Determinants of Credit Risk: The Case of Selected Commercial Banks in Ethiopia

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***Abstract*— Risk assessment is the careful analysis and evaluation of the diverse factors that can bring risks. Risk assessment provides the banks an opportunity to determine the vulnerabilities and risk associated with a banking system. The aim of this study is to assess determinants of credit risk in selected commercial banks in Ethiopia. To this end, secondary data from ten commercial banks over the period 2010 to 2017 were collected from the audited financial statement of the selected banks available in the National Bank of Ethiopia. The assumption tests were made and indicate the fitness of data for further tests and also the post estimation tests recommend pooled ordinary least square for the regression analysis. The result indicated that predictor variables like efficiency ratio, return on equity and bank size have statistically significant positive effects on the dependent variable (credit risk). In addition, the study showed that capital adequacy had statistically significant negative effect in predicting the dependent variable, credit risk. However, predictor variables like return on asset, leverage and loan to deposit ratio didn't make any statistically significant effect on credit risk. Finally, it was recommended that, commercial banks in Ethiopia are advised to become more effective, in management to use funds contributed by shareholders, in spending sufficient resources on analyzing loan application, introduction of modern risk management technology, that are believed to improve the effectiveness of commercial banks in Ethiopia.**

***Index Terms*— Ethiopia, commercial banks, credit risk, bank specific factors.**

I. BACKGROUND OF THE STUDY

Lending is the heart of the banking industry. The lending activities are performed by banks which are very important in every economy for they provide special functions or services which if disturbed or interfered with, can lead to adverse effects on the rest of the economy (1). The financial industry has always been affected by unsystematic changes such as changes in the economic situation (uncertain interest rates, foreign exchange rates), political changes, social changes and systematic risk such as internal controls, corporate governance and information technology systems as well (2). Credit is derived from a Latin word 'credere' meaning trust. When a seller transfers his wealth to a buyer who has agreed to pay later, there is a clear implication of trust that payment will be made at agreed date (3). Credit loans constitute a cornerstone of the banking industry.

Bankers are concerned with six main types of risk. These are credit risk, liquidity risk, market risk, interest rate risk, earnings risk and solvency risk (4) that can be grouped as credit risk, market risk and operational risk (5). Among these risks, credit risk plays the major role since by far the largest asset item is loans, which generally account for half to almost three-quarters of the total value of all bank assets. Risk-taking is an inherent element of banking and, indeed, profits are in part the reward for successful risk taking. In contrary, excessive, poorly managed risk can lead to distresses and failures of banks. Risks are, therefore, warranted when they are understandable, measurable, controllable and within a bank's capacity to withstand adverse results (6).

Risk assessment is the careful analysis and evaluation of the diverse factors that can bring risks. Risk assessment provides the banks an opportunity to determine the vulnerabilities and risk associated with a banking system. According to (7), the significance of risk assessment is apparent once a risk management system is developed and management wants to recognize the effectiveness of such a system.

The credit management is one of the major issues of banks that concern many stakeholders where better credit risk management results in better bank profitability. This research, therefore, attempts to explore bank specific determinants of credit risk in the case of selected commercial banks of Ethiopia. However, the results of those studies were inconsistent. This inconsistency of results might be attributable to the method of data analysis used by different researchers and difference in the economic condition of the countries in which banking sectors are operating.

To date, few researches were undertaken on the determinants of credit risk in countries with emerging economy like Ethiopia case by (12), (13), (14), (15), (16), (17) (24) and (18). These studies are a very recent one, but, there are some gaps in that some variables like return on asset and leverage are not totally touched by those researchers. Besides, there are some variables like bank size, capital adequacy and efficiency

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ratio which are touched by those researchers but not in depth. Thus, the need for further investigation by others is required. Accordingly, this very research assumed that the level of credit risk depends on bank specific factors. The bank specific factors or determinant factors were Return on Assets, Return on Equity, Loan to deposit ratio (LTD), Leverage, Efficiency ratio, Capital Adequacy and Bank Size. Hence, the problems stated above along with the knowledge gap in the literature calls a research to examine this important area concerning the effect of bank specific variables or determinants of credit risk in Ethiopian commercial banks covering the period 2010 to 2017.

II. STATEMENT OF THE PROBLEM

The future of banking undoubtedly rests on risk management dynamics. Only those banks that have efficient risk management system will survive in the market in the long run. The effective management of credit risk is a critical component of comprehensive risk management essential for long-term success of a banking institution. Credit risk is the oldest and biggest risk that bank, by virtue of its very nature of business, inherits (8).

Even though, a lot of studies that were conducted at a cross countries, and single country based to examine the determinants of Credit risk, majority of the studies were prepared/inclined with reference to developed countries like Italy, Spain, Greece, EU and USA and the like. This shows that, those papers do not explain the issues of countries like Ethiopian case. The basic intention for this study is that, different studies were done in Europe and African countries (9), (10) & (11). However, the results of those studies were inconsistent. This inconsistency of results might be attributable to the method of data analysis used by different researchers and difference in the economic condition of the countries in which banking sectors are operating.

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III. OBJECTIVES OF THE STUDY

a. General Objectives

The main objective of this study is to examine the determinants of credit risk in selected commercial banks in Ethiopia.

b. Specific Objective of the Study

Specifically, this study addressed the following objectives;

1. To assess the effect of return on asset on credit risk in selected commercial Banks in Ethiopia.
2. 2.To assess the effect of return on equity on credit risk in selected commercial Banks in Ethiopia.
3. 3.To assess the effect of loan to deposit ratio(LTD) on credit risk in selected commercial Banks in Ethiopia.
4. 4.To assess the effect of leverage on credit risk in selected commercial Banks in Ethiopia.
5. 5.To assess the effect of efficiency ratio on credit risk in selected commercial Banks in Ethiopia.
6. 6.To assess the effect of capital adequacy on credit risk in selected commercial Banks in Ethiopia.
7. 7.To assess the effect of bank size on credit risk in selected commercial Banks in Ethiopia

IV. LITERATURE REVIEW

(19) found out that the key principles in credit risk management are establishment of a clear structure, allocation of responsibility and accountability, processes have to be prioritized and disciplined, responsibilities should be clearly communicated, and accountability assigned on his research title Credit Risk Management in Rural Commercial Banks in China.

(20) made a study to examine the macroeconomic and indigenous determinants of NPLs in the Indian banking sector using panel data a period from 1997 to 2009. The variables included were GDP growth, inflation rate, per capital income, saving growth rate, bank size, loan to deposit ratio, bank lending rate, operating expense to total assets, ratio of priority sector`s loan to total loan and ROA. The study found that real GDP growth rate, inflation, capital adequacy, bank lending rate and saving growth rate had insignificant effect; whereas loan to deposit ratio and ROA has strong positive effect but bank size has strong negative effect on the level of NPLs. The emergence of Customer Experience Management has brought huge changes in the corporate world during the recent years. (24)

(21) made a research on Macroeconomic Determinants of Credit Risk in Nepalese Banking Industry. The finding was that, inflation and foreign exchange rate influence credit risk negatively while GDP growth, growth of Broad Money Supply and Market Interest Rate failed to influence credit risk in the Nepalese banking industry. Many authors also strongly link the loan problem with macroeconomic variables.

(22) made a research on Bank Specific Determinants of Credit Risk in the Banking Sector of Bosnia and Herzegovina using the panel regression model and found that inefficiency and credit growth had a significant negative influence on credit risk while ROE Determinants of Credit Risk of Commercial Banks in Ethiopia Post Graduate Studies Saint Mary's University Page 30 and deposit rate had significant positive impact on credit risk. However, capital adequacy, liquidity,

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market power, ROA and reserve ratio had an insignificant impact on credit risk.

(16) studied credit risk management practice of Nib International Bank of Ethiopia and in his assessment the researcher come across that factors lead to wrong decision making and increase NPL level of the bank are concentration of credit in few sector and borrower, collateral as number one technique of credit risk management, absence of credit risk model of credit portfolio, lesser attention for MIS and advisory service to customers and absence of proper follow up.

(23) examined that credit risk management and profitability of commercial banks in Ethiopia. Find out that Both nonperforming loan ratio and capital adequacy ratio has a negative impact on profitability's of commercial banks in Ethiopia. He also stated that the impact level of nonperforming loan ratio is negative which means, a single unit increase in nonperforming loan ratio leads to (.594077) decrease of profitability of commercial banks of Ethiopia.

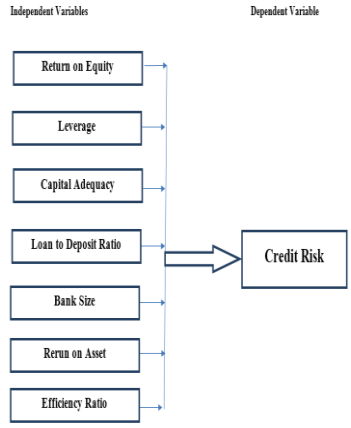
(14) studied factors influencing the level of credit risk in the Ethiopian commercial banks. The study find out that quantity of risk and quality of risk management related variables has got much influence on the credit risk level of banks. Nevertheless, risk direction related measures, which are mostly external focus, have limited influence on credit risk. More specifically the variation in the effect of stock and flow measures entails banks to further enhance mostly two of Basel principles: operating under a sound credit granting process and maintaining an appropriate credit, administration, measurement and monitoring process.

(12) has investigated Credit Management on Wegagen Banks. The main objective of the study is to evaluate the performance of credit management of Wegagen bank in Tigray Region as compared to National Bank's requirements in comparison with its credit policy and procedures. The following findings were the result of the investigation: the issues impeding loan growth and rising loan clients complaint on the bank regarding the valuing of properties offered for collateral, lengthy of loan processing, amount of loan processed and approved, loan period, and discretionary limits affecting the performance of credit management.

(15) has studied on "the determinants of Nonperforming loan on commercial banks of Ethiopia" also found as poor credit assessment, failed loan monitoring, underdeveloped credit culture, lenient credit terms and conditions, aggressive lending, compromised integrity, weak institutional capacity, unfair competition among banks, willful defaults by borrower and their knowledge limitation, fund diversion for un expected purposes and overdue financing has significant effect on NPLs. Besides, the study considers interest rate as bank specific factors and revealed as interest rate has no impact on the level of NPLs of commercial banks in Ethiopia. However, the authors didn't address macroeconomic determinants of NPLs and statistical relationship between all bank specific factors and NPLs in ECBs.

V. Conceptual Framework

From the theoretical and empirical literature reviews, the following conceptual framework of the study was developed by the researcher.



Source: Adopted from prevailing literatures

Figure 1 Conceptual Framework

VI. RESEARCH DESIGN AND METHODOLOGY

Explanatory research design was employed to examine the determinants of credit risk in selected commercial banks of Ethiopia. Data wa collected form banks registered by (6) for the year 2007/2008. Out of seventeen commercial banks in the country, ten commercial banks, that were registered by NBE before 2007/08 having at least eight years audited financial data (i.e. 2010-2017) were selected purposely as they meet the minimum criteria of having weitht years financial statement. Data with regard to bank specific factors were obtained from audited annual financial statements of the selected commercial banks. Descriptive statistics correlation and multiple linear regression analysis was employed to analyze the data.

VII. MODEL SPECIFICATION

The following model was adopted from previous literatures for the current study

$Yit = \beta 0 + \beta Xit + \varepsilon$

Where:

Yit is dependent variable,

β0 is the intercept (constant variable),

Xit is independent variable,

ε are the error terms

i is the number banks

t is the number of time period.

Credit risk $it = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \beta 7X7 + \varepsilon$

Where: Y= credit risk, β0= Constant term, X1 = Return on asset, X2 = Return on equity, X3= LTD, X4= Efficiency ratio, X5 = Leverage, X6 = Capital adequacy, X7 = Bank size.

β0 = Constant coefficient β1 – β7 = Regression coefficients for measuring independent variables,

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i = number of banks
t = time period
ε = Error term

VIII. DATA PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS

In this chapter, finding of the analysis and discussion of the result in order to achieve research objectives are discussed. It starts with the introduction and discussion for the result of descriptive statistics of the data followed by trend analysis for credit risk of commercial banks of Ethiopia. Besides, descriptive statistics of independent variables were elaborated in detail. Furthermore, tests for the assumptions of multiple linear regression model and correlation analysis were undertaken. Then model selection and regression result were presented. Finally, the result of the regression analysis was discussed in detail.

a. Descriptive Analysis

Descriptive Statistics of Dependent Variable and Independent Variables

TABLE I. DESCRIPTIVE STATISTICS OF DEPENDENT VARIABLE CREDIT RISK

	N	Minimum	Maximum	Mean	Std. Deviation
Credit Risk	80	0.001	0.07	0.0196	0.0115

Source: Authors computation of the SPSS Output

Table 1 shows mean, minimum, maximum and standard deviation values of the dependent variable, credit risk. The result showed that the mean distribution of credit risk (loan loss provision or less provision for doubtful loan divided by total loan) of selected banks in the sample was 0.0196 with standard deviation of 0.0115. In other words the average credit risk of selected banks in the year from 2010 to 2017 was 1.96%.

The mean value 1.96% CR of the sample commercial banks is less than the set threshold of average nonperforming loan below 5% (6). On the other extreme, the highest CR ratio of the sampled commercial banks was 7.00% which was in excess of the set threshold of average

nonperforming loan below 5% (NBE, 2008). The standard deviation of CR was 0.0115. This indicated that the variation among the sample commercial banks in their loan recovering capacity varies from the mean by 1.15%.

TABLE II. DESCRIPTIVE STATISTICS OF INDEPENDENT VARIABLES

	N	Minimum	Maximum	Mean	Std. Deviation
Return On Asset	80	.32	4.94	2.9976	.75853
Return On Equity	80	2.66	47.25	23.6362	7.98115
LDR	80	.36	.89	.5660	.09039
Efficiency Ratio	80	30.97	250.15	116.9434	46.29299
Leverage	80	.80	1.02	.8698	.03771
Capital Adequacy	80	.08	.20	.1327	.03196
Bank Size	80	7.02	12.81	9.4532	1.19823

Source: Authors computation of the SPSS Output

Table 2 above shows descriptive statistics results of independent variables. The total observation of this study was 80. The mean value of return on asset is 2.9976 with a minimum of 0.32 % and a maximum of 4.94. This indicated that , the most profitable bank among sampled banks earned 4.94 cents of profit after tax for a single birr invested in the asset of the firm. While, the least profitable bank of the banks earned 0.32 cents. The standard deviation statistics for ROA of 0.75853 depicted that profitability variation between the banks is significant.

The minimum and maximum score of return on equity was 2.66 and 47.25 respectively which indicates very high range (44.59) between the maximum and minimum score of return on equity. The mean score of return on equity was 23.64 with standard deviation of 7.98. The result implied that, the most profitable banks earned 47.25 cents of net income from a single birr of funds invested by its shareholders. On the other hand, least profitable banks earned 2.66 cents. This indicated that, Ethiopian Commercial banks earn 23.64% on averages from the equity per year.

Capital Adequacy (CAD) which was measured as total equity (capital and reserve) over total asset has got a maximum and minimum values of 20% and 8% respectively. The standard deviation was .03196 revealing the existence of variation of total equity to asset ratio between the sampled commercial banks level of dispersion towards the mean. A Mean value of .1327 percent indicates that CAD for the selected banks in Ethiopia during study period was above the minimum requirement, which is 8% set by NBE per NBE Directives No. SBB/50/2011. The mean capital ratio of 13.27% is more than the National Bank of Ethiopia (NBE) requirement, of 8%, and for it is generally accepted that, a bank with a high capital adequacy ratio is considered safe and likely to meet its financial obligations.

LTD ratio ranges from maximum of 89% to Minimum of 36%. It has mean value of loan of 56.6 percent. Both the Max. Value (0.89) and minimum value (0.36) are less than one, implying that the sampled commercial banks rely on their own customer's deposits for lending. Similarly, the Min.value (0.57) indicates that, on average the amounts of volatile deposits, liabilities for the banks were tied up with loans. The standard deviation of 9%. Indicates that there is dispersion of LTD towards its mean.

The mean value of bank size (BAS) which is measured by natural log of total asset of selected banks in the year from 2010 to 2017 was 9.45 with standard deviation of 1.198. This indicates the existence of less variation among selected

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commercial banks in terms of their size. The maximum and minimum values were 12.81 and 7.02 respectively.

The above table also depicted the descriptive statics of efficiency ratio which is often measured as a ratio of non-interest income to non-interest expense, that is , the higher the ratio, the greater the bank's efficiency and vice versa. It indicates that there is a very high range (219.18) between the maximum and minimum score of efficiency ratio with average deviation of 46.29 from the mean score of 116.94.

Leverage ratios, which, measures how leveraged a bank is, and a bank's degree of leverage (that is, its debt load) is often a measure of risk. When the debt ratio is high, bank has a lot of debt relative to its assets. From the above table, it is indicated that, the sampled Ethiopian Commercial Banks under the study period have got a mean value of leverage of 0.86 with minimum and maximum of 0.8 and 1.02 respectively with standard deviation of .03771.

c. Correlation Analysis

The following table indicate the correlation between dependent and independent variables and among the independent variables.

TABLE III. CORRELATION BETWEEN DEPENDENT AND INDEPENDENT VARIABLES

	Credit Risk	Return On Asset	Return On Equity	LTD	Efficiency Ratio	Leverage	Capital Adequacy	Bank Size
Credit Risk	1	.441**	.407**	-.395**	.708**	-.003	-.048	.027
Return On Asset		1	.644**	-.142	.704**	-.262*	.225*	-.034
Return On Equity			1	-.115	.688**	.354**	-.543**	.429**
LTD				1	-.404**	.030	-.125	.066
Efficiency Ratio					1	.030	-.077	-.001
Leverage						1	-.693**	.558**
Capital Adequacy							1	-.460**
Bank Size								1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Source: SPSS output

Table 3 shows the correlation between dependent variable and independent variables as well as the correlations among independent variables. Regarding the correlation between dependent variable and independent variables, the result shows that there was a statistically significant strong positive correlation between credit risk and efficiency ratio r = 0. 708, p< 0.01.

There was moderate positive correlation between credit risk and return on asset, r = 0.441, p < 0.01. Similarly, there was moderate positive correlation between credit risk and return on equity, r = 0.407, p < 0.01. This implies that as one variable increases the other variable also increases and vice-versa. However, there was moderate negative correlation between credit risk and LTD, r = -0.395, p < 0.01. This implies that as one variable increases the other variable decreases and vice-versa. The correlation between credit risk and leverage, credit risk and capital adequacy as well as credit risk and bank size was not statistically significant.

Table 3 also shows correlation among independent variables. The correlation between return on asset and efficiency ratio was the first strong correlation of all, r = 0.704, p < 0.01. This implies that there was a positive strong relationship between return on asset and efficiency ratio. The correlation between return on equity and efficiency ratio was the second strong correlation r = 0.688, p < 0.01. However, the correlation between return on asset and capital adequacy was the weakest statistically significant correlation among independent variables.

d. Multiple Linear Regression Analysis

TABLE IV. THE INFLUENCE OF INDEPENDENT VARIABLES ON THE DEPENDENT VARIABLE: MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.754a	.568	.526	.00671

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	.004	7	.001	13.534	.000b
Residual	.003	72	.000		
Total	.008	79			

a. Dependent Variable: CreditRisk

b. Predictors: (Constant), BankSize, Efficiency Ratio, LTD, CapitalAdequacy, Leverage, Return OnAsset, Return On Equity

The goodness of fit results of linear multiple regression with Credit Risk as the dependent variable and seven determinants (Return on Assets, Return on Equity, LTD, Leverage, Capital Adequacy and Bank Size) as predictors are reported in Table 4. The model reveals a statistically significant relationship between capital risk and determinants, F (7,72) = 13.53, p < 0.001. In addition, it also shows that the model is fit. In other words the model was significant.

TABLE V. REGRESSION COEFFICIENTS OF PREDICTOR VARIABLES IN PREDICTING THE DEPENDENT VARIABLE, CREDIT RISK

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Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.040	.030		1.333	.187
Return OnAsset	.006	.003	.472	1.761	.082
Return On Equity	-.001	.000	.790	2.518	.011
LTD	-.016	.010	-.151	-1.641	.105
Efficiency Ratio	.000	.000	.888	6.111	.000
Leverage	-.025	.031	-.098	-.808	.422
Capital Adequacy	-.167	.072	-.546	-2.328	.023
Bank Size	.002	.001	.238	2.116	.038

a. Dependent Variable: CreditRisk
Source: SPSS Output

In order to assess the effect of independent variables (determinants of credit risk) on credit risk, multiple linear regression analysis was computed. The table 5 shows that, among the predictor variables, variables like return on equity, efficiency ratio, capital adequacy and bank size made statistically significant effect on the dependent variable, credit risk. To evaluate the effect/contribution or influence of each independent variable to the dependent variable, one can see the Beta value. The Beta value for predictor variable, efficiency ratio, was 0.888 which implies that this predictor variable made the first strong positive and statistically significant effect on the dependent variable (credit risk) when the variance explained by all other variables in the model is controlled for.

In addition, return on equity made a statistically significant positive effect on the dependent variable with Beta value of 0.790. This implies that return on equity made the second strong effect or influence in predicting the criterion variable, credit risk. Furthermore, capital adequacy and bank size made the third strong negative and the fourth positive effect/influence/contribution in predicting the dependent variable, with Beta value of -0.546 and 0.238 respectively. However, the remaining predictor variables (return on asset, leverage and LTD) didn't make any statistically significant effect/influence in determining the dependent variable, $p > 0.05$.

In general, the study explored the effects of seven determinants (independent variables) on credit risk (dependent variable). Correlation results of this study indicated that the relationship between credit risk and independent variables (return on asset, return on equity, LTD and Efficiency ratio)were statistically significant ($p < 0.05$).

Regression result also indicated thatthe model (Return on Assets, Return on Equity, LTD, Leverage, Capital Adequacy and Bank Size) explained 56.8% of the variance in the dependent variable (Credit Risk). In addition, only four predictor variables (return on equity, efficiency ratio, capital adequacy and bank size) made statistically significant effect on the dependent variable, credit risk. Therefore, the specified model which was:

$$Y= \beta0 + \beta1X1+ \beta2X2 + \beta3X3 + \beta4X4 + \beta5X5 + \beta6X6 + \beta7X7 +\varepsilon$$

Where: Y= credit risk, β0= Constant term, X1 = Return on asset, X2 = Return on equity, X3= LTD, X4= Efficiency ratio, X5 = Leverage, X6 = Capital adequacy, X7 = Bank size.

is modified as:

Credit risk = 0.04 + 0.888 Efficiency ratio + 0.79ROE – 0.546Capital adequacy + 0.238 Bank size + 0.00671.

IX. CONCLUSION

The study indicated that there was a statistically significant strong positive correlation between efficiency ratio and credit risk. Return on equity had statistically significant positive effect on the dependent variable, credit risk. Capital adequacy which was measured as total equity (capital and reserve) over total asset found to have statistically significant effect on credit risk. Bank size had a statistically significant positive effect on credit risk. Predictor variables (return on asset, leverage and LTD) didn't make any statistically significant effect/influence in determining the dependent variable, credit risk.

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