Asian Economic and Financial Review
ISSN(e): 2222-6737/ISSN(p): 2305-2147

journal homepage: http://www.aessweb.com/journals/5002

DETERMINANTS OF NON-PERFORMING LOANS IN LICENSED COMMERCIAL BANKS: EVIDENCE FROM SRI LANKA

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ABSTRACT

This study investigates the determinant factors of ex-post credit risk considering non-performing loans (NPLs) as proxy variable in Sri Lanka's commercial banking sector and is carried out with a sample of nine licensed commercial banks for the period from 1999 to 2012. The study finds that the level of NPLs can be attributed to both macroeconomic conditions and banks' specific factors. It reveals that, NPLs tends to increase with deteriorating bank's efficiency. There is also a positive correlation between loan to asset ratio and NPLs. Meanwhile, banks with high level of credit growth associated with a reduced level of non- performing loans. Larger banks incur lesser loan defaults compared to smaller banks. With regard to macro-economic variables, NPLs vary negatively with the growth rate of GDP and Inflation and positively with the prime lending rate.

Keywords: Non-performing loans, Commercial banks, Bank-specific variables, Macro-economic variables, Credit risk, Sri Lanka

JEL Classification: G21.

Contribution/ Originality

This study is one of very few studies which have investigated the causes of non-performing loans in the commercial banking industry of Sri Lanka.

1. INTRODUCTION

Financial system stability is one of the key fundamentals upon which economic growth is built. Financial sector in Sri Lanka, like most developing countries is dominated by banking enterprises. Banking sector accounted for about 57 percent of the total assets of the financial system in year 2013. Therefore, soundness of banking institutions is an essential consideration for financial system

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DOI: 10.18488/journal.aefr/2015.5.6/102.6.868.882
ISSN(e): 2222-6737/ISSN(p): 2305-2147

stability. Exploring the determinant factors of ex post credit risk is an issue of substantial importance for regulatory authorities concerned on financial stability and banks management. The ex post credit risk takes the form of non-performing loans (NPLs). Credit risk is dependent on the quality of assets, and is reflected through the volume of NPLs.

NPL is likely to hamper economic growth and reduce the economic efficiency. The shocks to the financial system can arise from factors specific to the bank or macroeconomic conditions. In general, the researches adopted in the developed economies have confirmed that macroeconomic conditions affect credit risk. Relative causes of NPLs occurrence cited by some researchers includes; economic condition (Brownbridge, 1998; Jimenez and Saurina, 2006; Das and Ghosh, 2007; Al-Smadi and Ahmad, 2009), interest rate (Fofack, 2005; Jimenez and Saurina, 2006; Al-Smadi and Ahmad, 2009), inflation (Rajan and Dhal, 2003; Al-Smadi and Ahmad, 2009; Pasha and Khemraj, 2009), credit growth (Keeton, 2003; Boudriga *et al.*, 2009), inefficiency (Peristiani, 1996; Berger and DeYoung, 1997; Kwan and Eisenbis, 1997), profitability (Godlewski, 2004; Marco-Garciya and Robles-Fernàndez, 2008), Bank size and ownership (Das and Ghosh, 2007; Pasha and Khemraj, 2009; Misra and Dhal, 2010), and credit culture (De Zilva, 2004; Gunarathna, 2010).

Against this background, the aim of this study is to evaluate the determinants of non-performing loans in the commercial banks of Sri Lanka by looking at both bank-level data and macroeconomic indicators over the period 1999–2012.

The macro-economic factors include; real GDP growth, inflation growth, unemployment and interest rate prevailing in the economy. The bank-specific factors include; bank efficiency, risk profile, loan growth, market share and NPL rate of previous year. In addition the study would also contribute to the existing body of knowledge by conducting a comparative analysis of NPLs behavior between three groups of banks that are public commercial banks, large private commercial banks and small private commercial banks.

The results suggest that NPLs are indeed affected by both macroeconomic and bank-level factors. With regard to bank-specific variables; efficiency of the bank has recorded significant negative impact with NPLs. High loan to asset ratio is likely to incur higher levels of NPLs. Banks with high level of credit growth is associated with a reduced level of problem loans. Larger banks incur lesser loan defaults compared to smaller banks.

Among the macroeconomic determinants, the results suggest that an improvement in the real economy translates into lower NPLs. High lending rate in the economy increases defaulting of payments of bank loans. Unexpectedly our study revealed that during high inflationary periods banks are experiencing lower NPLs.

Public banks incur less loan defaults compared to private banks in recent past. The remaining of this paper is organized as follows. Second section describes Sri Lankan banking system and non-performing loans. Third section discusses previous research findings. Fourth section explores on data and methodology used in deriving the output. Empirical results analysis is in the fifth section and conclusion of the study is presented in the final section.

2. SRI LANKAN BANKING SYSTEM AND NON-PERFORMING LOANS

Financial sector in Sri Lanka is dominated by banking enterprises. In 2013, the banking sector comprised with 33 licensed banks with 12 foreign Licensed Commercial Banks (LCBs) and 21 domestic banks which include 9 licensed specialised banks and 12 local LCBs (CBSL, 2014). The banking sector accounted for about two third of the total assets of the financial system in 2013.Therefore, the strength of the financial system in Sri Lanka to a greater extent dependent on the soundness of banking institutions.During recent decades, many countries have witnesses banking crises. These crises have a bad impact on the economy. In addition, banking crises have significant cost. Fonseka (2009) conducted a comparison of NPLs in Bangladesh, Indonesia, Philippines, Malaysia, Thailand and Sri Lanka. Results revealed that Sri Lanka's performance is only better than Bangladesh. As World Bank (2013) explained, Sri Lanka account for moderately high NPL ratio among Asian countries except Bhutan and Pakistan. Low asset quality of Sri Lankan commercial banks is more emphasized when compared that with the developed countries. As to World Bank (2013) Australia, United Kingdom, Canada, New Zealand and Sweden account for less than 2 percent of NPLs in their commercial banking industry. Sri Lanka has experienced a distressed situation in number of commercial banks by recording high NPLs showing the early indicators of problematic bank practices which could have lead to bank failures. According to Central Bank of Sri Lanka (CBSL) by end of year 2013 gross NPL ratio of the country increased to 5.6 percent. The amount of total NPLs of Sri Lankan commercial banking sector is Rs 191 billion (CBSL, 2013). NPLs behavior between private and public commercial banks is depicted from the figure 1 as follows.

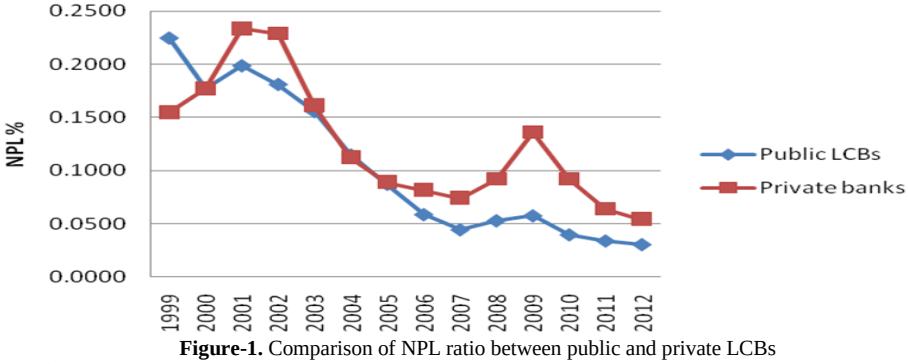

Figure-1. Comparison of NPL ratio between public and private LCBs

Source: Researcher's creation

At the initial time period considered in the study, public LCBs have recorded high NPL. In 1999, the average NPL of the two public commercial banks was 22.45 percent while in the private commercial banks it was 15.47 percent. After the year 2000 private banks were carrying higher percentage of NPLs. In 2012 the average NPL ratio was 5.4 percent in private banks and 3 percent in public banks. The study has conducted a comparative analysis between three groups of banks that are; Public LCBs, large private LCBs and small private LCBs. Descriptive statistics of bank-

specific variables with mean, maximum and minimum values for the three groups of banks is presented in Table 1.

Table-1. Descriptive statistics for the three groups of LCBs

Bank-specific variables	Public Banks (%)			Large Private Banks (%)			Small Private Banks (%)		
	Mean	Maxi.	Mini.	Mean	Maxi.	Mini.	Mean	Maxi.	Mini.
NPLs	10.40	25.32	2.80	10.81	28.17	2.43	14.21	44.83	3.38
Operating Expenses	4.36	9.75	2.85	4.19	7.45	1.66	4.85	10.92	2.02
Return on Assets	5.10	6.48	2.95	6.21	8.21	4.40	5.69	9.20	1.78
Loans to Assets	60.46	76.76	48.81	64.28	77.97	50.05	58.89	89.83	38.08
Loan Loss Provisions	0.92	2.82	-0.36	1.97	15.01	0.28	1.43	4.50	-2.24
Loan Growth	18.34	47.73	-15.40	18.03	44.89	-18.31	29.27	90.45	-40.95
Bank Size	23.46	29.82	20.26	9.41	13.96	4.95	1.05	3.09	0.17

As shown in the descriptive statistics banks under the small private category have recorded the highest mean value of NPLs ratio that is 14.21 percent as compared to 10.40 and 10.81 percent of public and large private banks respectively. The maximum NPL value of 44.83 percent is recorded by small banks category. Mean value of NPLs of large private banks are higher than that of public banks.

Banks under the large private banks category are maintaining around 64 percent of its total assets as loans and advances when compared to the 60 and 59 percent of public and small private banks respectively. This shows that the four largest private LCBs tend to be high risk takers. As the youngest banks in the banking industry, small private banks effort to capture the market is evident with its high loan growth rate. The average loan growth of small private banks is 29 percent when compared to the 18 percent of both public and large private banks. The maximum of 90 percent of loan growth is also recorded by the small private banks. As to McKinley and Barrickman (1994) as cited in Gunarathna (2010), high loan growth of these banks in small private category show the product driven nature of its credit culture and thus contributing to reduce asset quality in terms of NPLs.

All the banks in the three groups are having a similar efficiency level which is evident by the average operating expenses to operating income ratio. The dominant position of two public banks is evident by the value of size variable. Highest bank size based on the deposit base and the highest mean value of 29.82 and 23.46 percent respectively are reported by public banks.

Out of the three groups, small private commercial banks account for a higher NPL ratio mostly during the period. Public banks that were heavily burdened with default loans in early periods were able to maintain the lowest NPL ratio in recent past when compared to other banks. The large and small private banks tend to be the highest risk takers out of the groups which is evident by high percentage of loans and advances from the total assets. Small private banks have put more effort to

capture the market in recent past which is evident from the highest loan growth rate of 90 percent recorded with NTB. Thus the signs of this product driven lending culture contributed for them to record higher NPL value when comparing with other two groups.

3. LITERATURE REVIEW

In recent years, the literature on non-performing loans have occupied the interest of several authors particularly the attention in understanding of the variables liable to the higher NPL. The literature identifies two sets of factors to explain the evolution of NPLs over time. One group focuses on external events such as the overall macroeconomic conditions, which are likely to affect the borrowers' capacity to repay their loans, while the second group, which looks more at the variability of NPLs across banks, attributes the level of non-performing loans to bank-level factors. Theoretical background of the study lies in Diamond (1984) delegated monitoring theory of financial intermediation. Under this theory, depositors delegate monitoring of their funds to banks. Risk increase when banks make adverse loan selection. Therefore inefficient monitoring by banking institutions may explain reasons for high loan defaults.

3.1. Macro-Economic Determinants

Macroeconomic factors are viewed as exogenous forces which are influencing bank's performance. Banks anticipate that if a recession occurs, firms and households will encounter liquidity shortages, which in turn would raise the likelihood of delays in the fulfillment of their financial obligations (Jimenez and Saurina, 2006). Das and Ghosh (2007): Al-Smadi and Ahmad (2009): Warue (2013) and Brownbridge (1998) found a significant and negative relationship between problem loans and GDP. That indicates a downturn in economic activities contributes to increase problem loans. Fofack (2005) empirically analyzed the factors causing NPLs and found evidence that economic growth, real exchange rate appreciation and the real interest rate contributed to increase NPLs. Jimenez and Saurina (2006) also showed similar results found a significant and a positive relationship between market interest rate and problem loans.Warue (2013) also identified that lending interest rates are positive and significantly related to NPL in commercial banks. But a contradictory result of negative relationship was found by Al-Smadi and Ahmad (2009) between market interest rate and credit risk of Jordanian banks. As to their explanation low interest rate stimulates economic activities and productivity that affect positively firms' earnings.

Salas and Saurina (2002) revealed that real growth in GDP explain variations in NPLs. Jimenez *et al.* (2005) provide evidence that NPLs are determined by high real interest rates and lenient credit terms in addition to GDP of the economy. Al-Smadi and Ahmad (2009) found that inflation creates a substantial negative impact on credit risk. Warue (2013) also concluded that inflation has a negative impact to government commercial banks. Empirical studies tend to confirm a positive link between the NPLs and unemployment rate of the economy. Louzis *et al.* (2010) found that unemployment with one-period lag is a leading indicator of NPLs. It may be inferred

that a rise in unemployment may influence negatively the cash flow streams of households and increase the debt burden. With regard to firms, an increase in unemployment may signal a decrease production as a consequence of a drop in effective demand. This may lead to a decrease in revenues and a fragile debt condition.

3.2. Bank-Specific Determinants

In contrary to macro-economic determinants, distinctive features of the banking sector and the policy choices of individual banks, exert a decisive influence to increase NPLs. A strand in the literature has examined the connection between bank-specific factors and NPLs. Keeton (2003) showed a strong relationship between credit growth and impaired assets. Specifically the results showed that rapid credit growth was associated with lower credit standards contributed to higher loan losses.

Poor management in banks can imply weak monitoring for both operating costs and credit quality of customers, which will induce high levels of capital losses. Peristiani (1996) and Berger and DeYoung (1997) both foundcost efficiency to be positively related to examiners' ratings of bank management quality. Under the bad management hypothesis Berger and DeYoung (1997), managers were not competent to effectively assess and control risks incurred when lending to new customers. Kwan and Eisenbis (1997) demonstrate that higher levels of bank inefficiency can lead to an increase in problem loan ratios of banks. Bank profitability may also determine the risk taking behavior of managers. Banks with high profitability are less pressured to revenue creation and thus less constrained to engage in risky credit offerings. Godlewski (2004) use Return on Asset (ROA) as a proxy for performance, shows that banks profitability negatively impacts the level of NPL ratio. In investigating the problem loans in Spanish commercial and saving banks, Salas and Saurina (2002) reveal that, rapid credit expansion, bank size, capital ratio and market power explain the variation in NPLs. Das and Ghosh (2007) found a strongly significant and a positive impact of credit growth on problem loans.

Misra and Dhal (2010) findings are similar to that of Das and Ghosh (2007). They have identified a positive effect with size of the bank. Their justification is that large banks are more likely to have relatively more NPAs, due to the balance sheet constraint. But Hu *et al.* (2006) concluded that bank size is negatively related to NPLs. Further Hu *et al.* (2006) emphasized risk profile of banks. They have mentioned that banks with greater credit-deposit ratio could have more NPLs. Al-Smadi and Ahmad (2009) identified that provision for loan losses (PLL) is positively correlated with credit risk but not significant. But PLL was a significant predictor of credit risk according to Ahmad and Ahmad (2005). An increase of PLL level is an indicator of a deterioration of loan quality. Large PLL is required to cover higher NPLs and there is a potential to increase credit risk. Boudriga *et al.* (2009) found that bank specific determinants such as credit growth is negatively related to NPLs and banks concentrated on credit activities experience low levels of NPLs, indicate that focusing on lending activities allow banks to make better credit risk assessment. With regard to provision policy Boudriga *et al.* (2009) loan loss provisions are

positively linked to the level of NPL. This result differs from Boudriga and Jellouli (2008) results. Ownership type is a well known correlating function. As to the view of Rajaraman *et al.* (1999) public sector banks in India carry high NPAs. The paradox is that public institutions have been least effective in performing the intermediation function. Micco *et al.* (2004) also confirmed the above finding. Hu *et al.* (2006) also find a positive correlation between capital share owned by the state and the level of NPLs for Taiwanese banks.

Through the above critical review of literature, it is clear that the phenomenon of NPLs is experienced by commercial banks all over the world. But this issue is more critical in developing countries. Literatures provide evidence that NPLs is influenced by both bank-specific factors; credit growth, risk taking, efficiency, market power, ownership structure, diversification and macro-economic factors; economic growth, real interest rate, monetary expansion, unemployment and legal issues.

4. RESEARCH DESIGN

4.1. Sample Selection and Variables

In Sri Lanka by the end of 2013, commercial banking system consists with 24 banks, twelve of which are domestic commercial banks and twelve of which are branches of foreign commercial banks. Foreign LCBs were excluded from the study because of several reasons. First is the difference in the banking operation and accounting format compared with the domestic commercial banks mainly due to multi currency transactions. Second is the unavailability of the financial data. In addition, foreign commercial banking sector is characterized by several changes during test period from 1999 to 2012. From the twelve domestic LCBs, a sample of nine domestic LCBs was selected for this study. Three local commercial banks were excluded as they were not uniformly in operation for the considered fourteen years time period. Thus the sample is consisting with the two public LCBs and seven private LCBs. In the sample, six Systemically Important Banks (SIBs) are included which represent about 76.6 percent of LCB sector assets and 64 percent of banking sector assets (CBSL, 2012). The study mainly depends on secondary and quantitative data. Data on bank-specific factors were extracted from annual reports mainly income statements, balance sheets, notes to financial statements and from ten year summaries. Data on macro-economic variables are obtained from annual reports and other statistical reports of CBSL.

Non-performing loans are considered as the dependent variable in the study. Central Bank of Sri Lanka (2011) has classified non-performing advances of banks as; Overdue – In arrears for 3 to 6 months, Sub standard - In arrears for over 6 to 12 months, Doubtful – In arrears for over 12 to 18 months and Loss – In arrears over 18 months. As available in the annual reports of individual LCBs, the total rupee value of NPLs outstanding that comes under all the above categories by the end of December in each year of sample LCBs have been considered in the calculation of NPL ratio. The independent variables considered in this study have categorized mainly into bank-specific and macro-economic variables. Under the bank-specific variables, efficiency, risk profile,

loan growth, bank size and NPLs of the previous year and under the macro-economic variables, GDP growth, inflation, unemployment and lending rate have been considered.

4.2. Hypothesis Development and Econometric Model

Hypothesis have been developed with regard to bank's efficiency, risk profile, loan growth, bank size, lagged NPLs, GDP growth, inflation, unemployment and on lending rate. Indicators have been selected by reviewing the literature to represent variables that are most suited for the country's financial system. Accordingly expected relationship between dependent and independent variables are presented in the table 2.

Table-2. Definitions and expected signs of the variables

Notation	Empirical Definition	Expected Sign
$NPL_{i,t}$	Ratio of non-performing loans to total loans for bank *i* at time *t.*	
$OPE_{i,t}$	Operating expense to income ratio at bank *i* at time *t.*	(+)
$ROA_{i,t}$	Ratio of net income to total assets at bank *i* at time *t.*	(-)
$LA_{i,t}$	Ratio of loans to total assets of bank *i* at time *t.*	(+)
$PLL_{i,t}$	Ratio of provision for bad and doubtful debt to gross loans of bank *i* at time *t.*	(+)
$\Delta GRL_{i,t-1}$	The growth in loans given by bank *i* at time *t-1.*	(+)
$lnSZE_{i,t}$	The natural logarithm of size (market share) of bank *i* at time *t.*	(-)
NPLP i,t-1	Non-performing loans of the previous year for bank *i* at time *t-1*	(+)
ΔGDP_{t}	The annual growth in real GDP at time *t.*	(-)
ΔINF t	Annual inflation growth rate at time *t* (measured by Consumer Price Index).	(+)
UNE t	Annual unemployment rate at time t.	(+)
$AWPR_{t}$	Average Prime Lending ratio of commercial banks at time t.	(+)

The researcher has used OPE ratio to measure cost efficiency and ROA ratio as an indicator of performance efficiency. Evidence of literature shows that ratio of loans to asset captures the risk appetite of banks as used by Sinkey and Greenwalt (1991). Banks with high provisions are those engaged in riskier activities which lead to a high level of NPL (Boudriga *et al.*, 2009). Thus the study will employ ratio of LA and ratio of PLL as indicators of risk behaviour of the banks. The annual percentage change in loans and advances is used as an indicator of loan growth. Bank size that shows the market power has calculated using the ratio of individual banks customers' deposits to total customers' deposits of LCBs in the country. The change in GDP growth rate is also considered. The annual percentage change of the Consumer Price Index (CPI) value is taken as the indicator of country's inflation growth. Unemployment is measured as a percentage of the labour force without jobs from total labour force in the country. The Average Prime Lending Rate (AWPR) has been considered as the lending rate in the economy. The movement of banks' prime lending rate over the years reflects the general cost condition for borrowers.

This study employs the econometric model that is similar to Salas and Saurina (2002) model used to determine credit risk in Spanish banks. This same model with different variables has been used by Al-Smadi and Ahmad (2009) with regard to Jordanian banking sector. The model is a fixed effect panel data regression function that links the ratio of NPLs to total loans and key macro-economic and bank-specific variables. By considering both sets of variables the exact specification of the fixed effect panel regression model is constructed as follows.

$$\mathbf{NPL}_{i,t} = \beta_{1,i} + \beta_2 \Delta GDP_t + \beta_3 \Delta INF_t + \beta_4 UNE_t + \beta_5 AWPR_t + \beta_6 OPE_{i,t} + \beta_7 ROA_{i,t} + \beta_8 LA_{i,t} + \beta_9 PLL_{i,t} + \beta_{10} \Delta GRL_{i,t-1} + \beta_{11} lnSZE_{i,t} + \beta_{12} NPLP_{i,t-1} + \eta + \upsilon_{i,t}$$

Where: NPL i,t represent ratio of NPLs to total loans for bank *i* in year *t*; ΔGDP t represent the annual growth in real GDP at time *t*; ΔINF t represent the annual inflation growth rate at time *t*; UNE t represent unemployment rate at time *t*; AWPR t represent average prime lending rate at time *t*; OPE i,t and ROA i,t represent operating expenses to income ratio and return on assets ratio that capture the efficiency of bank *i* in year *t*; LA i,t and PLL i,t represent loans to assets ratio and provision for loan losses that capture the risk profile of bank *i* in year *t* respectively; ΔGRL i,t-1 represent growth in loans for bank *i* in year *t-1*; lnSZE *i*,t represent natural log of the ratio of relative market share of each bank's deposits that capture the size of the institution at time *t*; NPLP i,t-1 represent NPLs of bank *i* in year *t-1*; and $\upsilon_{i,t}$ is the error term. In the model η captures the fixed effect of each bank.

5. EMPIRICAL RESULTS

5.1. Descriptive Statistics

Table 3 shows the descriptive statistics of selected variables in the study. The mean NPL of all banks over the test period is 0.119. This suggests that banks could not collect 11.9 percent of every loan given. The highest NPLs is 0.448 while the lowest is 0.024. The mean value of LA ratio suggests that from the total asset value of banks, 62 percent consists of with advances which indicate the high risk taken by bank managers to boost the profits. Some banks have maintained asset portfolio consisting of 89 percent as loans and advances which is very high, than a healthy balance. The mean growth rate of loans over 14 years test period is 21.8 percent. Maximum loan growth is recorded as 90.5 percent which is much higher than the average.

With regard to macro-economic variables the mean GDP growth over 14 years period is 5.4 percent, with the highest growth in 2011 of 8.2 percent and the lowest growth of -1.5 percent in 2001. The highest inflation growth of 17 percent was recorded in 2007. The mean rate of unemployment is 6.7 percent with a low standard deviation among of 0.016. The lowest and highest unemployment rate of 4.0 and 8.9 percent were recorded in 2012 and 2008 respectively. The mean value of market lending rate measured by average prime lending rate of commercial banks is 13.8 percent with a standard deviation of 0.038.

Table-3. Descriptive statistics

Variables	Mean	Median	Maximum	Minimum	Std. Dev.
Non Performing Loans (NPL)	0.119	0.089	0.448	0.024	0.087
Operating expense to Income (OPE)	0.043	0.041	0.109	0.017	0.014
Return on Assets (ROA)	0.058	0.059	0.092	0.018	0.012
Loans to assets (LA)	0.616	0.622	0.898	0.381	0.095
Loan loss provisions (LLP)	0.016	0.010	0.150	-0.022	0.019
Loan growth (GRL)	0.218	0.207	0.905	-0.410	0.197
Bank size (SZE)	0.097	0.080	0.298	0.002	0.085
GDP growth (GDP)	0.054	0.060	0.082	-0.015	0.024
Inflation growth (INF)	0.094	0.084	0.175	0.047	0.041
Unemployment (UNE)	0.067	0.069	0.089	0.040	0.016
Market interest rate (AWPR)	0.138	0.132	0.215	0.090	0.038

Number of observations 126

5.2. Regression Analysis

In developing the panel data regression model, the explanatory power of bank-specific variables was tested first with the dependent variable. The fixed effect panel regression model for bank-specific variables is constructed as follows.

$$\mathbf{NPL}_{i,t} = \beta_{1,i} + \beta_2 OPE_{i,t} + \beta_3 ROA_{i,t} + \beta_4 LA_{i,t} + \beta_5 PLL_{i,t} + \beta_6 \Delta GRL_{i,t-1} + \beta_7 lnSZE_{i,t} + \beta_8 NPLP_{i,t-1} + \eta + \upsilon_{i,t}$$

The regression results in Table 4 showsthe significance of bank-specific regressors in explaining the dynamics of NPLs. The adjusted R-squared suggests that bank-specific variables explain 72 percent variation of the NPLs in LCBs.

Table-4. Panel regression results for bank-specific variables

Variables	Coefficient	Std.error	t-statistics	Probability
Bank-Specific factors				
C	-0.069	0.039	-1.770	0.079
OPEi,t	1.272***	0.357	3.566	0.000
ROAi,t	-1.082***	0.396	-2.730	0.007
LAi,t	0.225***	0.048	4.646	0.000
LLPi,t	0.172	0.255	0.675	0.501
GRLi,t-1	-0.051**	0.024	-2.168	0.032
SZEi,t	-0.087	0.055	-1.570	0.032
NPLPi,t-1	0.594***	0.060	9.778	0.000
Adjusted R-squared	0.715			
Durbin-Watson Stat	1.678			

* significant at 0.1, ** significant at 0.05, and *** significant at 0.01

The explanatory power of both bank-specific variables and macro-economic variables was tested with the dependent variable. Four macro-economic variables that are GDP, INF, UNE and AWPR are added to the model, in the view of investigating the correlation with NPLs and to increase the explanative ability of the model. The fixed effect panel regression model for both bank-specific and macro-economic variables is as follows.

$$NPL_{i,t} = \beta_{1,i} + \beta_2 \Delta GDP_t + \beta_3 \Delta INF_t + \beta_4 UNE_t + \beta_5 AWPR_t + \beta_6 OPE_{i,t} + \beta_7 ROA_{i,t} + \beta_8 LA_{i,t} + \beta_9 PLL_{i,t} + \beta_{10} \Delta GRL_{i,t-1} + \beta_{11} lnSZE_{i,t} + \beta_{12} NPLP_{i,t-1} + \eta + \upsilon_{i,t}$$

By adding macro-economic variables a significant increase in adjusted R-squared is evident with the value 0.78. This suggests bank-specific variables together with macro-economic variables explain 78 percent variations of the NPLs in LCBs. As to regression results, nine independent variables were found statistically significant at 1, 5 and 10 percent confidence intervals, while the rest of other four variables were not significant.

At bank-specific level, operating expense to income ratio shows positive relationship between with NPL as expected. This finding is similar to the findings of (Berger and DeYoung, 1997; Fofack, 2005; Al-Smadi and Ahmad, 2009). ROA shows significant negative relationship with NPLs. Godlewski (2004) using ROA as a proxy for performance shows that banks profitability negatively impacts the level of NPL ratio. T values of OPE and ROA suggest that bank efficiency has an explanatory power over NPLs.

Table-5. Panel regression results for bank-specific and macro-economic variables

Variables	Coefficient	Std.error	t-statistics	Probability
Bank-Specific factors				
C	-0.049	0.046	-1.070	0.287
OPEi,t	0.725**	0.338	2.144	0.034
ROAi,t	-0.609*	0.362	-1.682	0.095
LAi,t	0.203***	0.045	4.520	0.000
LLPi,t	0.271	0.244	1.109	0.269
GRLi,t-1	-0.044**	0.022	-1.951	0.053
SZEi,t	-0.091**	0.050	-1.823	0.071
NPLPi,t-1	0.543***	0.062	8.671	0.000
Macro-Economic factors				
ΔGDP_t	-0.789***	0.198	-3.986	0.000
ΔINF_t	-0.216**	0.105	-2.065	0.041
UNE_t	0.300	0.330	0.908	0.365
$AWPR_t$	0.264**	0.111	2.366	0.019
Adjusted R-squared	0.782			
Durbin-Watson Stat	1.785			

* significant at 0.1, ** significant at 0.05, and *** significant at 0.01

Ratio of loans to assets is positive and significant at one percent significant level. The finding is in line with Sinkey and Greenwalt (1991) who stated that banks that value profitability more than the cost of high risk that is represented by a high loan to asset ratio are likely to incur higher levels of NPLs. The coefficient estimate of the LLP is having a positive correlation with NPLs as expected but is insignificant. The results are similar to that of Al-Smadi and Ahmad (2009). A different result was obtained in panel of Tunisian banks by Boudriga and Jellouli (2008) who observed a negative relationship between lagged provisions and NPL.

The coefficient estimates for Loan Growth is significant at 5 percent level, but showed an unexpected negative correlation. It therefore follows that commercial banks which extend relatively

higher levels of credit are likely to incur lower non-performing loans. It is important to note that our results are contrary to most of researchers such as Jimenez *et al.* (2005); Lis *et al.* (2000) and Sinkey and Greenwalt (1991) However, similar findings are reported by Pasha and Khemraj (2009) and Al-Smadi and Ahmad (2009).

The variable Size is negative with *t* value of -1.823 and is weakly significant. This finding is consistent with Rajan and Dhal (2003), Salas and Saurina (2002), Hu *et al.* (2006) and Al-Smadi and Ahmad (2009)who have reported an inverse relationship due to the fact that big banks have large resources to evaluate their loans, which improve the quality of loans, and greater opportunities for portfolio diversification more than small banks. As noted by Hu *et al.* (2006), larger banks have more resources and are more experienced in dealing better with bad borrowers. Finally, the last bank-specific variable that is one lag NPL is a significant predictor of current year NPLs. Das and Ghosh (2007) found a significant and positive relationship between one lag NPLs and credit risk. The same result was derived by Al-Smadi and Ahmad (2009).The positive sign of the coefficient suggests that the NPL of one period is closely related to that of the previous period.

Three of macro-economic variables GDP, inflation, and average prime lending ratio have a significant impact on determining the NPL ratio in banks. Among the macro-economic variables, the variable with the highest *t* value is GDP. As to previous studies of Salas and Saurina (2002), Rajan and Dhal (2003), Jimenez and Saurina (2006) and Fofack (2005) the real growth rate of GDP is a significant predictor of credit risk faced by banks. The coefficient estimate of GDP is negative and significant at 1 percent level as expected. This implies that NPLs are lower during good economic conditions and high during bad economic conditions.

Inflation coefficient with *t* value of -2.065 suggests that it has a substantial impact on NPLs. This negative relationship may be due to the decrease in volume of loans granted by banks and the banks becoming more selective of high quality borrowers during high inflation period. The finding is similar to that of Al-Smadi and Ahmad (2009). Unemployment rate of the country have a positive but insignificant effect on NPLs. The market lending rate that is measured by AWPR does have a significant and positive relationship. Increase of one percent market interest rate leads to increase NPL ratio by 0.26. The results of several studies done by Jimenez and Saurina (2006); Quagliariello (2007) and Fofack (2005)support the idea that high interest rate increase obligation of borrowers and thus increase credit risk.

6. CONCLUSION AND IMPLICATIONS

This study attempted to ascertain the determinants of NPLs in the licensed commercial banking sector in Sri Lanka. We have examined the impact of bank-specific variables and macro-economic independent variables to the NPLs. Results of regression indicated that NPLs of banks depend on both bank-specific and macro-economic variables. Thus nine independent variables are found statistically significant.

The two indicators that is loans to assets ratio and loan loss provision ratio that is used to measure the risk appetite of banks indicated a positive correlation with NPLs. As opposite to the

way we expected results revealed that high credit growth is associated with a reduced level of problem loans. This inverse relationship suggests that banks which are more aggressive in the credit market are likely to incur lower NPLs. The empirical results reveal that efficiency and size of the bank is also having explanatory power over NPLs. In line with previous research, this study discloses that when efficiency of the bank increases NPLs reduce. Size of the bank has inverse relationship with NPLs.

With regard to macro-economic variables GDP growth rate and inflation has recorded a significant inverse relationship while lending rate record significant positive influence. This suggests that strong performance in the real economy results in lower NPLs. During high inflationary periods banks are experiencing lower NPLs due to the change in their loan policy. High lending rate prevails in the market increase the obligation of borrowers and thus increases defaulting of payments.

The descriptive analysis of the study confirmed that the average NPL ratio in the sample LCBs during 1999-2012 is 11.9 percent, while the international limit of such ratio is 2 percent. Throughout the considered period public commercial banks were able to maintain better asset quality than private commercial banks that operate in the country.

There are several policy implications that can be gleaned from the analysis. First, evidence suggests that high risk taking behavior of bank management often leads to poor loan quality. Shareholders must exert appropriate monitoring on managers action and to implement suitable control devices to minimize possible agency conflicts.

Commercial banks need to continue to strengthen their credit risk mitigation measures to maintain the stability of the banking sector. As such, it is essential for banks to carry out proper evaluation of credit applications and closely monitor repayment capacity and cash flow of the borrowers to ensure that expansion of credit will not pose a further risk to financial system stability. Resolution of NPLs in countries like Sri Lanka ultimately lies in developing a competitive environment for the financial sector as a whole.

7. ACKNOWLEDGEMENTS

It is an accepted fact that nothing constructive could be achieved in isolation. I appreciate the support given by Mrs. K. Dassanayake, Director of Governor's Secretariat Department and Secretary to the Governor of Central Bank of Sri Lanka in data collection of this study. I also wish to express my gratitude to the staff of the Licensed Commercial Banks in Sri Lanka who imparted the much needed information about their banking institutions to me.

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