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Determinants of Credit Market in Indonesian Banking Industry (Penentu Pasaran Kredit dalam Industri Perbankan Indonesia)

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ABSTRACT

This study aims to find out determinants of conventional banks' credit supply and demand in Indonesia between 2005 and 2014, a period after recovery from financial crisis in 1997/1998. Some literatures suggest that demand and supply of credit are determined by the rates of credit and bonds. This study is expected to contribute to the literature by considering the role of prudential policy, market structure and banks ownership on supply and demand for credits. By using the bank level yearly data, the Seemingly Unrelated Regression model is employed to manage simultaneity between demand and supply of credit. The empirical findings support the literature that in the case of Indonesian banking, demand and supply of credit are determined by the rates of lending and yields of bonds and the rates of Bank Indonesia Certificate (Sertifikat Bank Indonesia/SBI). This study also reveals that prudential regulation has even dampened the banks' capability to supply lending. By implication, banks' higher lending capacity could improve their supply of credits. Hence, larger banks are proved to be able to supply more credits than the smaller ones; whereas the demands for credit remain to be substantially determined by the macroeconomic conditions.

Keywords: Demand and supply of credit; banking; interest rates; macroeconomics; capital adequacy ratio

ABSTRAK

Kajian ini bertujuan untuk mengenalpasti penentu-penentu penawaran dan permintaan kredit bank konvensional di Indonesia antara tahun 2005 dan 2014, satu tempoh masa penyembuhan daripada krisis kewangan pada tahun 1997/1998. Beberapa kajian lepas mencadangkan bahawa permintaan dan penawaran kredit adalah ditentukan oleh kadar kredit dan bon. Kajian ini menjangkakan untuk memberi sumbangan kajian dengan mempertimbangkan peranan polisi berhema, struktur pasaran dan pemilikan kredit. Dengan menggunakan data tahunan peringkat bank, model Regresi Seemingly Unrelated digunakan untuk menguruskan secara bersamaan antara permintaan dan penawaran kredit. Penemuan empirikal menyokong kajian lepas bahawa dalam hal perbankan Indonesia, permintaan dan penawaran kredit ditentukan oleh kadar pemberian pinjaman dan hasil bon dan kadar Sertifikat Bank Indonesia / SBI. Kajian ini juga mendedahkan bahawa peraturan berhema telah melemahkan keupayaan bank untuk membiayai pinjaman. Dengan implikasi, kapasiti pinjaman bank yang lebih tinggi dapat meningkatkan penawaran kredit mereka. Oleh itu, bank-bank yang lebih besar terbukti dapat membekalkan lebih banyak kredit daripada bank-bank yang lebih kecil; manakala tuntutan untuk kredit kekal banyak ditentukan oleh keadaan makroekonomi.

Kata kunci: Permintaan dan penawaran kredit; perbankan; kadar faedah; makroekonomi; nisbah kecukupan modal

INTRODUCTION

Recent research of banking credit in many countries confirmed that the banking credit behavior is correlated with monetary policy, macroeconomic indicator, and business sector (Bernanke & Gertler 1995; Everaert et al. 2015; Kashyap et al. 2014; Yurdakul 2014; Ford et al. 2003; Popov 2013). Everaert et al. (2015) examined credit market in Central, Eastern, and South eastern Europe countries such as Latvia, Lithuania, Montenegro, Poland, and Romania. Their study indicated "... that supply factors, on average and relative to demand factors, determine credit growth in the post-crisis period." In the case of

Indonesia, a study by Rahayu et al. (2013) suggested that there was a gap between demand and supply of credit after the monetary crisis in 1997. An increase of demands for credit did not directly lead to an increase of lending supply. In addition, their study indicated that the speed of adjustment into equilibrium between demand and supply of credit was lower particularly for local banks.

Understanding the credit behavior of banking sector in Indonesia is important since banks dominate the financial industry by 86 per cent in terms of assets. In addition, credit from banking sector is the major source of lending for business and households (Alamsyah, 2004). Yet, the low disbursement of loan in Indonesian banking has highly signalled banks' lack of intermediary role to the economy. A study by Agung et al. (2000) and Zulverdi et al. (2004) show that loan supply was less sensitive to changes in interest rates compared to the demand for loans. They argued that the suboptimal intermediation role of banks increased the proportion of undisbursed loans in the Indonesian banking after crisis 1997.

Besides, the gap between demand and supply in credit market has also dampened the capability of banking industry to conduct their role as financial intermediary. According to Rahayu et al. (2013), the slow recovery from 1997 financial crisis was due to the lengthy process of equilibrium adjustment between supply and demand of credit. Banks avoided risks by investing their assets into liquid investment, such as Central Bank certificates (Sertifikat Bank Indonesia/SBI) and government bonds. They found that the gap was persistent in local banks, particularly state-owned banks (BUMN) and Regional Development Banks (Bank Pembangunan Daerah/BPD). They argued that this may occur as local banks were less efficient and it might be caused by the influence of ownership structure on banks' behaviour. Some studies in Indonesian banking industry confirm that banks are not working in their most efficient scale (Astiyah & Jardine 2005; Margono et al. 2010; Viverita & Ariff 2011). Furthermore, a study by Mulyaningsih et al. (2014) reveals that government banks behaved least competitive than their private counterparts due to the implicit government guarantee and facilities.

Specifically, this study investigates the demand and supply of banking credit market in Indonesia based on Rahayu et al. (2013), Wignall and Gizycki (1992), Calani et al. (2010), Guo and Stepanyan (2011), Jacobs and Rayner (2012), and Tabak et al. (2012). In the case of banking credit market model, this study will refer to Rahayu et al. (2013), Wignall & Gizycki (1992), Devarajan (2004), and Jacobs and Rayner (2012). In addition, it also aims to examine the influence of lending rates, policy rates and bonds yield, the level of efficiency, motives of credit disbursement, capital, and the influence of banks' ownership structure on the credit market in Indonesian banking industry. The finding is expected to provide valuable information for banking industry and policy maker in Indonesia particularly on understanding credit market and how to reduce the gap between credit supply and demands.

There are three contributions derived from this study particularly in the area of credit market in developing economies. First is taking into account the influence of ownership structure on credit supply as indicated in the previous study by Fungáčová et al. (2013) which revealed that state-owned bank behaved counter-cyclical in regards to lending during the economic crisis. This may imply that ownerships structure determines that supply of credit. The second contribution is capturing the impact of prudential policy for example in terms of higher capital adequacy ratio on banks supply of credit. Previous studies by Brownbridge (1998), Watanabe (2007), Francis & Osborne (2009) and Aiyar et al. (2016) revealed that tighter policy with regard to high capital reduces banks' lending capacity. Third, this study is also intended to explore the influence of market structure and banks' performance on credit. Studies by Jesus & Gabriel (2006) and di Patti & Gobi (2002) highlight that market structure and banks' efficient performance determine credit supply. Banks lend more in a more competitive environment. Moreover, merger banks are able to improve their efficiency level, enabling them to increase supply of credit.

Hence, two research questions to be raised are: (i) what are the factors determining of banking credit model in Indonesia; and, (ii) what are the influence of the price level, price of substitute products, efficiency, capital, and banks' ownership structure, and macroeconomic factors on the credit market in Indonesian banking.

The paper is organized as follows. Part II discusses the existing literature on the determinants and the equilibrium model of supply and demand of credit. Part III illustrates the empirical strategy, data and variables. Part IV discusses the results of the main regression, which is followed by conclusions and policies implications.

LITERATURE REVIEW

Financial Intermediary Institution

The majority of literature and articles in financial institution emphasized the importance of financial institutions' role in allocating the fund from surplus unit, as a depositor, into deficit unit in the form of loans (Stiglitz & Greenwald 2003; Güner 2003; Mishkin 2001; Saunders & Walter 1994; Bernanke & Blinder 1988). The important role of financial institution is known as financial intermediaries function.

A theory proposed by Diamond and Dybvig (1993) and Diamond (1984) on the financial intermediation show that banks and other financial intermediaries are able to solve the incentives and information problems which usually exist in the relation of depositors and investors. The financial institutions can manage those problems better compared to capital market or non-financial institutions (Becker & Victoria 2011). They argued that banks are unique particularly in terms of their assets. They can act as delegated monitors (Diamond 1984). In the investment projects, for example, banks might perform as monitors. In addition, banks have access into investment. This could not be done by the capital market. Insukindro (1990) studied the

Indonesia credit market by using Indonesia monetary variables between 1969 and 1987. He found that the main determinant of credit demand is transaction motive. It is in line with the assumption that the income of economy players limits the demand of bank's credit. Moreover, the study found an indication that profit motive underlie the welfare maximization in banking sector. Banks respond on the changes of bank's reserves and local private income.

According to Bernanke and Blinder (1988), banks role as an intermediation institution is a special function. Bernanke and Blinder (1988) developed the frame of simple IS-LM model to explain their view on the policy transmission mechanism of Central Bank. The model describes the transmission of Central Bank policies through banks assets and banks liability. They justified the credit view theory that financial institution has a special function as financial intermediary particularly where asymmetry information exists. In accordance with Bernanke and Blinder (1988), Saunders and Walter (1994) emphasized the importance of financial institution as financial intermediary in the economy where there is an excess of fund in one side (loan supply) and shortage of fund in the other side (loan demand). The existence of monitoring cost, liquidity cost and price risk of holding money has encouraged individuals to select the right financial institution than invest their money into the capital market. In the latter the possibility of asymmetry information occurrence is very high.

Money Market, Credit Market and the Market Equilibrium of Loans

The dispute on the role of money and credit to economy is still taking place. The controversy started since Patinkin (1956) proposed his idea to divide assets ownership into three which are money, bonds and loans. The underlying reason of the assets division is the assumption that those assets are not a perfect substitution and there is no credit rationing. This conclusion is similar with study by Bernanke and Blinder (1988). The study by Bernanke and Blinder (1988) had been able to develop the IS-LM model representing the equilibrium of the two portfolios which are holding money and bonds.

Bernanke and Blinder (1988) assumed that creditors and debtors select between bonds and loans with regard to the interest rates applied for those two instruments. If ρ is the credit interest rates, i is the bonds interest rates, and y is income, thus the demand of credit is $L^d = L(\rho, i, y)$. As income (PDB) increases the demand on credit also increases for financing the working capital and liquidity purposes.

In order to understand the supply of loans, they simply described the banks' balance sheet. Assets consist of reserves (R); bonds (B^b); loans (L^s) and liability consists of deposits (D). If reserves consist of desired reserves (τD) and excess reserves (E) thus the banks constraints is becoming $B^b + L^s + E = D(1 - \tau)$. Assuming that portfolio provision desired is reliant to assets return (where excess reserves are zero), we will have $L^s = \lambda(\rho, i)D(1 - \tau)$, where it has similar equation for B^b and E . Therefore, the equilibrium in credit market is formulated as:

$$L(\rho, i, y) = \lambda(\rho, i)D(1 - \tau) \quad (1)$$

Money market is described by using conventional LM curve. If the reserves are equal to $\varepsilon(i)D(1 - \tau)$, the supply of credit (by ignoring the cash) is equal to banks reserves (R) multiplied by money multiplier $m(i) = [\varepsilon(i)D(1 - \tau) + \tau]^{-1}$. The demand of savings is determined by the transaction motive. It depends on interest rates, income, and total wealth and its value is constant of $D(i, y)$. The equilibrium in money market is then presented in Equation-2 as follows:

$$D(i, y) = m(i)R \quad (2)$$

Implicitly $D(i, y)$ and $L(\rho, i, y)$ define the demand of non-bank on bonds as the demand of money plus the demand of bonds and minus the demand of loans.

The remaining market is goods market described in the conventional IS curve and written as Equation-3

$$y = Y(i, \rho) \quad (3)$$

by using Equation-2 to replace $D(1 - \tau)$ in the right hand side from Equation-1 with $(1 - \tau)m(i)R$. Then, Equation-1 can be resolved for ρ as a function of i, y , dan R :

$$\rho = \Phi(i, y, R) \quad (4)$$

finally, by substituting Equation-3 to Equation-4 we will produce

$$y = Y(i, \Phi(i, y, R)) \quad (5)$$

We will draw a graph called CC (Commodities and Credit) curve which has a negative slope similar to IS conventional curve. The reason of having negative slope for CC curve is the same with the IS conventional curve. Referring to Figure 1, CC curve is similar to IS curve if loans and bonds are perfect substitutions. Thus, the borrower will be $L\rho \rightarrow -\infty$ and lenders will be $\lambda\rho \rightarrow -\infty$. Or it may behave like IS if the demand of commodity is not sensitive to credit interest rates ($Y\rho = 0$). In this situation the credit market is not relevant to IS-LM. This phenomenon is known as money view. On the other hand, if money and bonds are perfect substitutions ($D_i \rightarrow -\infty$), the LM curve will be horizontally shaped. It is known as credit view and Keynes considered it as liquidity trap.

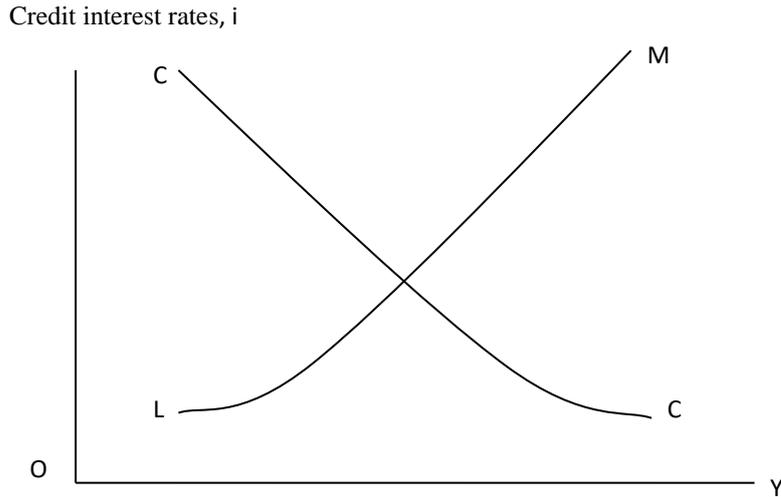


FIGURE 1. The Relationship between LM and CC

The study conducted by Bernanke & Blinder (1988) compared the impact of shock in the money market and credit market to output in the 1980s. They concluded that the impact of money market on the output is larger than the credit market. The study implies that the role of credit is more stable than money.

Korteweg & Loo (1977) developed Brunner-Meltzer model in order to explain the demand and supply of money and credit in the open economy. There are at least three variables determining banks and individuals' rational portfolio which are: (i) return and alternative cost of portfolio selection; (ii) financial and monetary policies from monetary authority including its portfolio behavior and control instrument such as reserve requirement, maximum level of loans and interest rates regulation; and, (iii) predetermined variables, such as real phenomenon and balance sheet identity (Korteweg & Loo 1977).

Stiglitz and Greenwald (2003) developed a model to analyze the supply and demand of credit. The model includes the credit market equilibrium into IS-LM model by assuming no perfect substitution in the assets market. In addition, there are at least two types of assets in the assets portfolio (Stiglitz & Greenwald 2003; Bernanke & Blinder 1988; Tobin & Golub 1998; Patinkin 1956).

Stiglitz and Greenwald (2003) argued that supply of loans is a function of credit interest rates (r), interest rates of government bonds (ρ) (as it affects the size of deposits, capital stock (K), stock capital of firm (K_f), nature condition (z), reserve requirement or other types of regulation (q), and national income (y). National income is a flow variable and it can be included into variable z . However, in order to make the difference between the model and the standard IS-LM model, they should be separated.

$$L_s = L_s(r, \rho, y; z, K, K_f, q) \quad (6)$$

Supply of loans relies on banks' capital and firms' capital K_f . The dependence between supply and loans and firms' capital can be explained as the value of r is fixed, the lower K_f induces higher probability of default of payment. Furthermore, it will reduce the size of loans. By using the similar method, in the simple model, the demand of loans is a function of r , y , and z , as below model

$$L_d = L_d(r, Y; z, K_f) \quad (7)$$

Bank and households have a demand on T-bills. The size of demands depends on return gained from T-bills:

$$T = T(r, \rho, y; z, K, K_f, q) \quad (8)$$

The size of T-bills invested by banks depends on the demand and capacity of banks to manage the risk as well as other variables. In the case of perfect competition in saving banks market, it was argued that banks do not have T-bills. As such, those variables would not appear in the T-bills equation.

In the case of the absence of credit rationing, the supply and demand of credit determine the market equilibrium. Therefore, the market equilibrium for credit will be

$$L_d = L_s \quad (9)$$

and the equilibrium in the T-bills market is

$$T(r, \rho, y; z, K, K_f, q) = T_s \quad (10)$$

where T_s is a supply of T-bills which is controlled by government or monetary authority. We can simultaneously solve Equation-10 and 11, where ρ and r are a function of y :

$$\rho = \rho[y; z, K, K_f, q] \quad (11)$$

$$r = r[y; z, K, K_f, q] \quad (12)$$

then we can substitute Equation-12 to 10. We will have a monetary equilibrium curve. It is simply known as L*M* curve which is developed as traditional LM curve.

There is an alternative formulation as below,

$$\xi = r - \rho$$

ξ is a *spread* between credit interest rates and savings interest rates. We can in turn solve Equation-9 and 10 simultaneously to assess ξ and r in Equation-12.

$$\xi = \xi [y; z, K, K_f, q] \quad (13)$$

The demand of credit depends on the credit interest rates and the supply of credit depends on the deposits interest rates. We can derive IS curve through the relationship between investment and savings on interest rates. Investment level depends on credit interest rates and savings depends on deposits interest rates.

Some studies also highlighted the influence of ownership structure in explaining the banks' credit behaviour. Fungáčová et al. (2013) observed the credit supply during financial crisis. They examined the credit supply across banks with different ownership structure. They found that crisis led to lower credit supply particularly for foreign-owned banks. Meanwhile, the reduction of credit supply was much lower in the state-owned banks. Their findings are supported the hypothesis that foreign banks have lack of loyalty especially during the crisis. On the other hands, state-owned banks are positioned as main supporters of state interest to support the economy especially during the economic downturn.

The behavior of state-owned banks in extending lending was also observed by Dinç (2005). In addition to macroeconomic variables and banks characteristics, such as banks' size and their capital ratio, the lending growth of government banks are also influenced by the election period. During the election, the lending of government banks was being used as political tools to generate support and punish the opponents of the incumbents.

Furthermore, the supply of credit of banking sector is determined by the degree of prudential regulation. During the recovery period after financial and economic crisis, the regulators preferred to introduce tighter regulations, for example Basel Accord that introduced higher capital ratio and risk based capital, an increase of reserve requirement and loan loss provision. Brownbridge (1998) concluded that imprudent regulation has contributed to an increase of non-performing loans due to bad lending. In addition, Watanabe (2007) after crisis, economy experienced credit crunch as banks were reluctant to disburse loans as lending quality was lowered. In addition, prudent regulation implemented by regulators after crisis has also lowered credit supply by banking sector (Francis & Osborne 2009). On the other hand, a recent study by Aiyar et al. (2016) discussed the respond of credit supply of both monetary policy and minimum capital requirements. They concluded that banks in the UK had lowered their lending during the tightening of capital requirements and monetary policy. Fang et al. (2018) also underlined the role of higher capital adequacy ratio in lowering banks supply of credit even though the impact was merely short.

Banks' credit supply is determined by the market structure and banks efficiency. Jesus & Gabriel (2006) employed the measures of market structure to examine banks' credit supply. Competitive market induces banks to enhance their lending. However, an expansionary credit policy may pose higher loan losses if banks take risky projects and experience imperfections of equity market and maturity mismatches.

The supply of credit is also determined by the efficiency level of banks. More efficient banks are capable to either minimize their cost or maximize their output, which is referred to technical efficiency. In this regards, banks operation is more cost efficient thus banks are capable to disburse more lending. A study by di Patti & Gobi (2002) examined specifically the impact of merger and acquisition in the banking sector on credit to business in Italy in the 1990s. Their study supported the notion that merger and acquisition improved banks efficiency and banks' capability in disbursing their lending. Particularly, the study found that corporate borrowers gained positive impact from the lenders acquisitions or mergers as they experienced an increase in the credit availability. Moreover, the study suggested that an increase in banks' efficiency generated by mergers and acquisitions would improve their capability in lending efficiently by reallocating credits from borrowers that experienced excess lending to those confronted with credit shortage.

METHODOLOGY

With focus on banking credit market in Indonesia between 2005 and 2014 that experienced credit crunch and undisbursed lending, this study examines the conventional banks' credit demand and supply by observing all 101 banks. The secondary data, which were collected from Indonesia Bureau of Statistics (BPS) and Financial Service Authority of Indonesia (Otoritas Jasa Keuangan/OJK), comprised demand and supply of credit, interest rate of credit, Gross Domestic Product (GDP), operational cost and operational revenue, inflation rate, interest rate of central bank, and Capital Adequacy Ratio (CAR).

The empirical strategy is taken by modifying the banking credit model introduced by Rahayu et al. (2013) by adding efficiency and ownership structure and estimates using seemingly unrelated regression to manage the problem of simultaneity originating from the dependence between volume of credit and credit interest rates in the demand and supply equations. If there is a correlation between residuals in the equations, the estimation of Zellner SUR is preferred compared to the Ordinary Least Square or OLS (Gujarati & Porter 2009; Tatoğlu et al. 2017). The SUR technique run the Generalized Least Square (GLS) that produces more efficient estimators than the OLS. The correlation between the residuals is tested by using Lagrange Multiplier (LM) test (Breusch & Pagan 1979). The null hypothesis states the correlation (covariance) between residuals is zero. The test shows that the Breusch Pagan test of independence $\chi^2(1)$ is 40.392 and the probability to reject the null hypothesis is 0.000. This implies that the covariance of residuals is more than 0 showing that the residuals are correlated.

The detailed information of variable definition and proxies employed to measure the variables are available in Table 1 below.

Credit demand (of banks):

$$L_{it}^D = \alpha_0 + \alpha_1 r_{Lit} + \alpha_2 INF_{it} + \alpha_3 KURS_{it} + \alpha_4 Y_{it} + \alpha_5 YGAP_{it} + u_{it} \quad (14)$$

Credit supply (from banks):

$$L_{it}^S = \beta_0 + \beta_1 r_{Lit} + \beta_2 r_{SBI_{it}} + \beta_3 r_{SUN_{it}} + \beta_4 CAP_{it} + \beta_5 CAR_{it} + \beta_6 IP_{it} + \beta_7 SHARE_{it} + \beta_8 EFI_{it} + \beta_9 DGOV_{it} + v_{it} \quad (15)$$

$$L_{it} = \min(L_{it}^S, L_{it}^D) \quad (16)$$

TABLE 1. Operational Definition and Proxies of Variables

Variable	Description
L_{it}^D = volume of demand for credit	Total credit measured by the outstanding of credit by the end of year disbursed by conventional banks. Data is collected from financial reports published by the Financial Service Authority of Indonesia (OJK). The outstanding credit is in the real values by dividing the credit volume with the consumers' price index. Further, the variable is transformed to logarithmic form.
r_L = credit interest rates (real)	Credit interest rates is defined as an average credit interest rates for working capital of all conventional banks. In order to generate real value of credit interest rates, this study subtract the rates with inflation rates in the corresponding year. The interest rates data is collected from the statistics published by the Central Bank.
r_{SBI} = credit rates of certificates of Bank Indonesia (SBI)	Interest rates of Bank Indonesia certificates. The data is collected from the Central Bank.
r_{SUN} = yields of government bonds	Yields of 5-years Indonesian Government Bonds. The data is collected from the https://id.investing.com/rates-bonds/indonesia-5-year-bond-yield-historical-data
INF = Inflation expectation	Expectation to the inflation is defined as year on year inflation based on December data. The inflation rates are calculated using the Consumers' Price Index (Indeks Harga Konsumen/IHK) with base year of 2007 as formulated below: $INF_{it} = (IHK_{it} - IHK_{it-1}) / (IHK_{it-1}) * 100\%$ The data is collected from Indonesia Bureau of Statistics.
FX = Foreign Exchange (KURS)	Foreign exchange rate of Indonesia Rupiah (IDR) to US Dollar by the end of the year. A higher values of FX indicates depreciation of local currency to the international currency of the US Dollar.
Y = National Income	Yearly national income is represented by the Gross Domestic Product (GDP) in real value after divided by the consumers' price index. Further, the variable is transformed to logarithmic form.
YGAP = Output Gap	The gap of output is defined as the actual Gross Domestic Product (GDP) subtracted by the potential GDP. This values are generated using the Hodrick- Prescott filtered. If the actual GDP is lower than the its potential, the gap will be negative so firms will increase their capital using loans from banks.
L_s = volume of supply of credit	Total credit measured by the outstanding of credit by the end of year disbursed by conventional banks. Data are collected from financial reports published by the Financial Service Authority of Indonesia (OJK). The outstanding credit is in the real values by dividing the credit volume with the consumers' price index. The variable is then transformed to logarithmic form.
IP = Production Index of manufacturing sector	The production index is a proxy of borrowers' ability to repay their debts. It is measured by using the production index of the manufacturing sector published by the Indonesia Bureau of Statistics.
CAP = loanable funding capacity	The loanable funding capacity representing the banks capacity to disburse loans. It is calculated by subtracting total assets to reserve requirement, cash in vault, and government bonds within banks investment portfolio (Zulverdi et al. 2004).
CAR = Capital Adequacy Ratio	CAR is the minimum capital held by banks in order to comply the minimum reserve of the regulators.
EFI = total efficiency score	Banks efficiency score which is comprised of technical and allocative efficiency generated by the Data Envelopment Analysis (DEA).
Variable	Description
DGOV = Dummy for government banks	Government banks are defined as those at least 25 percent of the shares are owned by the Central Government. The Indonesian Law on limited liability company states that the major shareholders are those owned at least 25 percent of shares in the business entity.
Share= market share	The share of bank i in the industry. It is calculated by dividing the assets of bank i to total assets of banking industry in the particular year.

EMPIRICAL RESULTS

This section discusses the empirical findings on the determinants of demand and supply of credit of conventional banks in Indonesia between 2005 and 2014. The first part describes the descriptive statistics of all relevant variables. There are one

hundred and one conventional banks in the Indonesian banking industry and this number was only a half of the total number of banks prior to the 1997/ 1998 financial crises. The population of banks was significantly lower due to banks' closure, mergers and acquisitions and banks collapsed. This study captures all conventional banks in the industry. Thus, of ten years of the study period, the total number of observation is 1,010 capturing 101 banks.

The volume of demand is equal to the volume of credit supply. Using the base year of 2007, on average the volume of credit disbursed by conventional banks was IDR 136 billion. The largest lending disbursement was IDR 3 trillion. In terms of lending rate, on average between 2005 and 2014 the price of funds was 13.4 percent or 7.88 percent in real value after subtracting with the rate of inflation. Meanwhile, the interest rates of central bank certificates (SBI) was 7.98 percent or only 2.45 percent in real value. The yield rate of government bonds was 7.26 percent on average or 1.74 percent in real value. The central bank certificates and government bonds are perceived as having lower risk and so the returns were lower than risky portfolio of lending.

In terms of macroeconomics conditions, Indonesia experienced double digits inflation in 2005 of 17 percent, and it lowered in the later period and the average inflation was 7.2 percent. As the inflation rates was relatively high, the real interest rates were corrected significantly. The currency of Indonesian Rupiah (IDR) to US Dollar was 9,944 on average and it was depreciated to 12,440 in 2014. With regard to national income, on average Indonesia's income was IDR 2,150 trillion or 17.6 trillion in real values using the base year of 2007. The GDP gap shows the difference between actual GDP and its potential. On average, Indonesian output gap was positive, i.e., 2,290 indicating that the economy performed above its potential with the average production index of manufacturing sector being 4.676.

TABLE 2. The Descriptive Statistics of Credit Volume, Interest Rates, Macroeconomics Indicators and Banks' Characteristics

Variable	Unit	Observation	Mean	Std. Dev.	Minimum	Maximum
Credit Volume						
LD	Billion IDR	1,010	17,600	47,800	1.229	490,000
LD (real)	Billion IDR	1,010	136	345	0.01	3,082
LS	Billion IDR	1,010	17,600	47,800	1.229	490,000
LS (real)	Billion IDR	1,010	136	345	0.01	3,082
Interest Rates						
rSBI	Percent	1,010	7.975	2.027	5.75	12.750
rSBI (real)	Percent	1,010	2.455	4.166	-2.515	12.750
rL	Percent	1,009	13.400	2.088	7.900	16.950
rL (real)	Percent	1,009	7.877	4.047	1.463	16.950
rSUN	Percent	1,010	7.262	3.167	0	11.997
rSUN (real)	Percent	1,010	1.742	2.697	-0.661	6.998
Macroeconomics						
Consumers Price Index	Unit	1,010	122.331	20.024	94.436	159.11
Inflation	Percent	1,010	7.232	4.318	2.288	17.124
Variable	Unit	Observation	Mean	Std. Dev.	Minimum	Maximum
FX	IDR	1,010	9,944.6	1,214.465	8,991	1,2440
Y	Trillion IDR	1,010	2,150	379	1.6	2.8
Y (real)	Trillion IDR	1,010	17.6	0.424	16.998	18.317
YGAP	Billion IDR	1,010	-0.0002106	3,0439.52	-46,901.65	46,084.81
YGAP (real)	Billion IDR	1,010	2.29E-06	337.8587	-472.9713	568.3096
IP	Unit	1,010	4.676	3.145963	-2.21	8.15
Banks Characteristics						
CAR	Percent	997	25.78	23.87	0	489.58
CAP	Billion IDR	1,010	23,900	61,100	-4,236	609,000
CAP (real)	Billion IDR	1,010	187	450	-33	3,827
EFI	Unit	1,010	0.455	0.2514438	0.061	1.00
Dgov	Dummy	1,010	0.039604	0.1951235	0	1
Share	Percent	1,010	.9902475	2.419686	0	18.62

The Indonesian banks had been able to comply with the minimum capital requirement. On average, banks recorded 25 percent of the Capital Adequacy Ratio (CAR). This indicates that banks were keen to keep the buffer sufficiently. Regarding to the capacity lending, Indonesian banking on average had available loans to be disbursed amounting to IDR 187 billion in real values. The levels of Indonesian banking efficiency were varied. However, on average banks recorded efficiency score of 0.45 using 0 to 1 scale where higher score indicates better efficiency performance. Meanwhile, some banks recorded low efficiency score where the lowest reached 0.061. Finally, the means of market share of Indonesian bank was 0.99 percent where the biggest bank owned 18.62 percent and the smallest had almost negligible share in the industry.

The next part of this section discusses the determinants of demand and supply of credit from the conventional banks. The models perform quite well as most of explanatory variables are significant statistically in explaining the demand and supply of credits. As discussed previously, this paper employs the Seemingly Unrelated Regression (SUR) approach to manage the simultaneity issue of the volume of demand and supply. As with the demand for credit, it was negatively influenced by lending rate. This finding is consistent with the theory that as the interest rate gets higher, the demand for

credit will be lower as the price is getting more expensive. Hence, the demand for credit was also influenced by the yields from government bonds. The estimation reveals that higher yields contributed to higher demand for credits.

TABLE 3. The Empirical Results of Demand and Supply of Credit using the Seemingly Unrelated Regression (SUR)

Equation	Obs	Parms	RMSE	R-sq	chi2	P
Log LD (real)	990	7	1.795517	0.054	50.03	0
Log LS (real)	990	8	0.4640825	0.9368	14496.28	0
Log LD (real)						
rL (real)	-0.0887037	0.0217561	-4.08	0	-0.1313448	-0.0460625
rSUN(real)	0.1595468	0.0831753	1.92	0.055	-0.0034738	0.3225674
LogY (real)	40.77031	18.70576	2.18	0.029	4.107705	77.43292
	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
YGAP (real)	-0.0019488	0.0009806	-1.99	0.047	-0.0038707	-0.0000269
Inflation	0.1186855	0.0634931	1.87	0.062	-0.0057588	0.2431297
FX	-0.0001431	0.0001228	-1.17	0.244	-0.0003838	0.0000975
IP	-0.0210988	0.0286606	-0.74	0.462	-0.0772726	0.035075
_cons	-387.1114	182.1638	-2.13	0.034	-744.1458	-30.0769
Log LS (real)						
rL (real)	0.023899	0.0098439	2.43	0.015	0.0046052	0.0431927
rSBI (real)	-0.0505406	0.009195	-5.5	0	-0.0685625	-0.0325187
rSUN (real)	-0.0268699	0.0059943	-4.48	0	-0.0386185	-0.0151212
CAR	-0.0076072	0.0006954	-10.94	0	-0.0089701	-0.0062442
LogCAP (real)	0.5870223	0.0760935	7.71	0	0.4378817	0.7361628
EFI	-0.0006421	0.0106206	-0.06	0.952	-0.0214581	0.0201738
Dgov	0.1007855	0.1058324	0.95	0.341	-0.1066422	0.3082133
Share	0.86591	0.0123453	70.14	0	0.8417137	0.8901064
_cons	0.8869467	0.1520293	5.83	0	0.5889748	1.184919

The Macroeconomic Conditions had a substantial impact on the demand for credit as shown by the empirical results. The Gross Domestic Product (GDP) has substantial impact on demand for lending where the coefficient was 40.77 and it was significant at 5 per cent significance level. The gap of GDP has a negative influence to the demand for credit as predicted by theory. This indicates that as the actual GDP was lower than its potentials, firms would increase their capital using loans from banks. The demand for loans was in turn influenced by inflation rates. A higher rate indicates higher expectation of inflation and this induces firms to demand for loans.

The lending supply was determined by price level of its product and substitute products. A higher lending rate provides larger incentives for banks to disburse more loans. In addition, higher rates of SBI and yields of government bonds would lower supply of lending. This finding underlines that Indonesia banking portfolio is comprised of loans, SBI and government bonds. An increased price of substitute products lowers the lending rate relatively and reduces the lending supply accordingly. The supply of lending was also influenced by the Capital Adequacy Ratio (CAR) where higher CAR would contribute to banks' lower lending capacity. In turn, higher lending capacity would affect lending supply positively. In sum, larger banks were found to have higher supply of credit than the smaller ones.

The estimation results show that almost all the coefficients of parameters are statistically significant. This implies that the coefficients of parameter estimate of the model are consistent with the theory. Moreover, the chi-square of the models is also statistically significant so that all coefficients of the model have an impact on dependent variables simultaneously. The coefficient determination is sufficient to describe the variation of dependent variables explained by independent variables in the model, although they are too small in the demand function. As the disturbance error of the model is small, it means that the model is accurately estimated.

CONCLUSION

As mentioned previously, this study aims to understand the behaviour of conventional banks' supply and demand of credit in Indonesia between 2005 and 2014, a period after recovery from financial crisis in 1997/1998. An equilibrium model of credit market developed by Bernanke & Blinder (1988) is employed as the basis to understand the behaviour of credit supply and demands. They argued that demand and supply of credit are determined by rates of credit and bonds. Thus, creditors and debtors select between bonds and loans regarding to the interest rates applied for those two instruments. This study supports Bernanke & Blinder (1998) where in the case of Indonesian banking, demand and supply of credits are determined by rates of lending and yields of bonds. In addition, supply of credit is also determined by the rates offered by the SBI. A higher rate of lending induces banks to lend more while lowering the demand for credit. Government bonds and SBI are the substitute of loans, thus as the bond yields and SBI rates increase, the supply of credit lowered.

This study also reveals that prudential regulation, for instance, by increasing the capital adequacy ratio (CAR) has even dampened the banks capability to supply lending. The finding also shows that higher lending capacity improves banks

supply of credit. In addition, larger banks are proved able to supply more credit than the smaller ones. In sum, the macroeconomic conditions had a substantial impact on the demand for credit while the GDP and inflation have positive impact on demand for credit. In addition, the existence of output gap enhanced the demand for loans. The demand for loans was in turn influenced by inflation rates.

The policy recommendations derived from this study as follow. The regulator should consider the impact of prudential policy specifically in terms of increasing capital adequacy ratio (CAR) in lowering lending of banks. During the observation period, the central bank increased the level of CAR to be complied by conventional banks from 8-11 percent in 2012 to 8-14 percent in 2013. The level of capital is higher for banks with higher risk profile. This policy imposed cost for economy in terms of lower lending from banking industry. Second policy implication is related to the importance of capacity lending and share of banks in the industry in enhancing supply of credit. The current consolidation policy that encourages banks to merge may contribute to larger banks' share and their lending capacity. These are essential to increase credit supply. Lastly, this study highlights the role of pro-growth policies in enhancing demand for credit. Government should prioritize policies related to productivity improvement for example technology enhancement, tax incentives for business, simplification of procedure for investment and trade and human capital development to boost economic growth.

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Determinants of Credit Market in Indonesian Banking Industry (Penentu Pasaran Kredit dalam Industri Perbankan Indonesia)

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ABSTRACT

This study aims to find out determinants of conventional banks' credit supply and demand in Indonesia between 2005 and 2014, a period after recovery from financial crisis in 1997/1998. Some literatures suggest that demand and supply of credit are determined by the rates of credit and bonds. This study is expected to contribute to the literature by considering the role of prudential policy, market structure and banks ownership on supply and demand for credits. By using the bank level yearly data, the Seemingly Unrelated Regression model is employed to manage simultaneity between demand and supply of credit. The empirical findings support the literature that in the case of Indonesian banking, demand and supply of credit are determined by the rates of lending and yields of bonds and the rates of Bank Indonesia Certificate (Sertifikat Bank Indonesia/SBI). This study also reveals that prudential regulation has even dampened the banks' capability to supply lending. By implication, banks' higher lending capacity could improve their supply of credits. Hence, larger banks are proved to be able to supply more credits than the smaller ones; whereas the demands for credit remain to be substantially determined by the macroeconomic conditions.

Keywords: Demand and supply of credit; banking; interest rates; macroeconomics; capital adequacy ratio

ABSTRAK

Kajian ini bertujuan untuk mengenalpasti penentu-penentu penawaran dan permintaan kredit bank konvensional di Indonesia antara tahun 2005 dan 2014, satu tempoh masa penyembuhan daripada krisis kewangan pada tahun 1997/1998. Beberapa kajian lepas mencadangkan bahawa permintaan dan penawaran kredit adalah ditentukan oleh kadar kredit dan bon. Kajian ini menjangkakan untuk memberi sumbangan kajian dengan mempertimbangkan peranan polisi berhema, struktur pasaran dan pemilikan kredit. Dengan menggunakan data tahunan peringkat bank, model Regresi Seemingly Unrelated digunakan untuk menguruskan secara bersamaan antara permintaan dan penawaran kredit. Penemuan empirikal menyokong kajian lepas bahawa dalam hal perbankan Indonesia, permintaan dan penawaran kredit ditentukan oleh kadar pemberian pinjaman dan hasil bon dan kadar Sertifikat Bank Indonesia / SBI. Kajian ini juga mendedahkan bahawa peraturan berhema telah melemahkan keupayaan bank untuk membiayai pinjaman. Dengan implikasi, kapasiti pinjaman bank yang lebih tinggi dapat meningkatkan penawaran kredit mereka. Oleh itu, bank-bank yang lebih besar terbukti dapat membekalkan lebih banyak kredit daripada bank-bank yang lebih kecil; manakala tuntutan untuk kredit kekal banyak ditentukan oleh keadaan makroekonomi.

Kata kunci: Permintaan dan penawaran kredit; perbankan; kadar faedah; makroekonomi; nisbah kecukupan modal

INTRODUCTION

Recent research of banking credit in many countries confirmed that the banking credit behavior is correlated with monetary policy, macroeconomic indicator, and business sector (Bernanke & Gertler 1995; Everaert et al. 2015; Kashyap et al. 2014; Yurdakul 2014; Ford et al. 2003; Popov 2013). Everaert et al. (2015) examined credit market in Central, Eastern, and South eastern Europe countries such as Latvia, Lithuania, Montenegro, Poland, and Romania. Their study indicated "... that supply factors, on average and relative to demand factors, determine credit growth in the post-crisis period." In the case of

Indonesia, a study by Rahayu et al. (2013) suggested that there was a gap between demand and supply of credit after the monetary crisis in 1997. An increase of demands for credit did not directly lead to an increase of lending supply. In addition, their study indicated that the speed of adjustment into equilibrium between demand and supply of credit was lower particularly for local banks.

Understanding the credit behavior of banking sector in Indonesia is important since banks dominate the financial industry by 86 per cent in terms of assets. In addition, credit from banking sector is the major source of lending for business and households (Alamsyah, 2004). Yet, the low disbursement of loan in Indonesian banking has highly signalled banks' lack of intermediary role to the economy. A study by Agung et al. (2000) and Zulverdi et al. (2004) show that loan supply was less sensitive to changes in interest rates compared to the demand for loans. They argued that the suboptimal intermediation role of banks increased the proportion of undisbursed loans in the Indonesian banking after crisis 1997.

Besides, the gap between demand and supply in credit market has also dampened the capability of banking industry to conduct their role as financial intermediary. According to Rahayu et al. (2013), the slow recovery from 1997 financial crisis was due to the lengthy process of equilibrium adjustment between supply and demand of credit. Banks avoided risks by investing their assets into liquid investment, such as Central Bank certificates (Sertifikat Bank Indonesia/SBI) and government bonds. They found that the gap was persistent in local banks, particularly state-owned banks (BUMN) and Regional Development Banks (Bank Pembangunan Daerah/BPD). They argued that this may occur as local banks were less efficient and it might be caused by the influence of ownership structure on banks' behaviour. Some studies in Indonesian banking industry confirm that banks are not working in their most efficient scale (Astiyah & Jardine 2005; Margono et al. 2010; Viverita & Ariff 2011). Furthermore, a study by Mulyaningsih et al. (2014) reveals that government banks behaved less competitive than their private counterparts due to the implicit government guarantee and facilities.

Specifically, this study investigates the demand and supply of banking credit market in Indonesia based on Rahayu et al. (2013), Wignall and Gizycki (1992), Calani et al. (2010), Guo and Stepanyan (2011), Jacobs and Rayner (2012), and Tabak et al. (2012). In the case of banking credit market model, this study will refer to Rahayu et al. (2013), Wignall & Gizycki (1992), Devarajan (2004), and Jacobs and Rayner (2012). In addition, it also aims to examine the influence of lending rates, policy rates and bonds yield, the level of efficiency, motives of credit disbursement, capital, and the influence of banks' ownership structure on the credit market in Indonesian banking industry. The finding is expected to provide valuable information for banking industry and policy maker in Indonesia particularly on understanding credit market and how to reduce the gap between credit supply and demands.

There are three contributions derived from this study particularly in the area of credit market in developing economies. First is taking into account the influence of ownership structure on credit supply as indicated in the previous study by Fungáčová et al. (2013) which revealed that state-owned bank behaved counter-cyclical in regards to lending during the economic crisis. This may imply that ownerships structure determines that supply of credit. The second contribution is capturing the impact of prudential policy for example in terms of higher capital adequacy ratio on banks supply of credit. Previous studies by Brownbridge (1998), Watanabe (2007), Francis & Osborne (2009) and Aiyar et al. (2016) revealed that tighter policy with regard to high capital reduces banks' lending capacity. Third, this study is also intended to explore the influence of market structure and banks' performance on credit. Studies by Jesus & Gabriel (2006) and di Patti & Gobi (2002) highlight that market structure and banks' efficient performance determine credit supply. Banks lend more in a more competitive environment. Moreover, merger banks are able to improve their efficiency level, enabling them to increase supply of credit.

Hence, two research questions to be raised are: (i) what are the factors determining of banking credit model in Indonesia; and, (ii) what are the influence of the price level, price of substitute products, efficiency, capital, and banks' ownership structure, and macroeconomic factors on the credit market in Indonesian banking.

The paper is organized as follows. Part II discusses the existing literature on the determinants and the equilibrium model of supply and demand of credit. Part III illustrates the empirical strategy, data and variables. Part IV discusses the results of the main regression, which is followed by conclusions and policies implications.

LITERATURE REVIEW

Financial Intermediary Institution

The majority of literature and articles in financial institution emphasized the importance of financial institutions' role in allocating the fund from surplus unit, as a depositor, into deficit unit in the form of loans (Stiglitz & Greenwald 2003; Güner 2003; Mishkin 2001; Saunders & Walter 1994; Bernanke & Blinder 1988). The important role of financial institution is known as financial intermediaries function.

A theory proposed by Diamond and Dybvig (1993) and Diamond (1984) on the financial intermediation show that banks and other financial intermediaries are able to solve the incentives and information problems which usually exist in the relation of depositors and investors. The financial institutions can manage those problems better compared to capital market or non-financial institutions (Becker & Victoria 2011). They argued that banks are unique particularly in terms of their assets. They can act as delegated monitors (Diamond 1984). In the investment projects, for example, banks might perform as monitors. In addition, banks have access into investment. This could not be done by the capital market. Insukindro (1990) studied the

Indonesia credit market by using Indonesia monetary variables between 1969 and 1987. He found that the main determinant of credit demand is transaction motive. It is in line with the assumption that the income of economy players limits the demand of bank's credit. Moreover, the study found an indication that profit motive underlie the welfare maximization in banking sector. Banks respond on the changes of bank's reserves and local private income.

According to Bernanke and Blinder (1988), banks role as an intermediation institution is a special function. Bernanke and Blinder (1988) developed the frame of simple IS-LM model to explain their view on the policy transmission mechanism of Central Bank. The model describes the transmission of Central Bank policies through banks assets and banks liability. They justified the credit view theory that financial institution has a special function as financial intermediary particularly where asymmetry information exists. In accordance with Bernanke and Blinder (1988), Saunders and Walter (1994) emphasized the importance of financial institution as financial intermediary in the economy where there is an excess of fund in one side (loan supply) and shortage of fund in the other side (loan demand). The existence of monitoring cost, liquidity cost and price risk of holding money has encouraged individuals to select the right financial institution than invest their money into the capital market. In the latter the possibility of asymmetry information occurrence is very high.

Money Market, Credit Market and the Market Equilibrium of Loans

The dispute on the role of money and credit to economy is still taking place. The controversy started since Patinkin (1956) proposed his idea to divide assets ownership into three which are money, bonds and loans. The underlying reason of the assets division is the assumption that those assets are not a perfect substitution and there is no credit rationing. This conclusion is similar with study by Bernanke and Blinder (1988). The study by Bernanke and Blinder (1988) had been able to develop the IS-LM model representing the equilibrium of the two portfolios which are holding money and bonds.

Bernanke and Blinder (1988) assumed that creditors and debtors select between bonds and loans with regard to the interest rates applied for those two instruments. If ρ is the credit interest rates, i is the bonds interest rates, and y is income, thus the demand of credit is $L^d = L(\rho, i, y)$. As income (PDB) increases the demand on credit also increases for financing the working capital and liquidity purposes.

In order to understand the supply of loans, they simply described the banks' balance sheet. Assets consist of reserves (R); bonds (B^b); loans (L^s) and liability consists of deposits (D). If reserves consist of desired reserves (τD) and excess reserves (E) thus the banks constraints is becoming $B^b + L^s + E = D(1 - \tau)$. Assuming that portfolio provision desired is reliant to assets return (where excess reserves are zero), we will have $L^s = \lambda(\rho, i)D(1 - \tau)$, where it has similar equation for B^b and E . Therefore, the equilibrium in credit market is formulated as:

$$L(\rho, i, y) = \lambda(\rho, i)D(1 - \tau) \quad (1)$$

Money market is described by using conventional LM curve. If the reserves are equal to $\tau(i)D(1 - \tau)$, the supply of credit (by ignoring the cash) is equal to banks reserves (R) multiplied by money multiplier $m(i) = [\tau(i)D(1 - \tau) + \tau]^{-1}$. The demand of savings is determined by the transaction motive. It depends on interest rates, income, and total wealth and its value is constant of $D(i, y)$. The equilibrium in money market is then presented in Equation-2 as follows:

$$D(i, y) = m(i)R \quad (2)$$

Implicitly $D(i, y)$ and $L(\rho, i, y)$ define the demand of non-bank on bonds as the demand of money plus the demand of bonds and minus the demand of loans.

The remaining market is goods market described in the conventional IS curve and written as Equation-3

$$y = Y(i, \rho) \quad (3)$$

by using Equation-2 to replace $D(1 - \tau)$ in the right hand side from Equation-1 with $(1 - \tau)m(i)R$. Then, Equation-1 can be resolved for ρ as a function of i, y , dan R :

$$\rho = \Phi(i, y, R) \quad (4)$$

finally, by substituting Equation-3 to Equation-4 we will produce

$$y = Y(i, \Phi(i, y, R)) \quad (5)$$

We will draw a graph called CC (Commodities and Credit) curve which has a negative slope similar to IS conventional curve. The reason of having negative slope for CC curve is the same with the IS conventional curve. Referring to Figure 1, CC curve is similar to IS curve if loans and bonds are perfect substitutions. Thus, the borrower will be $L\rho \rightarrow -\infty$ and lenders will be $\lambda\rho \rightarrow -\infty$. Or it may behave like IS if the demand of commodity is not sensitive to credit interest rates ($Y\rho = 0$). In this situation the credit market is not relevant to IS-LM. This phenomenon is known as money view. On the other hand, if money and bonds are perfect substitutions ($D_i \rightarrow -\infty$), the LM curve will be horizontally shaped. It is known as credit view and Keynes considered it as liquidity trap.

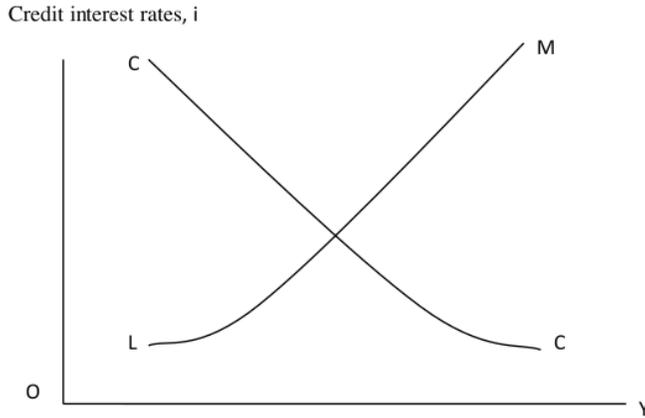


FIGURE 1. The Relationship between LM and CC

The study conducted by Bernanke & Blinder (1988) compared the impact of shock in the money market and credit market to output in the 1980s. They concluded that the impact of money market on the output is larger than the credit market. The study implies that the role of credit is more stable than money.

Korteweg & Loo (1977) developed Brunner-Meltzer model in order to explain the demand and supply of money and credit in the open economy. There are at least three variables determining banks and individuals' rational portfolio which are: (i) return and alternative cost of portfolio selection; (ii) financial and monetary policies from monetary authority including its portfolio behavior and control instrument such as reserve requirement, maximum level of loans and interest rates regulation; and, (iii) predetermined variables, such as real phenomenon and balance sheet identity (Korteweg & Loo 1977).

Stiglitz and Greenwald (2003) developed a model to analyze the supply and demand of credit. The model includes the credit market equilibrium into IS-LM model by assuming no perfect substitution in the assets market. In addition, there are at least two types of assets in the assets portfolio (Stiglitz & Greenwald 2003; Bernanke & Blinder 1988; Tobin & Golub 1998; Patinkin 1956).

Stiglitz and Greenwald (2003) argued that supply of loans is a function of credit interest rates (r), interest rates of government bonds (ρ) (as it affects the size of deposits, capital stock (K), stock capital of firm (K_f), nature condition (z), reserve requirement or other types of regulation (q), and national income (y). National income is a flow variable and it can be included into variable z . However, in order to make the difference between the model and the standard IS-LM model, they should be separated.

$$L_s = L_s(r, \rho, y; z, K, K_f, q) \quad (6)$$

Supply of loans relies on banks' capital and firms' capital K_f . The dependence between supply and loans and firms' capital can be explained as the value of r is fixed, the lower K_f induces higher probability of default of payment. Furthermore, it will reduce the size of loans. By using the similar method, in the simple model, the demand of loans is a function of r , y , and z , as below model

$$L_d = L_d(r, Y; z, K_f) \quad (7)$$

Bank and households have a demand on T-bills. The size of demands depends on return gained from T-bills:

$$T = T(r, \rho, y; z, K, K_f, q) \quad (8)$$

The size of T-bills invested by banks depends on the demand and capacity of banks to manage the risk as well as other variables. In the case of perfect competition in saving banks market, it was argued that banks do not have T-bills. As such, those variables would not appear in the T-bills equation.

In the case of the absence of credit rationing, the supply and demand of credit determine the market equilibrium. Therefore, the market equilibrium for credit will be

$$L_d = L_s \quad (9)$$

and the equilibrium in the T-bills market is

$$T(r, \rho, y; z, K, K_f, q) = T_s \quad (10)$$

where T_s is a supply of T-bills which is controlled by government or monetary authority. We can simultaneously solve Equation-10 and 11, where ρ and r are a function of y :

$$\rho = \rho[y; z, K, K_f, q] \quad (11)$$

$$r = r[y; z, K, K_f, q] \quad (12)$$

then we can substitute Equation-12 to 10. We will have a monetary equilibrium curve. It is simply known as L^*M^* curve which is developed as traditional LM curve.

There is an alternative formulation as below,

$$\xi = r - \rho$$

ξ is a *spread* between credit interest rates and savings interest rates. We can in turn solve Equation-9 and 10 simultaneously to assess ξ and r in Equation-12.

$$\xi = \xi [y; z, K, K_f, q] \quad (13)$$

The demand of credit depends on the credit interest rates and the supply of credit depends on the deposits interest rates. We can derive IS curve through the relationship between investment and savings on interest rates. Investment level depends on credit interest rates and savings depends on deposits interest rates.

Some studies also highlighted the influence of ownership structure in explaining the banks' credit behaviour. Fungáčová et al. (2013) observed the credit supply during financial crisis. They examined the credit supply across banks with different ownership structure. They found that crisis led to lower credit supply particularly for foreign-owned banks. Meanwhile, the reduction of credit supply was much lower in the state-owned banks. Their findings are supported the hypothesis that foreign banks have lack of loyalty especially during the crisis. On the other hands, state-owned banks are positioned as main supporters of state interest to support the economy especially during the economic downturn.

The behavior of state-owned banks in extending lending was also observed by Dinç (2005). In addition to macroeconomic variables and banks characteristics, such as banks' size and their capital ratio, the lending growth of government banks are also influenced by the election period. During the election, the lending of government banks was being used as political tools to generate support and punish the opponents of the incumbents.

Furthermore, the supply of credit of banking sector is determined by the degree of prudential regulation. During the recovery period after financial and economic crisis, the regulators preferred to introduce tighter regulations, for example Basel Accord that introduced higher capital ratio and risk based capital, an increase of reserve requirement and loan loss provision. Brownbridge (1998) concluded that imprudent regulation has contributed to an increase of non-performing loans due to bad lending. In addition, Watanabe (2007) after crisis, economy experienced credit crunch as banks were reluctant to disburse loans as lending quality was lowered. In addition, prudent regulation implemented by regulators after crisis has also lowered credit supply by banking sector (Francis & Osborne 2009). On the other hand, a recent study by Aiyar et al. (2016) discussed the respond of credit supply of both monetary policy and minimum capital requirements. They concluded that banks in the UK had lowered their lending during the tightening of capital requirements and monetary policy. Fang et al. (2018) also underlined the role of higher capital adequacy ratio in lowering banks supply of credit even though the impact was merely short.

Banks' credit supply is determined by the market structure and banks efficiency. Jesus & Gabriel (2006) employed the measures of market structure to examine banks' credit supply. Competitive market induces banks to enhance their lending. However, an expansionary credit policy may pose higher loan losses if banks take risky projects and experience imperfections of equity market and maturity mismatches.

The supply of credit is also determined by the efficiency level of banks. More efficient banks are capable to either minimize their cost or maximize their output, which is referred to technical efficiency. In this regards, banks operation is more cost efficient thus banks are capable to disburse more lending. A study by di Patti & Gobi (2002) examined specifically the impact of merger and acquisition in the banking sector on credit to business in Italy in the 1990s. Their study supported the notion that merger and acquisition improved banks efficiency and banks' capability in disbursing their lending. Particularly, the study found that corporate borrowers gained positive impact from the lenders acquisitions or mergers as they experienced an increase in the credit availability. Moreover, the study suggested that an increase in banks' efficiency generated by mergers and acquisitions would improve their capability in lending efficiently by reallocating credits from borrowers that experienced excess lending to those confronted with credit shortage.

METHODOLOGY

With focus on banking credit market in Indonesia between 2005 and 2014 that experienced credit crunch and undisbursed lending, this study examines the conventional banks' credit demand and supply by observing all 101 banks. The secondary data, which were collected from Indonesia Bureau of Statistics (BPS) and Financial Service Authority of Indonesia (Otoritas Jasa Keuangan/OJK), comprised demand and supply of credit, interest rate of credit, Gross Domestic Product (GDP), operational cost and operational revenue, inflation rate, interest rate of central bank, and Capital Adequacy Ratio (CAR).

The empirical strategy is taken by modifying the banking credit model introduced by Rahayu et al. (2013) by adding efficiency and ownership structure and estimates using seemingly unrelated regression to manage the problem of simultaneity originating from the dependence between volume of credit and credit interest rates in the demand and supply equations. If there is a correlation between residuals in the equations, the estimation of Zellner SUR is preferred compared to the Ordinary Least Square or OLS (Gujarati & Porter 2009; Tatoğlu et al. 2017). The SUR technique run the Generalized Least Square (GLS) that produces more efficient estimators than the OLS. The correlation between the residuals is tested by using Lagrange Multiplier (LM) test (Breusch & Pagan 1979). The null hypothesis states the correlation (covariance) between residuals is zero. The test shows that the Breusch Pagan test of independence $\chi^2(1)$ is 40.392 and the probability to reject the null hypothesis is 0.000. This implies that the covariance of residuals is more than 0 showing that the residuals are correlated.

The detailed information of variable definition and proxies employed to measure the variables are available in Table 1 below.

Credit demand (of banks):

$$L_{it}^D = \alpha_0 + \alpha_1 r_{Lit} + \alpha_2 INF_{it} + \alpha_3 KURS_{it} + \alpha_4 Y_{it} + \alpha_5 YGAP_{it} + u_{it} \quad (14)$$

Credit supply (from banks):

$$L_{it}^S = \beta_0 + \beta_1 r_{Lit} + \beta_2 r_{SBI_{it}} + \beta_2 r_{SUN_{it}} + \beta_3 CAPL_{it} + \beta_4 CAR_{it} + \beta_6 IP_{it} + \beta_7 SHARE_{it} + \beta_7 EFI_{it} + \beta_{21} DGOV_{it} + v_{it} \quad (15)$$

$$L_{it} = \min(L_{it}^S, L_{it}^D) \quad (16)$$

TABLE 1. Operational Definition and Proxies of Variables

Variable	Description
L_{it}^D = volume of demand for credit	Total credit measured by the outstanding of credit by the end of year disbursed by conventional banks. Data is collected from financial reports published by the Financial Service Authority of Indonesia (OJK). The outstanding credit is in the real values by dividing the credit volume with the consumers' price index. Further, the variable is transformed to logarithmic form.
r_L = credit interest rates (real)	Credit interest rates is defined as an average credit interest rates for working capital of all conventional banks. In order to generate real value of credit interest rates, this study subtract the rates with inflation rates in the corresponding year. The interest rates data is collected from the statistics published by the Central Bank.
r_{SBI} = credit rates of certificates of Bank Indonesia (SBI)	Interest rates of Bank Indonesia certificates. The data is collected from the Central Bank.
r_{SUN} = yields of government bonds	Yields of 5-years Indonesian Government Bonds. The data is collected from the https://id.investing.com/rates-bonds/indonesia-5-year-bond-yield-historical-data
INF = Inflation expectation	Expectation to the inflation is defined as year on year inflation based on December data. The inflation rates are calculated using the Consumers' Price Index (Indeks Harga Konsumen/IHK) with base year of 2007 as formulated below: $INFL_t = (IHK_t - IHK_{t-1}) / (IHK_{t-1}) * 100\%$ The data is collected from Indonesia Bureau of Statistics.
FX = Foreign Exchange (KURS)	Foreign exchange rate of Indonesia Rupiah (IDR) to US Dollar by the end of the year. A higher values of FX indicates depreciation of local currency to the international currency of the US Dollar.
Y = National Income	Yearly national income is represented by the Gross Domestic Product (GDP) in real value after divided by the consumers' price index. Further, the variable is transformed to logarithmic form.
YGAP = Output Gap	The gap of output is defined as the actual Gross Domestic Product (GDP) subtracted by the potential GDP. This values are generated using the Hodrick-Prescott filtered. If the actual GDP is lower than the its potential, the gap will be negative so firms will increase their capital using loans from banks.
L_s = volume of supply of credit	Total credit measured by the outstanding of credit by the end of year disbursed by conventional banks. Data are collected from financial reports published by the Financial Service Authority of Indonesia (OJK). The outstanding credit is in the real values by dividing the credit volume with the consumers' price index. The variable is then transformed to logarithmic form.
IP = Production Index of manufacturing sector	The production index is a proxy of borrowers' ability to repay their debts. It is measured by using the production index of the manufacturing sector published by the Indonesia Bureau of Statistics.
CAP = loanable funding capacity	The loanable funding capacity representing the banks capacity to disburse loans. It is calculated by subtracting total assets to reserve requirement, cash in vault, and government bonds within banks investment portfolio (Zulverdi et al. 2004).
CAR = Capital Adequacy Ratio	CAR is the minimum capital held by banks in order to comply the minimum reserve of the regulators.
EFI = total efficiency score	Banks efficiency score which is comprised of technical and allocative efficiency generated by the Data Envelopment Analysis (DEA).
Variable	Description
DGOV = Dummy for government banks	Government banks are defined as those at least 25 percent of the shares are owned by the Central Government. The Indonesian Law on limited liability company states that the major shareholders are those owned at least 25 percent of shares in the business entity.
Share = market share	The share of bank i in the industry. It is calculated by dividing the assets of bank i to total assets of banking industry in the particular year.

EMPIRICAL RESULTS

This section discusses the empirical findings on the determinants of demand and supply of credit of conventional banks in Indonesia between 2005 and 2014. The first part describes the descriptive statistics of all relevant variables. There are one

hundred and one conventional banks in the Indonesian banking industry and this number was only a half of the total number of banks prior to the 1997/ 1998 financial crises. The population of banks was significantly lower due to banks' closure, mergers and acquisitions and banks collapsed. This study captures all conventional banks in the industry. Thus, of ten years of the study period, the total number of observation is 1,010 capturing 101 banks.

The volume of demand is equal to the volume of credit supply. Using the base year of 2007, on average the volume of credit disbursed by conventional banks was IDR 136 billion. The largest lending disbursement was IDR 3 trillion. In terms of lending rate, on average between 2005 and 2014 the price of funds was 13.4 percent or 7.88 percent in real value after subtracting with the rate of inflation. Meanwhile, the interest rates of central bank certificates (SBI) was 7.98 percent or only 2.45 percent in real value. The yield rate of government bonds was 7.26 percent on average or 1.74 percent in real value. The central bank certificates and government bonds are perceived as having lower risk and so the returns were lower than risky portfolio of lending.

In terms of macroeconomics conditions, Indonesia experienced double digits inflation in 2005 of 17 percent, and it lowered in the later period and the average inflation was 7.2 percent. As the inflation rates was relatively high, the real interest rates were corrected significantly. The currency of Indonesian Rupiah (IDR) to US Dollar was 9,944 on average and it was depreciated to 12,440 in 2014. With regard to national income, on average Indonesia's income was IDR 2,150 trillion or 17.6 trillion in real values using the base year of 2007. The GDP gap shows the difference between actual GDP and its potential. On average, Indonesian output gap was positive, i.e., 2,290 indicating that the economy performed above its potential with the average production index of manufacturing sector being 4.676.

TABLE 2. The Descriptive Statistics of Credit Volume, Interest Rates, Macroeconomics Indicators and Banks' Characteristics

Variable	Unit	Observation	Mean	Std. Dev.	Minimum	Maximum
Credit Volume						
LD	Billion IDR	1,010	17,600	47,800	1,229	490,000
LD (real)	Billion IDR	1,010	136	345	0.01	3,082
LS	Billion IDR	1,010	17,600	47,800	1,229	490,000
LS (real)	Billion IDR	1,010	136	345	0.01	3,082
Interest Rates						
rSBI	Percent	1,010	7.975	2.027	5.75	12.750
rSBI (real)	Percent	1,010	2.455	4.166	-2.515	12.750
rL	Percent	1,009	13.400	2.088	7.900	16.950
rL (real)	Percent	1,009	7.877	4.047	1.463	16.950
rSUN	Percent	1,010	7.262	3.167	0	11.997
rSUN (real)	Percent	1,010	1.742	2.697	-0.661	6.998
Macroeconomics						
Consumers Price Index	Unit	1,010	122.331	20.024	94.436	159.11
Inflation	Percent	1,010	7.232	4.318	2.288	17.124
Variable	Unit	Observation	Mean	Std. Dev.	Minimum	Maximum
FX	IDR	1,010	9,944.6	1,214.465	8,991	1,2440
Y	Trillion IDR	1,010	2,150	379	1.6	2.8
Y (real)	Trillion IDR	1,010	17.6	0.424	16.998	18.317
YGAP	Billion IDR	1,010	-0.0002106	3,0439.52	-46,901.65	46,084.81
YGAP (real)	Billion IDR	1,010	2.29E-06	337.8587	-472.9713	568.3096
IP	Unit	1,010	4.676	3.145963	-2.21	8.15
Banks Characteristics						
CAR	Percent	997	25.78	23.87	0	489.58
CAP	Billion IDR	1,010	23,900	61,100	-4,236	609,000
CAP (real)	Billion IDR	1,010	187	450	-33	3,827
EFI	Unit	1,010	0.455	0.2514438	0.061	1.00
Dgov	Dummy	1,010	0.039604	0.1951235	0	1
Share	Percent	1,010	.9902475	2.419686	0	18.62

The Indonesian banks had been able to comply with the minimum capital requirement. On average, banks recorded 25 percent of the Capital Adequacy Ratio (CAR). This indicates that banks were keen to keep the buffer sufficiently. Regarding to the capacity lending, Indonesian banking on average had available loans to be disbursed amounting to IDR 187 billion in real values. The levels of Indonesian banking efficiency were varied. However, on average banks recorded efficiency score of 0.45 using 0 to 1 scale where higher score indicates better efficiency performance. Meanwhile, some banks recorded low efficiency score where the lowest reached 0.061. Finally, the means of market share of Indonesian bank was 0.99 percent where the biggest bank owned 18.62 percent and the smallest had almost negligible share in the industry.

The next part of this section discusses the determinants of demand and supply of credit from the conventional banks. The models perform quite well as most of explanatory variables are significant statistically in explaining the demand and supply of credits. As discussed previously, this paper employs the Seemingly Unrelated Regression (SUR) approach to manage the simultaneity issue of the volume of demand and supply. As with the demand for credit, it was negatively influenced by lending rate. This finding is consistent with the theory that as the interest rate gets higher, the demand for

credit will be lower as the price is getting more expensive. Hence, the demand for credit was also influenced by the yields from government bonds. The estimation reveals that higher yields contributed to higher demand for credits.

TABLE 3. The Empirical Results of Demand and Supply of Credit using the Seemingly Unrelated Regression (SUR)

Equation	Obs	Parms	RMSE	R-sq	chi2	P
Log LD (real)	990	7	1.795517	0.054	50.03	0
Log LS (real)	990	8	0.4640825	0.9368	14496.28	0
Log LD (real)						
rL (real)	-0.0887037	0.0217561	-4.08	0	-0.1313448	-0.0460625
rSUN(real)	0.1595468	0.0831753	1.92	0.055	-0.0034738	0.3225674
LogY (real)	40.77031	18.70576	2.18	0.029	4.107705	77.43292
	Coef.	Std. Err.	Z	P>z	[95% Conf. Interval]	
YGAP (real)	-0.0019488	0.0009806	-1.99	0.047	-0.0038707	-0.0000269
Inflation	0.1186855	0.0634931	1.87	0.062	-0.0057588	0.2431297
FX	-0.0001431	0.0001228	-1.17	0.244	-0.0003838	0.0000975
IP	-0.0210988	0.0286606	-0.74	0.462	-0.0772726	0.035075
_cons	-387.1114	182.1638	-2.13	0.034	-744.1458	-30.0769
Log LS (real)						
rL (real)	0.023899	0.0098439	2.43	0.015	0.0046052	0.0431927
rSBI (real)	-0.0505406	0.009195	-5.5	0	-0.0685625	-0.0325187
rSUN (real)	-0.0268699	0.0059943	-4.48	0	-0.0386185	-0.0151212
CAR	-0.0076072	0.0006954	-10.94	0	-0.0089701	-0.0062442
LogCAP (real)	0.5870223	0.0760935	7.71	0	0.4378817	0.7361628
EFI	-0.0006421	0.0106206	-0.06	0.952	-0.0214581	0.0201738
Dgov	0.1007855	0.1058324	0.95	0.341	-0.1066422	0.3082133
Share	0.86591	0.0123453	70.14	0	0.8417137	0.8901064
_cons	0.8869467	0.1520293	5.83	0	0.5889748	1.184919

The Macroeconomic Conditions had a substantial impact on the demand for credit as shown by the empirical results. The Gross Domestic Product (GDP) has substantial impact on demand for lending where the coefficient was 40.77 and it was significant at 5 per cent significance level. The gap of GDP has a negative influence to the demand for credit as predicted by theory. This indicates that as the actual GDP was lower than its potentials, firms would increase their capital using loans from banks. The demand for loans was in turn influenced by inflation rates. A higher rate indicates higher expectation of inflation and this induces firms to demand for loans.

The lending supply was determined by price level of its product and substitute products. A higher lending rate provides larger incentives for banks to disburse more loans. In addition, higher rates of SBI and yields of government bonds would lower supply of lending. This finding underlines that Indonesia banking portfolio is comprised of loans, SBI and government bonds. An increased price of substitute products lowers the lending rate relatively and reduces the lending supply accordingly. The supply of lending was also influenced by the Capital Adequacy Ratio (CAR) where higher CAR would contribute to banks' lower lending capacity. In turn, higher lending capacity would affect lending supply positively. In sum, larger banks were found to have higher supply of credit than the smaller ones.

The estimation results show that almost all the coefficients of parameters are statistically significant. This implies that the coefficients of parameter estimate of the model are consistent with the theory. Moreover, the chi-square of the models is also statistically significant so that all coefficients of the model have an impact on dependent variables simultaneously. The coefficient determination is sufficient to describe the variation of dependent variables explained by independent variables in the model, although they are too small in the demand function. As the disturbance error of the model is small, it means that the model is accurately estimated.

CONCLUSION

As mentioned previously, this study aims to understand the behaviour of conventional banks' supply and demand of credit in Indonesia between 2005 and 2014, a period after recovery from financial crisis in 1997/1998. An equilibrium model of credit market developed by Bernanke & Blinder (1988) is employed as the basis to understand the behaviour of credit supply and demands. They argued that demand and supply of credit are determined by rates of credit and bonds. Thus, creditors and debtors select between bonds and loans regarding to the interest rates applied for those two instruments. This study supports Bernanke & Blinder (1998) where in the case of Indonesian banking, demand and supply of credits are determined by rates of lending and yields of bonds. In addition, supply of credit is also determined by the rates offered by the SBI. A higher rate of lending induces banks to lend more while lowering the demand for credit. Government bonds and SBI are the substitute of loans, thus as the bond yields and SBI rates increase, the supply of credit lowered.

This study also reveals that prudential regulation, for instance, by increasing the capital adequacy ratio (CAR) has even dampened the banks capability to supply lending. The finding also shows that higher lending capacity improves banks

supply of credit. In addition, larger banks are proved able to supply more credit than the smaller ones. In sum, the macroeconomic conditions had a substantial impact on the demand for credit while the GDP and inflation have positive impact on demand for credit. In addition, the existence of output gap enhanced the demand for loans. The demand for loans was in turn influenced by inflation rates.

The policy recommendations derived from this study as follow. The regulator should consider the impact of prudential policy specifically in terms of increasing capital adequacy ratio (CAR) in lowering lending of banks. During the observation period, the central bank increased the level of CAR to be complied by conventional banks from 8-11 percent in 2012 to 8-14 percent in 2013. The level of capital is higher for banks with higher risk profile. This policy imposed cost for economy in terms of lower lending from banking industry. Second policy implication is related to the importance of capacity lending and share of banks in the industry in enhancing supply of credit. The current consolidation policy that encourages banks to merge may contribute to larger banks' share and their lending capacity. These are essential to increase credit supply. Lastly, this study highlights the role of pro-growth polices in enhancing demand for credit. Government should prioritize policies related to productivity improvement for example technology enhancement, tax incentives for business, simplification of procedure for investment and trade and human capital development to boost economic growth.

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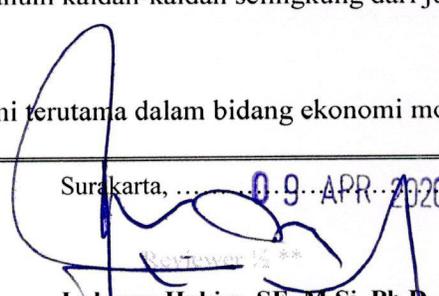
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