

Determinants of Non Performing Loans: Evidence from Sri Lanka

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Abstract- In the recent past, the global financial crisis and the subsequent recession in many developed countries have increased households' and firms' defaults, causing significant losses to the banks. Case of Sri Lanka is no difference. The changes in the economic conditions are believed to have a critical role to play in determining the level of nonperforming loans. Regulators all over the world have started to pay more attention to the credit quality of the Banks and strengthened the regulatory frameworks. This paper attempts to study the macroeconomic determinants of banks' loan quality in Sri Lanka by analyzing secondary data over the period 1998–2014. The methodology to be adopted for the study was arrived at upon careful review of the literature and following the empirical studies conducted on the determinants of the nonperforming loans. The finding of the analysis is that, out of the six determinants, GDP growth rate and the Export Growth are significant in determining the level of the NPLs in the Sri Lankan banking sector. The relationship of the GDP with the NPL is found to be positive which is not consistent with the majority of the empirical findings

Keywords- Nonperforming Loans; Macroeconomic Determinants

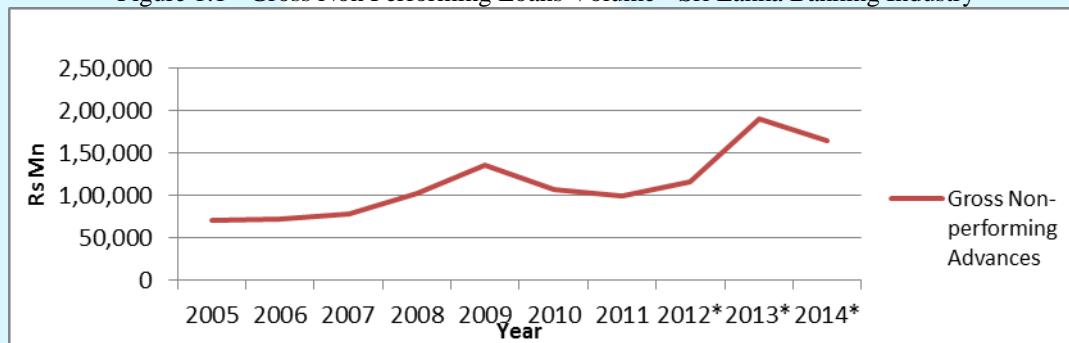
1. INTRODUCTION

Deterioration in the quality of the loan books of the Banks has been a main cause of financial instability in the banks which would ultimately impact the entire financial system of the country. Past studies (Bonilla, 2012)[4], (Khemraj & Pasha, 2009)[17] and the incidents reported around the world shows that accumulated bad loans play a major role in Bank failures. The scope of this research is limited to explore the determinants of macroeconomic variables. As discussed number of studies were found in the literature where the impact of macroeconomic variables has been studied. Non availability of publicly accessible data prevents a comprehensive study on bank specific variables. In studying the impact of types of the borrowers

and their behaviour, factors which are specifically affecting different sectors (Keeton & Morris, 1987)[16] that lead to varying level of nonperforming loans in different sectors, data at more granular level are required. Non accessibility to these data is a limitation in studying the factors that may have a notable impact on the aggregate nonperforming loans.

In the recent past, the global financial crisis and the subsequent recession in many developed countries have increased households' and firms' defaults, causing significant losses to the banks. Case of Sri Lanka is no difference. The Figure 1.1 below illustrates the movement of Nonperforming loans (NPLs) amount of the Sri Lanka Banking Industry.

Figure 1.1 - Gross Non Performing Loans Volume - Sri Lanka Banking Industry



Source: Author compiled (2016)

It can clearly be identified that the nonperforming loans have increased over the period in the financial sector in Sri Lanka. There is a greater impact from nonperforming loans to the profitability of the Banking industry. Banks are supposed to set aside considerable amount of money for loan loss provisions. It could be clearly identify the

impact the nonperforming loans have on the profitability of the Banks. Regular monitoring of loans and advances, possibly with an early warning system capable of alerting regulatory authorities of potential bank stress, is thus essential to ensure a sound financial system and prevent systemic crises. Currently no such tools or methods are

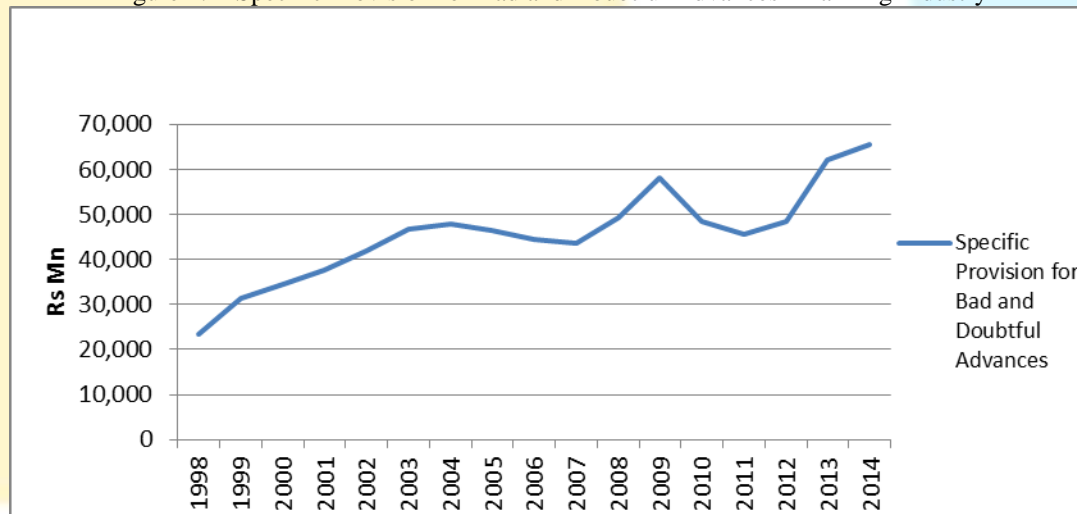
being used by the local regulators to monitor the quality of the loan books of the bank.

Events took place during the past decade, that shook the financial system of the country necessitate and highlighted the importance of careful management of the assets and liabilities of the financial industry. The banks play a key role in the financial system in any country across the globe. The link between banks around the world made the situation even more sensitive when it comes to the stability of the world economy. The impact of the bad loans and effects to the stability of the financial system is depicted in Figure 1.21.2 below the provision for loan losses has reached the Rs 65 Billion mark by the end of the year 2014.

system of the county has a clear relationship. What is important to understand is what causes the loans to go bad. Essentially lot of factors influence a loan to become a nonperforming loan (NPL) and may consist of microeconomic, macroeconomic, socio-economic, geographical, behavioral and many other valid factors. However scope of this paper is limited to the study of key macroeconomic factors that causes a loan to become a nonperforming loan.

As depicted in

Figure 1.2 -Specific Provision for Bad and Doubtful Advances - Banking Industry



Source: Author compiled (2016)

This paper attempts to study the macroeconomic determinants of banks' loan quality in Sri Lanka by analyzing secondary data over the period 1998–2014. Macroeconomic developments may have a different impact on loan quality depending on the type of the borrower.

2. RESEARCH PROBLEM AND THE OBJECTIVE

The business of Banks mainly the financial intermediation involves borrowing from surplus units and lending to the deficit units. Channeling funds from surplus units to deficit units while maintaining sufficient liquidity to pay the depositors on demand is a challenging task for the Banks. In order to pay back it is essential to recover what has been lend out as loans and advances. When considerable portion of these loans and advances are not paid back as and when they become due together with the interest charged on them, the Banks will incur losses and find it difficult to repay the depositors. As per the Banking Act direction No 03 of 2008 on Classification of Loans and Advances, Income Recognition and Provisioning when an the outstanding balance of an overdraft remain in excess of the sanctioned limit

continuously for a period of 90 days or more such overdrafts are classified as nonperforming. Loans which are repayable in monthly installments are classified as nonperforming loans when the principal or interest has not been paid for three consecutive loan installments. (Central Bank of Sri Lanka, 2013)[8] (Akinlo & Emmanuel, 2014)[3]

The nonperforming loans have been identified as one of the main causes of Bank failures. A failed financial institution brings many negative effects to the entire economy. Therefore managing nonperforming loans and maintaining it at an acceptable level is an important task for the stability of Banks as well as the financial system of a country. In order to manage the nonperforming loans, it is important to understand the determinants of the nonperforming loans and their relationship which is the main problem that would be addressed throughout the research.

Thus, Identify the macroeconomic determinants of Nonperforming loans of the Sri Lankan Banking sector and their explanatory power is the main objective and sub objectives are to study the short term relationship of explanatory variables with nonperforming loans.

3. SIGNIFICANCE OF THE STUDY

Banking and Finance sector has faced difficulties over the years for different reasons. The main causes of serious banking problems continue to be lack of credit standards for borrowers and counterparties, poor portfolio risk management, and a lack of attention to changes in economic or other circumstances that can lead to deterioration in the credit standing of a bank's counterparties.

The impact of Nonperforming loans (NPLs) is two folds for the capital adequacy ratio and it erodes the profitability of a bank as a result of provisions for nonperforming loans. The increase in nonperforming loans would increase the risk weighted assets and it further reduce the retain earnings which will be one of the components considered for capital of the Bank. Internationally, banks have been moving towards the use of sophisticated models for measuring and managing risks in an integrated manner with a view to ensuring a comprehensive Internal Capital Adequacy Assessment Process (ICAAP) under Pillar 2 of the Basel II framework. However in the local context Banks are using mostly scenario based approaches for stress testing activities.

The significance of this study is that, it attempts to develop a relationship between the NPL and the macroeconomic variables which will help all the Banks in the country in devising a similar model to have a forward-looking stress testing mechanism to forecast the level of nonperforming loans in response to the changes in the macroeconomic environment. The model could also be used by the Banks to forecast the nonperforming loans and have a set of action plans ready to face adverse situations.

4. A BRIEF LITERATURE REVIEW

The literature review supports to identify the research phenomenon, the variables and the hypotheses. One of the widely discussed relationships in literature is that the stability and the vulnerability of the banking sector in the boom and depression of business cycles. Quagliariello (2007)[22] analyses more than 200 Italian Banks over a period of almost two decades to understand the effect of evolution of the business cycle on Bank losses due to credit risk. The outcome of the study confirms that banks' loan loss provisions and new bad debts are affected by the evolution of the business cycle. It is observed from the empirical studies that, during economic boom, growth in bank loans are accelerated and a notable decline in credit growth in the depression business cycles (Marcucci & Quagliariello (2008)). In an economic depression situation the opposite of what was discussed under the boom can be seen. The banks are reluctant to extend credit for investments which would reduce the growth in overall lending in the economy. As identified by Marcucci & Quagliariello (2008)[20] this may have a feedback effect on the economy as well. One important

finding of their study is that when capital surplus over the regulatory minimum are low, banks may reduce lending, which in turn negatively affect the output of the economy. As discussed the literature on the NPLs observed this cyclic effect where NPLs are low during boom due to high revenue of borrowers provide them with stable cash flows to meet their loan obligations (Quagliariello, 2007)[22]. The main reason for the growth in the NPLs has been identified by these studies as the fall in the value of collaterals during the depression, consequently not covering the outstanding balance in case of a default.

The findings of Marcucci & Quagliariello (2008) are consistent with the results of the investigation conducted in USA by Keeton and Morris (Keeton & Morris, 1987). Keeton has (Keeton, 1999)[15] done another study to investigate the impact of higher loan growth in the NPLs. Data of USA banks over the period of 1982-1996 were used and employed Vector Auto Regression (VAR) to analyse the model. His findings supported the hypothesis which relates the higher delinquency rate to rapid growth in credit. Messai & Jouini (2013) used a sample of 85 Banks in three European countries for the period from 2004 to 2008 to study both macro and bank specific determinants of the nonperforming loans. They found a negative relationship between the return on assets and the NPLs under the bank specific variables. Bonilla (2012)[4] used NPLs data of Italy and Spain to study the macroeconomic determinants. Akinlo & Emmanuel (2014)[3] stressed the importance of credit risk assessment as a major component of macro prudential analysis. A somewhat different perspective on the NPLs was discussed by Florin(2014) which expressed the nonperforming loans as non-quality of part of bank lending. A fixed effect model using a panel dataset was used by Khemraj & Pasha (2009)[17] to study the determinants NPLs in the Guyana banking sector. Although a positive relationship is observed, the study found to be insignificant.

The literature review revealed that previous studies conducted on NPLs focused mainly on two factors. The empirical evidence identified that NPLs could be explained by bank specific factors and macroeconomic factors. The literature review revealed that numbers of studies have been conducted in different parts of the world that found evidence to support the both relationships.

5. METHODOLOGY AND THE CONCEPTUAL FRAMEWORK OF THE STUDY

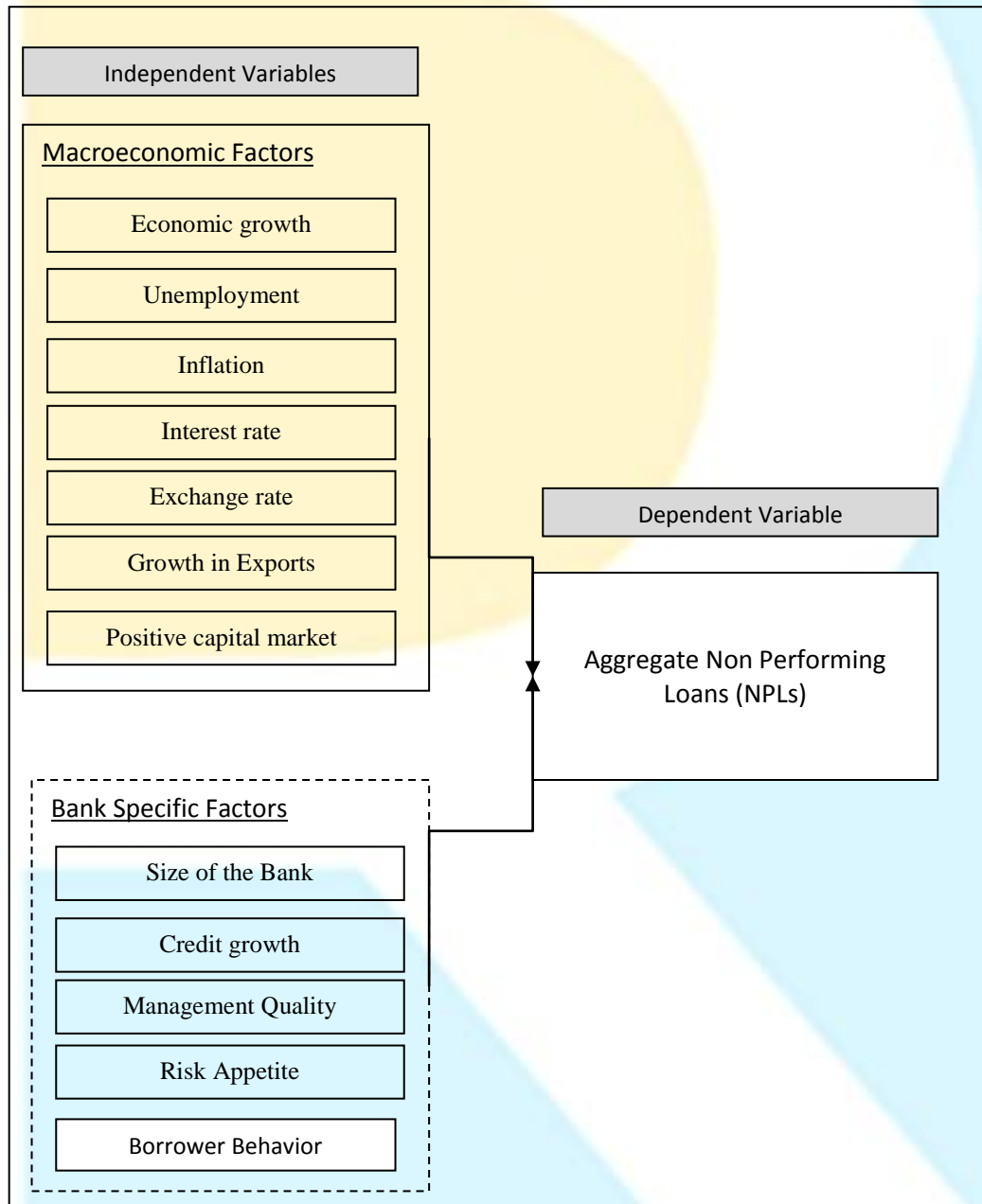
Following the review of literature this chapter presents an overview of the conceptual framework, macroeconomic model, econometric tests conducted, sources and the type of data used in the analysis.

The empirical evidence identified that NPLs could be explained by bank specific factors and macroeconomic factors. Louzis, Vouldis and Metaxas (2011)[19]

explained that determinant of NPLs should not be sought exclusively among macroeconomic variables. While recognizing the fact that bank specific factors may have an impact on the aggregate level of NPL's the scope of Figure 5.1 is developed based on the literature review by recognising both factors that affect the NPLs.

this study is limited to studying the impact of macroeconomic factors. The conceptual framework graphically illustrated in

Figure 5.1 - Conceptual Framework



Based on the above conceptual framework and the scope of the study regression model has been developed taking only the macro economic variables into consideration. The current study is a correlational study which attempts to identify the relationship between the macroeconomic determinants of nonperforming loans in Sri Lanka and the explanatory power of such variables. The analysis

process is econometrical in nature which uses secondary time series data to analyse the relationship using the ordinary least square method of regression (OLS).

6. VARIABLE DEFINITIONS AND DATA OPERATIONALIZATION

Majority of the researchers used the nonperforming loans ratio as the proxy to capture the impact on banking sector from the macroeconomic factors. Messai & Jouini (2013)[21], used non performing loans to total loans as the independent variable. Akinlo & Emmanuel (2014)[3] used the nonperforming loans to total loans as the dependent variable to study the determinants of nonperforming loans in Nigeria. The present study use the same definition, ratio of nonperforming loans to total loans as the dependent variable. Following the literature review Current study use quarterly real GDP for the period from year 2008 to 2014 as one of the independent variables in the regression model. Nonperforming loans may have a significant relationship with unemployment, given the fact that Banks grant personal loans and housing loans mainly to the employed. Empirical studies (Messai & Jouini, 2013[21], Bonilla, 2012[4], Akinlo & Emmanuel, 2014)[3] support the view that the unemployment has a significant influence on the nonperforming loans. The current study uses the quarterly data on unemployment rate of Sri Lanka from year 2008 to 2014 as an independent variable. Movement of the consumer price index as a percentage of a predefined base year is considered the inflation rate. In Sri Lanka the Colombo Consumer Price Index (CCPI) is used to gauge the inflation rate of the country and the data were taken from the Department of Census & Statistics, Sri Lanka in 2015.

Interest is the price paid by the borrowers for the funds they borrow. The current study uses the interest rate as a determinant of nonperforming loans after careful evaluation of the literature. Average weighted lending rate (AWLR) published by the Central Bank of Sri Lanka has been used as the proxy to capture the movement in interest rates. Real effective exchange rate is defined as the weighted average of a country's currency relative to an index or basket of other major currencies adjusted for the effects of inflation. The current study also uses the real effective exchange rate as a determinant of nonperforming loans following the empirical evidence. The study uses the exports growth as an independent variable to check the possible relationship with nonperforming loans. Quarterly data from year 2008 to 2014 have been used in the regression model. This study considers the All Share Price Index of the Colombo Stock Exchange as the proxy to capture the impact of stock market performance on NPLs in the Sri Lanka Banking sector.

7. STATISTICAL MODEL SPECIFICATION

Multiple regression analysis has been used as the initial method in studying the relationship between macroeconomic variables and the NPLs in Sri Lanka

banking sector. The regression analysis helps identifying the determinants and their explanatory power. Review of the empirical studies revealed that, regression analysis has been used in majority of the studies (Ahmad, F., & Bashir, T. (2013)[1], Jimenez (2006)[13], Khemraj & Pasha(2009)[17]) conducted across the world to analyse the relationship between macroeconomic determinants and nonperforming loans.

The methodology adopted for this study was the OLS regression analysis using secondary time series data on nonperforming loans and macroeconomic variables. The regression model is given below.

$$NPL_t = \beta_0 + \beta_1 GDP_t + \beta_2 UNEMP_t + \beta_3 INF_t + \beta_4 INTR_t + \beta_5 EXRT_t + \beta_6 EXPT_t + \beta_7 ASPI_t + \mu_t$$

NPL _t	- Non performing loans at time _t
GDP _t	- Gross Domestic Product at time _t
UNEMP _t	- Unemployment at time _t
INF _t	- Inflation at time _t
INTR _t	- Interest Rate at time _t
EXRT _t	- Exchange Rate at time _t
EXPT _t	- Exports Growth at time _t
ASPI _t	- Capital Market Growth at time _t
β ₀	- Intercept of the Regression
β ₁ - β ₇	- Coefficients of the variables.
μ _t	- Error term
t	- Time period (2008Q ₁ -2014Q ₄)

In order to capture the relationship of the growth rates, all the variables were converted to the log first difference using E views statistical software package. The log converted variables represent the growth rates which will be used in the regression model to estimate the relationship between nonperforming loans and the macroeconomic variables.

It is required for the time series to be stationary for drawing useful inferences. A data series is said to be stationary if the mean and the variance of the time series are constant over time and the value of the covariance between two time periods depends only on the distance or lag between the two time periods and not on the actual time at which the covariance is computed. The correlation between a series and its lagged values are assumed to depend only on the length of the lag and not when the series started. This property is known as stationarity and any series obeying this is called a stationary time series. (Ahmed, 2008)[2]. Use of non stationary data for estimation can lead to make inaccurate regression results. Since the current study uses time series data it is required to test the data for stationarity prior to regression of the variables. Accordingly the time series has been tested for stationarity using Augmented Dickey Fuller (Dickey and Fuller, 1981) unit root tests in E-views. The unit root tests were conducted by including an intercept and a trend in the test equation as appropriate. The unit root tests for stationarity were carried out in level and first difference.

8. ANALYSIS OF THE DATA AND THE ESTIMATED RESULTS

Initially the data has been analysed to recognize the basic properties of normality, asymmetric and stationary aspect of the time series.
The

Table 8.1 illustrates a detailed statistical summary of the variables considered in the model.

Table 8.1 - Descriptive Statistics

	DNPL	DASPI	DEXPT	DEXRT	DGDP	DINF	DINTR	DUNEMP
Mean	-0.010	0.003	-0.003	-0.001	-0.002	-0.001	-0.004	-0.000
Median	-0.026	0.026	0.016	-0.002	-0.036	-0.000	-0.005	0.015
Maximum	0.234	0.440	0.318	0.053	0.114	0.035	0.066	0.215
Minimum	-0.156	-0.469	-0.240	-0.074	-0.119	-0.070	-0.077	-0.209
Std. Dev.	0.110	0.186	0.136	0.032	0.081	0.023	0.027	0.109
Skewness	0.944	-0.032	0.305	-0.321	0.039	-0.891	0.004	-0.065
Kurtosis	2.963	3.674	2.517	2.760	1.495	4.001	4.523	2.503
Sum Sq. Dev.	0.315	0.906	0.482	0.027	0.174	0.014	0.019	0.314
Observations	27	27	27	27	27	27	27	27

Source: Author compiled (2016)

8.1 Stationarity Test Analysis

A data series is said to be stationary if the mean and the variance of the time series are constant over time and the value of the covariance between two time periods depends only on the distance or lag between the two time periods

and not on the actual time at which the covariance is computed.

In order to ensure the stationarity of the data Augmented Dicky Fuller tests were conducted on the variables which were used in the model. Based on the following hypothesis, the **Error! Reference source not found.** shows the summary of ADF unit root tests results.

Table 8.2 - ADF Unit Root Test Results Summary

	I (0)			I (1)		
	Test Statistic	Critical Value at 5%	P value	Test Statistic	Critical Value at 5%	P value
ASI	-3.622	-3.699	0.012			
INTR	-2.687	-2.991	0.090	-6.487	-2.981	0.000
INF	-4.232	-2.976	0.002			
EXPT	-3.532	-2.976	0.014			
EXRT	-3.850	-2.976	0.007			
GDP	-2.266	-2.991	0.190	-21.802	-2.991	0.000
NPL	-3.021	-2.998	0.047			
UNEMP	-6.336	-2.976	0.000			

Source: Author compiled (2016)

All variables have been checked for the existence of a trend prior to applying the unit root test. The test results do not indicate any trend in the variables that are used in the study for the selected sample. The detailed test results are given in the **Error! Reference source not found.**

The Augmented Dickey Fuller (ADF) unit root test results indicate that INTR and GDP are non stationary at level. The test statistic of both the variables is less than the critical value in absolute term at 5% level and therefore the null hypothesis of presence of unit root is accepted. All the other variables are stationary at level according to the ADF test results which is tabulated in **Error! Reference source not found.** INTR and GDP are stationary at first difference According to the unit root test

outcome of ADF test it is identified that some variables are non stationary at level and those variables are stationary at first difference. To bring all the variables to a common platform in order to apply OLS regression, the variables have been converted to first difference (I_1) to make the time series data stationary.

Implicit assumption that is made when applying the OLS estimation is that explanatory variables are not correlated with each other. The high correlation among explanatory variables is referred to as multi collinearity problem. Multi collinearity makes it tedious to assess the relative importance of the independent variables in explaining the variation caused by the dependent variable. (Lani, 2015)

Table 1 - Correlation Matrix of Independent Variables

	DASPI	DEXPT	DEXRT	DGDP	DINTR	DINF	DUNEMP
DASPI	1.000						
DEXPT	0.047	1.000					
DEXRT	-0.153	0.206	1.000				
DGDP	0.352	0.038	0.224	1.000			
DINTR	-0.121	-0.054	0.260	0.137	1.000		
DINF	0.138	0.201	-0.316	-0.541	0.098	1.000	
DUNEMP	0.171	-0.348	-0.168	-0.311	-0.203	0.097	1.000

Source: Author Compiled in 2016

According to the correlation matrix presented in **Error! Reference source not found.** no strong correlations were observed among the explanatory variables. However a notable correlation is observed among the Inflation and the GDP growth rate which is slightly over 0.5. Correlation among GDP and the ASPI is also found to be somewhat higher though it is not considered significant in affecting the OLS estimation.

9. ANALYSIS OF REGRESSION RESULTS AND DISCUSSION

This section deals with the model estimation and discusses the resulting outcome of the regression model.

Error! Reference source not found.: The regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.009096	0.017716	-0.513448	0.6136
DASPI	0.150842	0.126183	1.195423	0.2466
DEXPT	-0.365954	0.155382	-2.355185	0.0294
DEXRT	0.411672	0.650594	0.632763	0.5344
DGDP	0.751114	0.355568	2.112433	0.0481
DINF	1.697073	1.171406	1.448748	0.1637
DINTR	-0.342312	0.752669	-0.454797	0.6544
DUNEMP	0.079709	0.198301	0.401960	0.6922
R-squared	0.507999	Mean dependent var		-0.010797
Adjusted R-squared	0.326736	S.D. dependent var		0.110186
S.E. of regression	0.090410	Durbin-Watson stat		1.919890
Sum squared resid	0.155306			
Log likelihood	31.32425			
F-statistic	2.802545			
Prob(F-statistic)	0.034947			

Source: Author compiled (2016)

According to the results of the regression analysis, two variables namely export growth and GDP are significant at 95% confidence interval where the p values of these variables are less than 0.05. However a noteworthy observation is made in the coefficient values of the variables where the coefficient value of the GDP stands at positive 0.7511 which is not consistent with the direction of results of majority of the studies discussed in the literature. The positive relationship implies that the NPLs tend to rise as the economy grows. Though it is difficult to interpret the outcome which doesn't seem to be fit in

A detailed analysis on the relationship among the dependent variable and the independent variables is presented along with the explanatory notes.

Regression results can be applied to identify the long term relationships among variables. As discussed in the methodology OLS regression is used to estimate the relationship between dependent variable and independent variables. The result of the regression is illustrated in **Error! Reference source not found. Error! Reference source not found..**

with the economic theory and the majority of the studies conducted worldwide, in reality this may be a possibility given the period considered for the study. Collapse of number of finance companies was observed during the period from year 2008 to 2009 which later transmitted to the Banking sector as well. Few Banks face liquidity issues and the Central Bank had to intervene to prevent a major systemic crisis in the financial markets of the country

9.1 Analysis of Short Term Relationships

One of the secondary objectives of this study is to analyse the short term relationships, the explanatory variables have with the NPLs. The regression analysis deals with the dependence of one variable on other variables and it does not imply causation. The existence of a relationship between variables does not prove causality or the direction of influence. In order to identify this causal relationship among the variables the Granger Causality test has been employed. Such an analysis would assist in investigating the direction of and a possible causal relationship between the explanatory variables and nonperforming loans.

A time series v is said to Granger-cause w if statistically significantly better predictions of w can be made by including lagged values of v in the conditioned information set in addition to lagged values of w [Granger (1969)[12], Agénor and Taylor (1992)]. Let \tilde{w}_t be the vector of nonperforming loans transformed to stationarity and \tilde{v}_t the value of a given explanatory variable taken at Table below.

time t ($0 < t \leq T$), the length of the time series. The vector \tilde{v}_t is said to Granger-cause \tilde{w}_t if lagged values of \tilde{v}_t , ($\tilde{v}_t = \tilde{v}_{t-1}$) significantly help in the prediction of \tilde{w}_t , given lagged value of \tilde{w}_t . Formally, the Granger test of causality can be analyzed from the following bivariate representation: (Fofack, 2005)

$$\tilde{v}_t = \alpha_0 + \alpha_1 \tilde{v}_{(t-1)} + \dots + \alpha_l \tilde{v}_{(t-l)} + \beta_1 \tilde{w}_{(t-1)} + \dots + \beta_l \tilde{w}_{(t-l)} + \varepsilon_t$$

Equation 1 - Bivariate regression for causality (1)

$$\tilde{w}_t = \alpha_0 + \alpha_1 \tilde{w}_{(t-1)} + \dots + \alpha_l \tilde{w}_{(t-l)} + \beta_1 \tilde{v}_{(t-1)} + \dots + \beta_l \tilde{v}_{(t-l)} + \mu_t$$

Equation 2 - Bivariate regression for causality (2)

The null hypothesis of the Equation 1 is that w does not granger cause v while in the Equation the null hypothesis is that v does not granger cause w .

Results derived by applying the Granger causality test to identify the existence of a causal relationship between the nonperforming loans and the explanatory variables at lags up to four periods is given in the

Table 9.2: Granger Causality Test Results

Null Hypothesis:	Lags: 2		Lags: 3		Lags: 4	
	F-Stat	Prob.	F-Stat	Prob.	F-Stat	Prob.
DASPI doesn't Gr. Ca. DNPL	7.452	0.003	4.558	0.016	5.922	0.005
DNPL doesn't Gr. Ca. DASPI	1.721	0.203	0.574	0.639	0.814	0.536
DEXPT doesn't Gr. Ca. DNPL	0.949	0.403	0.685	0.572	0.774	0.559
DNPL doesn't Gr. Ca. DEXPT	0.515	0.604	0.426	0.736	0.735	0.580
DEXRT doesn't Gr. Ca. DNPL	1.124	0.344	0.347	0.791	0.674	0.620
DNPL doesn't Gr. Ca. DEXRT	2.022	0.158	1.211	0.335	2.336	0.100
DGDP doesn't Gr. Ca. DNPL	8.867	0.001	7.643	0.001	2.617	0.080
DNPL doesn't Gr. Ca. DGDP	13.488	0.000	1.205	0.337	1.409	0.281
DINF doesn't Gr. Ca. DNPL	3.313	0.057	1.550	0.238	0.208	0.929
DNPL doesn't Gr. Ca. DINF	6.770	0.007	2.255	0.118	1.901	0.166
DINTR doesn't Gr. Ca. DNPL	0.495	0.613	0.552	0.653	7.838	0.001
DNPL doesn't Gr. Ca. DINTR	0.350	0.708	1.860	0.174	1.422	0.277
DUNEM doesn't Gr. Ca. NPL	3.185	0.062	2.333	0.110	2.182	0.124
DNPL doesn't Gr. Ca. UNEM	0.572	0.572	0.253	0.858	0.427	0.786

Source: Author compiled (2016)

According to the results of the Granger causality test the ASPI does Granger Cause NPL at every lag level that has been tested. Therefore we reject the null hypothesis that ASPI does not Granger cause NPL. However the relationship is unidirectional where NPL does not Granger causes ASPI according to the test results. One key observation is that EXPT does not have a causal relationship between NPL and the two variables are therefore statistically independent according to the Granger Causality test. Though the regression results found that the EXPT is a statistically significant determinant of NPL, according to the Granger causality test results, a short term causal relationship among the

two variables is not observed. Therefore we accept the null hypothesis in both the directions. A similar outcome was observed with the EXRT and UNEMP where a causal relationship with NPL is not observed according to the test results.

GDP and NPL are found to have a bidirectional causal relationship at the lag one, according to the causality test results. Therefore a short term feedback effect on the real economy is there due to the nonperforming loans of the Banking sector and vice versa. However at the lag two it was observed that the GDP Granger cause NPL though there is no causal effect from NPL to GDP. Therefore the relationship is unidirectional at the lag two. According to

the granger causality test results INF does not Granger cause NPL at the selected lag levels. However NPL does Granger cause INF at the lag one and the short term relationship therefore is unidirectional. A causal relationship among the INTR and NPL is also found to be unidirectional where INTR Granger cause NPL at the lag four level. However the tests results suggest that the NPL does not Granger cause INTR at the selected lags

10. REFERENCES

- [1] Ahmad, F., & Bashir, T. (2013). Explanatory power of macroeconomic variables as determinants of non-performing loans: Evidence from Pakistan. *World Applied Sciences Journal* , 243-255.
- [2] Ahmed, S. (2008). Aggregate economic variables and stock market in India. *International Research Journal of Finance and Economics* , 14, 141 - 162.
- [3] Akinlo, O., & Emmanuel, M. (2014). Determinants of Non-Performing Loans in Nigeria. *Accounting & Taxation* , 6 (2), 21-28.
- [4] Bonilla, C. A. (2012). Macroeconomic determinants of the Non-Performing Loans in Spain and Italy. University of Leicester .
- [5] Central Bank of Sri Lanka. (2014). Annual Report. Colombo: Central Bank of Sri Lanka.
- [6] Central Bank of Sri Lanka. (2015). Annual Report. Colombo: Central Bank of Sri Lanka.
- [7] Central Bank of Sri Lanka. (2010). Current Economic Indicators, Exchange Rates. Retrieved May 22, 2015, from http://www.cbsl.gov.lk/htm/english/_cei/er/e_1.asp
- [8] Central Bank of Sri Lanka. (2013). Directions, Determinations, and Circulars issued to Licensed Commercial Banks. Central Bank of Sri Lanka.
- [9] Central Bank of Sri Lanka. (2006). Exchange Rate. Colombo: Central Bank of Sri Lanka.
- [10] Central Bank of Sri Lanka. (2016). Monetary Policy Review – June 2016. Colombo: Central Bank of Sri Lanka.
- [11] Department of Census & Statistics. (2015). Department of Census & Statistics. Retrieved May 23, 2015, from www.statistics.lk
- [12] Granger, C. W. (1969). Investigating causal relations by Econometric models and cross-spectral methods. *Econometrica* , 424-438.
- [13] Jimenez G, S. J. (2006). Credit Cycles, Credit Risk and Financial Regulation. *International Journal of Central Banking* , 65-98.
- [14] Kalirai H, S. M. (2002). Macroeconomic stress Testing: Preliminary evidence for Austria. Asutrian National Bank Financial Stability Report.
- [15] Keeton, W. R. (1999). Does faster loan growth lead to higher loan losses? *Federal Reserve Bank of Kansas City Economic Review* , 57-75.
- [16] Keeton, W. R., & Morris, C. S. (1987). Why do banks' loan losses differ? *Federal Reserve Bank of Kansas City Economic Review* . , 3-21.
- [17] Khemraj, T., & Pasha, S. (2009). The determinants of non-performing loans: an econometric case study of Guyana. Caribbean Centre for Banking and Finance Bi-annual Conference on Banking and Finance. St. Augustine, Trinidad.
- [18] Lani, J. (2015). Statistics Solutions. Retrieved July 21, 2015, from <http://www.statisticssolutions.com/>
- [19] Louzis, D. P., Vouldis, A. T., & Metaxas, V. L. (2011). Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Banking & Finance* , 36 (4), 1012-1027.
- [20] Marcucci, J., & Quagliariello, M. (2008). Is bank portfolio riskiness pro cyclical? Evidence from Italy using a vector auto regression. *Journal of International Financial Markets* , 18 (1), 46-63.
- [21] Messai, A. S., & Jouini, F. (2013). Micro and Macro Determinants of Non-performing Loans. *International Journal of Economics and Financial Issues* , 3 (4), 852-860.
- [22] Quagliariello, M. (2007). Banks' riskiness over the business cycle: a panel analysis on Italian intermediaries. *Applied Financial Economics* . , 119-138.