ST. MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DETERMINANTS OF NON-PERFORMING LOAN: A CASE OF DEVELOPMENT BANK OF ETHIOPIA

BY

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Determinants of Non-performing loan: A case of Development bank of Ethiopia

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A THESISSUBMITTED TO ST. MARY'S UNIVERISTY SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE MASTERS OF BUSINESS ADMINISTRATION in Accounting and Finance

Advisor

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Determinants of Non-performing loan: A case of Development bank of Ethiopia

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Declaration

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of Dejene Mamo (Ast Prof). All sources of materials used for the thesis have been duly acknowledged, the researcher further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

Rediet Gebeyehu _____

St. Mary's University, Addis Ababa **January, 2020**

ENDORSEMENT

This thesis has been submitted to St. Mary's university, school of Graduate Studies for examination with my approval as a university advisor.

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Advisor Signature

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ABSTRACT

This study was conducted with an objective of identifying the determinants of non-performing loan in DBE during the period of 1991 to 2018. The study has used NPL as dependent variable and ROA, asset size of the bank, amount of loan, real interest rate, GDP and inflation as independent variables. The stationary behavior of variables included in the model is tested using ADF test, and the test result showed all variables were stationary either at level or first difference. The study used the Autoregressive distributed lag (ARDL) model and bounds testing procedure to examine the presence of long-run and short-run relationship among dependent and independent variables. The result of short run estimation shows that all bank specific and macroeconomic variables are significant at significance level of 1% and 5%. But the result of long run estimation showed that asset size of the bank, loan deposit ratio and real interest rate are statistically significant. ROA, GDP and inflation are not significant in determining NPL in DBE in long run. The bank expansion, loan provision and interest income are resulting on higher non-performing loan. the bank is recommended to improve loan management during the expansion of the bank asset, focusing on loan collection not only loan provision and manage the interest rate expansion through consideration of development activity.

Key Words: non-performing loan, determinants, Autoregressive distributed lag Model, DBE

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Role of banks in an economy is very significant by availing credit to borrowers and by financial intermediation of collecting money and making loan for investment. They play intermediary roles between money depositors and those in need of fund for their investments thereby ensure that money flows are smooth (Richard, 2011). Loan has dual importance; it is important for the company that gives the loan that enables to collect interest income and it is important for the borrowers that increase financial position of the borrower for further investment. It is highly important to loan provider to manage the loan provided because the lender is more affected than the borrower if the loan is not repaid. The strategic phases are loan appraisal before the provision of the loan and monitoring and evaluation after the loan is provided. It common the borrowers default the loan. Despite this economic importance of loan, Non-performing Loans (NPLs), as an indicator of poor performance of banks, have gained the attention of scholars (Richard, 2011).

Increasing NPLs are causing crisis in the banking industry (Barr and Siems, 2014). NPLs are one of the main reasons that cause insolvency of the financial institutions and ultimately hurt the whole economy (Mohammed et al, 2012). According to the International Monetary Fund (IMF, 2009), a nonperforming loan is any loan in which principal and interest payments are more than 90 days overdue; or when more than 90 days worth of Loans may be in the forms of overdraft, loan and advances, business funding arrangements and local purchasing order financing, amid others. Loans symbolize investments and typically constitute the lengthened assets of banks.

According to Mohammed et al, (2012) commercial banks and development banks are very common in providing loan to different borrowers. The loan requests are either for working capital or projects. The loan provision is based on the repayment capacity of the

borrower. Different studies in different countries showed that about 8% of loans of commercial banks and 11% of loan development banks are not repaid that indicates development banks are weaker in managing loan. According to the studies, the main determinants of the non-performing loan are interest rate, GDP, bank's loan supervision capacity and economic condition.

According to NBE report (2019), in Ethiopia, about 9.1% of loans of commercial banks in Ethiopia are not collected and the problem is sever in Development Bank of Ethiopia (DBE) that about 12% of loan is not collected. Private commercial banks in Ethiopia provide loan for working capital and projects based on their business motives. Commercial bank of Ethiopia and Development Bank of Ethiopia (DBE) are policy banks that provide loan for working capital (commercial loan) and loan for development projects (development loan) respectively. DBE has higher NPL when compared to CBE. Based on the policy direction of Ethiopia government, DBE finances different development economic activities and companies staring from small enterprises to mega projects. Various studies have identified causes of non-performing loan of the commercial banks and DBE. They came up with different findings and common factors that affect the performance of loan are GDP and inflation rate, and bank-specific factors, such as ROA, CAP and lagged NPLs rate. Comparatively, studies about determinants of NPL are fewer in DBE than commercial banks in Ethiopia. Therefore, this study intends to identify the determinants of non-performing loan in DBE.

1.2 Statement of the problem

Financing development activities has various contributions for economic growth of a nation by creating job opportunities, motivating entrepreneurship, increasing supply of products and increasing investment. But the loan provision needs critical analysis of the loan requests. According to DBE (2019) the NPL of the reached 12% of the total loan provided by DBE. The report further indicated weakness of the bank in loan appraisal stage, weak loan follow up practices and instability of macroeconomic factors. Although the provision of loan is mainly important for the borrowers, the bank is wasting large amount of resources that can finance other important loan requests.

Different studies identified the determinants of NPL in developments banks but they come up with inconclusive findings. Further studies in Ethiopia about determinants NPL in DBE are few and also have various findings based on their research strategy (Adebola, et al(2011), Ahlem and Fathi (2013), Arega et al (2016), and Mahmoud and Mohamed (2015). Despite their strategies, the studies have identified that NPL of DBE is affected by GDP growth, foreign direct investment, and average exchange rate, poor due diligence assessment, insufficient grace period given by the Bank for the repayment, non-credit worthy project financing, financing second hand machines, lack of proactive measures taken against sign of default, willful default, rent seeking character of borrowers, poor financial record system of borrowers, misfortune of borrower, unavailability labor force in the project area, saturation of demand for the product of the project, remoteness from market, and unsuitable agro-ecological condition.

Therefore, this study intends to identify determinants of NPL in DBE by using time series data from 1991 to 2018 about the bank specific factors and macroeconomic variables.

1.3 Research questions

This study intends to answer following research questions;

1. How bank specific factors affect the NPL?
2. How macroeconomic factors affect NPL?

1.4 Objective of the Study

1.4.1 General objective of the Study

General objective of the study is to examine determinants of NPL in DBE during the period of 1991 to 2018.

1.4.2 Specific objectives

1. To identify bank specific factors that affect the NPL
2. To examine macroeconomic factors that affect NPL

1.5 Scope of the study

This study is scoped to Development Bank of Ethiopia. The time scope of the study is year from 1991 to 2019. Conceptually the study will be scoped to bank specific and macroeconomic factors. Among different bank specific factors, the study has used ROA, asset of bank, and loan deposit ratio. Real interest rate, inflation, and economic growth are macroeconomic factors used in the study. In addition, methodologically the study is scoped to using only secondary data and quantitative analysis.

1.6 Significance of the study

This study will be important for DBE for credit management and the study will be useful for commercial banks in Ethiopia also. Further the study can be used by further studies in the area of this study.

1.7 Organization of the Study

The study is organized under five chapters. The first chapter is an introductory chapter. The second chapter deals deal with review of both theoretical and empirical literatures related to the study and conceptual framework of the study. The third chapter deals with research methodology which is about approaches of the study, design of the research, source of data, variable specification, and model specifications. The fourth chapter presents the results and discussions which summarize the results/findings of the study, and interpret and/or discuss the findings. The final chapter is about summary of major findings, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical review

2.1.1 The Concept of Non-Performing Loans

The concept of Non-performing loans differs from one country to another. A loan maybe considered non-performing in one country and might not be considered as such in another country. However, opinions in some cases do match. As such, the following is the definition suggested by the International Monetary Fund's (IMF) Compilation guide on financial soundness indicators (2015): "A loan is non-performing when payments of interest and/or principal are past due by 90 days or more, or interest payments equal to 90 days or more have been capitalized, refinanced, or delayed by agreement, or payments are less than 90 days overdue, but there are other good reasons such as a debtor filing for bankruptcy to doubt that payments will be made in full." According to Basel Committee on Banking Supervision (2001) as cited in Kargi (2011), loan is considered default when bank declares that a borrower (that is, debtor) cannot meet his/her obligation and repay the loan, or similarly to the first definition, the borrower past due more than 90 days on any payment of the bank credit. These definitions offer a sensible framework for identifying non-performing loans, which the repose of the report is based on.

Caprio and Klin-gebiel(1999) defined Non-performing loans as "loans which for a relatively long period of time do not generate income. This implies that the principal and or interest on these loans have been left unpaid for at least 90 days." Another definition was given by VanGreuning, &Bratavonic(2003) as "a non-performing loan is an advance by a financial institution that is not earning income and full payment of principal. As such interest is no longer anticipated." Moreover, Bloem and Freeman (2005) put a criteria for a loan to be called NPL as "a loan is NPL when payments of interest and/or principal are past due by 90 days or more, or interest payments equal to 90 days or more have been capitalized, refinanced, or delayed by agreement". By and large, NPLs are loans that are

outstanding both in its principal and interest for a long period of time disagreeing to the terms and conditions under the loan contract as noted by (Gesu, 2014).

National bank of Ethiopia directive requires all banks to maintain a provisions for Loan Losses account which shall be created by charges to provision expense in the income statement and shall be maintained at a level adequate to absorb potential losses in the loans or advances portfolio. In determining the adequacy of the provisions for Loan Losses Account, provisions may be attributed to individual loans or advances or groupsof loans or advances. The provisions for Loan Losses account always have a credit balance. Additions to or reductions of the provisions for Loan Losses Account should be made only through charges to provisions in the income statement at least every calendar quarter.

2.1.2 The impact of NPL on the Operation of Banks

Reduces profitability

NPLs rate is the most important issue that has negative effect on bank profitability and inability to survive. This is true because NPLs have serious negative impact on loan growth rate; in which case, there will be a negative effect on banks profitability as it reduces loan amount and interest income of the banks simultaneously (Ugoani, 2016). In line with National bank of Ethiopia regulations, the lending institution has to make provision and charges for credit losses (bad debt/impairment) which ultimately reduce the profit level. Beside this delay or failure of repayment of loan principal and interest on time and in full, negatively affects the profitability of the banks by reducing the interest income generated from granting more credit

Hurts the bank's reputation

Reputation is everything in the banking business. A lowered reputation will steer away big customers and forces them to look for other banks. This will surely result in lower deposit and consequently, lower lending. (Onchomba, 2014).

Cause insolvency

Banks kept only some money deposits as a reserve; the rest is lent out. If the lowered reputation due to NPLs results in withdrawal of deposits of big customers, the bank will effectively be insolvent.

2.1.3 The causes of Non-performing loans

Seven predominant models of non-performing loans focus on different causes. They are Risk premium, principal agent problem, adverse selection, moral hazard, patronizing effect, Die another day effect, Petroski effect.

Risk Premium

This model which is recommended by Ewert, Schenk, (2000), proposes that financial decisions incur different degrees of risk. The "perceived credit risk" depends on a person's judgment. Risk and expected return move in tandem; the greater the risk, the greater the expected return. An investor assuming risk from his/her investment requires a risk premium above the risk –free rate. Risk –free rate is a compensation for time and risk premium for risk. The higher the risk of an action, the higher will be the risk of premium leading to higher required return on that action. So according to this theory, the corresponding risk should affect interest rate, that is, the higher the failure risk of the borrower, the higher the interest rate (Ewert, Schenk,Szczesny, 2000).

The Principal -Agent problem

The idea underlying this model is that organization decision – taking authority lies in the hands of managers. Shareholders as owners of a company are the principals and managers are their agents. Thus there is a principal – agent relationship between shareholders and managers. In theory managers should act in the best interests of shareholders, that is, their actions and decisions should lead to shareholders wealth maximization (SWM). But in practice, managers may not necessarily act in the best interest of shareholders and they may pursue their own personal goals. This problem

arises because managers are motivated by self-interest. The root causes of this self – interest is jealousy. Managers work hard to make sure that companies become successful and make huge profit. But due to managers hard work only the shareholders become rich and not managers.

Adverse selection

The idea underlying this model is that borrowers do not always provide all the information required. Even if they do, not all information will be correct (Changeta, 2007). Borrowers generally have private (internal) information about their projects that is more accurate than the information possessed by lenders. As a consequence, a lender could still be uncertain about the default risk of a loan contract and have difficulties in assessing and controlling the nature and behavior of the borrower. The adverse selection problem occurs if lenders try to protect themselves against default risk by setting their contractual terms in a manner appropriate for the expected average quality of their loan applicants.

Moral Hazard

This model proposes that borrowers who have internal information take hidden actions that increase their default probability. Therefore, moral hazard arises as a result of changes in the two parties incentives after entering into a contract such that the riskiness of the contract is altered (Chengeta, 2007).

Patronizing effect

This model proposes that there is a possibility lenders are unwilling to collect. Unwillingness may arise from several factors such as poor policies, procedures, structure, rewards, physical setting, etc. Such internal problems weaken management and motivate borrowers not to repay the loan, because they are confident that no serious action will be taken against them (Islam, Shil, Mannan, 2005).

Die another day effect

The idea underlying this model is that in our society, people give more importance on current consumption. So they do not mind spending the borrowed fund for consumption, if they are not strictly followed up. People hold a very short vision of thinking for today leading to sufferings tomorrow. So a significant portion of capital goes to unproductive sector that may be termed as die another day effect. So this means that if borrowers are not followed up, they get wrong perception about the management, that is, it is weak, so borrowers will squander the loan money unwisely. In brief, weak follow up weakens the system (Islam, Shil, Mannan, 2005).

Petroski Effect

In "To engineer is human; the role of failure in successful design", Henry Petroski, a forensic civil engineer fascinated with failure of large structures notes that each new major bridge, for example, always has to be higher, longer, stronger or cheaper than the last bridge of similar design. Something that works tends to be the subject of attempts at replication and improvement in new environments. This means that risk increases and is always to some degree unknown as the low risk situations become saturated. The idea underlying this model is that when credit managers make different types of loans, for example business loans or personal loans, they expect the same characteristics to affect other types of loans. This kind of expectation increases risk (Islam, Shil, Mannan, 2005).

2.1.4 Theories of non-performing loans

There are different of theories of NPL that are developed by different scholars. This study has reviewed the theories presented by Warue (2013) and Muriithi (2013). Warue (2013) stated three theories underpinning non-performing loans; deflation theory, financial theory and Ownership structure theory. Muriithi (2013) stated four theories of nonperforming loans namely asymmetry theory, agency theory, transaction cost theory and stakeholder theory.

2.1.4.1 Deflation theory

Fisher, (1933), which suggests that when the debt bubble bursts the following sequence of events occurs; debt liquidation leading to distress selling and contraction of deposit currency, as bank loans are paid off. This contraction of deposits cause a fall in the level of prices, which leads to greater fall in the net worth of business, hence precipitating bankruptcies which leads the concerns running at a loss to make a reduction in output, in trade and in employment of labor. These cycles cause complicated disturbances in the rates of interest and a fall in the money value. The complicated disturbances described above can be summed as both external and internal forces (macro and micro factors) influencing state of over-indebtedness existing between, debtors or creditors or both which can compound to loan defaults.

2.1.4.2 Financial theory

According to Minsky (1974) this theory is also known as financial instability hypothesis, and attempted to provide an understanding and explanation of the characteristics of financial crisis. The theory suggests that, in prosperous times, when corporate cash flow rises beyond what is needed to pay off debt, a speculative euphoria develops, and soon thereafter debts exceed what borrowers can pay off from their incoming revenues, which in turn produces a financial crisis. As a result of such speculative borrowing bubbles, banks and lenders tighten credit availability, even to companies that can afford loans and the economy subsequently contracts.

The theory identifies three types of borrowers that contribute to the accumulation of insolvent debt: The "hedge borrower" can make debt payments (covering interest and principal) from current cash flows from investments. For the "speculative borrower", the cash flow from investments can service the debt, i.e., cover the interest due, but the borrower must regularly roll over, or re-borrow, the principal. The "Ponzi borrower" borrows based on the belief that the appreciation of the value of the asset will be sufficient to refinance the debt but cannot make sufficient payments on interest or principal with the cash flow from investments; only the appreciating asset value can keep the Ponzi borrower afloat. Financial theory underpin this study in that, a hedge borrower would have a normal loan and is paying back both the principal and interest; the

speculative borrower would have a watch loan; meaning loans‟ principal or interest is due and unpaid for 30 to 90 or have been refinanced, or rolled-over into a new loan; and the Ponzi borrower would have a substandard loan, meaning the payments do not cover the interest amount and the principal is actually increasing. The primary sources of repayment are not sufficient to service the loan. The loan is past due for more than 90 days but less than 180 days. Watch loans and substandard loans are nonperforming loans, hence applicability of financial theory in this study.

2.1.4.1.3 Ownership structure theory

Jensen (1976) integrated the elements of theory of property rights (Ronald, 1937), the theory of agency (Ross,1973) and Mitnick, 1974) and the theory of finance (Minsky, 1974). The theory explains why highly regulated industries such as public utilities or banks have higher debt-equity ratios for equivalent levels of risk than the average non-regulated firm. Jensen (1976) argues that, “ownership structure” rather than “capital structure” is the crucial variables to be determined, not just the relative amounts of debt and equity but also the fraction of the equity held by the manager.

2.1.4.4 Asymmetry Theory

The theory explains that in the market, the party that possesses more information on a specific item to be transacted is in a position to negotiate optimal term for the transaction than the other party (Auronen, 2003).The party that knows less about the same specific item to be transacted is therefore in a position of making either right or wrong decision concerning the transaction. It may be difficult to distinguish good from bad borrowers (Richard, 2011).This may result into adverse selection and moral hazards problems. Adverse selection and moral hazards have led to significant accumulation of Non-Performing loan in banks (Bester, 1994).

2.1.4.5 Agency Theory

According to the Agency theory, the principal agency problem can be reduced by better monitoring such as establishing more appropriate incentives for managers. In the field of corporate risk management agency issue have been shown to influence managerial attitudes towards risk taking and hedging Smith and Stulz(1985). Theory also explains a possible mismatch of interest between shareholder management and debt holders due to asymmetries in earning distribution, which can result in the firm taking too much risk or not engaging in positive net value project (Smith and Stulz, 1987). Consequently, agency theory implies that defined hedging policies can have important influence on firm value (Fite and Pfleiderer, 1995).

2.1.4.6 Transaction Cost Theory

In transaction cost theory, does not contradict the assumption of complete markets. It is based on convexities in transaction technologies. Here, the financial intermediaries act as coalitions of individual lenders or scale or scope in the transaction technology. Transaction cost theory has proven an essential framework for decision on the vertical boundaries of the firm. Transaction costs are the cost associated to the division of work. Williamson (2000), indicated that transaction occurs when a good or service is transferred across a technology separable interfaces. Variables that describe a transaction are among others, the specificity, the uncertainty, and the frequency of the transaction, whether an asset or a service is only or much more valuable in the context of a specific transaction. In the following human capital specificity the asset specificity and the site specificity are taken into account (Reddy, 2002).

2.1.4.7 Stakeholder theory

Stakeholder theory, developed originally by Freeman (1984) as a managerial instrument, has since evolved into a theory of the firm with high explanatory potential. Stakeholder theory focuses explicitly on equilibrium of stakeholder's interests as the main determinant of corporate policy. The most promising contribution to risk management is the extension of implicit contracts theory form employment to other contracts, Including sales and financing Cornell and Shapiro, (1987). To certain industries, particularly high-

tech and services, consumer trust in the company being able to continue offering its services in the future can substantially contribute to company value. However, the value of these implicit claims is highly sensitive to expected costs of financial distress and bankruptcy. Since corporate risk management practices lead to a decrease in these expected costs, company value rises (Klimczak, 2005). Therefore stakeholder theory provides a new insight into possible rationale for risk management. However, it has not yet been tested directly. Investigations of financial distress hypothesis provide only indirect evidence (Judge, 2006)

2.2 Empirical review

Viswanadham (2015) has identified Determinants of Non-Performing Loans in Commercial Banks: A Study of NBC Bank Dodoma Tanzania. The study data was collected from 152 respondents and the result of data analysis was presented by using tables, percentages, mean and standard deviation. Data collection methods adopted for the study were interview, questionnaire and documentary evidence. The study has identified the effect of Interest rate, GDP, concentration of lending activities, bank's loan supervision capacity and economic condition on NPL, and the results suggest that interest rate, GDP, bank's loan supervision capacity and economic condition influence the level of NPLs. However, the results did not suggest that concentration of lending activities increase the level of NPLs. The study suggests that banks should put in place a vibrant credit process that ensures proper customer selection and risk identification, robust credit analysis, proactive monitoring and clear recovery strategies for bad loans, formulate clear policy framework that addresses issues of ethical standards and check and balance credit process, organizational capacity enhancement of banks, deliberate effort to develop credit culture for managing loans ,and ensure prudent policies that govern bank loans.

El-Maude et al (2017) examined the relationship between bank specific and macroeconomic determinant of non-performing loans in Nigerian deposit money banks over the period of 5 years (2010 to 2014) by using a sample of 10 banks on a cross sectional basis. The study adopted non-survey research design and secondary data was used. The data were analyzed using descriptive statistics, correlation coefficient and

multiple regressions. The findings reveal positive significant relationship between Non-Performing loans and Loan to deposit and Bank size; whereas relationship between capital adequacy ratio and Inflation reveals a positive insignificant relationship; whereas Return on asset had negative insignificant relationship with the rate of non-performing loans. Based on the findings, it is recommended that CBN for policy purposes should frequently assess the lending habit of deposit money banks in Nigeria.

Keeton and Morris (2007) presented one of the earliest studies to examine causes of loan losses in commercial banks in USA. Their studies found evidence that economic condition, and poor performance of certain sectors were significant determinants of loan losses.

Sinkey and GreenWalt (2011), whose study examined the loan loss- experience of large commercial banks in USA, provided evidence that both internal and external factors explain the loan-loss rate (defined as net loan charge of plus NPLs divided by total loans plus net charge offs) of these banks. These authors found a significant positive relationship between the loan – loss rate and internal factors such as high interest rate, excessive lending , and volatile funds. Also in another related study Sinkey and Green Walt (2011) argued that depressed regional economic conditions explained the loss- rate in commercial banks.

Ewert, Schenk and Szczesny (2010) studied banks lending performance in Germany. Their study found evidence that high interest rate, and inadequate collateral had significant positive relationship on the banks poor lending performance.

Bercoff, Jose , Julian, Giovanni and Franque (2012) studied the fragility of the Argentinean banking system over the 1993-2006 period. They strongly suggested that non- performing loans are affected by both bank specific factors and macroeconomic factors.

From 1995 to 2007, Salas and Saurina (2012) studied determinants of problem loans of Spanish commercial and saving banks. Their study found out that real

growth in GDP, rapid credit expansion, bank size, capital ratio and market power explained variations in non- performing loans.

Abafita (2013) studied problem loans at Oromai credit and savings share company in Kuyu. The author argued that education, loan size, loan diversion, availability of other credit sources, loan supervision, and suitability of loan were positively related to poor loan repayment performance.

Rajan and Dhal (2013) examined non- performing loans of public sector banks in India. They found evidence that favorable macro –economic conditions, and financial factors such as maturity cost and terms of credit, bank size and credit orientation are significant determinants of non- performing loans.

Fofack (2015) conducted a study on non-performing loans in sub Saharan Africa after which he concluded that economic growth, real exchange rate appreciation, the real interest rate, net interest margins, and inter-bank loans are significant determinants of non- performing loans in these countries. The author attributed strong association between the macroeconomic factors and non-performing loans to the undiversified nature of some African economies. Further, Jimenez and Saurina (2015) studied the Spanish banking sector from 1984 to 2013. They provided evidence that non-performing loans are determined by GDP growth, high interest rate and lenient credit terms.

Oladeebo and Oladeebo (2008) conducted research on factors affecting loan repayment among small holder farmers in Ogbomoso agricultural zone of Oyo state in Nigeria. They found evidence that amount of loan collected, age experience with credit usage, and level of education were major significant socio-economic factors determining loan repayment.

Aballey (2009) studied the causes of bad loans portfolio at African Development Bank. He found evidence that non-performing loans are positively correlated to ineffective monitoring of loans and poor credit appraisal.

Further, Kangimba (2010) studied determinants of non- performing loans in Standard Charted Bank. He argued that long duration granted for repayment of loans, unwillingness of borrowers to pay back the loan, cheating in declaration of collateral, poor management, lack of business skills, and high competition are the reasons for non-performing loans.

Din'ohi (2011) who conducted research on factors that increased the level of non-performing loans at AKIBA commercial bank found out that poor practicing of credit policies, and procedure, unavailability of accurate information were positively related to non- performing loans.

Several studies which followed the publication of Din'ohi have proposed similar explanations for problematic loans in Tanzania. For instance Mwakoba (2011) studied determinants of non- performing loans at SACCOS, and found strong association between non-performing loans and high interest rate, insufficient collateral and business problems. More recently Kwayu (2011) analyzed factors for non-repayment of bank loans at NBC Dodoma region. She argued that interest rate does not affect repayment of loans, but costs incurred during loans application are high. The attitudes of borrowers contributed to non-repayment of loans. Other reasons for poor repayment of loans were bad economic condition and high competition.

Louzis, Vouldis and Metaxas (2010) conducted a study to examine the determinants of NPLs in the Greek financial sector using fixed effect model from 2003-2009 periods. The variables included were ROA, ROE, solvency ratio, loan to deposit ratio, inefficiency, credit growth, lending rate and size, GDP growth rate, unemployment rate and lending rates. The finding reveals that loan to deposit ratio, solvency ratio and credit growth has no significant effect on NPLs. However, ROA and ROE has negative significant effect whereas inflation and lending rate has positive significant effect on NPLs. It justifies that performance and inefficiency measures may serve as proxies of management quality.

Djiogap and Ngomsi (2012) investigated the determinants of bank long-term loan in the Central African Economic and Monetary Community (CEMAC). They used the panel

data of 35 commercial banks from six African countries over the period 2001-2010. They used fixed effect model to examine impact of bank size, GDP growth and capital adequacy ratio on NPLs. The study found negative significant impact of CAR on the level of NPLs. Their finding justifies as more diversified banks and well capitalized banks are better able to withstand potential credit. However, inflation variable is statistically insignificant in explaining the total business loans ratios of banks.

In the work of Saba, Kauser and Azeem (2012) where they examined "Determinants of Nonperforming Loan on US banking sector" also investigate the bank specific and macroeconomic variables of nonperforming loans from 1985 to 2010 period using OLS regression model. They considered total loans, lending rate and Real GDP per capital as independent variables. The finding reveals as real total loans have positive significant effect whereas interest rate and GDP per capital has negative significant association with NPLs. Similarly, Mileris (2012) on the title of "macroeconomic determinants of loan portfolio credit risk in banks" was used multiple and polynomial regression model with cluster analysis, logistic regression, and factor analysis for the prediction. The finding indicates that NPLs are highly dependent of macroeconomic factors.

Perception of Pakistani Bankers" utilized both primary and secondary data in 2006 years. The data was collected from 201 bankers who are involved in the lending decisions or handling nonperforming loans portfolio. Correlation and regression analysis was carried out to analyze the impact of selected independent variables. The variables included were interest rate, energy crisis, unemployment, inflation, GDP growth, and exchange rate. The study found that, interest rate, energy crisis, unemployment, inflation and exchange rate has a significant positive relationship whereas GDP growth has insignificant negative relationship with the nonperforming loans.

Skarica (2013) also conducted a study on the determinants of NPLs in Central and Eastern European countries. In the study, Fixed Effect Model and seven Central and Eastern European countries for 2007-2012 periods was used. The study utilized loan growth, real GDP growth rate, market interest rate, Unemployment and inflation rate as determinants of NPLs. The finding reveals as GDP growth rate and unemployment rate

has statistically significant negative association with NPLs with justification of rising recession and falling during expansions and growth has an impact on the levels of NPLs. This shows as economic developments have a strong impact on the financial stability. The finding also reveals as inflation has positive impact with justification as inflation might affect borrowers' debt servicing capacities.

Tomak (2013) conducted study on the "Determinants of Bank's Lending Behavior of commercial banks in Turkish" for a sample of eighteen from 25 banks. The main objective of the study was to identify the determinants of bank`s lending behavior. The data was covered 2003 to 2012 periods. The variables used were size, access to long term funds, interest rates, GDP growth rate and inflation rate. The finding reveals that bank size, access to long term loan and inflation rate have significant positive impact on the bank`s lending behavior but, interest rates and GDP are insignificant.

Ali and Iva (2013) who conducted study on "the impact of bank specific factors on NPLs in Albanian banking system" considered Interest rate in total loan, credit growth, inflation rate, and exchange rate and GDP growth rate as determinant factors. They utilized OLS regression model for panel data from 2002 to 2012 period. The finding reveals a positive association of loan growth and real exchange rate, and negative association of GDP growth rate with NPLs. However, the association between interest rate and NPL is negative but week. And also inflation rate has insignificant effect on NPLs.

Aregawi (2015) examined the causes of non-performing loans and its provision in development bank of Ethiopia. The study sampled 60 firms from both performing and nonperforming clients' and 14 employees using primary data collected through questionnaire and unstructured interview. The findings of the study revealed that demographic characteristics of the clients and employees have significant effect on the repayment of loans. The study concluded that the causes of the non-performing loans are diversion to the other business, marketing problems, inflation condition, lack experts on the business, due to shortage supplies to their business and asymmetric information between the bank and employee. The study recommends that government should extend their Growth and Transformation Plan (GTP) to five years to enable the bank to

recognize and reduced the causes of non-performing loans and their provision as a policy on regional level.

However, a number of researchers found significant relationship (i.e,. both positive and negative) between bank specific variables (capital adequacy ratios, loan to deposit ratios, return on assets, total loans and bank size) and macro-economic variables (inflation, lending rate, exchange rate, gross domestic product, unemployment, energy crisis and money in supply) on non-performing loans such as Louzis, Vouldis, and Metaxas, 2010; Joseph, 2011; Sakiru, 2011; Konfi, 2012; Saba, Kauser and Azeem, 2012; Skarica, 2013; Ahmad and Bashir, 2013; Badar and Yasmin, 2013; Tomak, 2013; and Gesu, 2014. This contravene the findings of Djiogap and Ngomsi, 2012; Swamy, 2012; Furhan et al. 2012; Ali and Iva, 2013; and Ranjan & Chandra, 2013., whose findings were insignificant on non-performing loans in relation to lending rate, inflation, loan to deposits ratio, ROA and GDP.

An Empirical Study made on Commercial Banks in Pakistan by Badar and Yasmin (2013) on the title of "Impact of Macroeconomic Forces on Nonperforming Loans" the long and short run dynamics between nonperforming loans and macroeconomic variables covering the period from 2002 -2011 of 36 commercial banks in Pakistan were assessed. In the study, inflation, exchange rate, interest rate, gross domestic product and money supply were included as macroeconomic variables. They applied vector error correction model. The study found that as there is strong negative long run relationships exist of inflation, exchange rate, interest rate, gross domestic product and money supply with NPls.

Ranjan and Chandra (2013) analyzed the determinants of NPLs of commercial banks' in Indian in 2002 the study utilized panel regression model and found that lending rate also have positive impact on the NPLs justifying that the expectation of higher interest rate induced the changes in cost conditions to fuel and further increase in NPLs.

2.3 Literature Gap and Hypothesis Development

The majorities of the studies have identified determinants of NPL in commercial banks in different part of the world. But few attentions are given to development banks that are highly important for economic growth. These studies also focused mainly on macroeconomic factors. But factors that are manageable by the banks have gotten few attentions.

H1: Loan has positive effect on NPL

H2: Size of the bank has positive effect on NPL

H3: Profitability has negative effect on NPL

H4: Interest rate has positive effect on NPL

H5: economic growth has negative effect on NPL

H6: economic instability has positive effect on NPL

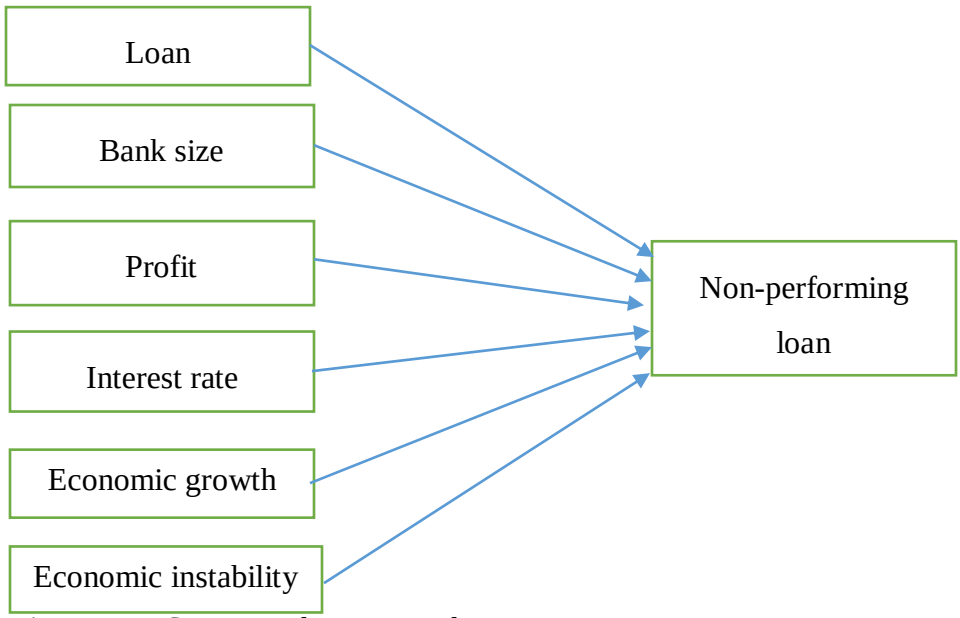


Figure 2. 1 Conceptual Framework

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter presents about the methodology followed to meet the research objective. It deals with the research design, data source, and model specification.

3.1 Research Design

This study was conducted with main objective of identifying the determinants of NPL in DBE during the period of 1991 to 2018. It has followed descriptive and explanatory research designs. The descriptive design was intended to assess the trend of the determinants and NPL is analyzed by using mean, standard deviations and time series graphs. To this end, this study has used ARDL model and its procedures to identify causal relationship. Further, this study designs to use quantitative data from secondary sources.

3.2. Data Type and Source

This study has used dataset of 28 years (1991-2018) that includes regime of Ethiopia People Revolutionary Democratic Front (EPRDF)). This study is conducted by using bank specific and macroeconomic variables. These variables were used for the descriptive and regression purposes. In both cases, the study has used secondary data. Data of real interest rate, economic growth and inflation rate was collected from World Bank database about World Bank Development Indicators (WDI) and United Nations Conference for Agreement on Trade and Development (UNCATD). Bank specific data; NPL, ROA, total asset of the bank, amount of loan are collected from DBE.

3.3 Variable Specification

Dependent variable is Non-performing loan function which is measured as ratio of NPL to total loan expressed as; NPLs=Amount of nonperforming loan/ Amount of total loan * 100%

The independent variables of the study are**l**oan, asset, return on asset, real interest rate, economic growth, and Inflation Rate.

1. Loan (LDR) is measured as proportion of loan provided to deposit in the bank.

2. Asset (AST) is measured as natural logarithm of total asset of the bank which is proxy to size of the bank

3. Return on asset (ROA) is measured as net income of the bank to the total asset size of the bank which is proxy to profitability of the bank.

4. Real interest rate (RIR) the loan interest rate that the bank collect income from the loan provided.

5. GDP is real GDP growth of the country which is proxy to economic growth

6. Inflation (INF) annual inflation rate of the country and it is proxy to economic instability.

3.4 The Model Specification

The study intends to identify both short run and long run effect of determinants on NPL of DBE. Since the study covers the period 1991 to 2018 that the variables constitute time-series information, the appropriate modeling strategy is one involving time-series analysis. In order to address the objective of the study Autoregressive Distributed lag model(ARDL) suggested by Pesaran (2001), for co-integration investigation and error correction (short run) analysis. ARDL model identifies both the short run and long run relationship.

Model for the study is expressed as;

NPL = (LDR,AST, ROA, RIR,GDP, INF)…… (3.1)

The regression equation for non-performing loans will be specified as:

$$NPL_t = \beta_0 + \beta_1 LDR_t + \beta_2 AST_t + \beta_3 ROA_t + \beta_4 LIR_t + \beta_5 GDP_t + \beta_6 INF_t + \varepsilon_t \ldots\ldots\ldots\ldots \quad (3.2)$$

NPL is non-performing loan, LDR is loan to deposit ratio, AST is asset of the bank, ROA is return on asset, RIR is Real interest rate, GDP is Growth rate of real GDP, and INF is Inflation Rate. e is the error term at time t.

The study has used Eviews 10, statistical software package for the entire analysis of the study.

3.5 Econometric estimation

3.5.1 Unit Root Test

Before conducting the ARDL strategy, the time series properties of the variables need to be examined. Non-stationary time series data has often been regarded as a problem in empirical analysis. Working with non-stationary variables leads to spurious regression results from which further inference is meaningless when these variables are estimated in their levels. In order to overcome this problem there is a need for testing the stationarity of these economic variables. The unit root and co-integration test on relevant economic variables are performed in order to determine time series characteristics. In general, economic variables which are stationary are called I(0) series and those which are to be differenced once in order to achieve a stationary value are called I(1) series. In testing for stationarity, the standard Augmented Dickey and Fuller (1979), and Phillips and Perron (1988) are performed to test the existence of unit root in order to establish the properties of individual series.

3.5.2 ARDL (Bounds Test) Approach to Co-integration

The Autoregressive Distributed Lag (ARDL) or Bound Test approach to co-integration developed by Pesaran and Shin (1999) and further extended by Pesaran et al. (2001) is adopted for this study. The procedure is adopted for the following reasons. Firstly, the bounds test procedure is simple. As opposed to other multivariate co-integration techniques such as Johansen and Juselius (1990), it allows the co-integration relationship to be estimated by OLS once the lag order of the model is identified. Secondly, the bounds testing procedure does not require the pretesting of the variables included in the model for unit roots unlike other techniques such as the Johansen approach. It is

applicable irrespective of whether the repressors in the model are purely I(0), purely I(1) or mutually co-integrated. Thirdly, the test is relatively more efficient in small or finite sample data sizes. Estimates derived from Johansen-Juselius method of co-integration are not robust when subjected to small sample sizes as compared to bounds test. With these reasons specified, the researcher adopts the ARDL model for this study.

The co-integration test is based on the F-statistics or Wald statistics. The F-test has a nonstandard distribution. Thus, Pesaran and Pesaran (1997) and Pesaran et al (2001) have provided two sets of critical values for the co-integration test. The lower critical bound assumes that all the variables are I(0), meaning that there is no co-integration among the variables, while the upper bound assumes that all the variables are I(1). If the computed F-statistic is greater than the upper critical bound, then the null hypothesis will be rejected suggesting that there exists a co-integrating relationship among the variables. If the F-statistic falls below the lower critical bounds value, it implies that there is no co-integration relationship.

However, when the F-statistic lies within the lower and upper bounds, then the test is inconclusive. In this context, the unit root test is conducted to ascertain the order of integration of the variables. If all the variables are found to be I(1), then the decision is taken on the basis of the upper critical value. On the other hand, if all the variables are I (0), then the decision is based on the lower critical bound value.

The ARDL model specified in equation tested using the appropriate lag-length selection criterion. According to (Pesaran & Shin, 1999), as cited in (Narayan, 2004) for the annual data a maximum of two lag lengths are recommended. From this, a lag length that minimize AIC is chosen. In addition to this, the study has also used AIC to determine the optimal lag because it is a better choice for smaller sample size data as this study. Apart from this, AIC found to produce the least probability of under estimation among all criteria available. (Liew & Khimsen , 2004).

3.5.3Model Assumption Tests

An important consideration to be made in relation to estimating the model is to do with the existence of spurious regression. The model that was used for the study was tested for conformance of classical model assumptions.

After the models is estimated, the study has conducted the diagnostic tests which are important in order to make sure that the results obtained from ARDL estimation can be used for forecasting or policy purposes. These post estimation tests are mostly performed on the residual of the model and they include: the LM test for residual autocorrelation, Jarque-Bera test for residual, test for stability and test for the presence of heteroskedasticity residuals.

The Jarque-Bera normality test is used to determine whether the regression errors are normally distributed. It is a joint asymptotic test whose statistic is calculated from the skewness and kurtosis of the residuals. This study has used Jarque-Bera method to test normal distribution of residuals.

Testing for autocorrelation helps to identify any relationships that may exist between the current values of the regression residuals and any of its lagged values (Brooks, 2002). The null hypothesis of the LM test for autocorrelation is that the residuals are not serially correlated, while the alternative is that the residuals are serially correlated. This study has checked the serial correlation by using LM Method.

The test for heteroskedasticity investigates whether the variance of the errors in the model are constant or not. Breusch-Pagan-Godfrey test is used to check whether the residuals are homoscedastic. It tests the null hypothesis that the residuals are both homoscedastic and that there is no problem of misspecification. The test regression is run by regressing each cross product of the residuals on the cross products of the repressors and testing the joint significance of the regression.

To check the verifiability of the estimated long run model, some diagnostic test is undertaken prior in doing any analysis. In this study we carried a number of model

stability and diagnostic checking, which includes serial correlation test (Brush & Godfray LM test), Hetroskedasticity test (ARCH) and Normality test (Jaque-Bera test). In addition to the above diagnostic tests, the stability of long run estimates has been tested by applying the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) test. Such tests are recommended by (Pesaran et al.2001). In order to reject or accept the null hypothesis, we can decide by looking the p-values associated with the test statistics. That is the null hypothesis is rejected when the p-value are smaller than the standard significance level (i.e. 5%).

CHAPTER FOUR

RESULT AND DISCUSSION

4.1 Introduction

This study was conducted with an objective of identifying determinants of Non-performing loan a case of Development Bank of Ethiopia. The study has used time series data about bank specific and macroeconomic factors. The study has covered regime of current government, EPRDF that the data includes period from 1991 to 2018. As a result, the study has used time series strategy to analyze the data. This chapter of the study presents result of data analysis and interpretations. Further, chapter presents discussion on the results. The study has followed descriptive and explanatory methods of data analysis. The first section of the chapter presents descriptive analysis and the second section presents econometric analysis.

4.2 Descriptive Analysis

Based on previous studies, this study has used bank specific and macroeconomic variables in analyzing determinants of non-performing loan. The study has assessed 3 bank specific and 3 macroeconomic factors that might affect non-performing loan. The bank specific factors are profitability of the bank, total asset of the bank and amount of loan. The macroeconomic factors are real interest rate, economic growth and economic instability. This section presents the result of descriptive analysis and provides discussion on the result. The study has used statistics such as mean, standard deviation, minimum and maximum for descriptive analysis. The value of the mean reports the arithmetical average of the variables which are included in the study. The minimum and maximum values indicate the lower and the highest value of the variable. The standard deviation exhibits how much variation or dispersion exists from the mean. A low standard deviation indicates that the data points are inclined to be extremely close to the mean; while high values of standard deviation indicates that the data set is broaden out over a large range of values. The result of descriptive analysis is presented in table 4.1 below.

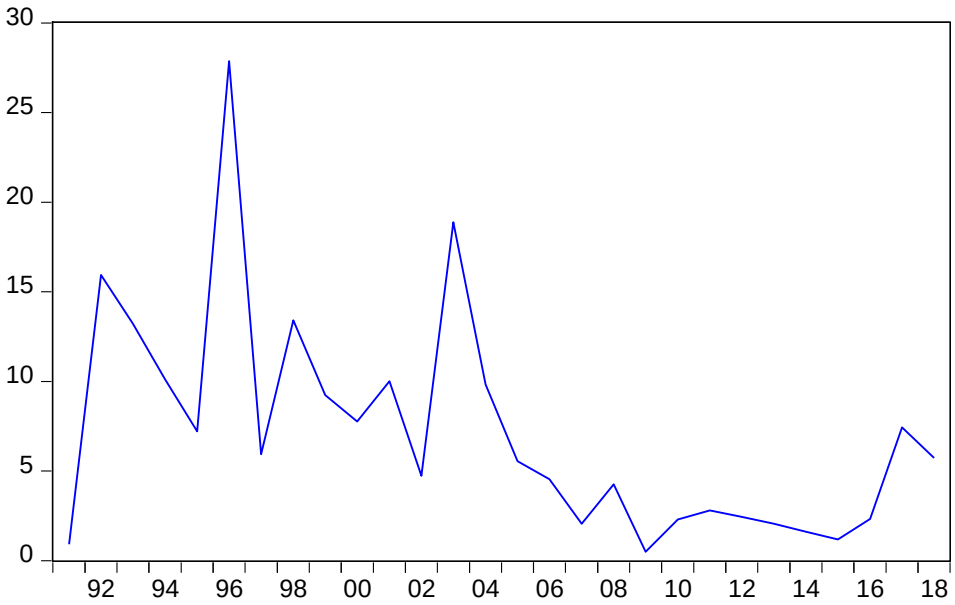
Table 4. 1 Descriptive Analysis

	Mean	Maximum	Minimum	Std. Dev.	Obs
NPL	7.13855	27.87456	0.499856	6.282469	28
ROA	2.224711	4.052321	0	1.098772	28
AST	8.054056	10.72383	5.455321	1.681658	28
LDR	1.465285	2.054078	0.837398	0.31398	28
RIR	8.954565	15.08333	6	2.631605	28
GDP	6.938287	13.5726	-8.67248	6.051807	28
INF	10.49485	44.35669	-8.484249	11.80856	28

Source: Secondary data, 2019

As depicted in table 4.1 above, the average NPL during period from 1991 to 2018 was 7.14%. This indicates that DBE was not collecting 7.14% of its loan annually. The highest NPL, 27.87% was registered in 1996 and lowest was 0.5% that registered in 2009. The value of standard deviation is high suggesting that very high variation of the performance of the bank regarding loan management. Trend of the NPL is presented in figure 4.1 below.

Figure 4. 1Trend of NPL (1991-2018)



Source: Author's Computation, 2019

As depicted in figure 4.1 above, the NPL of the bank has very high volatility. This suggests the loan management of the bank is highly varying. But on overall, NPL is decreasing during the study period suggesting that the loan performance of the bank is improving overtime.

This study intents to identify what caused the variation of the loan performance of the bank. As a result, description of possible bank specific and macroeconomic factors was conducted before making the association. These possible bank specific factors addressed by the study were return on asset, amount of loan, and total asset of the bank.

As depicted in table 4.1 above, the average of return on asset (ROA) during the 28 years was 2.22% ranging from 0 to 4.05%. The mean value suggests the bank was earning net profit of 2.22 birr with 100 birr investment. This implies that the bank has good financial performance that Mishkin(2002) states that a bank is profitable when its ROA is at least 1%. But the standard deviation value is smaller indicating smaller variation of ROA of the bank from 1991 to 2018.

Amount of loan is measured as proportion of loan to deposit of the bank. Mean value for loan is 1.47 suggesting that the bank borrowers take loan of 147% on their deposit. The amount of loan varies from 83.7% to 205% on the deposit of the borrowers. The smaller value of standard deviation suggests lower variation of loan to deposit proportion during the study period.

The macroeconomic factors assessed by the study were real interest rate, economic growth and economic stability. The average value for real interest rate is 8.95% ranging from minimum of 6% to maximum of 15% in 1991 and 1995 respectively. The standard deviation for average real interest rate suggests high variation of the interest rate during the study period.

The economic growth is indicated by GDP growth rate. As depicted in the table 4.1 above, very high variation of economic growth was registered in Ethiopia from 1991 to 2018. The average growth rate was 6.94% annually with maximum of 13.57% and

minimum of -8.67% during the 28 years. The highest economic growth was observed in 2004 and the lowest was in 1992. Higher value of economic growth shows fast economic growth but large variation of economic growth suggest instabilities in the economy. This implies that although economic growth of Ethiopia from 1991 to 2018 is fast, it is not sustainable.

Another, macroeconomic factor used in the study was economic instability. Inflation rate was used proxy to economic instability. The average inflation rate was 10.49% that suggests an average of 10.49% increase in consumer price index annually from 1991 to 2018. The highest inflation rate of 44.37% and the lowest rate of -8.48% was observed in 2008 and 1996 respectively. The fluctuation and high values of inflation rate shows economic instability in Ethiopia from 1991 to 2018.

4.2 Unit Root Test

According to Gujarati (2004) the standard classical methods of estimation are based on a set of assumptions that all variables are stationary. However, most economic variables are not stationary. Stationary data has zero mean for its error term, constant variance and the covariance between any two time periods depends only on the distance or lag between the two periods and not on the actual time which it is computed. On the other hand a time series variable is stationary if its mean, variance and auto covariance (at various lags) remain the same on matter at what point they are measured i.e. they are time invariant.

Harris, (1995) states that the most common and popular method of testing unit root is the Dickey-Fuller (DF) test that it is simple and more general method. However, the DF test has a series limitation in that it suffers from residual autocorrelation. Therefore to overcome this problem, the study will use Augmented Dickey-Fuller model (ADF) that the DF model is augmented with additional lagged first differences of the dependent variable. If the variables are not stationary at level, they are differenced to make them stationary.

Unit Roots tests were conducted by utilizing the Augmented Dickey- Fuller (ADF) tests. ARDL co-integration approach is based on the assumption that no variable is integrated

at I(2) level. Therefore, to avoid spurious results it is necessary to check that all variables are integrated at I(0) and I(1). The underlying models include a constant and time trend. The essence of the Augmented Dickey-Fuller (ADF) tests is to verify the null hypothesis of non-stationary, the rejection of which requires a negative and significant test statistic. The optimal lag length of the lagged differences of the tested variable is determined by minimizing the Akaike Information Criterion (AIC).

The computed absolute value of the test statistics (Dickely-Fuller statistics) was checked against the maximum values of these criteria with the 95 percent absolute critical value for the Augmented Dickey-Fuller statistic. If the computed absolute test statistic value was greater than the absolute critical value, then we rejected the null of unit root, which means stationary in the time series. The study variables are stationary at either level or first difference (see annex A1). Therefore, the appropriate model to estimate determinants of NPL during the period of 1991 to 2018 was ARDL model. -

4.3 Co-integration test (ARDL approach)

Co-integration means the presence of error correcting representation.That is, any deviation from the equilibrium point will revert back to its long run path.The deviation from long run equilibrium is corrected gradually through a series of partial short run adjustments. Thus co-integration implies the presence of error correcting representation and any deviation from equilibrium will revert back to its long run path.An ECM depicts both the short run and long run behavior of a system. The study has employed co-integration test to select appropriate model for the study. Co-integration among the non-stationary variables reflects the presence of long run relationship (Gujarati, 2004). In ARDL approach, the first step is to test the presence of co-integration or long run relationship among the variables. This test is done using the ARDL Bounds test F-statistic and the optimal lag was selected by Akaike Information criterion (AIC) method.

Pesaran et al (2001) have provided two sets of critical values for the co-integration test. The lower critical bound assumes that all the variables are I(0), meaning that there is no co-integration among the variables, while the upper bound assumes that all the variables

are I(1). If the computed F-statistic is greater than the upper critical bound, then the null hypothesis is rejected suggesting that there exists a co-integrating relationship among the variables. If the F-statistic falls below the lower critical bounds value, it implies that there is no co-integration relationship. However, when the F-statistic lies within the lower and upper bounds, then the inference is inconclusive and knowledge of the order of the integration of the underlying variables is required before conclusive inferences can be made.

The result of bound test is presented in table 4.2 below. As shown in the table 4.2 below, in co-integration test of ARDL bounds test, since the calculated F statistics (7.921295) is greater than the upper critical bound (3.28) at 5% significance level, the null hypothesis is rejected suggesting that there exists a co-integrating relationship between NPL and its determinates during the period of 1991 to 2018.

Table 4. 2Bound Test

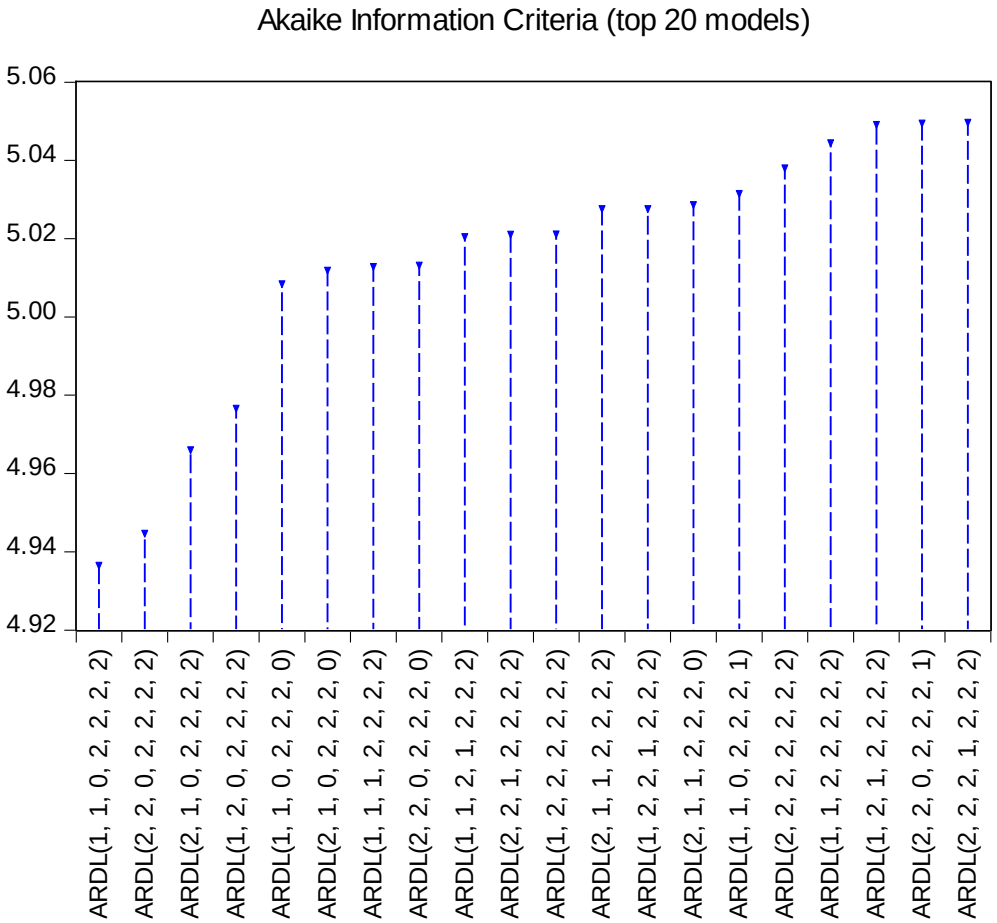
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.921295	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

Source: Author's Computation, 2019

4.4 Lag Order selection

The model was estimated by ARDL and the optimal lag was selected by Akaike Information criterion (AIC) method. In this study automatic selection (using the Akaike Information Criterion) was used with a maximum of 2 lags of both the dependent variable and the repressors. The result of model selection criteria is presented in figure 4.2 below. The procedure has selected an ARDL (1, 1, 0, 2, 2, 2,2) model (1 lag, NPL, 1 lag of ROA, no lag of AST, 2 lag of LDR, 2 lad of RIR, 2 lag of GDP and 2 lag of INF, LOGFER).

Figure 4. 2 Model Selection Criteria



Source: Own computation, 2019

4.5 Diagnostic tests

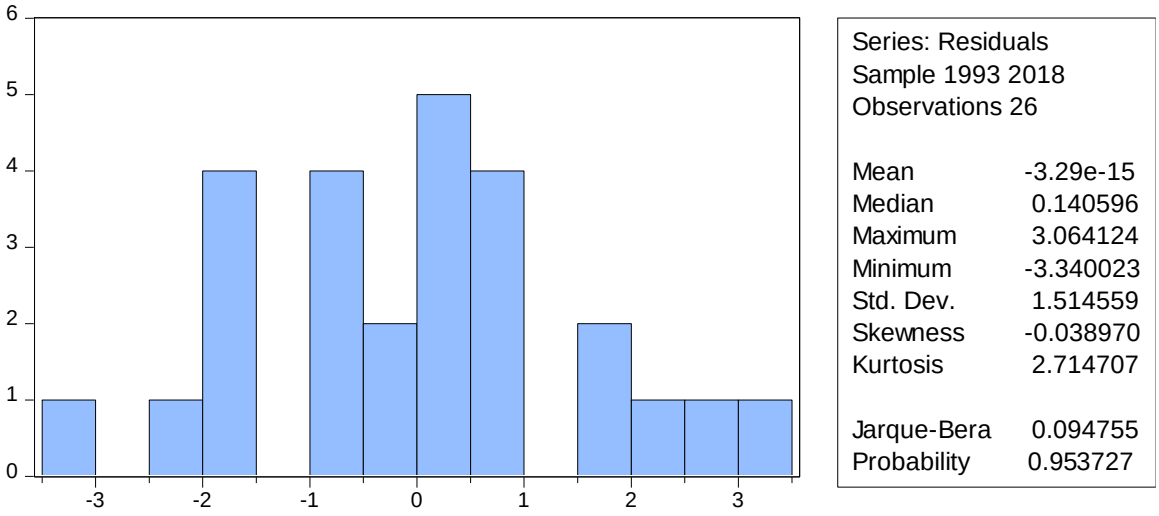
To ascertain the goodness of fit of the estimated model, the diagnostic tests were conducted about residual diagnosis and model stability. The residual diagnostic tests were conducted to identify the existence of problem of serial correlation, heteroskedasticity and non-normality. The stability diagnosis is intended to identify the stability in long-run equation during study period and it is analyzed by using cumulative sum of recursive residuals (CUSUM) and the cumulative sum squares of recursive residuals (CUSUMSQ).

4.5.1 Residual Diagnosis

4.5.1.1 Normality Test

By using the Jarque-Bera normality test, the study checked whether the residuals are normally distributed or not. If the residuals are normally distributed, the histogram should be bell-shaped and the Bera-Jarque statistic would not be significant. Since P-value of Jarque-Bera is greater than 0.05, the study could not reject the null hypothesis of residuals are normally distributed. The result of normality test suggests that the error terms of the specified model are normally distribute.

Figure 4. 3 Normality Test



4.5.1.2 Serial correlation test

This study is conducted to identify that the residuals associated with one observation are not correlated with the residuals of any other observation and tested by applying BreuschGodfrey Serial Correlation LM Test is applied. The p-values of F-statistic and Obs*R-squared exceeds the 5% critical value. This suggests that there is no serial correlation among the residuals.

Table 4. 3 Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.082799	Prob. F(2,7)	0.9214
Obs*R-squared	0.600866	Prob. Chi-Square(2)	0.7405

4.5.1.3 Heteroskedasticity

This test is conducted to ensure that the standard errors are not wrong and any inferences made could not be misleading with null hypothesis that the errors are homoscedastic and independent of the repressors and that there is no problem of misspecification. This study carries out Breusch-Pagan test for heteroskedasticity. The Breusch-Pagan-Godfrey Test shows that the F- statistic and chi-square p-value are more than 5% percent. Therefore, the study could not reject the null-hypothesis that the residuals. This suggests that the residuals of the model have no problem of heteroskedasticity.

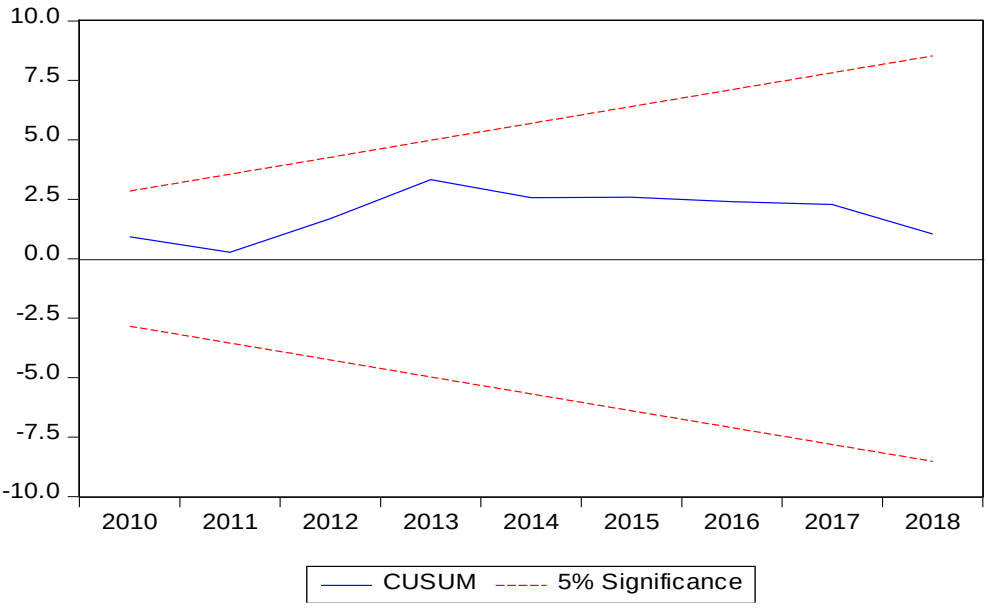
Table 4. 4Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.417601	Prob. F(16,9)	0.9388
Obs*R-squared	11.07806	Prob. Chi-Square(16)	0.8046

4.5.2 Stability Test

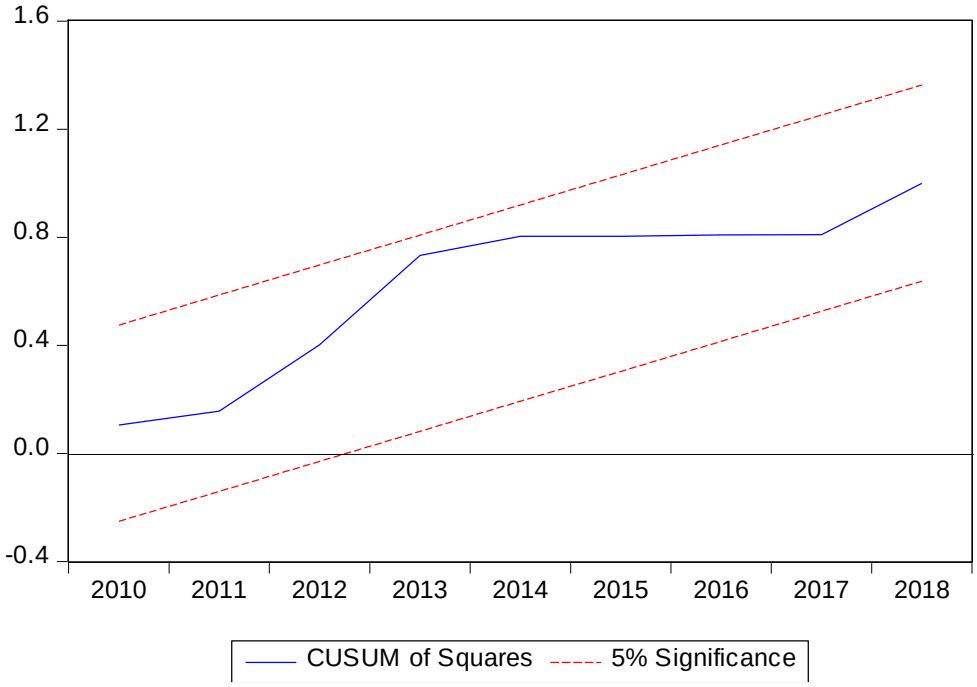
Pesaran et al (2001) recommended that the stability of long run estimates to be tested by applying CUSUM and CUSUMSQ.

Figure 4. 4 Model Stability CUSUM Test



According to these tests parameter instability exists when cumulative sum goes outside the area between the two critical lines within the 5% significance lines. In this study, the line is well within the confidence bands and it suggests the null hypothesis of stability is cannot be rejected. Therefore, this indicates that stability in the equation during the sampled period.

Figure 4. 5 Model Stability: CUSUMQ Test



In addition, the CUSUMQ test finds parameter stability if the cumulative sum of squares is generally within the 5% significance lines, suggesting that the residual variance is stable. Since the line is well within the confidence bands, the null hypothesis of stability is not rejected that suggests the residual variance is stable in the equation during the sample period.

4.6 Estimation Result

This study was conducted with an objective of identifying determinants of NPL in DBE period from 1991 to 2018. Based on this general objective, the study has examined both short-run and long-run association. After ensuring that the study variables are stationary at level and first difference, the ARDL method was employed to investigate the association. This section of the study presents the estimation result for determinants of NPL in DBE during the period of 1991 to 2018 in short run and in long run.

The result of long run regression and the short run dynamics is presented in table 4.5 and table 4.6 respectively.

Table 4. 5 Long Run Dynamics

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	-1.191947	1.884092	-0.632637	0.5427
AST	6.050153	2.370553	2.552212	0.0311
LDR	-11.73508	6.301170	-1.862366	0.0955
RIR	4.304975	1.263796	3.406384	0.0078
GDP	0.108153	0.377231	0.286701	0.7808
INF	-0.086603	0.152716	-0.567088	0.5845
C	-63.40566	25.20871	-2.515228	0.0330

Source: Own computation, 2019

Short run behavior of time series variables is captured through dynamic modeling.If there is long run relationship among the variables, an error correction model (ECM) can be formulated that portray both the dynamic and long run interaction between the variables. ECM enables to capture the short run dynamics of the model and formulated based on the identified long run relationships.ECM restricts the long run behavior of the endogenous variable to converge to their co-integrating relationships while allowing for short run adjustment.The ECM has important implication in linking the short-run periods to the long run period.

Table 4. 6Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ROA)	3.228308	0.568534	5.678301	0.0003
D(LDR)	-0.655495	2.309804	-0.283788	0.7830
D(LDR(-1))	7.328899	2.246183	3.262823	0.0098
D(RIR)	2.378090	0.461432	5.153716	0.0006
D(RIR(-1))	-3.037909	0.454614	-6.682392	0.0001
D(GDP)	0.465531	0.098712	4.716054	0.0011
D(GDP(-1))	0.484314	0.100549	4.816700	0.0010
D(INF)	-0.021976	0.034218	-0.642232	0.5367
D(INF(-1))	0.104886	0.034795	3.014400	0.0146
CointEq(-1)	-0.890692	0.083916	-10.61407	0.0000

Source: Own Computation, 2019

As depicted in table 4.5 above, among the bank specific determinants, effect of ROA is negative but the effect is statistically insignificant in long run. But in short run ROA is positive and significant at significance level of 1%. This finding is similar to finding of Din'ohi (2011) that lower profitability increases the intention of collection of loan that reduces the NPL of a bank.

Total asset has positive and significant relationship NPL at significance level of 5% in long run. But asset has not any short run dynamics with NPL. With similar to Kangimba (2010), the result of long run association suggests that larger asset size is resulting on higher NPL in DBE during the period of 1991 to 2018.

On the other hand, the coefficient of loan to deposit ratio is negative and statistically significant at significance level of 10%. In short run, the effect of loan amount is insignificant at first lag. Effect of loan is positive and significant at second lag at significance level of 1%. The overall significance at short run is significant at significance level of 1%. This finding is according to finding of Djiogap and Ngomsi (2012).

The external determinants used in the study were real interest rate, GDP and inflation. Among the external factors only real interest rate is positive and statistically significant at significance level of 1% in long run. In short run, real interest rate has negative effect at

its first lag but positive effect is running from second lag to NPL of the bank. On overall, the short run effect of real interest is negative and significant at significance level of 5%. This finding is supported by finding of Skarica (2013) that higher interest rate results on higher cost of doing business that reduces collection of interest.

The effect of economic growth is insignificant on NPL in long run. In short run, economic growth has positive effect on NPL at both lag levels. This suggests that NPL variation in DBE is independent to change economic growth in long run but NPL of the bank was increasing when the economy has better performance.Similar to this finding, Saba, Kauser and Azeem (2012) shown that better economic performance improves collection of loan.

Similar to GDP growth, inflation has insignificant effect on NPL in long run. Effect of inflation is positive and significant at second lag and negative and insignificant at first lag. The overall, effect of inflation is significant at significance level of 5%. This finding is according to finding of Tomak (2013).

Error correction term (ECT)shows speed of adjustment back to long-run relationship. It denotes that a deviation from the long run equilibrium which is corrected gradually through a series of short run partial adjustments. The coefficient of ECT shows speed of adjustment of the dependent variable towards its long run steady state path.The coefficient of ECT is negative and statistically significant at significance level of 1% implies the existence of stable long run relationship among variables.A stable co-integrating relationship adjusts the short-run deviations by the extent of the error correction term. The estimated value of ECT is -0.89 suggesting that the adjustment process back to the long run equilibrium after a shock is 89% percent a year.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Major Finding

This study was conducted with an objective of identifying the determinants of non-performing loan in DBE during the period of 1991 to 2018. The study has used NPL as dependent variable and ROA, asset size of the bank, amount of loan, real interest rate, GDP and inflation as independent variables. The stationary behavior of variables included in the model is tested using ADF test, and the test result showed all variables were stationary either at level or first difference. The study used the Autoregressive distributed lag (ARDL) model and bounds testing procedure to examine the presence of long-run and short-run relationship among dependent and independent variables.

The result of short run estimation shows that all bank specific and macroeconomic variables are significant at significance level of 1% and 5%. But the result of long run estimation showed that asset size of the bank, loan deposit ratio and real interest rate are statistically significant. ROA, GDP and inflation are not significant in determining NPL in DBE in long run.

5.2 Conclusions

Based on the empirical findings, this study has drawn following conclusions from long run estimation;

This study reveals that asset has positive and significant effect on NPL. This suggests that when asset of the bank expands, the NPL of the bank was increasing from 1991 to 2018. This implies that expanding the banking was resulting on higher NPL because of weaker asset management.

Amount of loan relative to deposit of the borrowers has negative effect on NPL indicating that when loan asset ratio increase NPL of the bank decreases. The loan

repayment is higher when lower deposit is requested from the buyers to provide the loan. The bank is not providing the amount of loan that the borrowers can pay back.

Real interest rate is positively affecting NPL of DBE suggesting that when real interest rate is higher NPL is also higher. When lending rate is higher with fixed level of saving interest, NPL of DBE is higher because of higher cost of borrowing.

In short run, all determinants are significant in affecting loan repayment of the bank except loan deposit ratio.

Return on asset of the bank has positive effect on NPL of the bank suggesting that when profitability of the bank is higher NPL is higher. This implies that the bank is ignoring collection of NPL when it is profitable and when the profit is lower the bank gives attention for NPL to increase financial performance of the bank.

Similar to long run effect, the effect of real interest rate is positive on NPL. Higher lending interest rate is resulting on higher NPL because higher cost of borrowing.

The effect of GDP is positive on NPL that when economic growth is higher, NPL is higher also. This suggests the borrowers of DBE are not repaying their loan instead they are using economic growth opportunity for further investment.

Economic instability increases NPL that suggests instable economic system is resulting on lower cash flow of the borrowers. Higher inflation creates higher price that reduces demand for the product. Economic instability is lowering the performance of the borrowers and increase the amount of NPL.

5.2 Recommendations

Based on the conclusions drawn, this study has provided following recommendations to improve the loan performance.

Positive association between ROA and NPL, the bank is trying to manage NPL when the bank is less profitable. Therefore, the loan management of the bank is recommended sustained loan management irrespective to the level of profit.

Asset expansion of the bank has resulted on higher NPL. Therefore, the management of the bank is recommended to fix expansion of the bank in a way that result on good loan performance. Expansion of the bank is resulting on expansion of loan but the loan is not properly collected.

Since real interest rate has positive effect on NPL, the bank is recommended to provide loan at lower interest rate otherwise the bank has to reduce amount of loan during the period when the real interest rate is higher.

When there is higher economic growth, NPL is higher. Therefore, the bank is recommended reduce loan to borrowers who have low cash flow that when the economy is at good condition they reinvest the interest instead of paying their loan.

When the economy is highly instable, stronger loan management is required. The bank is recommended to make loan to borrowers who can withstand economic shocks.

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ANNEX

A1: Unit root test

Null Hypothesis: NPL has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.957050	0.3027
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

Null Hypothesis: NPL has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.564439	0.2977
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

Null Hypothesis: D(NPL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.585542	0.0000
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

Null Hypothesis: D(NPL) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 6 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.550258	0.0609
Test critical values:	1% level	-4.498307	
	5% level	-3.658446	
	10% level	-3.268973	

Null Hypothesis: ROA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.047696	0.2661
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

Null Hypothesis: ROA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.919233	0.1724
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

Null Hypothesis: D(ROA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.891402	0.0000
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

Null Hypothesis: D(ROA) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.844545	0.0004
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

Null Hypothesis: AST has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.525853	0.8695
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

Null Hypothesis: AST has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.664635	0.0451
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

Null Hypothesis: D(AST) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.911312	0.3216
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

Null Hypothesis: D(AST) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.973189	0.5845
Test critical values:	1% level	-4.416345	
	5% level	-3.622033	
	10% level	-3.248592	

Null Hypothesis: LDR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.999634	0.0476
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

Null Hypothesis: LDR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.566420	0.0522
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

Null Hypothesis: D(LDR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.418843	0.0000
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LDR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.228632	0.0001
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

Null Hypothesis: RIR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.753207	0.3945
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

Null Hypothesis: RIR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.433818	0.0678
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

Null Hypothesis: D(RIR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.647194	0.0116
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

Null Hypothesis: D(RIR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.557161	0.0539
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

Null Hypothesis: GDP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.176064	0.0032
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

Null Hypothesis: GDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.604446	0.0055
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.571566	0.0016
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.460283	0.0091
Test critical values:	1% level	-4.416345	
	5% level	-3.622033	
	10% level	-3.248592	

Null Hypothesis: INF has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.179081	0.0032
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

Null Hypothesis: INF has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.627451	0.0052
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.084667	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.928186	0.0000
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

A2: Regression Result

Dependent Variable: NPL
Method: ARDL
Date: 12/26/19 Time: 19:38
Sample (adjusted): 1993 2018
Included observations: 26 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): ROA AST LDR RIR GDP INF

Fixed regressors: C
Number of models evalulated: 1458
Selected Model: ARDL(1, 1, 0, 2, 2, 2, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
NPL(-1)	0.109308	0.196922	0.555080	0.5924
ROA	3.228308	1.599451	2.018385	0.0743
ROA(-1)	-4.289966	1.140665	-3.760935	0.0045
AST	5.388825	1.643626	3.278620	0.0096
LDR	-0.655495	4.901163	-0.133743	0.8965
LDR(-1)	-2.467955	4.463538	-0.552915	0.5938
LDR(-2)	-7.328899	4.045776	-1.811494	0.1035
RIR	2.378090	0.966526	2.460452	0.0361
RIR(-1)	-1.581591	1.196121	-1.322267	0.2187
RIR(-2)	3.037909	0.879379	3.454607	0.0072
GDP	0.465531	0.196329	2.371178	0.0418
GDP(-1)	0.115114	0.189851	0.606339	0.5593
GDP(-2)	-0.484314	0.192406	-2.517146	0.0329
INF	-0.021976	0.067942	-0.323456	0.7537
INF(-1)	0.049726	0.060832	0.817426	0.4348
INF(-2)	-0.104886	0.080730	-1.299222	0.2262
C	-56.47493	15.22377	-3.709654	0.0048

R-squared	0.933680	Mean dependent var	6.404121
Adjusted R-squared	0.815778	S.D. dependent var	5.881178
S.E. of regression	2.524265	Akaike info criterion	4.936597
Sum squared resid	57.34722	Schwarz criterion	5.759199
Log likelihood	-47.17576	Hannan-Quinn criter.	5.173477
F-statistic	7.919120	Durbin-Watson stat	1.991886
Prob(F-statistic)	0.001753		

A3: ARDL Error Correction Regression

ARDL Error Correction Regression
Dependent Variable: D(NPL)
Selected Model: ARDL(1, 1, 0, 2, 2, 2, 2)
Case 2: Restricted Constant and No Trend
Date: 12/26/19 Time: 19:41
Sample: 1991 2018
Included observations: 26

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ROA)	3.228308	0.568534	5.678301	0.0003
D(LDR)	-0.655495	2.309804	-0.283788	0.7830
D(LDR(-1))	7.328899	2.246183	3.262823	0.0098
D(RIR)	2.378090	0.461432	5.153716	0.0006
D(RIR(-1))	-3.037909	0.454614	-6.682392	0.0001
D(GDP)	0.465531	0.098712	4.716054	0.0011
D(GDP(-1))	0.484314	0.100549	4.816700	0.0010
D(INF)	-0.021976	0.034218	-0.642232	0.5367
D(INF(-1))	0.104886	0.034795	3.014400	0.0146
CointEq(-1)*	-0.890692	0.083916	-10.61407	0.0000

R-squared	0.944351	Mean dependent var	-0.356755
Adjusted R-squared	0.913048	S.D. dependent var	6.420306
S.E. of regression	1.893199	Akaike info criterion	4.398136
Sum squared resid	57.34722	Schwarz criterion	4.882019
Log likelihood	-47.17576	Hannan-Quinn criter.	4.537477
Durbin-Watson stat	1.991886		

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	7.921295	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

A4: Bound Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.921295	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99
			Finite Sample: n=35	
Actual Sample Size	26			
		10%	2.254	3.388
		5%	2.685	3.96
		1%	3.713	5.326
			Finite Sample: n=30	
		10%	2.334	3.515
		5%	2.794	4.148
		1%	3.976	5.691