lower deposit rates than small ones, which tend to increase their deposit rate to attract customers (Agapova & McNulty, 2016). This argument is supported by a preliminary study by Bikker and Gerritsen (2018), stating that larger banks in the Dutch market offer lower interest rates.

Less liquid banks decrease capacity to issue bonds and pursue a high amount of demand deposits. Therefore, they tend to offer a relatively high interest rate on time deposit. Conversely, when banks have excess liquidity above the required level, their deposit demand decreases. Hence, they offer a relatively lower deposit rate, and a negative relationship between liquidity surplus and deposit interest rate increases. This hypothesis was proven by a preliminary study by Bikker and Gerritsen (2018) in the Dutch Market. Bai et al. (2018) defined liquidity mismatch as the condition between funding liquidity of assets and liabilities. For example, a long-term loan from a debtor is an illiquid asset, while cash from third parties is liquid. Furthermore, deposits from third parties are regarded as short-term debt liabilities for banks and make them prone to liquidity risk. Bikker and Gerritsen (2018) stated a significant positive coefficient between liquidity mismatch and deposit interest rate. A larger liquidity mismatch means that liquidity in assets is higher than a liability, due to the need to balance this mismatch to increase liquidity.

Manlagnit (2015) reported that efficiency positively affects the deposit interest rate. More efficient banks manage their costs to be lower to offer higher interest rates on deposits to win competition. This hypothesis is based on Ahmad and Matemilola's (2013) study, which found a significant negative relationship between efficiency and net interest margin spread in banks in Indonesia, Malaysia, Thailand and South Korea. This is supported by Bikker and Gerritsen's (2018) study in the Dutch Market, which found that inefficiency has a signif-

icant negative impact on the deposit interest rate. Due to this, inefficient banks will try to lower costs by acquiring assets with high interest income and technically passing on managerial expenses to customers (Doyran, 2013). One added variable to this study that has not been investigated before as one of determinant factors of the Time Deposit rate is the interaction between lending rate and market concentration. Although, the relationship between Lending towards Deposit rate has already been explained before, Arping (2017) stated that this relationship highly depends on industry structure or HHI in particular countries. Therefore, a particular country has intense competition that leads to a lower interest margin with a high deposit interest rate and lower loan rate. This variable interacts with HHI due to the interdependency and the purpose of minimizing multicollinearity.

Considering some of the previous studies above, this study aims to determine the specific factors contributing to lowering the NIM spread without reducing a bank's profitability in Indonesia, Thailand & Philippines. The hypotheses can be as the following:

H_{1a}: *Macroeconomic factors significantly affect the loan rate.*

H_{1b}: *A bank's size significantly affects the loan rate.*

H_{1c}: *A bank's liquidity significantly affects the loan rate.*

H_{1d}: *Capital adequacy ratio significantly affects the loan rate.*

H_{1e}: *Deposit strength significantly affects the loan rate.*

H_{1f}: *Credit risk significantly affects the loan rate.*

H_{1g}: *Bank capital channel significantly affects the loan rate.*

H_{1h}: *Bad loans significantly affect the loan rate.*

H_{1i}: *Z-score significantly affects the loan rate.*

H_{1j}: *Herfindahl Index significantly affects the loan rate.*

H_{2a}: *Macroeconomic factors significantly affect time deposit rate.*

H_{2b}: *Stock market stress significantly affects the time deposit rate.*

H_{2c}: *Capital adequacy ratio significantly affects the time deposit rate.*

H_{2d}: *Liquidity surplus significantly affects the time deposit rate.*

H_{2e}: *Size significantly affects the time deposit rate.*

H_{2f}: *Liquidity mismatch significantly affects the time deposit rate.*

H_{2g}: *Inefficiency significantly affects the time deposit rate.*

H_{2h}: *Stock market stress significantly affects the time deposit rate.*

H_{2i}: *Herfindahl Index significantly affects the loan rate.*

2. METHOD

This study was conducted using the unbalanced quarterly panel data. All data were retrieved from the S&P Capital IQ database and each country's central bank. Syariah and foreign banks were excluded to avoid bias due to their varying regulation. Empirical model from Gambacorta (2008) was replicated with additional variables of time deposit with the interaction of HHI. This additional variable is based on the theory proposed by Arping (2017) on the interdependency between loan and credit rates

$$
\begin{aligned}
IL_{it} = {} & \beta_0 + \beta_1 IL_{it-1} + \beta_2 IM_{t-1} + \\
& + \beta_3 Infl_{t-1} + \beta_4 GDP_{t-1} + \beta_5 Size_{t-1} + \\
& + \beta_6 Liq_{it-1} + \beta_7 Cap_{it-1} + \beta_8 DS_{it-1} + \\
& + \beta_9 CR_{it-1} + \beta_{10} CK_{it-1} + \beta_{11} BL_{it-1} + \\
& + \beta_{12} Zscore_{it-1} + \beta_{13} \sigma_{it-1} + \beta_{14} HHI_{it-1} + \\
& + \beta_{15} ID_{i,t-1} HHI_{it-1} + \beta_{15} \theta_{it} + \varepsilon_{it},
\end{aligned}
\tag{1}
$$

where i stands for banks and t stands for a period.

Table 1. Definition of variables from equation 1

Variables	Symbols	Description	Definition operational
Dependent variables	IL	Interest Rate on Domestic Short-Term Loan	Quarterly Data from Central Banks' Websites
Independent variables (macroeconomics)	IM	Market Interest Rate	Market Interest Rate Data from Central Banks' Websites
	GDP	Economic Growth	% change in GDP
	Infl	Inflation Rate	Inflation rate data retrieved from Central Banks' websites
	HHI	Herfindahl Index in Industry Local Market	sum of squares of individual bank/total banking sector assets
Bank Specific Characteristics. That influence "bank lending channel"	Size	Size	Log of Total Assets
	Liq	Liquidity	(Cash + Securities) / Total Assets
	Cap	Capital Ratio	Excess Capital / Total Assets
	DS	Deposit Strength	Deposits / (Deposit + Bond)
	CR	Credit Relationship	Long-Term Loan/ Total Loans
Bank Capital Chanel	CK	Bank Specific cost of monetary policy due to maturity transformation. This variable captures "interest rate risk"	*Operational Variable is explained below
Credit Risk	BL	Bad Loans	NPL/ Total Loans
Bank's Stability	Zscore	Low risk Bank will have High Z Score	$\dfrac{ROA + \left(Equity\,/\,Asset\right)}{\sigma ROA}$
Interest Rate Volatility	σ	Coefficient of variation of IM	Standard Deviation of Interest Rate Money Market
Dummies	θ	Convergence Dummy: Step dummy that takes the value of 1 in recession period and 0 for the others	Stock Market Declined Twice in one quarter
Deposit Interest Rate	ID. HHI	Interest Rate on Time Deposit	Interest Rate on Time Deposit · *HHI*

Bank Capital Chanel (C) variable that represents bank-specific cost due to maturity mismatch between assets and liabilities was calculated with $C = \rho_{t-1}\,\Delta IM_t$, where ρ_{t-1} denotes loss per unit of banks' assets when the interest rate was raised by 1%. The cost at time t was influenced by maturity transformation in t-1. Therefore, the loss per unit due to the mismatch and interest rate was multiplied to determine the real cost. Hence, $C = \rho_{t-1}\,\Delta IM_t$ represented the cost (gain) of a bank in each period, and this measure influenced the interest rate.

$$\rho_i = \frac{\sum_j (\chi_j \cdot A_j - \xi_j P_j)}{\sum_j A_j} \cdot 100, \tag{2}$$

where A_j = amount of assets in month j to maturity; P_j = amount of liabilities in month j to maturity; X_j = increase in the interest rate on assets and liabilities.

Time deposit with one-year maturity was used in this study. This timeframe is also synchronized with the short-term loan maturity rate. Empirical model on Interest Rate on Time Deposit was replicated from Bikker and Gerritsen (2018) with one additional variable (*Loan Rate HHI*).

$$
\begin{aligned}
TD_{it} = {} & \lambda_0 + \lambda_1 TD_{it-1} + \lambda_2 MR_{t-1} + \\
& + \lambda_3 INFL_{t-1} + \lambda_4 VOL_{t-1} + \lambda_5 HHI_{t-1} + \\
& + \lambda_6 GDP_{t-1} + \lambda_7 VIX_{t-1} + \lambda_8 Size + \\
& + \lambda_9 CR_{it-1} + \lambda_{10} LS_{it-1} + \lambda_{11} LLM_{it-1} + \\
& + \lambda_{12} InEFF_{it-1} + \lambda_{13} IL_{it-1} \cdot HHI_i + \mu_{it},
\end{aligned}
\tag{3}
$$

3. RESULTS

Tables A1 and A2 (Appendix A) describe some basic information about Commercial Banks in Indonesia, Thailand, and Philippines. According to the Chairman of the Financial Services Authority (OJK), Indonesia has the highest Capital Adequacy Ratio globally. Therefore, it is not surprising why the average CAR in Indonesia from 2012 to 2020 is 19.4%, the highest among Thailand and the Philippines. This result is also supported by the Capital Adequacy Ratio set by Financial Regulator in each country, with Indonesia having the highest minimum requirement. Otoritas Jasa Keuangan (2016) stated that banks must have a minimum CAR of 10% to 14%. The required minimum CAR in Thailand is 8.5%, and 10% in the Philippines. Gambacorta (2008) reported that higher capitalization is necessary to cover risky portfolios. Therefore, Table B1 (Appendix B)

Table 2. Definition of variables from equation 2

Source: Bikker and Gerritsen (2018).

Variables	Symbols	Description (Quarterly Data)	Source
Dependent variables	TD	Interest Rate on Time Deposit	Quarterly Data from Central Banks' Website
Independent variables (macroeconomic variables)	MR	Market Rate	Market Interest Rate Data from Central Banks' Website
	INFL	Inflation Rate	Inflation rate data from Central Banks' website
	VOL	Market Rate Volatility	Standard Deviation of Market Interest Rate
	HHI	Market concentration	Sum of squares of an individual bank / Total banking sector assets
	GDP	Economic Growth	% change in GDP
	VIX	Stock Market Stress (SPX Volatility Index)	SPX Volatility Index
Independent variables, bank specific variables	Size	Bank Size	Log of Total Assets
	CR	Capital Ratio	(Tier 1 + Tier 2 Capital)/ Total Weighted Assets
	LS	Liquidity Surplus	Excess Liquidity / Total Assets
	Liquidity Mismatch	Share of Long-Term Assets (> 12 months) in total required liquidity divided by share of long-term liabilities (>12 months) in total available liquidity.	Long Assets / Long Liabilities
	InEFF	Operational Inefficiency	Total operating Cost / Total Assets
Explanatory variables	IL·HHI	Lending Rate	IL HHI

shows that the capital ratio has a positive correlation with Z-Score, which is negatively correlated with Bad Loans.

HHI is the measurement of market concentration that represents competition. The average HHI score in Indonesia is 2.9%, the lowest among the other two countries, as shown in Table A1 of the Appendix. The Philippines has 7.7%, and Thailand has 10.3%. These three countries have a high positive correlation between HHI and Size. Therefore, it can be concluded that Thailand has the highest monopoly power. Besides HHI, it also has the highest average bank size of 9.049. This is followed by the Philippines at 8.735 and Indonesia at 7.723. It can be concluded that Thailand's banking industry tends to be a monopoly. Moreover, there is a very high correlation between Size and HHI. The correlation number is 0.950 (Appendix D, Table D1), which means that the largest bank highly dominates the banking industry. Claeys and Vennet (2008) stated that a concentrated banking system is less likely to suffer from a crisis. This analysis explains why Thailand's market rate volatility is the lowest. Tables 3 and 4 use a simultaneous equation regression model from equation 1 and 3 to investigate the factors that determine Loan interest rate and Time Deposit Rate.

Variables	Indonesia	The Philippines	Thailand
	Nominal	Nominal	Nominal
Herfindal Index$_{t-1}$	0.056	0.019	0.099***
	(0.387)	(1.072)	(3.937)
Market Interest Rate$_{t-1}$	0.129***	0.032	−0.154***
	(3.004)	(0.351)	(−3.499)
Inflation$_{t-1}$	0.067***	0.064**	0.039***
	(2.964)	(1.972)	(3.986)
Liquidity$_{t-1}$	0.000***	−0.013	0.001
	(4.189)	(−0.993)	(0.207)
Size$_{t-1}$	0.000	0.001	−0.017***
	(0.286)	(0.388)	(−4.408)
Interest Rate Volatility$_{t-1}$	0.002	−0.000	0.001
	(1.452)	(−0.016)	(0.967)
Time Deposit Rate$_{t-1}$ xHHI$_{t-1}$	−0.337	−2.514***	−0.179
	(−0.122)	(−3.919)	(−0.913)
Dummy	0.000	0.000	0.000***
	(0.437)	(0.039)	(2.885)
Time Deposit Rate$_{t-1}$	0.012	0.398***	0.060
	(0.163)	(7.096)	(1.495)
R Square	0.926	0.758	0.970
Adj R Square	0.915	0.732	0.966
Prob (F Statistics)	0.000	0.000	0.000
Durbin Watson	1.993	1.280	2.239

*Note: ***, **, and * denote significance at 1%, 5%, and 10%, respectively.*

Table 4. Regression results of the Time Deposit Rate

Source: Data processing (2021).

Variables	Indonesia	The Philippines	Thailand
	Nominal	Nominal	Nominal
Time Deposit$_{t-1}$	0.629***	0.552***	0.602***
	(16.585)	(7.285)	(8.652)
Capital Ratio$_{t-1}$	0.022	0.040	−0.002
	(1.292)	(0.998)	(−0.111)
GDP Growth$_{t-1}$	0.009	0.011**	−0.000
	(0.800)	(2.115)	(−0.052)
HHI$_{t-1}$	0.564*	−0.011	0.122
	(1.823)	(−0.291)	(1.268)
Inefficiency$_{t-1}$	0.149	−1.058	−0.676*
	(0.544)	(−1.557)	(−1.764)
Inflation$_{t-1}$	0.089**	0.128***	0.023
	(2.067)	(3.047)	(1.115)
Liquidity Surplus$_{t-1}$	0.013	−0.062***	−0.000
	(0.935)	(−3.228)	(−0.135)
Liquidity Mismatch$_{t-1}$	0.003***	−0.000	−0.003*
	(2.635)	(−0.433)	(−1.871)
Market Interest Rate$_{t-1}$	−0.054	−0.150	0.128
	(−1.169)	(−0.871)	(0.955)
Size$_{t-1}$	−0.010	−0.014	−0.013
	(−1.403)	(−0.829)	(−1.422)

Table 3. Regression results of the Loan Interest Rate

Source: Data processing (2021).

Variables	Indonesia	The Philippines	Thailand
	Nominal	Nominal	Nominal
Interest Loan$_{t-1}$	0.657***	0.723***	0.849***
	(18.105)	(9.101)	(20.193)
Z Score$_{t-1}$	−0.000*	0.000*	0.000
	(−1.621)	(1.784)	(−0.917)
Bad Loan$_{t-1}$	−.0.000	−0.005	−0.006
	(−0.360)	(−0.812)	(−0.491)
Bank Capital Channel$_{t-1}$	−0.001	−0.000	0.000
	(−0.954)	(−0.378)	(0.516)
Capital Ratio$_{t-1}$	−0.013	−0.000**	−0.007
	(−1.158)	(−2.244)	(−1.107)
Credit Relationship$_{t-1}$	0.029	−0.003	−0.020
	(0.804)	(−0.151)	(−1.429)
Deposit Strength$_{t-1}$	0.010	−0.029*	0.004
	(1.081)	(−1.762)	(0.491)
GDP Growth$_{t-1}$	0.015*	0.002	−0.001
	(1.668)	(0.516)	(−0.909)

Table 4 (cont.). Regression results of the Time Deposit Rate

Variables	Indonesia	The Philippines	Thailand
	Nominal	Nominal	Nominal
Stock Market Stress$_{t-1}$	0.011	0.088**	–0.010
	(0.471)	(2.467)	(–1.044)
Market Rate Volatility$_{t-1}$	0.002	–0.003	–0.001
	(1.037)	(–0.972)	(–0.399)
Interest Loan$_{t-1}$*HHI*$_{t-1}$	–4.539*	0.229	–1.502
	(–1.696)	(0.275)	(–1.391)
Interest Loan$_{t-1}$	0.020	0.394**	0.372*
	(1.878)	(2.551)	(1.761)
R Square	0.890	0.747	0.883
Adj R Square	0.880	0.706	0.865
Prob. (F Statistics)	0.000	0.000	0.000
Durbin Watson	2.054	1.777	1.963

Note: ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Based on Table 3 and 4, regression result in Indonesia shows H_{1a}, H_{1i}, H_{1c}, H_{2a}, H_{2i} and H_{2f} are not rejected. Based on regression result from Philippines shows: H_{1a}, H_{1d}, H_{1e}, H_{1i}, H_{2a}, H_{2d} and H_{2h} are not rejected. Whereas from Thailand it shows that H_{1a}, H_{1b}, H_{1j}, H_{2g}, H_{2f} are not rejected.

4. DISCUSSION

In the Indonesian banking industry, Z-score has a significant negative impact on the Loan Interest Rate. Higher Z-score indicates lower risk and a more stable bank. Therefore, the more stable the bank, the lower the loan interest rate and the more prudent with riskier portfolio. GDP growth and inflation have a significant positive impact on the Loan interest rate. Gambacorta (2008) also supports this result. Better economy presented by the GDP growth has the ability to increase the number of profitable projects, thereby leading to a rise in demand for credit. This mechanism boosts the demand for loans and directly leads loan interest rates to be higher. Liquidity has a significant positive impact on the loan rate in Indonesia. This is in accordance with the study by Setiawan (2010), stating that to meet Basel III requirements, Indonesian banks tend to increase their liquid assets and capital level. This condition leads to lower profitability and decreased performance conditions because banks' management will strive to maintain their perfor-

mance as an assurance to their shareholders. Due to this condition, loan rates are increased to overcome the negative impact of lower income. According to preliminary studies, lower income can be caused by (i) rising liquid assets and (ii) lower loan volumes due to increased minimum capital and liquidity requirements.

Some determinant factors of the Loan Rate in the Philippines come from a bank's specific factors such as Z-Score, Bad Loans, Capital Ratio and Deposit Strength. Z-score has a significant positive impact on the loan rate. This result is contrary to Indonesia's condition. The more stable the bank, the greater their confidence level in charging higher interest loans because they believe the Philippines prefer stable banks regardless of the higher loan rate charged. This result is also supported by Islam and Nishiyama (2016) who state that if the banks are special, customers are willing to pay higher interest loans. Although bad loans have negative effects in these three countries, only the Philippines has a significant impact. Higher Bad Loan in this study comes from recession or crisis. The higher bad loan comes from systemic risk, therefore, all banks tend to lower their loan rates to help businesses survive. CAR has a significant negative impact on the loan rate. Because it represents their ability to cover the decrease in assets. Higher CAR indicates lower default probability, as shown in Table B1 of the Appendix. CAR also measures the sufficient amount of equity needed to absorb any shock experienced by banks (Ahmad & Matemilola, 2013). Deposit strength has a significant negative impact on loan rates because they have excess deposits in their liabilities, therefore, banks will aggressively seek loan demand to balance their financial balance sheet. To attract customers to increase loan demand, they will lower their loan rate.

The interaction between HHI and the Time Deposit Rate shows that in a less competitive market (higher HHI) with a higher time deposit rate, last quarter conditions result in lower interest loans. Banks are more considerate with society welfare by offering lower loan rates in the next quarter. Therefore, businesses can earn external financing through banks with less burden cost. This condition only occurs in the Philippines. Time deposit rate has a positive significant impact on the loan rate. This result is supported by Arping (2017). If banks pay higher deposit

rates, they face higher deposit repayments burdens. This will lead banks to take excessive risk by offering a riskier borrower. A riskier borrower will lead to higher loan interest as well.

The unique characteristic of the banking industry in Thailand is their monopoly condition, as indicated in their HHI index, which has a significant positive impact on the loan rate. This only occurs in Thailand. Therefore, the more power the bank has in the market, the higher the interest loan. Power in HHI is proxied by its market share, as stated by Islam and Nishiyama (2016), customers are willing to pay higher loan rates when banks are special. Another factor that has a significant negative impact on the loan rate in Thailand is size. The bigger the bank, the greater their willingness to lower their interest rate. This is in line with Agapova and McNulty (2016). Small banks are characterized by weak economic growth and financial stability. Therefore, they tend to have higher interest rate spreads to secure their condition. Size and HHI in Thailand have a very high correlation, as shown in Table D1 (Appendix D). This signifies that the biggest bank in Thailand also has the largest market share. By analyzing the result, it can be concluded that a few large banks dominate the banking industry in Thailand.

In the next section, some findings about determinant factors of the Time Deposit Rate in these three countries will be explained. Let's start with the Indonesian banking industry. The HHI has a significant positive impact on the time deposit rate. Therefore, the greater the bank's power, the greater its willingness to offer a higher time deposit rate. This is in line with Bikker and Gerritsen (2018), who stated that concentration increases the overall efficiency of the banking sector, therefore, they can charge a higher deposit rate. Inflation, in general, has a positive impact on the Time Deposit Rate in all three countries. According to Bikker and Gerritsen (2018), the interest rate strongly depends on macro factors such as inflation due to its ability to induce higher income and increase demand for deposits. A higher liquidity mismatch means increased assets and lower deposits from the customer. In Indonesia, Liquidity Mismatch has a significant positive impact on the deposit rate. Banks tend to aggressively seek demand for deposits to balance their sheet, thereby minimizing Liquidity mismatch. This happens only in Indonesia because the country still highly depends on the traditional activity of the banking industry compared to the equity and bond market. The banking industry in Indonesia still dominates financial institutions by contributing 40.4% of the total financial system, while the bond market is only 9.5% (Setiawan & Researcher, 2010). Size has a significant positive impact on the time deposit rate. This shows that the bigger the bank, the greater its capacity to offer a higher time deposit rate. Table B2 (Appendix B) shows that size has a negative correlation with inefficiency. Moreover, inefficiency also has a negative correlation with the time deposit rate.

Second, some findings about determinant factors of the Time Deposit Rate in the Philippines will be explained. Research conducted in the Philippines indicates that GDP growth positively affects the time deposit rate. This is because when GDP growth is higher, income increases and people invest more in short-term risk-free schemes. Owusu-Antwi et al. (2017) stated that an increase in economic performance by GDP growth rate is capable of lowering interest rate spread (Lower Loan Rate and Higher Deposit Rate). This argument is reflected in the determinant results for the loan rate in the Philippines. Even though it is insignificant, GDP growth negatively affects the loan rate. Liquidity shows a significant negative impact on the time deposit rate in the Philippines. The higher the liquidity, the lower the time deposit rate as banks try to reduce excess cash from depositors through loan credit. Bikker and Gerritsen (2018) stated that a larger liquidity surplus is related to a lower time deposit rate. Stock market stress has a significant positive impact on the time deposit rate in the Philippines. This result is supported by Bikker and Gerritsen (2018). Market under pressure is a proxy of difficulties to get funding by banks. Therefore, this condition leads banks to offer higher interest rates to attract deposit funding. Loan and time deposit rates are inseparable, with a significant positive impact in the Philippines and Thailand. According to Arping (2017), they move in line with the market rate because they are assumed to be tied to banks deposit volumes. Gambacorta (2008) stated that an increase in the market interest rate leads to a rise in the financing, thereby making lending activities more attractive. This mechanism boosts loan demand and increases interest rate. Furthermore, the rise in the market rate also leads to an increase in the money market rate. Therefore, this condition makes it more attractive to invest in money market or risk-

free securities, thereby detaining demand deposit. Banks also increase the time deposit rate to reduce the impact.

Inefficiency has a significant negative impact on the time deposit rate in Thailand. This is in line with Gambacorta (2008). The more efficient the bank, the higher its deposit rate it is willing to offer because it can manage its cost lower than the asset or operational costs. An inefficient banking system leads to higher loans and lower deposit rates (Owusu-Antwi et al., 2017). This is a crucial variable because the high-interest spread from the low deposit and high loan rates reduces an incentive to invest and thereby slows down the economic growth in that country. Liquidity mismatch shows a significant negative impact on the time deposit rate in Thailand. This result is in accordance with Bikker and Gerritsen's (2018) study that long liquidity mismatch is defined as the ratio that will have a negative impact on the time deposit rate. However, this differs from Indonesia. Long-term loans dominate long-term assets in Indonesia. It can be seen that the average credit relationship in Indonesia is the highest of the other two countries. Meanwhile, Thailand is dominated by bonds. Therefore, higher liquidity mismatch leads to lower time deposit rates in Thailand to minimize their liquidity mismatch.

Final results that can be drawn to formulate goals in order to minimize Net Interest Margin Spread are as follows:

$$NIM_{it} = IL_{it} - TD_{it}. \qquad (4)$$

$$
\begin{aligned}
NIM\ in\ Indonesia = \\
= (-0.00ZScore + 0.01GDP\ Growth + \\
+ 0.01Market\ Rate + \\
+ 0.07\ Inflation + 0.0Liquidity) - \\
- (0.57HHI + 0.09\ Inflation + \\
+ 0.00Liquidity\ Mismatch),
\end{aligned} \qquad (5)
$$

$$
\begin{aligned}
NIM\ in\ Philippines = (0.00Zscore - \\
- 0.00CAR - 0.03Desposit\ Strength + \\
+ 0.06Inflation) - (0.01GDP\ Growth + \\
+ 0.13Inflation - 0.06Liquidity\ Surplus + \\
+ 0.09Stock\ Market\ Stress),
\end{aligned} \qquad (6)
$$

$$
\begin{aligned}
NIM\ in\ Thailand = (0.1HHI - \\
- 0.15\ Market\ Rate + 0.04\ Inflation - \\
- 0.02\ Size + 0.00Dummy\ \text{Re}cession) - \\
- (-0.68Inefficiency - \\
- 0.00Liquidity\ Mismatch),
\end{aligned} \qquad (7)
$$

Equations 5, 6, and 7 above represent determinant factors of Net Interest Margin in each country that come from the factors affecting the loan rate and time deposit rate drawn from the result in Tables 3 and 4. To simplify and clarify the conclusion, the following equations are proposed:

$$
\begin{aligned}
NIM\ in\ Indonesia = -0.00ZScore + \\
+ 0.01GDP\ Growth + 0.01Market\ Rate - \\
0.02Inflation + 0.0Liquidity - \\
- 0.57HHI - 0.00Liquidity\ Mismatch,
\end{aligned} \qquad (8)
$$

$$
\begin{aligned}
NIM\ in\ Philippines = 0.00\ ZScore - \\
- 0.00CAR - 0.03Deposit\ Strength - \\
- 0.07Inflation - 0.01GDP\ Growth + \\
+ 0.06\ Liquidity\ Surplus - \\
- 0.09Stock\ Market\ Stress,
\end{aligned} \qquad (9)
$$

$$
\begin{aligned}
NIM\ in\ Thailand = 0.1HHI - \\
- 0.15Market\ Rate + \\
+ 0.04Inflation - 0.02Size + \\
+ 0.00Dummy\ Recession + \\
+ 0.68\ Inefficiency + \\
+ 0.00Liquidity\ Mismatch.
\end{aligned} \qquad (10)
$$

CONCLUSION

This study focused on the factors affecting the loan rate and time deposit rate of commercial banks in Indonesia, the Philippines and Thailand in order to know contributing factors to lower NIM in each country. This study reveals that factors contributing to minimizing NIM in Indonesia are Z-Score that represents banking stability, Market Concentration, Controllable inflation, and Liquidity mismatch.

First, banking stability in Indonesia needs to be higher. Government should encourage small banks to merge with a few big banks. This is because increased market concentration in Indonesia encourages the banking industry to raise their time deposit rate. From macroeconomic factors, a controlled increase in inflation also contributes to lower NIM. Liquidity mismatch condition can lower NIM, but this condition is unpreferable because if this happens in the long term, it will bring a bad impact for banks' liquidity. When GDP increases, Indonesian banks are tempted to increase their margin. In response to this condition, Indonesian regulators should encourage banks to focus more on off balance sheet activities to increase their profit and not only depend on the traditional banking activity.

Customers in the Philippines showed different characteristics from their Indonesian counterparts as they were willing to pay higher loan rates for more stable and credible banks. However, Philippine banks need to increase their CAR and deposit strength to achieve lower NIM. This is because highly capitalized banks are more capable of shielding economic shocks or monetary tightening. From a macroeconomic point of view, a controlled rise in inflation and an increase in GDP can lower NIM. This means that good economic conditions can influence banks to lower NIM. This characteristic is also shown on the result between the Interaction variable of the Time Deposit Rate and HHI towards Loan Rate. Higher market concentration in the Philippines will urge them to lower the Loan Rate. When stock market index volatility increases, banks tend to offer higher time deposit rate to attract investors for deposit demand. However, banks in the Philippines have to manage their liquidity well. Because too much liquid assets can lead to lowering their time deposit rate and finally increase interest rate spread.

However, customers in Thailand experienced unique characteristics such as higher market concentration, led to an increase in NIM. Big size of banks and higher efficiency can lower NIM. Therefore, large banks that are usually followed by high efficiency capabilities are able to lower loan rate and increase time deposit rate without incurring losses. Financial institutions in Thailand are very monopolistic, therefore, regulators need to take adequate action to prevent a further increase in interest rates. Moreover, largest banks in Thailand are banks with highest market share. In fact, these banks have capabilities to lower their NIM. From the macroeconomic factors' perspective, rising inflation and recession condition influence banks in Thailand to wider their NIM. They increase NIM when the recession hit, in order to survive and use their monopoly power to charge high interest rate when inflation rising. In response to this condition, Thai regulators should take action to force banks lowering their interest margins. Despite the above result, further research should focus more on off-balance sheet activities to avoid significant dependency on traditional banking in order to increase profit and reduce net interest margins.

AUTHOR CONTRIBUTIONS

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APPENDIX A

Table A1. Descriptive statistics from equation 1 (Loan Rate)

Variables Country	Bad Loan			Capital Ratio			Bank Capital Channel			Credit Relationship			Deposit Strength			Dummy			GDP Growth			HHI		
	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand
Mean	0.038	0.043	0.034	0.194	0.176	0.171	-0.003	-0.009	0.047	0.970	0.907	0.924	0.849	0.778	0.824	0.232	0.231	0.279	0.010	0.011	0.009	0.029	0.077	0.101
Median	0.025	0.020	0.032	0.185	0.154	0.172	0	0	0	0.978	0.982	0.933	0.852	0.799	0.825	0.000	0	0	0.004	-0.062	0.008	0.009	0.055	0.088
Max	0.797	0.786	0.076	0.512	0.455	0.234	0.499	0.315	0.306	1	1	0.971	0.976	0.949	0.973	1	1	1	0.122	0.128	0.123	0.195	0.253	0.199
Min	0.000	0.006	0.012	0.049	0.122	0.121	-0.497	-11.106	-0.025	0.775	0	0.844	0.630	0.554	0.588	0.000	0	0	-0.154	-0.157	-0.155	0.000	0.007	0.013
Observations	1146	203	354	1146	220	354	1146	220	354	1146	220	354	1146	220	354	1146	220	354	1146	220	354	1145	220	354

Variables Country	Time Deposit Rate			Loan Rate			Market Interest Rate			Inflation Rate			Liquidity			Size			Market Rate Volatility			Z Score		
	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand
Mean	0.062	0.022	0.017	0.110	0.055	0.067	0.057	0.036	0.017	0.040	0.029	0.008	0.968	0.267	0.163	7.723	8.735	9.037	0.098	0.107	0.032	3.054	3.941	4.777
Median	0.061	0.022	0.016	0.107	0.055	0.068	0.057	0.033	0.015	0.034	0.027	0.008	0.218	0.232	0.157	7.718	8.793	9.073	0	0	0.000	2.517	3.030	3.898
Max	0.104	0.059	0.038	0.173	0.115	0.079	0.077	0.048	0.030	0.083	0.067	0.036	244	0.675	0.378	9.179	9.517	9.582	0.656	0.471	0.204	22	16	44
Min	0.020	0.006	0.005	0.060	0.055	0.053	0.037	0.030	0.005	0.014	0.006	-0.016	0.071	0.126	0.024	6.304	7.904	8.236	0	0	0.000	-18	-1.817	-8.312
Observations	1146	196	354	1146	220	354	1146	220	354	1061	220	354	1145	220	354	1.145	220	354	1146	220	354	1.133	211	343

Table A2. Descriptive statistics from equation 3 (Time Deposit Rate)

Variables Country	Capital Ratio			GDP Growth			HHI			Loan Rate			Inefficiency			Inflation Rate		
	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand
Mean	0.193	0.176	0.171	0.010	0.011	0.010	0.029	0.063	0.103	0.110	0.055	0.067	0.008	0.006	0.005	0.042	0.029	0.008
Median	0.184	0.155	0.172	0.005	-0.062	0.019	0.010	0.055	0.089	0.107	0.055	0.068	0.008	0.006	0.005	0.036	0.027	0.008
Max	0.457	0.456	0.234	0.051	0.128	0.123	0.195	0.253	0.199	0.173	0.115	0.079	0.023	0.013	0.009	0.084	0.067	0.036
Min	0.049	0.122	0.121	-0.042	-0.157	-0.155	0.000	-1.986	0.013	0.060	0.036	0.053	0.001	0.003	0.003	0.014	0.006	-0.016
Observations	1129	220	347	1129	220	347	1128	220	347	1117	220	347	1127	220	347	1129	220	347

Variables Country	Liquidity			Liquidity Mismatch			Market Rate			Size			Stock Market Stress			Market Rate Volatility			Time Deposit Rate		
	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand	Indonesia	Philippines	Thailand
Mean	0.753	0.745	0.684	3.040	3.486	1.805	0.057	0.036	0.017	7.739	8.735	9.049	0.028	0.035	0.034	0.097	0.107	0.032	0.062	0.023	0.017
Median	0.763	0.762	0.694	2.939	3.089	1.755	0.058	0.033	0.015	7.752	8.793	9.092	0.023	0.029	0.026	0.000	0.000	0.000	0.062	0.022	0.015
Max	0.925	0.857	0.786	5.476	7.661	2.807	0.078	0.048	0.030	9.179	9.517	9.582	0.062	0.086	0.106	0.656	0.471	0.204	0.105	0.061	0.038
Min	0.477	0.440	0.433	1.634	1.011	1.210	0.038	0.030	0.005	6.358	7.904	8.236	0.002	0.001	0.007	0.000	0.000	0.000	0.020	0.001	0.005
Observations	1129	220	347	1011	219	347	1129	220	347	1129	220	347	1129	220	347	1129	220	347	1129	220	347

APPENDIX B

Table B1. Correlation within variables from equation 1 (Loan Rate – Indonesia)

Variables	Bad Loan	Capital Ratio	Credit Relationship	Bank Capital Channel	Deposit Strength	Dummy	GDP Growth	HHI	Time Deposit Rate	Loan Interest Rate	Market Rate	Inflation	Liquidity	Size	Market Rate Volatility	Z Score
Bad Loan	1.000	−0.003	−0.000	0.001	−0.039	−0.012	0.019	−0.036	0.083	0.073	0.027	−0.010	−0.006	−0.062	−0.018	−0.047
Capital Ratio	−0.003	1.000	−0.086	0.046	−0.238	0.036	−0.032	−0.052	−0.133	−0.064	−0.274	−0.293	−0.042	−0.182	0.067	0.057
Credit Relationship	−0.000	−0.086	1.000	−0.053	0.216	−0.064	0.039	−0.273	0.154	0.158	0.175	0.172	−0.047	−0.346	−0.026	0.036
Bank Capital Channel	0.001	0.046	−0.053	1.000	−0.007	−0.010	0.051	0.011	−0.039	−0.025	−0.035	−0.031	−0.000	0.008	0.077	0.016
Deposit Strength	−0.039	−0.238	0.216	−0.007	1.000	−0.063	0.022	−0.166	−0.014	0.074	0.166	0.175	0.039	−0.226	−0.010	−0.112
Dummy	−0.012	0.036	−0.064	−0.010	−0.063	1.000	−0.090	−0.027	0.023	−0.064	−0.076	−0.078	−0.025	0.049	0.088	0.000
GDP Growth	0.019	−0.032	0.039	0.051	0.022	−0.090	1.000	−0.006	−0.031	−0.008	0.012	0.006	0.032	−0.021	0.104	0.036
HHI	−0.036	−0.052	−0.273	0.011	−0.166	−0.027	−0.006	1.000	−0.437	−0.260	0.007	0.006	−0.024	0.781	−0.004	0.522
Time Deposit Rate	0.083	−0.133	0.154	−0.039	−0.014	0.023	−0.031	−0.437	1.000	0.670	0.141	0.088	0.074	−0.466	−0.021	−0.444
Loan Interest Rate	0.073	−0.064	0.158	−0.025	0.074	−0.064	−0.008	−0.260	0.670	1.000	0.335	0.288	0.064	−0.372	−0.009	−0.262
Market Rate	0.027	−0.274	0.175	−0.035	0.166	−0.076	0.012	0.007	0.141	0.335	1.000	0.768	0.064	−0.032	−0.145	0.090
Inflation	−0.010	−0.293	0.172	−0.031	0.175	−0.078	0.006	0.006	0.088	0.288	0.768	1.000	0.011	−0.052	−0.145	0.108
Liquidity	−0.006	−0.042	−0.047	−0.000	0.039	−0.025	0.032	−0.024	0.074	0.064	0.064	0.011	1.000	−0.042	−0.030	−0.037
Size	−0.062	−0.182	−0.346	0.008	−0.226	0.049	−0.021	0.781	−0.466	−0.372	−0.032	−0.052	−0.042	1.000	0.001	0.481
Market Rate Volatility	−0.018	0.067	−0.026	0.077	−0.010	0.088	0.104	−0.004	−0.021	−0.009	−0.145	−0.145	−0.030	0.001	1.000	0.018
Z Score	−0.047	0.057	0.036	0.016	−0.112	0.000	0.036	0.522	−0.444	−0.262	0.090	0.108	−0.037	0.481	0.018	1.000

Table B2. Correlation within variables from equation 3 (Time Deposit Rate – Indonesia)

Variables	Capital Ratio	GDP Growth	HHI	Interest Loan Rate	Inefficiency	Inflation	Liquidity	Liquidity Mismatch	Market Rate	Size	Stock Market Stress	Market Rate Volatility	Time Deposit Rate
Capital Ratio	1	−0.042	−0.049	−0.001	0.039	−0.311	−0.438	−0.006	−0.276	−0.137	−0.009	0.056	−0.133
GDP Growth	−0.042	1	−0.015	0.015	0.010	0.085	0.068	−0.025	0.075	−0.018	0.011	0.162	−0.016
HHI	−0.049	−0.015	1	−0.169	−0.030	−0.007	−0.140	0.582	−0.000	0.768	−0.026	−0.006	−0.411
Interest Loan Rate	−0.001	0.015	−0.169	1	0.025	−0.061	0.103	−0.301	−0.033	−0.185	−0.151	0.051	0.395
Inefficiency	0.039	0.010	−0.030	0.025	1	0.091	−0.090	0.172	0.075	−0.016	0.019	−0.018	−0.382
Inflation	−0.311	0.085	−0.007	−0.061	0.091	1	0.201	−0.013	0.798	−0.084	−0.039	−0.067	0.078
Liquidity Surplus	−0.438	0.068	−0.140	0.103	−0.090	0.201	1	−0.474	0.159	−0.306	−0.019	−0.026	0.261
Liquidity Mismatch	−0.006	−0.025	0.582	−0.301	0.172	−0.013	−0.474	1	−0.009	0.682	0.028	0.020	−0.507
Market Rate	−0.276	0.075	−0.000	−0.033	0.075	0.798	0.159	−0.009	1	−0.069	−0.099	−0.107	0.137
Size	−0.137	−0.018	0.768	−0.185	−0.016	−0.084	−0.306	0.682	−0.069	1	−0.009	0.017	−0.463
Stock Market Stress	−0.009	0.011	−0.026	−0.151	0.019	−0.039	−0.019	0.028	−0.099	−0.009	1	−0.143	−0.058
Market Rate Volatility	0.056	0.162	−0.006	0.051	−0.018	−0.067	−0.026	0.020	−0.107	0.017	−0.143	1	−0.025
Time Deposit Rate	−0.133	−0.016	−0.411	0.395	−0.382	0.078	0.261	−0.507	0.137	−0.463	−0.058	−0.025	1

APPENDIX C

Table C1. Correlation within variables from equation 1 (Loan Rate – the Philippines)

Variables	Capital Ratio	Bank Capital Channel	Credit Relationship	Deposit Strength	GDP Growth	HHI	Time Deposit Rate	Interest Loan Rate	Market Rate	Inflation	Liquidity	Size	Market Rate Volatility	Bad Loan	Z Score	Dummy
Capital Ratio	1	−0.016	−0.180	−0.625	−0.001	−0.286	0.345	−0.055	−0.007	−0.051	0.743	−0.386	0.011	0.381	−0.240	−0.020
Bank Capital Chanel	−0.016	1	0.015	−0.031	−0.067	0.099	−0.074	−0.082	0.094	0.083	0.009	0.115	−0.083	0.025	0.068	0.037
Credit Relationship	−0.180	0.015	1	0.124	−0.235	0.302	−0.106	−0.105	−0.029	−0.0164	−0.231	0.202	0.148	−0.251	0.157	0.158
Deposit Strength	−0.625	−0.031	0.124	1	0.010	0.252	−0.339	−0.091	−0.138	0.000	−0.933	0.178	−0.037	−0.208	0.339	−0.032
GDP Growth	−0.001	−0.067	−0.235	0.010	1	0.000	−0.056	−0.081	−0.001	0.060	0.042	0.006	−0.002	−0.066	−0.008	−0.273
HHI	−0.286	0.099	0.302	0.252	0.000	1	−0.291	−0.235	0.001	0.003	−0.293	0.897	0.002	−0.276	0.437	−0.003
Time Deposit Rate	0.345	−0.074	−0.106	−0.339	−0.056	−0.291	1	0.754	0.300	0.009	0.374	−0.184	0.063	0.217	−0.130	−0.025
Interest Loan Rate	−0.055	−0.082	−0.105	−0.091	−0.081	−0.235	0.754	1	0.419	0.014	0.046	−0.088	0.142	0.023	0.049	0.057
Market Rate	−0.007	0.094	−0.029	−0.138	−0.001	0.001	0.300	0.419	1	0.313	0.088	0.069	0.160	0.167	0.178	−0.146
Inflation	−0.051	0.083	−0.016	0.000	0.060	0.003	0.009	0.014	0.313	1	0.000	0.045	0.210	−0.008	0.093	0.119
Liquidity	0.743	0.009	−0.231	−0.933	0.042	−0.293	0.374	0.046	0.088	0.000	1	−0.242	0.006	0.325	−0.324	0.001
Size	−0.386	0.115	0.202	0.178	0.006	0.897	−0.184	−0.088	0.069	0.045	−0.242	1	0.013	−0.358	0.451	0.036
Market Rate Volatility	0.011	−0.083	0.148	−0.037	−0.002	0.002	0.063	0.142	0.160	0.210	0.006	0.013	1	−0.025	0.048	0.234
Bad Loan	0.381	0.025	−0.251	−0.208	−0.066	−0.276	0.217	0.023	0.167	−0.008	0.325	−0.358	−0.025	1	−0.128	−0.003
Z Score	−0.240	0.068	0.157	0.339	−0.008	0.437	−0.130	0.049	0.178	0.093	−0.324	0.451	0.048	−0.128	1	0.218
Dummy	−0.020	0.037	0.158	−0.032	−0.273	−0.003	−0.025	0.057	−0.146	0.119	0.001	0.036	0.234	−0.003	0.218	1

Table C2. Correlation within variables equation 3 (Time Deposit Rate – the Philippines)

Variables	Capital Ratio	GDP Growth	HHI	Interest Loan	Inefficiency	Inflation	Time Deposit Rate	Liquidity	Liquidity Mismatch	Market Rate	Size	Stock Market Stress	Market Rate Volatility
Capital Ratio	1	0.022	−0.288	−0.013	−0.489	−0.024	0.265	0.126	−0.372	0.015	−0.372	−0.056	−0.007
GDP Growth	0.022	1	0.011	−0.077	−0.035	0.059	−0.041	−0.003	0.021	−0.004	−0.002	−0.543	0.006
HHI	−0.288	0.011	1	−0.109	0.092	−0.164	−0.169	−0.056	0.298	−0.064	0.475	−0.057	−0.119
Interest Loan	−0.013	−0.077	−0.109	1	−0.258	0.008	0.882	−0.318	0.005	0.307	−0.229	0.097	0.113
Inefficiency	−0.489	−0.035	0.092	−0.258	1	−0.024	−0.545	0.097	0.150	−0.013	0.029	0.019	0.050
Inflation	−0.024	0.059	−0.164	0.008	−0.024	1	0.007	0.040	−0.002	0.313	0.042	0.094	0.213
Time Deposit Rate	0.265	−0.041	−0.169	0.882	−0.545	0.007	1	−0.269	−0.149	0.249	−0.258	0.030	0.048
Liquidity Surplus	0.126	−0.003	−0.056	−0.318	0.097	0.040	−0.269	1	0.321	−0.091	−0.038	0.009	−0.028
Liquidity Mismatch	−0.372	0.021	0.298	0.005	0.150	−0.002	−0.149	0.321	1	−0.058	0.354	0.039	−0.007
Market Rate	0.015	−0.004	−0.064	0.307	−0.013	0.313	0.249	−0.091	−0.058	1	0.064	0.101	0.163
Size	−0.372	−0.002	0.475	−0.229	0.029	0.042	−0.258	−0.038	0.354	0.064	1	−0.000	0.019
Stock Market Stress	−0.056	−0.543	−0.057	0.097	0.019	0.094	0.030	0.009	0.039	0.101	−0.000	1	0.251
Market Rate Volatility	−0.007	0.006	−0.119	0.113	0.050	0.213	0.048	−0.028	−0.007	0.163	0.019	0.251	1

APPENDIX D

Table D1. Correlation within variables from equation 1 (Loan Rate – Thailand)

Variables	Bad Loan	Bank Capital Chanel	Capital Ratio	Credit Relationship	Deposit Strength	Dummy	GDP Growth	HHI	Time Deposit Rate	Interest Loan	Market Interest Rate	Inflation	Liquidity	Size	Market Rate Volatility	Z Score
Bad Loan	1	−0.039	−0.025	−0.111	−0.316	0.005	−0.027	−0.061	−0.049	−0.103	−0.096	−0.066	0.270	−0.090	−0.013	−0.266
Bank Capital Chanel	−0.039	1	−0.081	0.096	−0.032	0.071	0.108	0.099	0.014	−0.013	0.044	0.092	0.056	0.086	0.243	0.024
Capital Ratio	−0.025	−0.081	1	−0.156	0.088	0.154	−0.006	−0.103	−0.559	−0.295	−0.578	−0.398	−0.094	−0.015	0.067	0.218
Credit Relationship	−0.111	0.096	−0.156	1	−0.118	−0.015	0.000	0.595	−0.055	−0.343	0.084	0.032	0.278	0.598	0.000	−0.067
Deposit Strength	−0.316	−0.032	0.088	−0.118	1	−0.021	−0.003	−0.036	−0.054	0.082	−0.024	0.006	−0.970	0.045	0.004	0.241
Dummy	0.005	0.071	0.154	−0.015	−0.021	1	0.090	−0.000	−0.158	−0.102	−0.223	−0.237	0.012	0.046	0.517	0.066
GDP Growth	−0.027	0.108	−0.006	0.000	−0.003	0.090	1	0.005	0.067	0.069	0.115	0.162	0.020	−0.007	−0.076	−0.068
HHI	−0.061	0.099	−0.103	0.595	−0.036	−0.000	0.005	1	−0.094	−0.606	0.039	0.024	0.168	0.950	−0.007	0.222
Time Deposit Rate	−0.049	0.0145	−0.559	−0.055	−0.054	−0.158	0.067	−0.094	1	0.691	0.906	0.735	0.064	−0.250	−0.098	−0.180
Interest Loan	−0.103	−0.013	−0.295	−0.343	0.082	−0.102	0.069	−0.606	0.691	1	0.656	0.505	−0.151	−0.706	−0.072	−0.189
Market Interest Rate	−0.096	0.044	−0.578	0.084	−0.024	−0.223	0.115	0.039	0.906	0.656	1	0.827	0.059	−0.101	−0.180	−0.117
Inflation	−0.066	0.092	−0.398	0.032	0.006	−0.237	0.162	0.024	0.735	0.505	0.827	1	0.031	−0.086	−0.192	−0.053
Liquidity	0.270	0.056	−0.094	0.278	−0.970	0.012	0.020	0.168	0.064	−0.151	0.059	0.031	1	0.092	−0.004	−0.226
Size	−0.090	0.086	−0.015	0.598	0.045	0.046	−0.007	0.950	−0.250	−0.706	−0.101	−0.086	0.092	1	0.037	0.257
Market Rate Volatility	−0.013	0.243	0.067	0.000	0.004	0.517	−0.076	−0.007	−0.098	−0.072	−0.180	−0.192	−0.004	0.037	1	0.049
Z Score	−0.266	0.024	0.218	−0.067	0.241	0.066	−0.068	0.222	−0.180	−0.189	−0.117	−0.053	−0.226	0.257	0.049	1

Table D2. Correlation within variables from equation 3 (Time Deposit Rate – Thailand)

Variables	Capital Ratio	GDP Growth	HHI	Interest Loan	Inefficiency	Inflation	Liquidity	Liquidity Mismatch	Market Rate	Size	Time Deposit Rate	Stock Market Stress	Market Rate Volatility
Capital Ratio	1	−0.003	−0.099	−0.300	−0.056	−0.398	−0.019	0.017	−0.579	−0.010	−0.565	0.025	0.054
GDP Growth	−0.003	1	−0.004	0.073	0.119	0.163	0.018	−0.021	0.113	−0.016	0.069	−0.118	−0.067
HHI	−0.099	−0.004	1	−0.608	−0.520	0.018	0.421	−0.430	0.037	0.950	−0.101	−0.002	−0.018
Interest Loan	−0.300	0.073	−0.608	1	0.440	0.507	−0.203	0.220	0.656	−0.707	0.692	−0.171	−0.064
Inefficiency	−0.056	0.119	−0.520	0.440	1	0.103	−0.601	0.408	0.100	−0.569	0.095	−0.116	−0.086
Inflation	−0.398	0.163	0.018	0.507	0.103	1	0.161	−0.165	0.826	−0.092	0.735	−0.183	−0.184
Liquidity Surplus	−0.019	0.018	0.421	−0.203	−0.601	0.161	1	−0.497	0.151	0.452	0.097	0.090	0.031
Liquidity Mismatch	0.017	−0.021	−0.430	0.220	0.408	−0.165	−0.497	1	−0.172	−0.394	−0.146	−0.055	0.000
Market Rate	−0.579	0.113	0.037	0.656	0.100	0.826	0.151	−0.172	1	−0.103	0.904	−0.185	−0.175
Size	−0.010	−0.016	0.950	−0.707	−0.569	−0.092	0.452	−0.394	−0.103	1	−0.257	0.030	0.027
Time Deposit Rate	−0.565	0.069	−0.101	0.692	0.095	0.735	0.097	−0.146	0.904	−0.257	1	−0.092	−0.084
Stock Market Stress	0.025	−0.118	−0.002	−0.171	−0.116	−0.183	0.090	−0.055	−0.185	0.030	−0.092	1	0.221
Market Rate Volatility	0.054	−0.067	−0.018	−0.064	−0.086	−0.184	0.031	0.000	−0.175	0.027	−0.084	0.221	1