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PRO-CYCLICALITY OF SMALL AND MEDIUM ENTERPRISE (SME) LOANS ACCORDING TO FINANCING TYPE BASED ON PURPOSE: EVIDENCE FROM KOREAN BANKS

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ABSTRACT

An empirical analysis is conducted on the pro-cyclicality of SME loans based on purpose, which has not been examined in previous research. In this study, the purpose of SME loans is divided into four types: total SME loans, long-term loans for investment in equipment, long-term loans for R&D investment, and short-term loans for working capital. The aim of the study is to determine whether pro-cyclicality exists in the four types of loans. In particular, it is expected that because of the high-risk weight considered in estimating credit risk, the number of long-term loans may have decreased in the economic distress experienced since 2006, when the Basel II accord came into effect. At that time, most banks adopted the advanced internal rating approach to calculate borrowers' credit risks. This study is based on the assumption that the risk weight of long-term loans is different from that of short-term loans. The GMM model is adopted to test the pro-cyclicality of long-term and short-term loans. The test results showed significant pro-cyclicality in long-term loans for investment in equipment and R&D. Second, there was no pro-cyclicality in short-term loans for purchasing raw materials. Third, the financial characteristics affecting the lending behaviour of banks were indicators of profitability and financial soundness of credit. Based on the results, effective policies are recommended, such as credit enhancement through credit guarantees, in order to alleviate the effects of pro-cyclicality on long-term loans.

Keywords: pro-cyclicality, the purpose of SME loans, advanced internal rating approach, lending behaviour

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INTRODUCTION

In the banking sector, pro-cyclicality is defined as variations in the granting of credit according to variations in the real business cycle. Thus, the phenomenon of granting credit is increased or decreased when the business cycle is expanded or depressed, respectively. Bernanke and Gertler (1990) showed that information asymmetry between borrowers and lenders leads to pro-cyclicality. In particular, small- and medium-sized loans, such as SME loans, have information asymmetry because little information is available to judge the credit condition of an SME. From the bank's perspective, a high credit risk indicates the probability of default on the loan. Craig, Davis, and Pascual (2006) and Seo (2013) found evidence of pro-cyclicality in SME loans. Craig et al. (2006) pointed out that excessive pro-cyclicality was the main reason for financial crises.

In response to the financial crisis of 2008–2009, a new capital regulation called Basel III has come into effect. Basel III includes the steps required for the regulation of capital buffers and of loan-to-deposit ratios to alleviate the effects of pro-cyclicality. In particular, the regulation of capital buffers to alleviate pro-cyclicality requires banks to secure capital in addition to the minimum amount of capital against future financial crisis, as suggested by the Bank for International Settlements (BIS). According to the regulation of capital buffers, until 2019, Korean banks are supposed to secure additional capital that is 2.5% of the capital buffer. The loan-to-deposit ratio regulation has been in effect as the macro-prudential regulation by the Korean financial authority for the management and evaluation of Korean banks since November 2008. This regulation requires that the range of average loan balances is restricted to 100% of the average deposit balance in order to sharply reduce the number of SME loans during the economic depression.

However, despite Basel III, Korean banks have a high sensitivity to credit risk because they tend to retrieve SME loans quickly when the risk management strategy detects signs of default. The banks' risk aversion behaviour is based on their adoption of the advanced internal rating approach, which occurred after the regulations of Basel II were implemented in 2006. The advanced internal rating suggested by Basel II regulates banks to estimate expected losses by multiplying exposure at default by probability of default and the 1-recovery ratio. Thus, banks encounter big differences between the expected losses of long-term loans and short-term loans even though borrowers have the same credit rating; the only difference is the extent of the loan period. Hence, compared with short-term loans, the expected losses on long-term loans will be higher than on short-term loans because of the higher balances and lower recovery ratios of long-term loans.

Under Basel III, the regime of advanced internal rating in credit risk management is still effective. Accordingly, in order to alleviate pro-cyclicality, Korean banks may manage credit risk using risk-aversion because of the internal rating scheme initiated by Basel II despite new regulations, such as the capital buffer and the loan-to-deposit ratio. In the light of the feature of credit risk management within Korean banks, it assumed that a difference exists between the pro-cyclicality pattern of long-term loans and short-term loans in the Korean SME loan market. Thus, the lending behaviour of Korean banks differs according to the loan period.

The current study analyses the pro-cyclicality of SME loans according to the purpose of the loan. Most SMEs raises funds to invest in equipment and research and development (R&D) on the long-term basis. Generally, short-term loans are used to pay salaries, and are used for working capital. Banks also established internal regulations to increase the flexibility of SME loans by restricting the maximum loan period depending on the usage of the loan. Loans for working capital and R&D are one year and up to ten years, respectively. Based on the internal regulation of Korean banks, the current study classifies loans into four categories: (1) total loan (*SME*); (2) loans for working capital used to purchase raw materials (*WorkM*); (3) loans for equipment investment (*InvE*); and (4) loans for R&D (*InvRD*). These categories are used to analyse lending behaviour in business cycles under the Basel regulations.

THEORETICAL BACKGROUND

Basel II, the new Basel accord, provides guidelines that banks must use to estimate minimum requirement capital by subdividing the credit ratings of borrowers, which were used before the implementation of the accord. Since 2006, most Korean banks estimate risk weights by using the loan balance upon bankruptcy, expected default rate, and loss in default. It is assumed that this advanced internal rating approach increased risk sensitivity because long-term loans are more disadvantageous in estimating risk weight than short-term loans are. Thus, the implementation of Basel II leads to intensifying the risk aversion to SME loans in Korean banks depending on business cycles.

However, risk-aversive lending behaviour by Korean banks may exacerbate the pro-cyclicality of loans. The pro-cyclicality of SME loans may be distinctive, depending on the loan period (Borio, Furfine, & Lowe, 2001; Sala & Saurina, 2002; Lowe, 2002; Bliss & Kaufman, 2002; Catarineu-Rabell, Jackson, & Tsomocos, 2003; Pain, 2003; Kashyap & Stein, 2004; Estrella, 2004; Lindquist, 2004;

Allen & Saunders, 2004; Berger & Udell, 2004; Jimenez & Saurina, 2006; Craig et al., 2006; Seo, 2011). Previous empirical studies found that adherence to the new Basel accord intensified the pro-cyclicality of SME loans. In their panel regression of 300 banks in 11 Asian countries, Craig et al. (2006) found evidence that the pro-cyclicality of SME loans had been exacerbated by the new Basel accord. In a recent study using Korean data from 1999 to 2008, Seo (2013) showed that the pro-cyclicality of SME loans increased, but there was no pro-cyclicality in large enterprise loans. Previous research examined the effects of lending behaviour on pro-cyclicality by classifying enterprise loans into SME loans and large enterprise loans.

Based on their research, Cavallo and Majnoni (2001), Segaviano and Lowe (2002), and Seo (2012) recommended that the provision system should be changed to alleviate the pro-cyclicality of bank loans. In particular, Seo (2012) suggested a forward-looking provision system, in which banks would reserve sufficient provisions on bad debt based on the expected loss when the economy expanded. Seo (2012) also showed evidence that the forward-looking provision system contributes to alleviating the pro-cyclicality of SME loans that have high credit risk and information asymmetry. This evidence implies that banks without sufficient provisions based on expected losses would show risk-aversive lending behaviour in response to the high-risk sensitivity of SME loans.

Craig et al. (2006) and Seo (2013) recommended the estimation method for pro-cyclicality by testing the significance of coefficient of loan change rates to gross domestic product growth rates. Based on a review of the relevant literature, Seo (2013) also pointed out that banks' financial characteristics affect the lending behaviour of Korean banks, including capital adequacy, financial soundness, and profitability. Berrospide and Edge (2010) argued that capital adequacy, such as the BIS, ratio plays a pivotal role in alleviating the uncertainty of bank loans. Ryu and Park (2010) supported the findings of Berrospide and Edge (2010). Aggarwal and Jacques (2001) insisted that financial soundness, such as the non-performing loan ratio, affects loan changes because it is an influential factor in estimating credit risk. In addition, Stolz and Wedow (2011) argued that the profitability of banks affects the minimum required capital and the level of capital buffer.

Previous theoretical studies on the pro-cyclicality of SME loans found that it has increased since the implementation of the new Basel accord. However, after the announcement of Basel III, few studies have examined the pro-cyclicality of SME loans depending on the purpose of the funds. Accordingly, the current study conducts an analysis to determine whether the purpose of the funds has affected pro-cyclicality of SME loans use since the adoption of Basel III.

DATA AND MODEL

Data

The current study used raw data on bank loans, the macro economy, and financial market in Korea in order to determine whether the pro-cyclicality of SME loans is affected by the purpose of the funds. The data were collected the Statistics Database of Small and Medium Business Administration, the Economic Statistics System of the Bank of Korea, and the Financial Statistics Information System of the Financial Supervisory Service. Raw data on bank loans to SMEs executed by 15 banks were collected for the period 2006, when the new Basel accord was implemented, to 2014. The data analysis focuses on the subdivisions of borrowers' credit ratings.

The dependent, independent, and control variables are presented in Table 1. As the table shows, the dependent variables are Total SME loans, loans for working capital used to purchase raw materials, loans for equipment, and loans for R&D. Each dependent variable represents the loan change according to the purpose of the loan in terms of SMEs. Natural logarithms are used to calculate the differential variables in the loan data. The independent variables of GDP rate, BIS ratio, net interest margin (NIM), and non-performing loan ratio (NPL) are included in the empirical test model. The market rate and default rate are used as control variables, and the business survey index is applied as an instrumental variable in the generalised method of moment (GMM).

Table 1
Definitions of variables

Variables	Definition	Contents
$\Delta SME_{i,t}$	Differentials of total SME loan	Dependent variable representing the change in total small and medium enterprise bank loan i with time t. It is calculated through adding natural logarithm to transform the variable into differentiated standardisation for data analysis as follows: $\Delta SME_{i,t} = \ln(SME_{i,t}) - \ln(SME_{i,t-1})$
$\Delta WorkM_{i,t}$	Differentials of SME loan for raw materials	Dependent variable representing the change in small and medium enterprise bank loan i with time t for raw materials as working capital. It is calculated through adding natural logarithm to make the variable transformed into differentiated standardisation style for data analysis as follows. $\Delta WorkM_{i,t} = \ln(WorkM_{i,t}) - \ln(WorkM_{i,t-1})$

(*continued on next page*)

Table 1: (*continued*)

Variables	Definition	Contents
$\Delta InvE_{i,t}$	Differentials of SME loan for investment in equipment	Dependent variable representing the change in small and medium enterprise bank loan *i* with time *t* for investment in equipment. It is calculated through adding natural logarithm to make the variable transformed into standardisation style for data analysis as follows. $\Delta InvE_{i,t} = \ln(InvE_{i,t}) - \ln(InvE_{i,t-1})$
$\Delta InvRD_{i,t}$	Differentials of SME loan for R&D investment	Dependent variable representing the change in small and medium enterprise bank loan *i* with time *t* for investment in research and development. It is calculated through adding natural logarithm to make the variable transformed into differentiated standardisation style for data analysis as follows. $\Delta InvRD_{i,t} = \ln(InvRD_{i,t}) - \ln(InvRD_{i,t-1})$
$BizCycle_t$	Business cycle for an independent variable	Proxy variable representing the business cycle or economic condition. It is calculated as the 1st differential of $\ln(GDP_t)$ removing seasonality. The proxy variable is adopted from Craig et al. (2006) and Seo (2013).
$BIS_{i,t}$	Capital adequacy ratio of bank	Proxy variable for the capital adequacy ratio based on Bank for International Settlements (BIS) rule in bank *i* with time *t*. The calculation method is as follows: $BIS_{i,t} = Capital(tier1 + tier2)_{i,t} \div Risk - weighted\_Asset_{i,t} \times 100$
$NIM_{i,t}$	Net interest margin of bank	Proxy variable for the net interest margin as the main source of profitability in bank *i* with time *t.* The calculation method is as follows: $NIM_{i,t} = (Interest\_Income - Interest\_Paid)_{i,t} \div Interest\_Bearing\_Asset_{i,t} \times 100$
$NPL_{i,t}$	Non-performing loan of bank	Proxy variable for financial soundness of bank *i* with time *t*. The proxy variable is adopted from Lee and Seo (2013). The calculation of the ratio is as follows: $NPL_{i,t} = Bad\_Debts_{i,t} \div Total\_Loans_{i,t} \times 100$
$Control(M)_t$	The level of market rate	Level of market rate, i.e. call rate, is as a control variable.
$Control(R)_t$	The level of default	Default rate in the country is a control variable.
Gindex	An instrumental variable	First differential of ln(*Business_Cycle_Index*) removing seasonality as an instrumental variable used in the generalised method of moment.
$Crisis\_Dum_t$	Dummy variable for financial crisis	Dummy variable for the global financial crisis from 2008 to 2009. The value is 1 or 0 if the financial crisis period is applied.

Model

The current study uses panel GMM methodology as expressed in Equations (1) and (2). Panel data, not time series data, are analysed because the bigger sample size of panel data, compared to time series data, increases the degree of freedom to contribute to raising the efficiency of estimation (Frees, 2004). Panel data analysis also mitigates potential problems in multicollinearity and estimation bias caused by omitted variables.

Moreover, GMM methodology is the most reliable estimation method because it does not required the distribution of residual terms. GMM methodology requires an instrumental variable (Z_i) and the orthogonality condition, $E[\mu_{i,t} Z_i] = 0$. The current study adopts the differentials of the business survey index as the instrumental variable. The appropriateness of the instrumental variable is proved by using the Sargan test, which is related to over-identification restrictions, as suggested by Arellano and Bond (1991). The test results confirmed that there was no bias in using the selected instrumental variable if the null hypothesis is that no correlation exists between the instrumental variables, and the residual term cannot be rejected statistically.

Equations (1) and (2) were designed for empirical testing. Equation (1) was used to test the pro-cyclicality of total SME loans or short-term SME loans for working capital, such as raw materials. Equation (2) was used is to determine whether pro-cyclicality existed in long-term SME loans, such as bank loan for investment in equipment or R&D. The results of Equations (1) and (2) are shown in Table 4 and Table 5.

$$\begin{aligned}\Delta SME_{i,t}\ (\Delta WorkS_{i,t}) = {} & \hat{\beta}_0 + \hat{\beta}_1\, BizCycle_t + \hat{\beta}_2\, BIS_{i,t} + \hat{\beta}_3\, NIM_{i,t} + \\ & \hat{\beta}_4\, NPL_{i,t} + Control(M)_t + Control(R)_t + \\ & Z_{i,t} + \upsilon_t + u_{i,t}\end{aligned} \tag{1}$$

$$\begin{aligned}\Delta InvE_{i,t}\ (\Delta InvRD_{i,t}) = {} & \hat{\beta}_0 + \hat{\beta}_1\, BizCycle_t + \hat{\beta}_2\, BIS_{i,t} + \hat{\beta}_3\, NIM_{i,t} + \\ & \hat{\beta}_4\, NPL_{i,t} + Control(M)_t + Control(R)_t + \\ & Z_{i,t} + \upsilon_t + u_{i,t}\end{aligned} \tag{2}$$

where:
i, t and v_t refers the numbers of cross-sectional data, time series data, and time effect to consider the time series effect of dependent variables in GMM methodology, respectively.
$Control(M)_t$ and $Control(R)_t$ mean the control variable for levels of market rate and default rate, respectively.
$Z_{i,t}$ means an instrumental variable.

RESULTS

Basic Statistics

Table 2 shows the basic statistics of the variables used in the study. No variable except for BIS was normally distributed because all Jarque-Bera statistics were significant. The mean of the change rate of total SME loans was 5.00% in a positive direction. However, the change rate of short-term loans had an average value of −2.67%, which was a negative value. In the case of long-term loans, the average change rates of SME loans for investment in equipment and R&D were −43.54% and 17.73%, respectively.

The mean GDP rate representing the business cycle was 0.8571%. The bank characteristics of capital adequacy ratio, net interest margin, and non-performing loan ratio had means of 13.88%, 2.45%, and 1.27%, respectively.

Table 2
Descriptive statistics

Variables	Mean	Median	Standard deviation	Minimum value	Maximum value	Jarque-Bera Statistic
Δ*SME*	0.0500	0.0538	0.0803	-0.1658	0.3248	6.0200**
Δ*WorkM*	-0.0267	0.1441	0.3867	-1.0430	0.4383	51.5504***
Δ*InvE*	-0.4354	0.0292	1.2147	-3.4913	0.5426	82.1622***
Δ*InvRD*	0.1773	0.2768	0.4655	-0.6210	0.8486	8.2912**
$BizCycle_t$ (%)	0.8571	0.8500	0.6123	-0.3500	1.5750	9.7796***
BIS (%)	13.8831	13.8200	1.6408	10.7100	18.0500	1.6275
NIM (%)	2.4496	2.5200	0.5850	0.2000	3.4800	31.6329***
NPL (%)	1.2704	1.1800	0.4829	0.3600	3.3400	196.2540***
Control(M) (%)	3.2064	3.0750	1.0700	4.7825	1.9850	11.8577***
Control(R) (%)	0.1726	0.1425	0.0922	0.1092	0.3883	61.0120***

Note: ** and *** means statistically significant at 5% and 1%, respectively.

Table 3 shows the result of Pairwise correlation analysis, and especially there is the positive significance between business cycle and the change rates of SME loans for R&D.

Table 3
Pairwise correlations analysis

Variables	Δ*SME*	Δ*WorkM*	Δ*InvE*	Δ*InvRD*	*BizCycle*
Δ*SME*	1.0000				
Δ*WorkM*	-0.0291 ($p < 0.7685$)	1.0000			
Δ*InvE*	-0.0612 ($p < 0.5353$)	0.9129 ($p < 0.0000$)	1.0000		
Δ*InvRD*	0.2037 ($p < 0.0371$)	-0.5515 ($p < 0.0000$)	-0.5262 ($p < 0.0000$)	1.0000	
BizCycle	0.0937 ($p < 0.3420$)	-0.1387 (0.1581)	0.0333 ($p < 0.7359$)	0.6022 ($p < 0.0000$)	1.0000

Note: Parentheses () mean the *p*-value.

Test Results

Table 4 presents the results of testing the existence of pro-cyclicality in total SME loans and short-term loans in relation to the business cycle. Model 1 and Model 2 indicate the test results using the changes in total SME loans and short-term SME loans as the dependent variables. Model 1 shows that pro-cyclicality existed in total SME loans depending on the business cycle, regardless of the inclusion of the dummy variable for the financial crisis stage: the estimated coefficients were 0.1141 and 0.1702 at 5% significance. However, no pro-cyclicality was found in the relation of short-term SME loans to the business cycle in Model 2: the estimated coefficients were insignificant at −0.1073 and −0.3532. Regarding short-term SME loans for purchasing raw materials the results showed that the pro-cyclicality of SME loans in relation to the business cycle had been mitigated since 2006 when the new Basel accord was implemented.

The bank characteristics of profitability and financial soundness were related to the change in short-term SME loans: the coefficients of NIM in and NPL were 0.0826 and −0.0488, respectively. However, no significance was found in the relationship between bank characteristics and loan change in Model 1 regardless of specification.

The Sargan test for robustness (Arellano & Bond, 1991) indicated that the selected instrumental variables were appropriate because the null hypothesis was not rejected. Furthermore, no *z*-statistic rejected the null hypotheses that there is no correlation in the residual term.

Table 4
Analytical results of effects of pro-cyclicality on total loans and short-term loans

	Model 1 (Dependent Variable=$\Delta SME_{i,t}$)		Model 2 (Dependent Variable = $\Delta WorkM_{i,t}$)	
	Spec. 1	Spec. 2	Spec. 3	Spec. 4
Intercept	0.2028 (1.01)	-0.6829 (-1.52)	-0.8926*** (-14.63)	-0.5043*** (-3.17)
(1) $BizCycle_t$	0.1141** (2.14)	0.1702** (2.45)	-0.1073 (-0.46)	-0.3532 (-1.20)
(2) $BIS_{i,t}$	-0.0078 (-0.79)	-0.0078 (-0.79)	-0.0018 (-0.21)	-0.0018 (-0.21)
(3) $NIM_{i,t}$	0.0674 (1.48)	0.0674 (1.48)	0.0826** (2.33)	0.0826** (2.33)
(4) $NPL_{i,t}$	0.0088 (0.70)	0.0088 (0.70)	-0.0488*** (-2.87)	-0.0488*** (-2.87)
(5) $Control(M)_t$	Included	Included	Included	Included
(6) $Control(R)_t$	Included	Included	Included	Included
(7) $Crisis\_Dum_t$	Excluded	Included	Excluded	Included
Time_effect	Yes	Yes	Yes	Yes
Firm_effect	Yes	Yes	Yes	Yes
Sargan_Test (χ^2)	4.63	4.63	3.98	3.98

Notes: ** and *** means statistically significant at 5% and 1%, respectively. The hypothesis of the Sargan test is that there is no correlation between the instrument variable and the residual term, and it cannot be rejected. The hypothesis of the Z test that there is no autocorrelation in the residual term, and it cannot be rejected.

Table 5 shows the results for the existence of pro-cyclicality of long-term SME loans according to the business. In Model 3 and Model 4, these results imply that long-term loans are pro-cyclical in relation to economic conditions. The estimated coefficients of the business cycle were significant at 1% regardless of the specification. Thus, the positive values of 0.4518, 0.6297, 0.3350, and 0.3391 imply that changes in long-term SME loans correspond to economic conditions in the same direction, which is called pro-cyclicality. Contrary to the changes in short-term loans, the results showed that SME loans for investment in equipment and R&D were affected by economic conditions, which was expected. Based on this result, it can be inferred that the existence of the pro-cyclicality of long-term loans is attributed to the high sensitivity of credit risk since the new Basel accord was implemented.

The bank characteristics of net interest margin and non-performing loan ratio were significantly correlated with changes in long-term loans. The coefficients were 0.0826 and -0.0488, respectively, in Model 3 and Model 4. The more the financial soundness was improved, the greater the increase in the long-term SME loan. This result aligns with Aggarwal and Jacques' (2001) finding that the non-performing loan ratio was a significant factor in loan change.

Table 5 shows the results of the Sargan and Z tests for robustness. No bias was found in estimating the coefficients by using the GMM methodology.

Table 5
Analytical results of effects of pro-cyclicality on long-term loans

	Model 3 (Dependent Variable = $\Delta InvE_{i,t}$)		Model 4 (Dependent Variable = $\Delta InvRD_{i,t}$)	
	Spec. 1	Spec. 2	Spec. 3	Spec. 4
Intercept	-0.2016*** (-24.29)	-0.4826*** (-51.80)	-0.1423*** (-4.20)	-0.1488*** (-4.39)
(1) $BizCycle_t$	0.4518*** (27.48)	0.6297*** (23.50)	0.3350*** (7.39)	0.3391*** (7.47)
(2) $BIS_{i,t}$	-0.0018 (-0.21)	-0.0018 (-0.21)	-0.0018 (-0.21)	-0.0018 (-0.21)
(3) $NIM_{i,t}$	0.0826** (2.33)	0.0826** (2.33)	0.0826** (2.33)	0.0826** (2.33)
(4) $NPL_{i,t}$	-0.0488*** (-2.87)	-0.0488*** (-2.87)	-0.0488*** (-2.87)	-0.0488*** (-2.87)
(5) $Control\ (M)_t$	Included	Included	Included	Included
(6) $Control\ (R)_t$	Included	Included	Included	Included
(7) $Crisis\_Dum_t$	Excluded	Included	Excluded	Included
Time_effect	Yes	Yes	Yes	Yes
Firm_effect	Yes	Yes	Yes	Yes
Sargan_Test (χ^2)	3.98	3.98	3.98	3.98

Notes: ** and *** means statistically significant at 5% and 1%, respectively. The hypothesis of the Sargan test is that there is no correlation between instrument variable and residual term, and it cannot be rejected. The hypothesis of the Z test that there is no autocorrelation in the residual term, and it cannot be rejected.

CONCLUSION

The current study was conducted to determine the pro-cyclicality of SME loans according the purpose of the loan. Previous studies found that the pro-cyclicality of SME loans was related to the business cycle because of the high credit risk and

asymmetrical information about SMEs. However, the results of the current study showed that SME loans are classified according to the loan period, and that the pro-cyclicality of long-term and short-term SME loans differed. This study examined the lending behaviour of Korean banks since 2006 when the Basel II accord was implemented. The sample consisted of data were collected for the period 2006 to 2014. The current study classified loan type according to the loan period based on the purpose of the loan. The advanced internal rating approach was used to examine the effect on the changes to SME loans, which was attributed to the high sensitivity to credit risk of SMEs.

The main test results are follows. First, pro-cyclicality in total SME loans existed even though some steps were taken to mitigate it, such as new regulations about the implementation of capital buffers and the reinforcement of the loan-to-deposit ratio recommended in the Basel III accord. Second, as expected, long-term SME loans also showed significant pro-cyclicality in relation to the business cycle. Thus, the advanced internal rating approach leads to high credit risk sensitivity; therefore, economic conditions and changes in SME loans are directly linked. Third, the pro-cyclicality of short-term loans for purchasing raw materials has been mitigated since the implementation of the Basel II accord. Contrary to total SME loans and long-term SME loans, the banks' lending behaviour with regard to short-term SMEs differed in terms of the linkage between economic conditions and changes in SME loans. Fourth, the bank characteristics of profitability and financial soundness affected loan change. In particular, the deterioration in financial soundness resulted in decreasing the number of both short-term and long-term SME loans. This evidence supports the research results of Aggarwal and Jacques (2001).

The lending behaviour of Korean banks has mitigated the pro-cyclicality of short-term loans. However, pro-cyclicality persists in long-term loans and total SME loans. The reason could be that the banks' lending behaviour with regard to SMEs differs according to the loan period, which could be attributed to differences in risk exposure and recovery rate according to default. Based on the results of this study, effective policies, such as credit enhancement through credit guarantees, are recommended to alleviate the effects pro-cyclicality on long-term loans.

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