

Survival analysis of loan repayment rate of customers of Hawassa district commercial bank

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The reviews of the balance sheet of commercial banks in Ethiopia showed that, loan item constitutes the largest portion of bank's assets. It also possesses the highest rate of profit relative to other alternative investments. While it is highly profitable, it also possesses the greatest risk. Such problems usually springs from loans that have become uncollectible due to mismanagement, illegal manipulation of loans, misguided lending policies. Identifying factors will contribute greatly in lifting-up the loan repayment rate of customers. A sample of 182 customers, who took loan from October, 2005 to April, 2012 was taken from the bank record. To model the survival repayment time as well as examine the association between the survival time with different demographic and loan characteristics variables, the Kaplan-Meier estimation method and Cox proportional hazard model were applied respectively. The result from Kaplan-Meier estimation revealed that the loan repayment rate is significantly related with loan size, loan type, and previous loan experience, purpose of loan, educational level and type of collateral offered. Commercial banks should design loan strategies giving particular emphasis on these factors while they are giving loans to their customers.

Key words: Kaplan-Meier estimation, Cox proportional hazard model, repayment time, balance sheets

Introduction

1.1. Background of the study and study area

In a financial system, commercial banking is one of an integral part that plays great role for development of countries. The social, economic and political development of any nation mainly depends on the quality and quantity of banks they have. The acknowledgement stemmed from the important and significant roles played by commercial banks as prime movers of the economic and social life of the nation. Good bank lending guarantees high profit levels, greater returns and wider scope of satisfying social responsibilities of the bank while bad lending affects banks and society negatively in several ways.

1.2. Statement of the problem

The reviews of the balance sheet of commercial banks in Ethiopia Ndugbu (2008) showed that, loan item constitutes the largest portion of bank's assets. It also possesses the highest rate of profit relative to other alternative investments. While it is highly profitable, it also possesses perhaps, the greatest risk. The risk associated with lending can only be averted or reduced through calculated forward planning, articulated

forecasting, conducting researches and good monitoring systems which sound lending policies should provide.

1.3. Literature Review

Factors affecting Repayment Performance

Based on past literature, the factors affecting repayment performance can be divided into four factors namely individual/borrowers factors, firm factors, loan factors and institutional/lender factors. Greenbaum (1991), Hoque (2000) and Coyle (2000) showed that when a loan is not repaid, it may be a result of the borrowers' unwillingness and/or inability to repay. Greenbaum and Thakor (1995) suggest to look at a borrowers' past record and economic prospects to determine whether the borrower is likely to repay or not. Besides characters of the borrowers, collateral requirements, capacity or ability to repay and condition of the market should be considered before giving loans to the borrowers.

2. Methodology

2.1. Description of Study Area and Population

This survey utilizes data collected from Hawassa branch Commercial bank of Ethiopia which has more than 30 sub-branches in the southern Ethiopia. Actually in this study, all customers of this bank who took loan for different purposes are the target population of the survey.

2.2. Data collection Procedure

I discussed with the officials of the bank about the objectives of the study and finally convinced them to get any kind of support from the bank. The bank at last gave the dataset on the loan of individuals eliminating the names of the customers from the dataset.

2.3. Study design

The cross-sectional study design was employed which mainly based on the data collected in the bank about the loans of customers and some related demographic and Socio-economic data characteristics of study participants. Regarding the sampling techniques, the study participants were selected from the data set using stratified simple random sampling. The researcher believes that the loan repayment rate of customers will depend on the type of loan they took from the bank.

2.4. Sample size determination

There are several formulas developed for sample size calculation that conform to different research situations. Accordingly, the sample size determination formula (Cochran, 1977) is adopted for this study.

$$n = \frac{z^2 p(1-p)/d^2}{1 + 1/N \left[\frac{z^2 p(1-p)}{d^2} - 1 \right]}$$

Where, n = the sample size needed, N = the total population size, Z is the upper $\alpha/2$ points of standard normal distribution with $\alpha=0.05$ significance level. Suppose the maximum allowable difference between the maximum likelihood estimate and the unknown population parameter, denoted by d , desired to be 0.021. The parameter p represents the proportion of customers who paid their loan in the stated period. According to the study done in Nigeria by Dermimi (2004), Among all customers who

took loan,80% repay the loan in the agreed time.($p = 0.8$, $q = 0.2$).Using these values, the Optimum sample size required for this study is found to be 183.

2.5. Variables in the study

The response (dependent) variable is the time the customers utilize to repay their loan. The predictor variables which are assumed to influence the survival of loan repayment included in the model are: Sex, Age of customer, Branch, Educational status, Marital Status, Purpose of loan, Experience of taking loan, Type of loan, Repayment date, Mode of Repayment and Type of Collateral.

2.6. Survival Data Analysis

The term survival analysis applies to techniques in which the data being analyzed represent the time it takes for a certain event to occur. The use of survival analysis, as opposed to the use of different statistical methods, is most important when there is no time-to-event record.

3. Result

3.1 Descriptive Statistics

A total of 183 participants who borrowed loan from Hawassa Branch commercial bank of Ethiopia are included in this study.

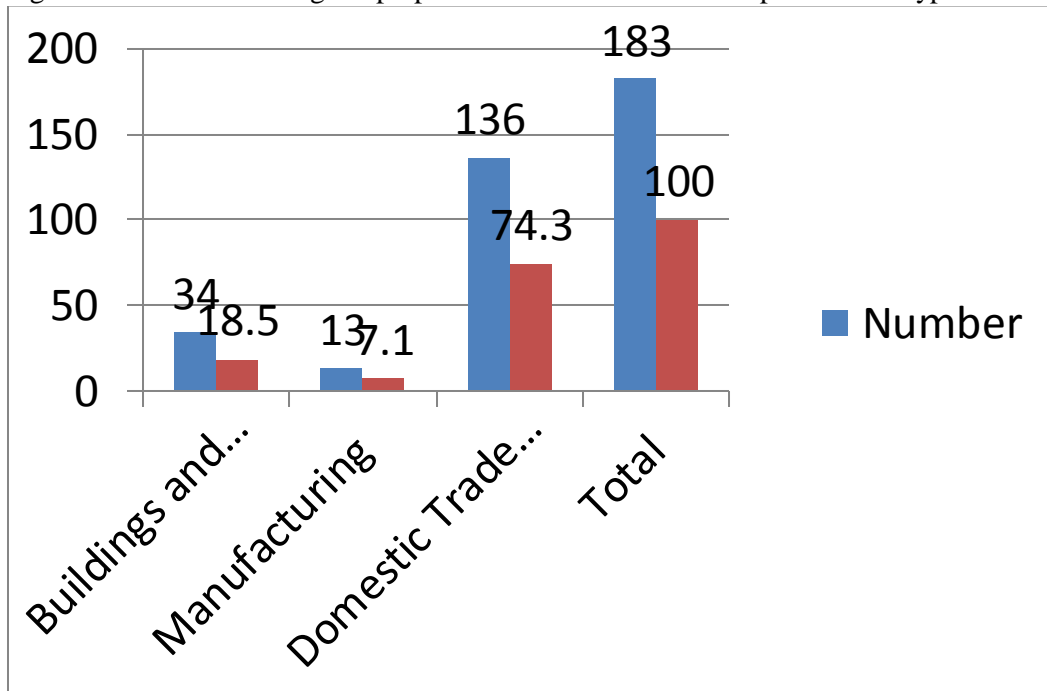
Table 3.1. Table showing the Socio-demographic characteristics of participants of the study

VARIABLES	FREQUENCY	PERCENTAGE
AGE		
25-34	18	9.8
35-45	93	50.8
46-55	51	27.8
56-65	20	10.9
Greater than 65	1	0.5
Total	183	100
Educational Status		
8 th grade	22	12
12 complete	140	76.5
Diploma	8	4.3
Degree and above	13	7.1
Total	183	100
Marital Status		
Married	170	92.8

Single	13	7.2
Total	183	100

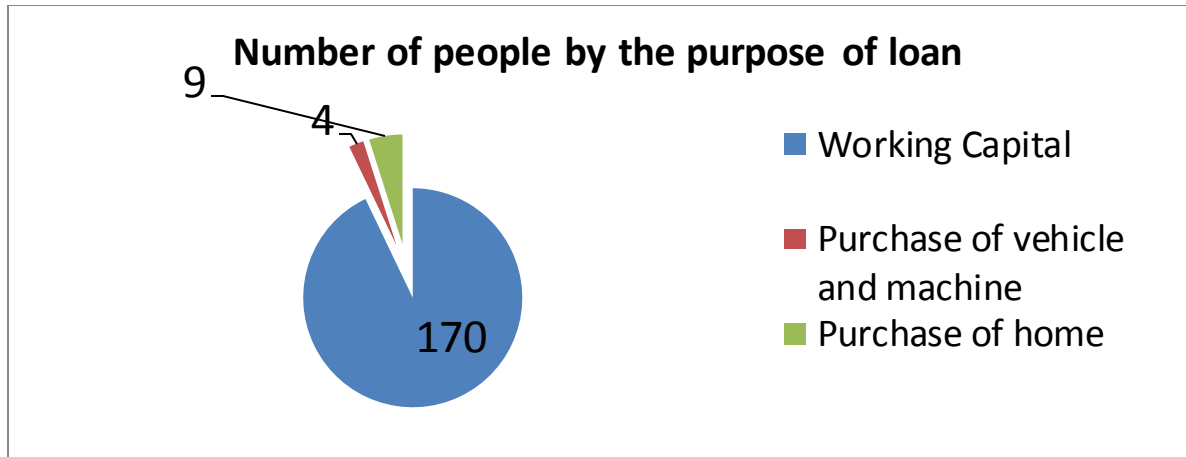
Among all the respondents involved in this study, about 80% were in the age range 35-55 years old. In contrast, there is only one respondent whose age is more than 65 years old. Regarding lenders educational status ,more than three fourth of the customers were 12 complete whereas, those with diploma and more constitute only 11.4%.With respect to the variable marital status, the dataset collected from the bank has only two marital status categories married and Single. About 93% of the bank customers were married people, whereas more than 7% of the respondents had single marital status.

Fig 3.1. Bar-chart showing the proportion of customers with respect to their type of loan



The bank gives loan to different type of customers for different activities. The types of loans that the bank gives to its customers are for Buildings and Construction, for Manufacturing and for Domestic Trade service. From the multiple bar chart shown above, we can understand that nearly three fourth of the customers use the loan borrowed from the bank for Domestic and Trade services. Secondly, nearly one fifth of the participants use their loan for Building and Construction. Therefore, from this multiple bar chart we can understand that higher proportion of the borrowers use the loan for Domestic and Trade services.

Fig 3.2 Pie-chart showing the number of people who got loan by the purpose of loan



From the above pie chart, we can understand that, majority of the respondents took loan for working capital. The proportion of people who took loan for purchase of vehicle and machine and home was very small.

3.2. Comparison of survival experience

In order to investigate if there is significant difference between the loan repayment rate by sex, marital Status, previous loan experience, type of loan, purpose of loan and mode of repayment. The survival of loan repayment is significantly related with the following variables: educational level, previous loan experience and type of loan. In contrary to the above the predictor variables sex, marital status, loan purpose and mode of loan repayment are not significantly related with loan repayment rate of customers.

Table 3.2: Comparison of survival experience on bank loan repayment using demographic, health and risk behavior variables (during 2003-2011)

Variables	Mean Survival time	Chi-Square	Log-Rank(Mantel-Cox)		Breslow (Generalized Wilcoxon)		
			df	Pr > Chi-Square	Chi-Square	df	Pr > Chi-Square
Sex		0.591	1	0.442	0.657	1	0.418
Education		14.351	3	0.003	8.405	3	0.002
Loan Experience		8.431	1	0.001	9.994	1	0.001
Type of Loan		6.458	2	0.002	8.874	2	0.003
Marital Status		0.726	1	0.394	1.235	1	0.267
Loan Purpose		1.948	2	0.378	1.039	2	0.595
Mode of Repay		3.108	3	0.375	1.347	3	0.718

4. Conclusions

This study tried to identify the major factors that can affect the loan repayment rate of Hawassa district commercial bank customers. To achieve this objective, a statistical analysis called survival analysis was employed to reach to the following conclusions:

- Different types of people took loan from this bank. Among these people majority (78.6%) of them were in the age range 35 to 55.
- Regarding customers educational status, people from grade 8 to degree and above took loan from the bank for different purpose. Among these people, more than three fourth of them were twelve grade graduates.
- The bank avails different type of loans for its customers. From all my study participants, greater proportion took their loan for Domestic trade services whereas few customers took the loan for manufacturing products.
- The bank arranges loan to customers for different purposes. Among those people who took loan from the bank, greater proportion took it for working capital. In contrast to this very few customers took loan for purchasing vehicle and machines.
- From the Kaplan Meier analysis and cox proportional analysis, we can conclude that the survival experience of loan repayment is significantly related with the variables: educational level, previous loan experience and type of loan.
- In contrary to the above findings, the predictor variables sex, marital status, loan purpose and mode of loan repayment are not significantly related survival experience of loan repayment rate of customers.

References

- Coyle, B. (2000). Framework for Credit Risk Management. CIB Publishing, UK.
- Dermine, J., Neto de Carvalho, C., (2006) Bank loan losses-given-default: a case study. Journal of Banking and Finance 30, 1219-1243. Economic Development institute of the World Bank, September, PP 1-34
- Greenbaum, S.I., & Thakor, A.V. (1995). Contemporary financial intermediation. Forth Worth, Texas: Dryden Press.
- Greenbaum, S.I (1991). Contemporary financial intermediation. Forth Worth, Texas: Dryden Press.
- Hoque, M.Z.(2000) Guided industrial credit. Monash University. <http://www.bizresearchpapers.com/Document4.pdf>. 22 April 2010.
- Ndugbu, M.O. (2008) "The Use of multiple Discriminant Analysis (MDA) in the Assessment of bank loans.