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The Non-performing Loans:

Some Bank-level Evidences

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Abstract

This paper looks into the non-performing loan problem in commercial banks. Using the threshold regression technique, we found some evidences that non-performing loans have non-linear negative effect on banks lending behaviour.

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Key Words: non-performing loan, credit crunch, threshold effect, capital ratio

I. Introduction

A simple definition of non-performing is: A loan that is not earning income and: (1) full payment of principal and interest is no longer anticipated, (2) principal or interest is 90 days or more delinquent, or (3) the maturity date has passed and payment in full has not been made.

The issue of non-performing loans (NPLs) has gained increasing attentions in the last few decades. The immediate consequence of large amount of NPLs in the banking system is bank failure. Many researches on the cause of bank failures find that asset quality is a statistically significant predictor

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of insolvency (e.g. Dermirgue-Kunt 1989, Barr and Siems 1994), and that failing banking institutions always have high level of non-performing loans prior to failure.

It is argued that the non-performing loans are one of the major causes of the economic stagnation problems. Each non-performing loan in the financial sector is viewed as an obverse mirror image of an ailing unprofitable enterprise. From this point of view, the eradiation of non-performing loans is a necessary condition to improve the economic status. If the non-performing loans are kept existing and continuously rolled over, the resources are locked up in unprofitable sectors; thus, hindering the economic growth and impairing the economic efficiency.

In this paper, we focus on the impacts of non-performing loans on microeconomics, specifically, at the bank level to empirically evaluate how non-performing loans affect commercial banks' lending behaviour. The rest of the article is organised as follows. Section 2 provides the definitions of non-performing loans. Section 3 discusses some consequences of non-performing loans on the economies. Section 4 explains the methodology for our empirical studies. Section 5 describes the data. Section 6 gives out the empirical results. And section 7 gives out the conclusion.

II. Non-performing Loans

There is no global standard to define non-performing loans at the practical level. Variations exist in terms of the classification system, the scope, and contents. Such problem potentially adds to disorder and uncertainty in the NPL issues. For example, as described by Se-Hark Park (2003), during 1990s, there were three different methods of defining non-performing loans in Japan: the 1993 method based on banking laws; the "Bank's Self-Valuation" in March 1996; and the "Financial Revival Laws-Based Debt Disclosure" in 1999. These measurements have gradually broadened the scope and scales of the risk-management method. Similar to the trend in Japan, more countries, regulators, and banks are moving towards adopting and adapting better and more consensus practices. For example, in the U.S., federal regulated banks are required to use the five-tier non-performing loan classification system according to BIS: Pass, Special Mention,

Substandard, Doubtful, and Loss. Presently, the five-tier system is the most popular risk classification method, or, in some cases, a dual system of reporting according to their domestic policy guidelines as well as the five-tier system. According to BIS, the standard loan classifications are defined as follows:

(1) **Passed**: Solvent loans;

(2) **Special Mention**: Loans to enterprises which may pose some collection difficulties, for instance, because of continuing business losses;

(3) **Substandard**: Loans whose interest or principal payments are longer than three months in arrears of lending conditions are eased. The banks make 10% provision for the unsecured portion of the loans classified as substandard;

(4) **Doubtful**: Full liquidation of outstanding debts appears doubtful and the accounts suggest that there will be a loss, the exact amount of which cannot be determined as yet. Banks make 50% provision for doubtful loans;

(5) **Virtual Loss and Loss (Unrecoverable)**: Outstanding debts are regarded as not collectable, usually loans to firms which applied for legal resolution and protection under bankruptcy laws. Banks make 100% provision for loss loans.[2]

Non-performing loans comprise the loans in the latter three categories, and are further differentiated according to the degree of collection difficulties.

In addition to the standardised system, efforts have been made to improve the classification of loans. For example, more countries are shortening the period when unpaid loans become past due, intending to put loans on lenders' timetable sooner and require them to address these loans before losses start to escalate. The International Accounting Standard 39 revised in 2003 focuses on recognition and measurement of financial instruments and, most importantly, defines and establishes the measurement and evaluation of impaired loans. As lenders usually make little or no loss provision for impaired loans, they are at risk to be suddenly forced to reclassify such loans as a loss and take a full write-down if the borrowers go bankrupt. The initiation of this standard is to prevent lenders from being caught off-guard. In addition, many global economists, rating agencies, and organisations such as the World Bank and the Asian Development Bank have begun to

[2] The details of the loan classifications are collected from various BIS documents.

evaluate the effects of NPLs on GDP growth. They reduce growth estimates to reflect the time and cost of resolving large non-performing loan issues.

In this paper, we use the standard BIS definition of NPLs, i.e., the last three categories of the BIS classification. First, the standard definition makes it possible to compare the non-performing loan problem across countries and banks. Second, the BIS definition is a prudential definition for NPLs, which includes loans with uncertainty in addition to the virtual loss, thus, it enable banks to address the NPL problems before it cause disasters.

III. The Effects of NPLs on Economics

Non-performing loans can lead to efficiency problem for banking sector. It is found by a number of economists that failing banks tend to be located far from the most-efficient frontier (Berger and Humphrey (1992), Barr and Siems (1994), DeYoung and Whalen (1994), Wheelock and Wilson (1994)), because banks don't optimise their portfolio decisions by lending less than demanded. What's more, there are evidences that even among banks that do not fail, there is a negative relationship between the non-performing loans and performance efficiency (Kwan and Eisenbeis (1994), Hughes and Moon (1995), Resti (1995)).

The phenomena that banks are reluctant to take new risks and commit new loans is described as the '"credit crunch" problem. According to the United States Council of Economic Advisors (1991), credit crunch is "a situation in which the supply of credit is restricted below the range usually identified with prevailing market interest rates and the profitability of investment projects". A "credit crunch" is a disequilibrium phenomenon. It is present when banks are unwilling to lend, especially when a firm with profitable projects cannot obtain credit in spite of low interest rates (lower than the expected marginal products). Credit crunch results in excess demand for credit and hence credit rationing, where loans are allocated via non-price mechanism. Eventually, it imposes additional pressure on the performance of the monetary policy.

The idea of credit crunch has drawn attention when the traditional view failed to satisfactorily explain the economy state for those countries that suffered from the South-East Asian financial crisis in 1997. Under the traditional view, the link between the interest rate change and the real economic activity occurs through investment and consumer durable expenditure. In response to the currency crisis in 1997, the interest rate was raised. It was strongly believed by IMF that the hike would help stabilise the foreign currency market and eventually induce banking reform by crowding out low-profit projects. However, the persistent fall in economic growth rate and the lasting economic recession cast doubt on the true benefits of the policy and the effectiveness of the traditional view of the transmission mechanism. The idea of credit crunch addresses an alternative explanation for the transmission mechanism.

During a crisis, in order to restore the credibility among creditors and depositors, failing financial institutions not only try to expand their equity bases, but also reduce their risky assets or change the composition of the assets portfolio. As a result of such defensive action, the corporate debtors are always targeted, thus stalling the overall economic growth.

Specially, the reluctance of banks to lend can be caused by several reasons, such as the increased capital adequacy requirement imposed by Basel Accords; impaired debt-servicing capacity, especially small-to-medium enterprises (SMEs); risks of a further fall in collateral value, etc., which make the interest rate not to serve as the main determinant by banks in credit approval. Non-performing loans have been viewed to constitute one of the most important factors causing reluctance for the banks to provide credit. In a high NPL condition, banks increasingly tend to carry out internal consolidation to improve the asset quality rather than distributing credit. Also, the high level of NPLs requires banks to raise provision for loan loss that decreases the banks' revenue and reduces the funds for new lending. The cutback of loans impairs the corporate sector as they have difficulties in expanding their working capital, blocking their chances of resuming normal operation or growing. Unavailability of credit to finance firm's working capitals and investments might trigger the second round business failure which in turn exacerbates the quality of bank loans, resulting in a re-emerging of banking or financial failure. In a worse case, it triggers an endless vicious liquidity spiral: As a result of poor economic condition and the depressed

economic growth, the level of NPLs increases → the weaker corporate sector makes banks more reluctant to provide additional credits → with insufficient capital, the production sector is further weakened, resulting in decreases in aggregate demand → again, even worse borrowers' condition creates more NPLs…

Krueger and Tornell (1999) support the credit crunch view and attribute the credit crunch in Mexico after the 1995 crisis partially to the bad loans. They point out that banks were burdened with credits of negative real value, thereby reducing the capacity of the banks in providing fresh fund for new projects. Agung et. al. (2001) using the macro and micro panel data analyses to study the existence of a credit crunch in Indonesia after the crisis. Both the macro and micro evidences show that there was a credit crunch, characterised by an excess demand for loans, starting to emerge in August 1997, one month after the contagion effects of the exchange rate turmoil in Thailand spreading to Indonesia. They investigate the relationship between the loan supply and real lending capacity, lending rates, real out put, bank's capital ratio, and non-performing loan. The results show that the coefficients on NPLs are negative and significant, which indicate that bank credit supply declines with the worsening of the NPLs problem. Westermann (2003) compares the cases of Germany after the credit boom of the late 1990s and Japan aftermath the bubble burst in early 1990s. He argues that even though the German banks were in a better condition than Japanese banks were, as the path of German's aggregate credit looks so similar to that of Japan, it is at least unlikely that the German credit slowdown was entirely driven by demand, while that of Japan was mostly caused by a lack of supply. There must at least be some supply side changes that affect the aggregate credit, and differences only exist in the magnitude of the problem. He further points out that the one of the main reasons in Germany for the credit crunch is the increased risk of non-performing loans after the credit boom.

IV. Empirical Specification

Empirical Methodology forTesting the Effect of Non-Performing Lonas

One implication from the Credit Crunch view is that increased non-performing loans can cause the

decline in commercial bank credits, as banks with high level of non-performing loans in their portfolio may become increasingly reluctant to take up new risks and commit new loans.

In this paper, we use panel data from individual bank's balance sheet to empirical assess whether non-performing loans will negatively affect bank's lending behaviour. The empirical model is specified to capture the credit supply side factors. Normally, the supply of loans is determined by banks' lending capacity and factors that influence banks' willingness to provide credits. In this paper, non-performing loans are also taken into consideration. Based on Credit Crunch view, the NPLs should have a negative effect on loans, implying that the higher NPLs in a bank's portfolio, the less credit that the bank can and is willing to supply.

For a simple commercial bank balance sheet, assets are mainly composed of commercial loans and other earning assets; while on the liability side, deposits and capital are the main components. Thus, we can conjecture that the loan growth is affect by deposit growth, capital growth and other earning assets growth. In addition, we take the non-performing loan growth into consideration. The basic model is as follows:

$$LGR_{i,t} = a_0 + a_1 DGR_{i,t} + a_2 CGR_{i,t} + a_3 OEAGR_{i,t} + a_4 NPLGR_{i,t-1} \quad (1)$$

where the index i is the index for individual banks and t is the index for time period. $LGR_{i,t}$ is the loan growth rate, $DGR_{i,t}$ is the deposit growth rate in each time period t, $CGR_{i,t}$ is the capital growth rate, $OEAGR_{i,t}$ is the other assets growth rate, and $NPLGR_{i,t-1}$ is non-performing loan growth rate of the pervious year.

As financial intermediations, commercial banks' main function is to receive deposits and make loans to facilitate the flow of capitals. For most of the commercial banks, deposits are the main funding sources for commercial banks' assets. And loans take up the biggest proportion in the asset portfolio. With the expansion of the asset size, banks will expand the volume of the loans to re-balance the asset portfolio. Under the normal situation, loan growth rate is expected to move in the same direction as the growth of deposits. The sign in front of $DGR_{i,t}$, thus, is expected to be

positive. But according to the non-performing loan hypothesis, when banks are in poor condition ridden by high level of NPLs, the willingness for the banks to expand loans is decreased, which implies that loan growth will not be consistent with the expansion of deposits.

Capital is the part of the long-term funds that banks can use with fewer restrictions than other kinds of funds from outside sources. In addition, capital acts as the safety cushion for bank's lending. With a higher capital level, banks will feel more confident and less constrained to extend loans. In order to maximise profits, which is the primary objective for most of the commercial banks, banks are supposed to increase lending with the growth of capitals, which implies a positive sign in front of $CGR_{i,t}$. However, under our hypothesis, such relationship between the lending and capital is distorted, which suggests the possibility of the negative sign.

The sign in front of $OEAGR_{i,t}$ is expected to be negative as other earning assets are the substitute for loans for a given amount of total assets. When the banks are heavily ridden by the non-performing loan problem, they are unwilling to make loans for fear of the generation of new non-performing loans; instead, they switch for securer assets, such as government bonds or treasury bills, thus, the substitute effect will be greater. As a result of such greater substitution effect, the other earning asset growth will have larger negative effects on loan growth. On the other hand, higher credit risk may impede the growth of other earning asset. With higher credit risk in portfolio, banks may have to retain more capital rather than investing in other earning assets to improve the safety position. In addition, higher credit risk will reduce banks' credit ranking on the financial markets, which will also reduce their ability to engage in various investments.

Under the non-performing loan hypothesis, the relationship between the loans and non-performing loan conditions are negative, indicating negative sign associated with non-performing loan growth rate. In our model, we use the lagged term of the non-performing loan growth. It is because that the amount of non-performing loans is not normally known until the end of period; however, the loan decisions are always made at the beginning of the period. Banks make decision according to

their existing non-performing loan situation, which can be roughly represented by the situation of non-performing loans at the end of last period.

The Effect of Capital Adequacy

The Risk-Based Capital Regulation by the Basle Accord II has been playing increasing critical role in commercial bank decisions. It mandates that banks hold capital in proportion to their perceived credit risks. The Risk-Based Capital (RBC) is viewed as a regulatory tax that is higher on assets in categories that are assigned higher risk weights. (Berger and Udell, 1994) As capital is usually more expensive to raise than other assets, such as insured deposits, therefore, the implementation of RBC is expected to further magnify the substitution effect, which encourage banks to switch from the 100 percent risk credit category, such as commercial loans, to assets in 0 percent risk category, such as government bonds and treasury bills.

Under Basle Accord framework, banks are supposed to perform differently according to their capital conditions. The reluctance in the supply of credit is expected to be more significant the greater the proportion of non-performing loans held by the capital-deficient banks. Banks faced with the requirement to raise their capital ratio to improve their risk position will make efforts to meet the RBC standards either by raising expensive capital or by reducing risk-weighted assets through substituting out commercial loans, where the latter enhances the negative effect on loans. As a result, the capital ratio will affect the lending decision. In addition, it will further influence the lending by interplaying with non-performing loans.

According to Basle Accord II, the target ratio of capital to risk weighted assets is set at 8%. However, the mean capital ratios in our samples that we will show later are all above the required 8%, which suggests that banks may have more rigid internal capital ratio requirements. In response to different characteristics and situations, different samples may have different levels of effective capital ratio constraints. Thus, in our studies, we need to find out the effective capital ratios which do play constraining roles for different samples. For each sample, we set $Dummy_{i,t} = 1$ if the capital ratio of the examining year t for bank i is equal or higher than

the effective capital ratio we find for that sample, otherwise, $Dummy_{i,t} = 0$. The adjusted regression equation which including the dummy effect on the constant and the dummy effect on the non-performing loan is:

$$LGR_{i,t} = a_0 + a_1 DGR_{i,t} + a_2 CGR_{i,t} + a_3 OEAGR_{i,t} + a_4 NPLGR_{i,t-1} + a_5 Dummy_{i,t} + a_6 Dummy_{i,t} NPLGR_{i,t-1} \quad (2)$$

The Instrument Variable Method

The variables we use in the regression are potentially endogenous as they are simultaneously determined through banks' balance sheet constraints and are correlated with each other. So we apply the method of two-stage least squares using instrumental variables. Wooldridge (2002) argues that the two-stage least squares estimator is the most efficient estimator for endogenous variables. We assume banks' behaviours are continuous and they re-balance the portfolio at the each period based on the portfolio of the previous period if nothing abnormal happens. So we use the lagged values of the variables, i.e., $OEAGR_{i,t-1}, DGR_{i,t-1}, CGR_{i,t-1}$, as the instruments in the first stage to get the estimations for the values of these variables in the current period, and then, use these fitted values to perform the linear regression:

$$LGR_{i,t} = a_0 + a_1 DGR_{i,t}' + a_2 CGR_{i,t}' + a_3 OEAGR_{i,t}' + a_4 NPLGR_{i,t-1} + a_5 Dummy_{i,t} + a_6 Dummy_{i,t} NPLGR_{i,t-1} \quad (3)$$

where $OEAGR_{i,t}', DGR_{i,t}', CGR_{i,t}'$ are the fitted values estimated in the first stage using the instrument variables.

The Threshold Effect of NPLs

So far, we have emphasised the negative aspects of non-performing loans, i.e., they reduces the efficiency of resource allocation of the financial system. But in reality, bad loans exist as a natural consequence of lending behaviour when banks re-balance their portfolio. Banks decide the degree of risk they will tolerate for a given level of expected return according to their risk preference. When the level of non-performing loans goes beyond a certain level that banks can accept, the re-balancing actions will be affected. It implies that the coefficient might change in reference to the amount of NPLs; and hence, we conjecture that negative effect on lending is non-linear, i.e.,

there is a critical threshold level decided by the rate of NPLs to total loans. Banks make lending decision differently reacting to non-performing loans rate under or above a certain level; when NPLs increase above the threshold, they start to cause negative effect on lending. The estimation of the threshold, thus, is the main concern in this study and it will be interesting to compare banks' behaviours below and above the threshold.

Threshold Method

Threshold regression techniques are used to address the question whether regression functions are identical across all observations in a sample or fall into discrete classes. The threshold models have a wide variety of applications in economics. Applications include separating and multiple equilibria, sample split, mixture models, switching models, etc. Hansen (2000) argues that the understanding of threshold models is a preliminary step in the development of statistical tools to handle more complicated statistical structures.

The development of threshold regression models can go back to Dagenals (1969). He uses the threshold regression technique to analysis the step-like-time-path discontinuous character of durable goods. Hansen (1999) develops the panel threshold regression methods for non-dynamic panels with individual-specific fixed effects. The basic structural equation for the model is:

$$y_{it} = \begin{cases} \mu_i + \beta_1' x_{it} + e_{it} & q_{it} \le \gamma \\ \mu_i + \beta_2' x_{it} + e_{it} & q_{it} > \gamma \end{cases} \qquad (4)$$

where the subscript i indexes the individual and the subscript t indexes time; the scalar y_{it} is the dependent variable, scalar q_{it} is the threshold variable, and x_{it} is regressor. In the model, the observations are divided into two regimes depending on whether the threshold variable q_{it} is smaller or larger than the threshold γ. The two regimes are distinguished by differing regression coefficients β_1, β_2. He shows that for any given γ, the slope coefficient β can be estimated by ordinary least squares (OLS).

The key issue of threshold method is how to determine the threshold point γ. A simple method

(Berthelemy & Varoudakis 1996) can be carried out as follows: For each possible threshold value, denote by $\hat{\sigma}_j^2$ the sum of the squares of the residuals in regressions, which are estimated over the two sub samples. $j=1$ and $j=2$, which are defined by the breaking point. If n_j is the size of each sub sample, the quasi log-likelihood of the data for this threshold level is defined by $QL=-\sum_{j=1}^{2} n_j \ln(\hat{\sigma}_j^2)$. The threshold value is chosen as the value which maximises QL.

In our estimation model, there are two critical thresholds, the non-performing loan rate and capital ratio. In specific, by applying Hansen's threshold method, we determine the thresholds by estimating the models as follows:

$$LGR_{i,t}=\begin{cases} a_0+a_1 DGR_{i,t}^{'}+a_2 CGR_{i,t}^{'}+a_3 OEAGR_{i,t}^{'}+a_4 NPLGR_{i,t-1} & NPLR_{i,t}\geq q \\ \quad +a_5 Dummy_{i,t}+a_6 Dummy_{i,t} NPLGR_{i,t-1} & \\ a_1^{'}+a_1^{'} DGR_{i,t}^{'}+a_2^{'} CGR_{i,t}^{'}+a_3^{'} OEAGR_{i,t}^{'}+a_4^{'} NPLGR_{i,t-1} & NPLR_{i,t}<q \\ \quad +a_5^{'} Dummy_{i,t}+a_6^{'} Dummy_{i,t} NPLGR_{i,t-1} & \end{cases}, \quad (5)$$

where q is the threshold level for the non-performing loan, and $Dummy_{i,t}=1$ if the capital ratio is greater than the effective capital ratio we find for that sample, and zero otherwise.

V. Data

The bank data are collected from BankScope Database by Bureau Van Dijk, which provides in-depth comprehensive bank statistics from 1998 to 2005. The banks we have included in our study are commercial banks. Taking deposits and making loans are their most fundamental functions and they are all oriented to maximise their profits as the primary objective, which are suitable for the purpose of our study.

The countries / regions we have looked into are as follows:

Region	Country	Number of Banks
	U.S.	1214
	Japan	155

Asian Crisis Countries[3]	Hong Kong	34
	Philippines	30
	Indonesia	33
	Thailand	14
	Republic of Korea	18
Western Europe	France	39
Eastern Europe	Poland	31
	Croatia	11
	Latvia	16
	Romania	10
	Serbia and Montenegro	7
	Ukraine	20
	Czech Republic	8
	Bosnia	6
	Hungary	13
	Slovakia	9
	Turkey	12

Table - 1 Sample countries and regions

In our samples, the United States has a most developed financial system with sophisticated risk management and control mechanism. We can use it as a benchmark to compare its results with other countries and regions. Japan banks have experienced a prolonged stagnancy since the early 1990s, and the non-performing loan problem lies at the heart. By looking at Japanese banks, we can find out how the extended non-performing loans affect banks lending behaviour. The Asian Crisis is still remaining fresh in our mind when the financial systems in Southeast Asian countries collapsed in 1997. The non-performing loans were mainly the results of over-heated lending in the economic expansion period prior to the outburst of the financial crisis. Banks heavily burdened by non-performing loans is one of the most important reasons of the crisis. The time period in our study is from 1998 to 2005, just after the financial crisis, which enables us to study the lending behaviour of the banks trying to recovering from the crisis. In the West Europe, we have France as our sample country. Although France is a developed country as the U.S., it has a quite different banking system. For the U.S., bank holding companies with larger sizes and wider business scopes are playing main roles; while, in France, the banking system is characterised by many smaller savings banks and building societies. As these banks generally do business at smaller scales and

[3] No data available for Malaysia.

scopes, they may have different attitudes towards risks, and hence, non-performing loans; thus the lending behaviour may differ as well. We also study the banks in the Eastern European countries. Most of the countries have experienced dramatic changes in political as well as financial system since 1990s and some countries have joined or are joining the European Union. Economies in these countries are growing fairly fast and banks are playing increasing important roles in the economy. By studying these countries, we may find different pattern for these developing countries. And the basic data descriptions are as follows:

	U.S.	Japan	Asian Crisis	France	Eastern Europe
Asset Growth Rate (%)	13.87	0.41	14.01	5.73	37.21
	(31.50)	(6.30)	(27.639)	(21.22)	(56.16)
OEA Growth Rate (%)	1.93	4.11	7.68	1.73	4.05
	(39.70)	(10.18)	(49.13)	24.57	(46.11)
Loan Growth Rate (%)	1.12	-1.51	1.58	0.55	7.76
	(15.33)	(4.94)	(20.79)	(13.33)	(30.72)
Deposit Growth Rate (%)	-0.48	0.76	1.49	0.53	1.53
	(13.74)	(5.47)	(21.43)	(10.90)	(15.35)
NPL Growth Rate (%)	14.86	3.74	9.36	-12.81	1.13
	(90.82)	(35.82)	(88.83)	(42.19)	(91.21)
Equity Growth Rate (%)	2.52	3.45	1.83	3.77	0.57
	(23.20)	(35.36)	(45.35)	(48.17)	(55.41)
NPLs to Loans Rate (%)	0.83	6.90	12.18	8.75	8.88
	(2.38)	(3.18)	(15.71)	(9.48)	(10.92)
Capital Ratio (%)	15.50	9.96	22.30	11.95	19.11
	(14.61)	(12.29)	(17.83)	(8.43)	(12.11)

Table - 2 Basic Data Description

Table -2 presents the mean values for the mean value for each of the yearly growth rates for the variables, and the standard errors are presented in the brackets.

In commercial banks, equity is basically composed of common stocks, preferred stocks, convertible stocks and retained earnings. Equity is the main and most stable components of the capital which banks own and use for long term. Thus, we use equity as a proxy for the capital.

From the basic data description, we can get a general idea of the situations of banks of different

countries and regions. The United States, as a whole, has much lower non-performing loan levels than the rest: its average NPL rate is only 0.83% compared to the highest 12.18% for Asian crisis countries, which implies that commercial banks in the U.S. generally have sound risk managing and controlling mechanism. While, Asian Crisis countries, are severely hit by the non-performing loans problems and recovering from the financial crisis during the period we are studying. We can expect different lending behaviours for them. The Eastern European banks have experienced fast growth for asset and loans; however, the larger standard errors indicate high volatility and imbalance of the growth in this sample, which is typical for many developing countries. Thus, we can anticipate that lending behaviour of the developing countries will be different from those of developed countries. Although the NPL rates are quite high for French banks, 8.75%, banks are experiencing decreases in non-performing loans with the mean rate -12.81%, which suggests that loan quality is improving in France in the period of study. Again, we may expect different lending behaviours of banks with improved loan quality against those of the banks with worsening loan quality.

For the risk-based capital ratio, all the samples have the mean values above the 8% required capital ratio according to Basle Accord II. On one hand, it indicates that banks have put emphasis on reserving adequate amount of capital to improve their risk position. Compared with other countries, the Asian crisis countries have an especially high capital ratio with the mean value of 22.30%. It shows that banks in these countries are improving their asset quality and capital adequacy since the crisis. However, we can argue that the increased capital ratio is basically the result of government rescuing actions. In order to save banks from disasters, governments of these countries have taken various measures, such as re-capitalising banks using public funds, establishing special vehicles to move problem loans out of banks, etc.. By these administrative measurements, the capital ratios are improved, while banks themselves have made fewer efforts.

VI. The Empirical Results and Analysis

U.S.

Before estimating the threshold for each sample, we first carry out the Hausman test to make sure that the sample has specific individual effects so that we can use the Hansen threshold technique. The test assume the H_0 hypothesis is that the difference of the coefficients obtained from the random effects and the fixed effects is not systematic; in other words, it assumes that if the random effects model is correct, the coefficients that are estimated by the random effects and that are estimated by the fixed effects should not statistically different. If we can reject the H_0 hypothesis, it implies that the random effects hypothesis of orthogonality is not correct for our data set. Thus, the fixed effects is more efficient and we can use the fixed effects method to determine the threshold. The Hausman test rejects the H_0 hypothesis and shows the evidence of the fixed effects. The major differences are in the other asset growth rate, deposit growth rate and equity growth rate:

	(b) fix	(B) ran	(b-B) Difference	Sqrt (diag (V_b – V_B))
OEAGR(t)	0.0272	0.0112	0.0161	0.0015
EGR(t)	-0.0418	-0.0339	-0.0079	0.0035
DGR(t)	-0.0868	-0.0624	-0.0244	0.0059
NPLGR(t-1)	-0.0106	-0.0099	0.0007	0.0066
Test:	H0: difference in coefficients not systematic			
	Chi2 (4) = (b – B)'[(V_b – V_B) ^ (-1)](b – B) = 135.50			
	Prob > chi2 = 0.000			

Table – 3 Hausman Test for U.S. sample

By using the threshold method, we find that the non-performing loan threshold for the U.S. sample is NPL rate 0.6% and the effective capital ratio is 14.9%, as at such levels that the value of QL is minimised. The regression result is as follows[4]:

Dependent Variable: LGR (t)				
Variable	Coefficient	Std. Error	Coefficient	Std. Error
	NPL Rate >= 0.6%		NPL rate < 0.6%	
Constant	0.9010**[5]	0.3560	1.3371***	0.2228
DGR(t)	0.2782***	0.0203	0.0816***	0.0193

[5] *** indicates 1% significance, ** indicates 5% significance, and * indicates 10% significance.

OEAGR(t)	-0.1008***	0.0052	-0.1494***	0.0050
EGR(t)	0.0546***	0.0112	-0.0003	0.0096
NPLGR(t-1)	-0.0089**	0.0035	-0.0026	0.0021
Dm	-2.8329***	1.0287	1.0660*	0.6117
Dm*NPLGR(t-1)	-0.0018	0.0060	-0.0058	0.0040
No. of Obs.	2570		3462	
No. of groups	807		988	
R-sq:	Within = 0.2754		Within = 0.2758	
	Between = 0.1163		Between = 0.3650	
	Overall = 0.2388		Overall = 0.2861	
Wald chi2	117.57		235.79	
Prob > Chi2	0.0000		0.0000	

Table – 4 U.S. sample results

Generally, when banks have non-performing loans less than the threshold, the loan growth rate is higher as suggested by the constants. Both of the cases have significant constants. When banks have non-performing loan rate less than 0.6%, the constant is 1.3371; and when banks have non-performing loan rate greater than 0.6%, the constant is lower at 0.9010. The results indicate that banks with better risk position (lower non-performing loans) have higher inclination to extend loans. However, when banks have higher non-performing loans in the portfolio, they may be more concerned about the risky, and hence, have lower tendency to increase loans.

When we look at the coefficient associated with the non-performing loan growth rates, we find statistically significant negative coefficient (-0.0089) when banks have non-performing loans more than the threshold level; on the other hand, when banks have non-performing loans less than the threshold level, the coefficient is not statistically significant. The results are consistent with our initial hypothesis that higher non-performing loans than the threshold will hinder banks' creation of new loans. By decreasing loans, banks can reduce the possibility of new non-performing loans generated from new lending. However, when banks' non-performing loans are below the threshold level, there is lower tendency for banks to reduce lending as the non-performing loans are under banks' acceptable level.

We find negative coefficients associated with other earning assets growth rates for both cases. Other earning assets are substitute for loan given a fixed amount of assets for banks to use.

Although making loans are still the most important function for commercial banks; with the innovation of financial instruments and less activity restriction, banks are expanding their business scope other than lending in order to obtain higher profitability and larger market power. Especially when banks have less risk constraints, i.e., less non-performing loans, they have more freedom to engage in various businesses, which is indicated by a higher degree -0.1494 compared with -0.1008.

When we look into the effect of capital adequacy, we find that higher capital ratios which are above the effective capital ratio (14.9%) have different effects for the two cases. When banks have non-performing loan rate below the threshold, the capital adequacy helps to accelerate the creation of new loans, as the coefficients in front of dm are positive and statistically significant (1.0660). Capital is the safety cushion for credit risk; as a result, higher capital level gives banks more desire to increase loans. On the other hand, when the non-performing loan rate is higher than the threshold level, the capital dummy has a statistically significant negative coefficient -2.8329. It shows that capital plays a stabilising role to reduce the lending growth rate when banks have more credit risk in the portfolio.

As a whole, we have found some evidences of our hypothesis that non-performing loans reduce the incentive to increase lending when banks have non-performing loan rate above the threshold level in the banks in U.S..

Japan

The Hausman test shows statistically significant evidence of fixed effects and the great difference exits in deposit growth rate:

	(b) fix	(B) ran	(b-B) Difference	Sqrt (diag (V_b – V_B))
OEAGR(t)	0.0687	0.0453	0.0234	0.0033
EGR(t)	-0.0233	-0.0176	-0.0057	0.0029
DGR(t)	-0.2653	-0.2148	-0.0505	0.0199
NPLGR(t-1)	0.00002	-0.0020	0.0020	0.0010
Test:	H0: difference in coefficients not systematic			
	Chi2 (4) = (b – B)'[(V_b – V_B) ^ (-1)](b – B) = 65.26			

	Prob > chi2 = 0.0000

Table – 5 Hausman Test for Japanese sample

For the sample of Japanese banks, we find the threshold of NPL rate is 6.9%, much higher than that of the U.S., which can be justified by a much higher average NPL rate of the raw data. In additional, because Japanese banks have been suffering from banking problem for quite a long period ever since the beginning the early 1990s, their ability to adjust lending objective according to non-performing loan situations may be impaired. Thus, the threshold for them to change their lending behaviour is quite high. And the effective capital ratio is 11.4%. The result is as follows:

Dependent Variable: LGR (t)				
Variable	Coefficient	Std. Error	Coefficient	Std. Error
	NPL Rate >= 6.9%		NPL rate < 6.9%	
Constant	-0.5232***	0.2003	0.0265	0.1376
DGR(t)	0.0809	0.0519	0.0223	0.0419
OEAGR(t)	-0.2490***	0.0150	-0.3719***	0.0132
EGR(t)	0.0174***	0.0062	0.0175*	0.0099
NPLGR(t-1)	0.0021	0.0044	0.0031	0.0038
Dm	2.0530**	0.9937	0.5814	0.3718
Dm*NPLGR(t-1)	-0.0819***	0.0132	-0.0061	0.0072
No. of Obs.	392		409	
No. of groups	119		126	
R-sq:	Within = 0.5755		Within = 0.7526	
	Between = 0.2914		Between = 0.7015	
	Overall = 0.4129		Overall = 0.7407	
Wald chi2	14.03		23.49	
Prob > Chi2	0.0507		0.0014	

Table – 6 Results for Japanese sample

The constant is negative when banks have non-performing loan rate above the threshold level and is statistically significant. It is consistent with our expectation that banks with poorer loan quality will reduce the lending to consolidate their asset quality.

There is little evidence that the growth of non-performing loans will cause banks in Japan to reduce their lending in either cases as neither of the coefficients associated with NPL growth is

statistically significant, which is to the contrary of the hypothesis that non-performing loans have negative effect on bank's lending. In fact, the results show that non-performing loan growth rate does not significantly affect the lending growth rate.

When we look at the other earning asset growth, we find that there are negative coefficients which are statistically significant for both cases. The negative signs suggest that there are obvious substitute effects that with the growth of total assets, banks choose to increase other earning assets rather than extending loans. However, such substitute effect is much larger when banks have non-performing loans less than the threshold. It shows that banks have less intention to replace loans by other earning assets when they have poorer loan quality. It may be explained that with bad asset quality, banks have less ability to engage in other kind of activity as their credit ranking is not high enough to support them; and what's more, poorer asset quality may impose constraints for them to use funds freely.

For banks having non-performing loan rate higher than the threshold level, capital adequacy increases banks' incentive to increasing lending. Although the coefficient for $Dm \cdot NPLGR$ is negative (-0.0819), the coefficient for Dm is much larger (2.0530). As a result, the combined effects shows that banks with more capital has higher tendency to increase lending as they are in a safer capital position than otherwise.

To summaries, from the result of Japanese banks, we have found mixed result as to the effects of non-performing loans and capital adequacy on banks' lending behaviour. Although we haven't found direct impact that non-performing loans reduce lending, however, when banks face higher non-performing loan level and lower capital ratio, they have the least incentive to increase their lending.

We haven't found clear evidence that non-performing loans have reduction effect on lending. Alternatively, according to the view of "debt over-hanging" view, the prolonged distress of banking problem in Japan is caused by the lack of demand rather than the supply. Banks still increase their lending despite of their NPL problem; however, with the long-lasing stagnation of

the economy, companies have less capacity and incentive to borrow money as they have less ability to make profit to pay the loans.

South-Eastern Asian Financial Crisis Countries

The Hausman test shows great difference in all the variables, which strongly suggests that we can use the fixed effects estimation:

	(b) fix	(B) ran	(b-B) Difference	Sqrt (diag (V_b – V_B))
OEAGR(t)	0.0639	0.0232	0.0407	0.0071
EGR(t)	-0.0431	-0.0292	-0.0139	0.0052
DGR(t)	0.0111	0.0249	-0.0138	0.0122
NPLGR(t-1)	-0.0257	0.0256	-0.0002	0.0031
Test:	H0: difference in coefficients not systematic			
	Chi2 (4) = (b – B)'[(V_b – V_B) ^ (-1)](b – B) = 47.49			
	Prob > chi2 = 0.0000			

Table – 7 Hausman Test for Asian sample

The threshold for Asian Crisis countries is 5.6% and the effective capital ratio is 13.5%. The results are:

Dependent Variable: LGR (t)				
Variable	Coefficient	Std. Error	Coefficient	Std. Error
	NPL Rate >= 5.6%		NPL rate < 5.6%	
Constant	4.5449**	2.1979	4.2506*	2.5045
DGR(t)	-0.0310	0.1127	0.1595*	0.0947
OEAGR(t)	-0.2879***	0.0708	-0.2493***	0.0717
EGR(t)	0.0593**	0.0278	0.0561	0.0592
NPLGR(t-1)	0.0078	0.0226	-0.0425	0.0333
Dm	-2.7929	2.5710	1.3652	2.4936
Dm*NPLGR(t-1)	-0.0315	0.0253	0.0237	0.0366
No. of Obs.	297		253	
No. of groups	86		74	
R-sq:	Within = 0.4002		Within = 0.2869	
	Between = 0.3082		Between = 0.0765	
	Overall = 0.3548		Overall = 0.1813	
Wald chi2	46.88		25.15	

Prob > Chi2	0.0000	0.0003

Table – 8 Results for Asian sample

Although this sample has the highest mean value of NPLs to loan rate, the threshold is not relatively high compared with other samples. Most of the banks in this sample were severely blown by the financial crisis and have been suffered from a lot of difficulty. As a result, they can tolerate only low level of risk, and changes in the level of non-performing loans will greatly affect their lending behaviours.

Different from other samples, the results of the constant terms show quite different patterns. When banks face non-performing loan rate higher than the threshold, they generally have a larger constant (4.5449) than the constant (4.2506) when they face non-performing loan rate lower than the threshold, which suggest that “bad” banks increase lending more aggressively than “good” banks.

We haven’t found statistically significant coefficients associated with non-performing loan growth rate in either case, which means that although asset quality is a serious problem for banks in this sample, banks’ lending behaviour are not affected greatly by the large amount of non-performing loans. After the crisis, governments in South-East Asian countries have taken many rescue activities such as injection of huge amount of government capital into problematic banks, moving non-performing loans out of banks, and setting up special government organisations to deal with non-performing loans, etc.. These activities have given banks disincentive to be worried about their loan qualities as banks are hoping governments to take action to solve their non-performing loans. Meanwhile, governments encourage banks to lend more to firms in difficulty, hoping that more funds can help them get out of the difficulty and make profits to pay back loans. However, in an economic recession as it was after the Asian Crisis, it is quite hard for firms to make profits even with enough financing because of the decline in aggregate demand. Thus, it would lead to more non-performing loans and ended up as a vicious circle. This can to some extent explain why bank recovery is very slow in these countries after the crisis. By the end of 2005, the average non-performing loan rate for Thailand, Korea, the Philippines and Indonesia were still around

10%.

The same reasons can be used to explain that equity growth rate have positive effect on loan growth rate (0.0593) when banks have non-performing loan above the threshold. With the growth of capital which is mainly from government injection, banks use these capitals to extend more loans according to government policies.

One of the main sources of the capital for the banks in this sample during this period is from government injection, which doesn't need banks' own efforts. Thus, banks are not constrained by the capital requirements. Because of the government intervention, the improved capital adequacy doesn't indicate good bank internal risk management; thus, the capital dummy doesn't show any significant impact on banks' lending behaviour.

The results are not consistent with that of Agung et. al (2001), who support the Credit Crunch view. But our results support that of Ghosh and Ghosh (1999), who investigate the Credit Crunch at the aggregate level for Indonesia, Korea and Thailand during 1997 – 98, and find little evidence of credit crunch. They attribute the decline of credit in these countries mainly to insufficient demands, not supply side reasons.

France

The Hausman test again shows the difference in deposit growth rate and suggests the fixed effects model:

	(b) fix	(B) ran	(b-B) Difference	Sqrt (diag (V_b – V_B))
OEAGR(t)	0.0579	-0.0012	0.0591	0.0268
EGR(t)	-0.3149	-0.1823	-0.1325	0.0500
DGR(t)	0.0263	-0.0154	0.0417	0.0498
NPLGR(t-1)	-0.0148	0.0154	0.0303	0.0160
Test:	H0: difference in coefficients not systematic Chi2 (4) = (b – B)'[(V_b – V_B) ^ (-1)](b – B) = 16.36 Prob > chi2 = 0.0059			

Table – 9 Hausman Test for French Sample

We have found that threshold for French banks is 5.75% of the NPL rate, and the effective capital ratio is 9.8%. The regression results are shown below:

Dependent Variable: LGR (t)				
Variable	Coefficient	Std. Error	Coefficient	Std. Error
	NPL Rate >= 5.75%		NPL rate < 5.75%	
Constant	-0.6065	3.3826	7.9287	8.1714
DGR(t)	-0.2394*	0.1324	0.0787	0.1201
OEAGR(t)	-0.2623***	0.0695	-0.0086*	0.0047
EGR(t)	0.0245	0.0252	0.2077**	0.0833
NPLGR(t-1)	0.0164	0.0495	0.5551	0.4644
Dm	3.2989	4.7084	-7.1216	8.6426
Dm*NPLGR(t-1)	0.0519	0.0624	-0.5672	0.4652
No. of Obs.	116		47	
No. of groups	32		15	
R-sq:	Within = 0.2300		Within = 0.3462	
	Between = 0.5616		Between = 0.0356	
	Overall = 0.3021		Overall = 0.1457	
Wald chi2	23.94		2.29	
Prob > Chi2	0.0012		0.0655	

Table – 10 Results for French sample

Both as developed countries, for the sample of French banks, we have a threshold much higher than that of the U.S. sample. Compared with U.S, France is typically composed of smaller banks such as savings banks and building societies, while U.S. has a large proportion of large banks and bank holding companies. Bank holding companies and large commercial banks generally have more alternative ways to invest in other than making loans. These alternatives make it possible for banks to switch their business when the non-performing loans go up; thus, the lending behaviour changes at a relatively low threshold. For smaller banks, loan is the main and the most important asset. It is not very easy for them to change their behaviour of asset composition until a relatively high non-performing loan rate.

The non-performing loan growth doesn’t have statistically significant effect on loan growth rate.

During the period we are observing, we find that French sample is experiencing high rate of decreasing in non-performing loan with the mean rate -12.81%, while the other samples have positive non-performing loan growth rate. Such improvement may be the result of better internal risk management. With a better portfolio quality, there is less incentive for bank to reduce lending. Rather than reducing loans, which enables banks to reduce the base for the new generation of non-performing loans, banks use better risk management to control non-performing loan while keeping their lending growth at the same time.

However, we still can detect from our results that banks with higher non-performing loan rate have less incentive to increase lending than banks with lower non-performing loan rate. When banks have non-performing loan rate higher than the threshold, facing with deposit growth, banks reduce the lending, as we have negative coefficient -0.2394, which is statistically significant. The coefficients suggest that with more funds generating from deposits which are available for banks to use, banks intend to use the funds in other ways rather than to increase the loans when they have many non-performing loans in the loan portfolio. Such evidence can also be found from the coefficients associated with the other earning asset growth rates. We find that the coefficients are negative and are statistically significant for both of the cases; however, the coefficient is much higher -0.2623 when banks have non-performing loan rate higher than the threshold, compared with -0.0086 when banks have non-performing loan rate below the threshold. When banks have higher non-performing loans, they switch more of their funds to other earning assets; and such tendency is lower when they have lower non-performing loans.

When the non-performing loan rate is less than the threshold, growth in capital gives banks incentive to increase lending as the coefficient is 0.2077, which is statistically significant. When banks have less non-performing loans which implies lower credit risk, there is less constraints for banks to use the capital. Thus, they extend more loans in order to gain more profits. On the other hand, when banks have higher non-performing loans, banks have to retain capital to achieve the capital requirement and to improve risk position.

We don’t find statistically significant evidence whether the capital adequacy helps to increase

lending. It suggests that there is less incentive for banks to increase lending with adequate capital. As French banks are mainly small banks which are more sensitive to risk and have fewer sources for raising capital, capital adequacy mainly acts as a safety cushion rather than giving banks incentive to increase loans. Increasing loans will lead to larger risky asset base; as a result, banks main again face pressure to maintain or raise capital ratio.

Eastern European Countries

Finally, the Hausman test again confirms the fixed effects model:

	(b) ran	(B) fix	(b-B) Difference	Sqrt (diag (V_b – V_B))
OEAGR(t)	0.0820	0.0606	0.0214	0.0085
EGR(t)	-0.0286	-0.0017	-0.0269	0.0090
DGR(t)	0.0023	-0.0027	0.0050	0.0468
NPLGR(t-1)	-0.0235	-0.0267	0.0033	0.0052
Test:	H0: difference in coefficients not systematic			
	Chi2 (4) = (b – B)'[(V_b – V_B) ^ (-1)](b – B) = 16.37			
	Prob > chi2 = 0.0026			

Table – 11 Hausman Test for Eastern European sample

The threshold for the Eastern European sample is 4.3% of the NPL rate and the effective capital ratio is 9.2%. The results are:

Dependent Variable: LGR (t)				
Variable	Coefficient	Std. Error	Coefficient	Std. Error
	NPL Rate >= 5.6%		NPL rate < 5.6%	
Constant	13.4676**	6.8930	-31.0899*	18.3848
DGR(t)	0.1012	0.1179	-0.1454	0.1630
OEAGR(t)	-0.3474***	0.0277	-0.1172*	0.0715
EGR(t)	0.1033***	0.0256	0.1483**	0.0736
NPLGR(t-1)	0.0595	0.0996	0.4909*	0.2553
Dm	-8.3046	7.0490	39.7979**	18.3526
Dm*NPLGR(t-1)	-0.0799	0.1003	-0.4761*	0.2553
No. of Obs.	435		265	
No. of groups	165		112	
R-sq:	Within = 0.4105		Within = 0.2022	
	Between = 0.1871		Between = 0.1036	

	Overall = 0.3061	Overall = 0.1356
Wald chi2	50.11	51.17
Prob > Chi2	0.0000	0.0000

Table – 12 Results for Eastern European sample

Different from other samples, we find quite different patterns of banks' lending behaviour for East European countries.

Generally speaking, the results show that banks with non-performing loans higher than the threshold are more aggressive in lending behaviour. The constant term has a large positive value 13.4676, which is statistically significant within 5% level. It suggests that banks with higher non-performing loans are less risk aversion and increase lending quickly. Again, the results show that banks increase their lending quickly with increase in capital (0.1033) when banks have non-performing loan higher than the threshold, and both of the coefficients are statistically significant. The original data shows that loans are growing much more quickly in this sample. And the mean non-performing loan to asset rate is second highest and is only lower than that of the South-East Asian countries sample. In developing countries, banks typically increase their lending aggressively in order to increase their business and obtain more market power. However, these banks are always less sophisticated in risk control; as a result, such fast growth in lending will end up in a vicious cycle that fast growth of non-performing loans is unavoidably accompanied with high speed of loan growth. For the case of banks having non-performing loan rate less than the threshold level, the constant is significantly negative (- 31.0899), which suggests that these banks are much less aggressive in lending. This, in turn, may suggest that the low level of non-performing loans are the result of prudential lending behaviour, and create a health cycle of lending behaviour.

In addition, we find that the coefficient associated with other earning asset growth rate is a large negative figure (-0.3474), which is statistically significant for banks with non-performing loans higher than the threshold level. It suggests that other earning assets have a large substitute effect on lending. At first glance, it seems to be inconsistent with the speedy growth of lending. However, when we look at raw data, it shows that the asset growth rate is extraordinary high 40.39% and the

loan growth rate only takes a small portion 9.59%. Thus, in this case, rather than substituting loans out of total assets, other earning assets actually are the complementary for loans. It indicates that banks are expanding their business widely with the fast development of their financial markets. With the economic growth and evolution of financial system, banks are trying to expand their business scope to play more roles in the financial sector rather than just focusing solely on extending credits.

On the contrary, when banks have non-performing loans lower than the threshold, they are less regressive in increasing lending as suggested by the estimated coefficients. However, when non-performing loan rates are under the threshold level, non-performing loans have positive impacts banks' lending behaviour with a statistically significant positive coefficient 0.4909. It suggests that banks may still increase their loans as the generation of non-performing loans is the natural result of lending, especially for banks in the expansionary stage.

The results also suggest that the capital adequacy plays an important role in this sample. Although this sample have a relatively high average capital ratio (19.11%), the effective capital ratio rate is fairly low (9.2%), suggesting that that a relative low capital ratio can greatly affect banks' lending behaviour. When banks have non-performing loans less than the threshold and have capital adequacy ratio above the effective value, i.e., the best case in all situations, they have very high incentive to increase their lending, which is suggested by the very high positive coefficient 39.7979 associated with the capital dummy, and this coefficient is statistically significant. Comparing the results from the other samples, the coefficient in this sample are of much larger scale, which implies that banks in Eastern European sample are much more sensitive to capital adequacy and have great aspiration to increase lending. Banks in expansionary stage are quite speculative in lending behaviour. Once the capital ratio reaches slightly above the Basle Accord II required 8% rate, they start to speed their lending. Such phenomenon is different from the other samples. For developed countries such as the U.S., banks have less incentive to speed expansion and keep the capital adequacy ratio high. Even they have enough capital, they don't increase the lending that much. For France and Japan, the capital adequacy doesn't affect their lending behaviour significantly, as they may regard the capital as safety cushion.

VII. Conclusion

We have studied how the non-performing loans affect banks' lending behaviour in different countries and regions. Our results suggest that non-performing loans have non-linear effects. To our expectation, we have detected some evidences that higher level of non-performing loans reduces banks' aspiration to increase lending. However, countries with different situations have shown different locations of the thresholds.

Evidence is less clear for South-East Asian Crisis countries as a result of distorted financial system and government intervention. We have found that non-performing loans don't deter banks' risky lending. For Japanese banks, we haven't found the negative influence of non-performing loans on banks' lending. The prolonged economic stagnation distorts the generally economic performance. As a result, the lack of demand for loans may contribute significantly to the extended bank problem in Japan. For developing countries such as Eastern European countries, banks are experiencing fast growth, which makes it more difficulty to predict their lending behaviour.

We have also found that the risk-based capital ratio has played a significant role to restrict banks' risky lending as its initial intention by BIS. Generally speaking, higher capital ratios give more incentive to increase lending than lower capital ratios when banks have less credit risk in the portfolio. Theses tendencies are most evident for banks in developed countries such as the U.S., as it has a well-developed financial systems and sophisticate risk management mechanism. On the other hand, implementation of risk-based capital requirement can also help to prevent risk-taking behaviour by calming down over-heated lending behaviour for high risk banks.

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