

UNIVERSITY OF NAIROBI

**AN EVALUATION OF THE EFFECT OF INTEREST
RATES ON CREDIT**

A CASE OF EQUITY BANK

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A Research Paper submitted in partial fulfillment of the requirements of Masters of
Economics

DECLARATION

This Research Paper is my original work and has not been presented for a degree in any other university.

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ABSTRACT

Equity Bank has the largest customer base of Kenyans with bank accounts. About 57 percent of all bank accounts are held in Equity Bank. This makes Equity Bank a major determinant on how banks' make their proposals on which interest rates to charge customers. The broad objective of the study is to evaluate the effect of interest rates on credit; whether when interest rates increase or decrease on the types of commercial banks' loans for different products; determine the number of people taking the loans, and the size of the loans taken.

Using primary data obtained from Equity Bank for the purposes of making inferences, the study involved 1,000 customers from various branches countrywide. The sample was randomly selected from the total customers of Equity bank of 2011. The results indicate that region and the repayment period are significant in explaining the amount of credit to the individual customers. After correcting for heteroskedasticity, the interest rate charged on loans is insignificant in explaining borrowing by Equity Bank's customers.

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ACRONYMS

CBK – Central Bank of Kenya

CRB – Credit Reference Bureau

SME – Small and Medium Size Enterprises

OLS – Ordinary Least Squares

T-Bill – Treasury Bill

T-Bond – Treasury Bond

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CHAPTER ONE

1. INTRODUCTION

1.1 Background of the study

Central Bank of Kenya controls the monetary policy of the economy. It is the task of Central Bank to sustain inflation at moderate level and exchange rate of local currency at a level that will not hurt the economic growth of the country. This is done using various policies like open market operations and cash reserve ratio. When there is high inflation in the economy and the currency of the economy has fallen against foreign currencies; the central bank will increase its benchmark lending rate. This will lead to a slowdown in credit from banks. When there is high inflation, it means that there is a large amount of money in the country chasing few available commodities. An increase in benchmark lending rate will reduce the large amount of money in the economy. This will force commercial banks to raise interest rates on loans to the public. This will cause people to take fewer loans or credit from banks, hence reduce the amount of money in circulation.

The high treasury bills rate will change investment of money in the economy. Most commercial banks will find it better to lend to the Government through the Central Bank as they will be highly compensated. Buying treasury bills also has no risk of losing on payment as you definitely know how much you will obtain at a certain time of investment and the government will always pay back without failure. This in actual sense will reduce the circulation of money in the economy and hence reduce inflation in the economy.

Commercial banks have different interest rates for various types of credit issued to customers. Interest rate will always be determined with target profile of customers in mind. If commercial banks are targeting the same profile of customers, each bank makes its interest rate to be attractive to customers, so as to sell more loans. Some banks might offer reducing balance interest rate and another offer flat rate on interest rate. The customer is always at will, to choose which loan will be favorable to repayment.

Though there are five credit segments at Equity Bank, the study will look at the following categories of customers:

- Small-scale farmers (Agriculture sector).
- Salary and wage workers in the low and middle income brackets (Consumer sector)
- Micro-businesses (mainly informal business operators like youth and women groups) (Imara sector).

Equity Bank has the largest customer base of Kenyans with bank accounts. About 57 percent of all bank accounts are held in Equity Bank. This makes Equity Bank a major determinant on how banks' make their proposals on which interest rates to charge customers. Equity Bank offers some loans similar to what other banks offer to customers and other loans developed by Equity Bank that are not offered by any other bank. It is only in Equity Bank that farmers have a variety of loans developed to meet their requirements; women and youth groups as well have loans developed for them. It's only in Equity Bank where customers will get loans at interest rate offered on group loans and farm loans because other banks do not offer these types of loan. Other loans that are offered by Equity Bank as well as other banks are asset finance, business loans, and

mortgage and check-off loans to employees of government and other well established institutions. Interest rates are determined by what other banks are offering to customers and the Central Bank requirements.

1.2 Statement of the problem

The Kenyan economy has suffered from escalating prices of commodities over a short period of time as a result of inflation. The existing high levels of inflation, high oil prices, Euro crisis, high import bill of intermediate goods, etc, have led to rampant volatility in the Kenya's currency vis-a-vis foreign currencies. As a result, the marginal propensity to save tends to decline, due to the increased propensity to spend on commodities having the same disposable income. Therefore, the public has to look for means of affording certain necessities e.g. housing, cars, land for settlement, and school fees, among others, in their lives which cannot be met using their disposable income.

They ultimately resort to borrowing funds from commercial banks so as to meet their needs. The loans given to the public are affected by interest rates, and the interest rates level charged on the loans are affected by inflation, among other things. Thus this study would like to examine the effect of interest rate on credit (loans) given to the members of the public.

1.3 Objectives of the study

The broad objective of the study is to evaluate the effect of interest rates on credit. That is, whether when interest rates increase or decrease on the types of commercial banks'

loans for different products¹ would determine the number of people taking the loans and the size of the loans taken.

The specific objectives are:

1. To examine the effect of interest rates on credit taken by the borrowers; and
2. To examine the how regional differences, repayment periods and gender affect the level of borrowing level of credit, across the various sectors.

1.4 Significance of the study

There needs to be competition by commercial banks so that the interest rate charged on the product would be pushed to be lower. From the policy perspective, the findings of the study will enhance policy makers understanding on the effects of interest rates on credit. This work will form a base for further research.

¹ These products are mortgage, agricultural credit, business loans, small and medium enterprise loans and consumer loans or group loans.

CHAPTER TWO

2 LITERATURE REVIEW

This chapter looks into theories and other literature related to how access to credit from banks and other financial institutions play a significant role in economic development and wealth creation for borrowers. The chapter ends with a summary and overview of the literature review.

2.1 Theoretical Literature Review

Interest is a fee paid by a borrower of assets to the owner as a form of compensation for the use of the assets. Simply, interest is the price paid for the use of borrowed money or money earned by deposited funds. In economics, interest is considered the price of credit. Interest rate is the cost of capital and is subject to the laws of supply and demand for money. When supply of money is low the interest rates are high whereas when the supply of money is high, interest rates are low. With the exception of Islamic Banks, Commercial banks charge interest.

The interest rates used by commercial banks are determined by various economic activities in the economy. The economic factors that determine interest rate include;

- Central bank rate
- The cost of deposits or funds, Treasury Bill (TB) Rate and Interbank Rate
- Market competition by commercial banks
- Inflation
- Risk of lending in the economy

The commercial banks choose the base interest rate that will enable them to make profit on loaned amount. They will not want to lose the investors money to customers who cannot pay back their loans. The commercial banks will want to have the highest loan asset quality i.e. less non-performing loans in which they pay less provision to Central Bank. Currently in Kenya, the highest asset quality accepted by Central Bank is 5%. That means that, only 5% of total loan book of the commercial bank should be in a position not to be collected (CBK 2014).

Most customers always want to borrow from commercial banks, whose interest rate is seemingly lower when compared to other commercial banks, the terms of service of repayment are better than other banks and the relationship that the customer has with the bank is good. In June 2014, the central bank rate was 8.50%, 91 treasury bill rate 9.283%, margin spreads 12%, Interbank Rate was around 6.8778% which varies a lot on a day to day basis and inflation was at 7.3% (CBK 2014). Commercial banks always include a percentage on base interest rate, to be in a position to obtain prime rate or lending interest rate that customers will pay when taking loans.

Canner, Avery and Brevoort (2009) explained credit scoring as a statistical technology that quantifies the credit risk posed by a prospective or current borrower. The study addressed the extent to which the considerations of certain factors included in credit scoring models might have a negative or differential effect on populations protected under the United States Equal Credit Opportunity Act (ECOA) and the extent to which alternative factors could be used in credit scoring to achieve comparable results with less

negative effect on protected populations. The study established that credit is critical to a well-functioning modern economy and that virtually all consumers rely on credit sometimes. The evidence indicated that credit scores are predictive of future credit repayment performance both for the production as a whole and for individual populations.

Fowowe (2011) looked at separate publications by McKinnon and Shaw in 1973 who argued that many Less Developing Countries had shallow financial markets which had contributed to retarded growth. The occurrence of shallow finance has distorted both interest rates and foreign exchange rates among other financial prices and consequently, the real rate of economic growth has been hampered. These sorts of economies were said to be financially repressed. McKinnon (1973) and Shaw (1973) argued that low interest rates had the effect of eroding savings and consequently undermining investments. They identified financial repression as a regime consisting of the imposition of interest rate ceilings, foreign-exchange regulations, directed credit allocation policies, high reserve requirements and heavy taxation of the financial sector.

McKinnon (1973) and Shaw (1973) advocated the liberalization of the financial sector of these developing countries in order to promote economic growth. One importance noted by Shaw (1973) of financial deepening was that it has the effect of raising real rates of interest and this has implication that interest rates are more effective and transparent in their function of providing information of existing opportunities in the substitutability of investment for current consumption.

Schumpeter (1912) analyzed the importance of finance to growth and he disagreed with Ricardo's belief that banks cannot contribute to the process of wealth creation but asserted that banks – and indeed all financial intermediaries – are created not only for transporting money but also for granting credit. The creation of credit by banks is essential for economic development and credit provides the entrepreneur with purchasing power without which it would be impossible to produce.

Hartley (1994) examined the effects of household constraints in a general equilibrium model with the inside and outside money. He assumed that financial intermediaries, whose liabilities serve as a medium of exchange, hold firm liabilities as assets. Lending by intermediaries tends to reduce interest rates, while credit constraints prevent household from borrowing to exploit those low interest rates. As a result, the stationary equilibrium real interest rate is significantly below the household rate of time preference. This finding may explain the risk-free rate puzzle. Households are willing to hold inside money and loans at such low interest rates in order to finance consumption or to self-insure against unanticipated fluctuations in future liquidity needs.

A key insight in Hartley Model is that the proportion of credit-constrained households and the multipliers from the credit and liquidity constraints depends on interest rates. Consequently, firms face an upward sloping supply curve of loans as a function of the real interest rate on loans. Equilibrium real interest rates and the aggregate level of saving and investment are jointly determined by household and firm behavior. In particular,

equilibrium real interest rates react to shifts in loan demand resulting from changes in the depreciation rate or the marginal productivity of capital.

Hartley noted that if households can borrow as well as lend directly to firms, the real interest rate on loans is linked to the household rate of time preference by inter-temporal arbitrage. Changes in household borrowing insulate investment and other real variables from financial disturbances. As a result the model has many standard features when credit constraints are absent. Harley concluded that an additional supply of loans from financial intermediaries tend to increase investment and reduce equilibrium real interest rates. Constraints on household borrowing then allow the stationary equilibrium real risk free interest rate to remain below the household rate of time preference. The increased concavity of the indirect utility of wealth functions when household face credit constraints might also explain high risk premiums.

Broecker (1990) observed that there are two forces which govern interbank competition: on the one hand, the bank wants to raise its interest rate given its clientele, but on the other hand a bank wants to lower interest rate in order to improve the average probability that its clientele will repay the loan. Broecker noted that this kind of competition resembles Bertrands-Edgeworth competition. The classical description of Bertrands-Edgeworth competition is based on capacity constraints and on increasing marginal costs. In his specification, a bank could serve the whole market and the tests of credit worthiness are costless. This similarity is solely due to the externalities caused by interest rate differentials and the rejection of decisions of the banks.

Chrystal and Mizen (2005) showed two practical reasons why credit is worth attention. First, the asset side of banks' balance sheet can be thought of as an intermediate variable that interest rate changes are designed to influence. Higher interest rates have their effect on spending, partly via reducing demand for loans. Slower lending growth feeds through into slower money stock growth and into slower spending growth. Thus it is sensible to study directly how bank lending behaves over the cycle and adjusts in response to policy changes.

Second, data on the asset side of banks balance sheet are not routinely produced along with those on monetary aggregates. It is important for policy makers to know whether those data contain additional information, or whether the money stock and lending counterparts are essentially telling the same story. Chrystal and Mizen (2005) explains that the study of 'credit' does not seek to replace the study of money but rather complement it. They focused on the money and credit held by non-bank household sector and defined credit to include only unsecured lending. This ensured that they do not fall into trap that some early papers on 'credit channels' were exposed to when dealing with aggregate data that essentially included the same information on the assets and liabilities sides of banks balance sheet.

McKillop and Wilson (2011) observed that Jackson (2006) compares credit union and bank pricing strategies on a variety of deposit (regular savings, interest checking, money market deposits accounts, certificates of deposits) and loans (new car loans, used car

loans and home equity loans) products. Jackson (2006) finds that credit unions and banks adjust rates paid on deposits and charged on loans as market conditions change. For deposit based products, both banks and credit unions tend to lower rates in response to a decrease in market interest rates quicker than they raise rates in response to an increase.

For loan-based products, commercial banks respond symmetrically to increases or decreases in market rates of interest. In contrast, credit unions tend to lower rates much quicker when market rates are falling than they raise rates on loans when market rates are increasing. Jackson argues these findings imply that banks change rates on deposit and loan products in such a way as to maximize profits, while credit unions change rates in such a way as to maintain a constant margin between average loan rates and average deposit rates.

Mariscal and Howells (2002) noted that before ‘competition and credit control’, banks operated an interest rate cartel with the result that interest was paid on just a subset of deposits and at rates that were low compared to other non-money liquid assets. The consequence of this was that a rise in bank rate communicated itself much more readily to loan rates and rates on non-monetary assets than it did to money itself. This remained true throughout the 1970s, although the effect diminished as banks began at least to compete among themselves for wholesale deposits.

A second effect of a bank rate increase is now apparent in these particular circumstances, it increases the opportunity cost of money. In so doing, it naturally induces a switch from

money to non-monetary assets and whatever effect the increase in official rate may have had on short-dated securities is attenuated by the switch out of money. The rate on non-monetary assets has risen by less than the rate on loans. Consequently, the rate on bank loans has risen relative to the rate on non-monetary assets. This seem to be of limited interest, until Mariscal and Howells recognized that non-monetary asset are someone's liabilities and were issued to fund a deficit and, partly therefore, as an alternative to borrowing from banks.

2.2 Empirical Literature Review

Gorton and He (2008) showed that banks competition for borrowers leads to periodic credit crunches, savings between high and low credit allocations. They say the reason being that bank lending standards may vary through time due to strategic interaction between competing banks. Credit cycles can occur without any change in the macroeconomic environment. Gorton and He (2008) suggest that bank lending is an important topic and changes in the credit allocation; sometimes called "credit crunches" appear to be important part of macroeconomic dynamics.

Rather than change the price of loans, interest rate, bank sometimes ration credit. A dramatic example given by Gorton and He (2008) in the United States of America is the period shortly after the Basel Accord was agreed in 1988, during which time the share of US total bank assets composed of commercial and industrial loans fell from about 22.5% in 1989 to less than 16% in 1994. At the same time, assets invested in government securities increased from 15% to almost 25%. Most generally, they noted that banks vary their lending standards or credit standards.

Bank “lending standards” or “credit standards” are the criteria by which banks determine and rank loan applicants’ risks of loss due to default and according to which banks then make their lending decisions. While not observable, there is a variety of evidence showing that while banking rates are sticky, banks do, in fact change their lending standards.

Lown and Morgan (2005) survey evidence and note that except in 1982, every recession was preceded by a sharp spike in the net percent of banks reporting a tightening of lending standards. Other evidence that bank lending standards change is based on econometrics. Asea and Blomberg (1998) using panel data for the period 1977 to 1973 examined a set of bank loan terms and demonstrated that banks change their lending standards from tightness to laxity systematically over the cycle. This suggests that bank lending standards as evidenced by the interest rates on borrowing are important not only in explaining aggregate economic activity but also the different sectors attractiveness to investment. This implies that if a sector is attractive customers will borrow with the expectation of a higher rate of return than the cost of borrowing.

Cuong (2008) looked at micro-credit as an important tool for smoothing consumption and promoting production, especially for poor households. He observed that without collateral the poor can face binding constraints in the credit market. In year 2003, the Vietnamese Government set up the Vietnam Bank Social Policies (VBSP) to provide the poor with preferential micro-credit. Cuong identified that the program was not targeted

well at the poor and that only 12% of the poor households in rural areas participated in the program in 2004. In the case of Equity Bank, there are no region specific interest rates but the preferential credit is covered in the different loan products. Additionally, it is argued that real rate of interest significantly affects private investment. This is supported by Zachary (2012), evaluating 50 small medium enterprises (SME) in Kenya and concludes that interest rate have a positive effect on demand for credit by enterprises.

It is important to note that the availability of credit facilities affects consumption patterns and investment. Therefore, examining the effect of the period to maturity of the loans is vital. Karlan and Zinman (2007) establish that an additional month to maturity increased loan demand in South Africa and suggest that to increase credit access it is important to use varied loan repayment period as a substitute of interest rates. In this study, the significance of the repayment period on borrowing will be measured.

Perry (2008) ascertain that lenders use credit scores to help them make lending decisions, although each lender may differ in terms of the level of risk it finds acceptable, and this may even vary for different types of loans. Additionally, the study examined the extent to which consumers lack financial knowledge and the resulting consequences. The empirical results showed that people who do not know their credit rating are more likely to overestimate than to underestimate their credit rating.

CHAPTER THREE

3. METHODOLOGY

This chapter outlines the methodological approach that is used in analyzing the effect of interest rates on credit: a case study of Equity Bank. The chapter begins by giving a theoretical framework of the model, model specification, and justification for use of the model, hypothesis of the study, data type and sources, measurement of variables, estimation method and econometric tests used in the study.

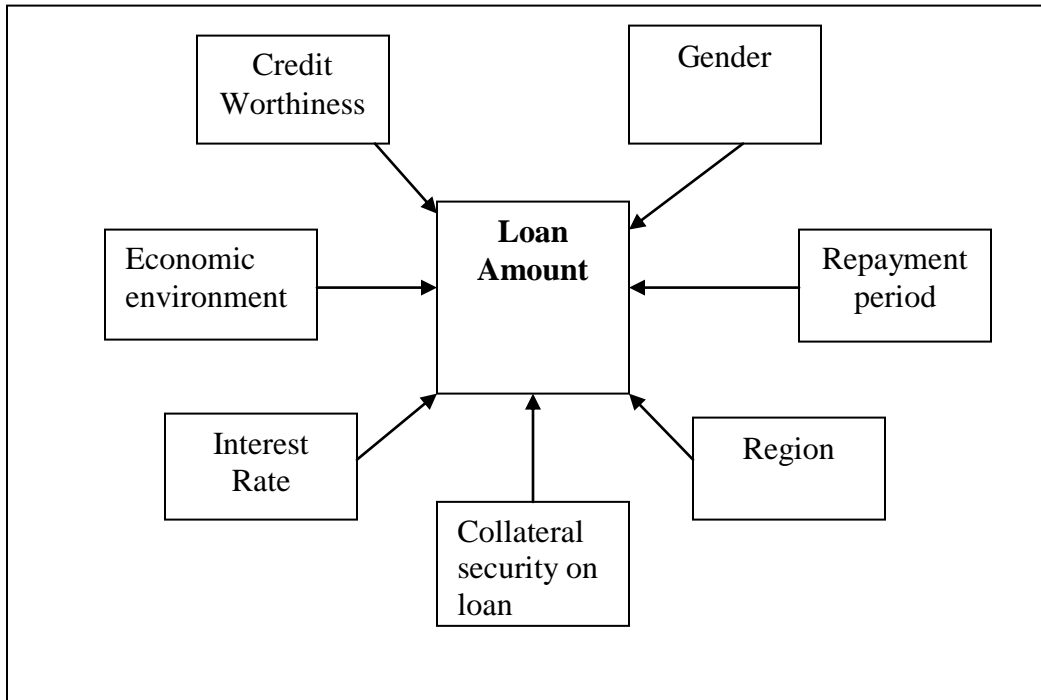
3.1 Research design

To achieve the research objectives, data was obtained from Equity Bank for the purposes of making inferences. The sampling frame was 1,000 customers from various branches in Central, Rift Valley and Nairobi regions. The sample was randomly selected from the total customers of Equity bank of 2011.

3.2 Conceptual Framework

From the reviewed literature and best practices, several factors influence access to credit from financial institutions and commercial banks. The conceptual framework of this study borrows from the analytical framework by Beck and De la Torre (2006) where demand for financial services is driven by both economic factors including price (interest rate), income and non-economic factors such as financial literacy and socio-economic barriers. Income, prices and wealth define the budget constraint of a consumer, whereas their constraints define the shape of the demand curve.

Figure 3.1: Factors determining the loan amount to customers



Source: Author's illustration

In this study, the main focus is how interest rate influences the demand for loan amount. However, the repayment period, gender and the region could also influence the credit issued to customers. Since information on the credit worthiness of the borrowers and measurement of the economic environment were not available, the factors considered in this study are the gender, repayment period, interest rate and the region.

3.3 Theoretical framework

This section is primarily concerned with the theoretical presentation of a model, which can be used as a framework for analysis of the effects of interest rates on credit.

3.4 The Model

The model that is used in estimating the effects of interest rate on credit was adopted from the Dale and Haldane Model (1993) where demand for loans (L_d) is a function of rates charged on bank loans (i_i), rates paid on short dated loans in Equity bank (i_b) and level of nominal income (y)

$$L_d = f(i_i, i_b, y) \dots\dots\dots(1)$$

From the above equation we can come up with an equation for our model as below,

$$C = f(i, r, g, s, p) \dots\dots\dots(2)$$

Where:

- C= amount of credit or loan taken
- i = interest rate charged by Equity Bank
- r= region of the borrower
- g= gender of the borrower
- s = sector in which the borrower participates
- p= repayment period

Equation 2 can be simplified as

$$C = \alpha + \beta_1 i + \beta_2 r + \beta_3 g + \beta_4 s + \beta_5 p + \epsilon \dots\dots\dots (3)$$

3.5 Data type and sources

The study will make use of primary data from Equity Bank that shows interest rate charged and amount of money taken over the specified period.

3.6 Data Analysis and econometric tests

This study uses the Ordinary Least Squares (OLS) estimation technique since we have a continuous dependent variable. The data analysis is carried using STATA. The model will be tested for heteroskedasticity, which is a potential problem with cross-sectional data. Heteroskedasticity occurs when the variances of all the observations are not constant (Wooldridge, 2003). A model that suffers from a heteroskedasticity problem will give consistent, but not efficient estimates. The Breusch-Pagan test will be used to detect whether in the estimated models a heteroskedasticity problem is present. Detected heteroskedasticity problems will be corrected using robust standard error for OLS estimation. However the resultant data presentation will be presented in form of tables, charts, diagrams and pictures.

3.7 Limitation of study

The scope of the study is limited to the amount of loan issued to Equity bank customers in Nairobi, Central and Rift Valley regions in the year 2012. One of the key challenges was to obtain the credit worthiness and income of the customers since the data provided by the bank, did not have these variables.

CHAPTER FOUR

4. ANALYSIS AND DISCUSSION

In this chapter, key findings of the study are presented and discussed. The first part gives a descriptive analysis of the dataset used. Secondly, factors that affect the demand for credit are analyzed and results presented. In the third part, the significant characteristics that influence customers demand for credit are described and discussed.

4.1 Selection of variables

Available literature suggests that the income or occupation, credit worthiness, region, the repayment period and gender are significant in explaining a customer's borrowing capacity. Table 4.1 below indicates the variables used and the expected signs.

Table 4.1: Explanation of Variables

Variable	Acronym	Explanation/measure	Expected sign
LOAN AMOUNT	Y	the logarithm of the amount of credit issued to customers	
REGION	Region	Central, Nairobi and Rift Valley	+
INTEREST	Interest	the interest rate charged to borrowers	-
REP_PERD	repayment	the repayment period in months	+
GENDER	gender	1 representing male and 0 female	+

Source: Author's illustration

In the analysis, the dependent variable is the loan amount which is influenced by interest rates, region, repayment period and gender of the borrower.

Descriptive Statistics

The Table 4.2, below shows some descriptive statistics on the data used for the analysis.

The mean loan amount is Kshs 70,403 with a standard deviation of 281531.2 from the

mean. The difference between the maximum and the minimum value is 7765316 indicating the presence of outliers in the data. It is worth noting that the mean and the median in this case vary quite notably, indicating the need to transform the variable using the logarithms. For the interest and the repayment period, the mean and the median do not vary considerably. The mean interest rate is 18.41 percent while the mean repayment period is one year. This indicates that the observation for the variable can be used without transformation.

The variables REGION, and SECTOR are categorical variables including three dummies each. REGION has Nairobi, Central and Rift Valley, where as SECTOR has IMARA, CONSUMER and AGRICULTURE. Additionally, the variable GENDER is binary in nature and has 0 representing male and 1 representing female.

Table 4.2: Descriptive Statistics

Variable	Mean	sd	median	min	max	range	skew	kurtosis
AMOUNT	70403.72	281531.2	29750	1183.9	7766500	7765316	21.64	564.44
REGION	1.56	0.72	1	1	3	2	0.87	-0.59
INTEREST	18.41	2.69	17	8	24	16	1.27	1.26
GENDER	0.75	0.43	1	0	1	1	-1.16	-0.66
REP_PERD	12.67	8.18	12	1	48	47	2.12	3.72
SECTOR	2.03	0.62	2	1	3	2	-0.02	-0.42

Source: Author's calculation

Correlation

Table 4.6 in the Appendix indicates the correlation matrix of the variables used in the study. From the table it can be observed that the AMOUNT of loan to customers is 32.6 percent positively correlated to the repayment period. Additionally, there is a strong positive correlation between INTEREST rate and SECTOR at 65 percent. Suggesting that

the level of interest rate charged influences the borrowing by Equity Bank customers from these business segments. At the same time, it can also be observed that INTEREST rate is correlated to the borrowing by REGION, however at 19 percent. This could be explained by the fact that there are different interest levels charged for the different customer from business segments.

Variable transformation

The study uses the Ordinary Least Squares (OLS) estimation method. To justify the use of OLS as the best linear unbiased estimator, under the Gauss Markov assumption of normal distribution, the study uses the histogram to check for normality. That is, if the assumption for normality does not hold, it will be difficult to compare sample means and make generalization of the whole population. The diagram below shows the histogram of the dependent variable when the logarithm is used to obtain a normal distribution.

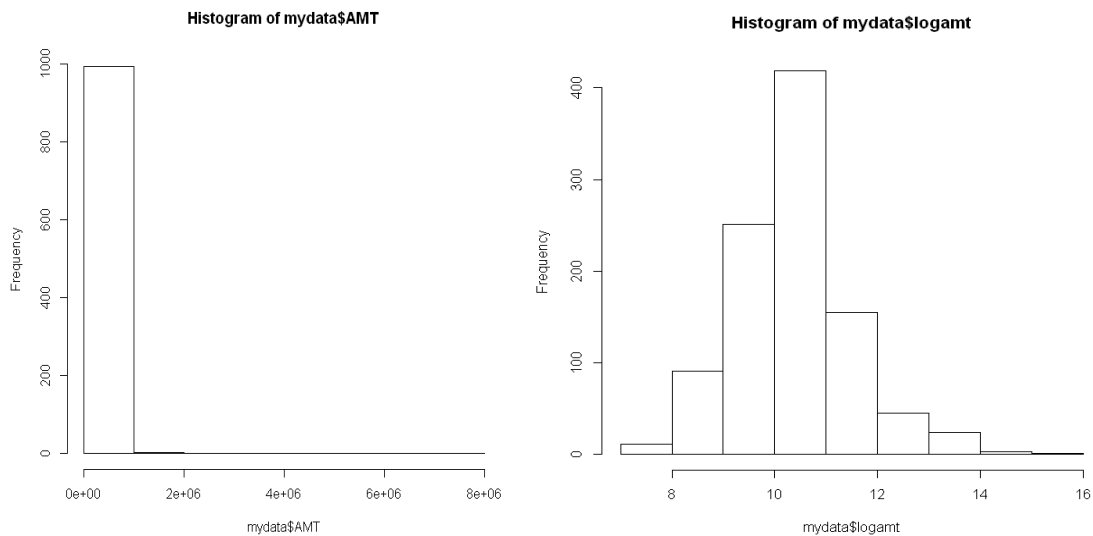


Figure 4.1: Histogram of the dependent variable (loan amount)

The first diagram shows that the loan amount is skewed to the left thus the need to transform the data. It is important to note that the since the loan amount has a very wide

range that is the difference between the highest value and the lowest value is very huge with outliers on the extreme ends. However, for the interest rate and the repayment period, the range is small and the observations almost similar in some cases. Therefore, the histogram of both the transformed and the non-transformed values are not normally distributed. This is as shown in the figure below;

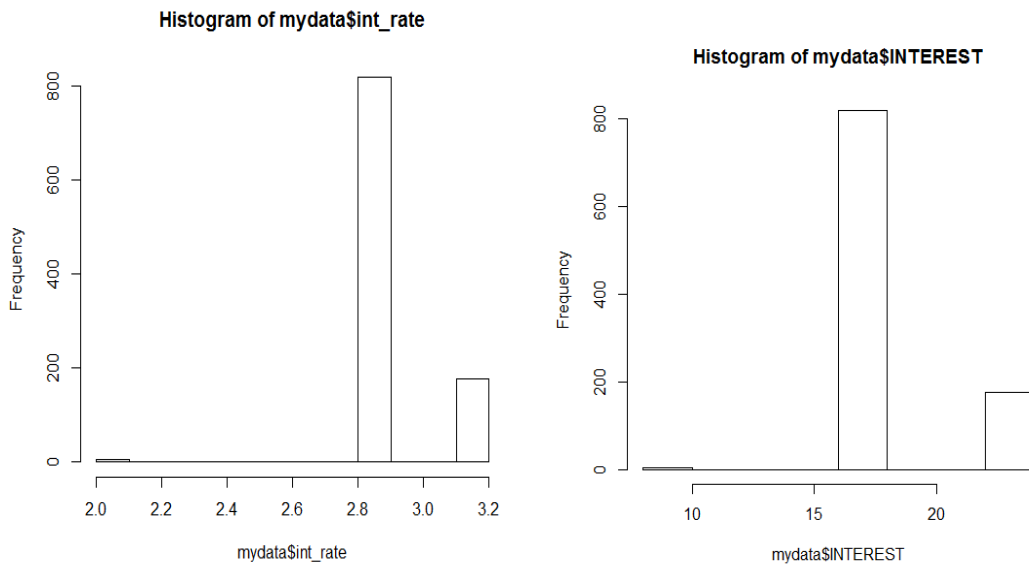


Figure 4.2: Histogram of the interest rate

The histogram on the left side shows the transformed interest rate amount and the right hand side shows the interest rate as observed from the data. It can be seen that there is no significant difference; hence, transformation is not likely to change the analysis.

The study uses the logarithm of the dependent variable as shown in the second diagram which is normally distributed. The final equation therefore has the dependent variable as the logarithm of the loan amount.

Model specification

$$\text{Log}(\text{LOAN AMOUNT}) = \alpha_0 + \beta_1\text{REGION} + \beta_2\text{INTEREST} + \beta_3\text{REP_PERD} + \beta_4\text{SECTOR} + \beta_5\text{GENDER} + \varepsilon$$

Table 4.3: Estimated OLS Equation Results

Coefficients:	Estimate	t value	Pr(> t)	Significance
Intercept	11.6644	12.061	< 2e-16	***
REGION Nairobi	0.4837	8.281	3.91E-16	***
Region Rift Valley	0.4368	5.953	3.64E-09	***
INTEREST	-0.1222	-3.053	0.00233	**
REP_PERD	0.0647	23.374	< 2e-16	***
SECTOR_CONSUMER	-0.3007	-1.049	0.2946	
SECTOR_IMARA	0.5500	2.152	0.03167	*
GENDER	-0.0454	-0.795	0.42678	

Source: Author's calculations

$$\ln(\text{Loan amount}) = 11.664 + 0.484 (\text{Region_Nairobi}) + 0.436 (\text{Region_Rift Valley}) - 0.122 \text{ Interest} - 0.300 (\text{Sector_Consumer}) + 0.550 (\text{Sector_Imara}) - 0.045 \text{ Gender}$$

In Table 4.3 above, only the Consumer and Imara sectors are reported since the inclusion of the other sectors significantly affects the model and the significance of the other variables. Interpreting the coefficients in situations where the dependent variable has been log transformed requires special computations to get the elasticities. Therefore, the interpretation of the β_1 would be $(e^{\beta_1} - 1) * 100$ percentage change in Y.

The results indicate that holding other predictors constant, a unit increase in the number of customers in Nairobi is likely to increase the credit amount by 62 percent that is $(e^{0.483} - 1) * 100$ compared to a customer in Central Kenya. Additionally, a unit increase in the interest rate which is our variable of interest decreases the loan borrowed by 11.5 percent that is $((e^{-0.122} - 1) * 100)$. The results also indicate that a unit increase in

borrowing by customers in the consumer sector results to a 34.98 per cent $(e^{0.300} - 1) \times 100$ decrease in the borrowed amount compared to borrowing for agricultural purposes. However, this is not significant in explaining borrowing. The results also indicate that holding other predictors constant, a unit increase in the repayment period would lead to a 6.68 percent $(e^{0.0647} - 1) \times 100$ increase in the credit amount.

Test for normality

Normality of the Residuals

The analysis further tests for normality of the residuals obtained after the regressing the model above, that is $(\text{Residuals} = y - \hat{y})$. The Figure 4.3 below shows the distribution of the residuals conducted as a test for normality. The Figure 4.4 in the appendix is a QQ Plot which shows that the tails of the residuals are normally distributed. This is further confirmed by Figure 4.3, the distribution of the studentized residuals diagram which is normally distributed.

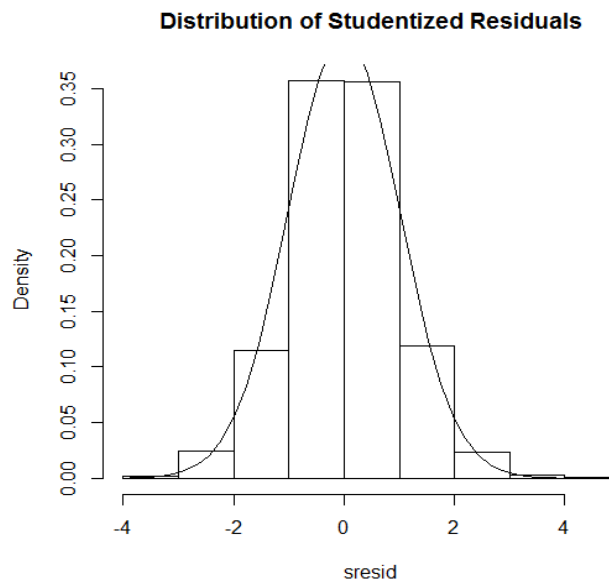


Figure 4.3: Distribution of the regression residuals

4.2 Test for heteroskedasticity

Wooldridge (2009) suggests that in the presence of heteroskedasticity, the standard errors that are used to calculate test statistics are biased and not valid in making conclusions of whether a particular variable is significant. Guided by this fact, it is therefore informative to test for heteroskedasticity before proceeding further with our analysis.

H_0 = the variance of the error term is constant across all population segments
(homoscedasticity exists)

H_1 = the variance of the error term is not constant across all population segments
(heteroskedasticity exists).

The Breusch-Pagan test for heteroskedasticity

Wooldridge (2009) states that the rejection rule for homoscedasticity is that if the p-value is small than the chosen significance level, we reject the null hypothesis of homoscedasticity. Using the results from the Breusch-Pagan test indicated as $\chi^2 = 135.1507$, $df = 7$, $p\text{-value} < 2.2e-16$, the results show that the p-value is lower than the 5% and 10% significance level, hence cannot reject the hypothesis of presence of heteroskedasticity. The problem of heteroskedasticity was solved using the Heteroscedastic Corrected Covariance Matrix (HCCM) to make inference as suggested by Long and Ervin (1998). The results are as shown below;

Table 4.4: Results after correcting for heteroskedasticity

Coefficients:	Estimate	t value	Pr(> t)	Significance
Intercept	11.6644	4.5386	6.357e-06	***
REGION Nairobi	0.4837	7.8708	9.190e-15	***
Region Rift Valley	0.4368	4.7323	2.542e-06	***
INTEREST	-0.1222	-1.1477	0.2514	
REP_PERD	0.0647	5.1454	3.216e-07	***
SECTOR_CONSUMER	-0.3007	-0.4034	0.6867	
SECTOR_IMARA	0.5500	0.8529	0.3939	
GENDER	-0.0454	-0.8070	0.4198	

Source: Author's calculations

After correcting for heteroskedasticity, the analysis proceeds to remove gender from the overall equation and further test if interest rate is significant and to what extent it affects the loan amount to Equity Bank customers. The variable has been omitted from the equation since, results from Table 4.2 and Table 4.3 indicate that it is not significant in determining the loan amounts to Equity Bank customers.

Table 4.5: Results without the variable Gender

Coefficients:	Estimate	t value	Pr(> t)	Significance	($e^{\beta_1} - 1$)
Intercept	11.2327	12.317	< 2e-16	***	
REGION Nairobi	0.4585	8.297	3.47e-16	***	0.581
Region Rift Valley	0.3857	5.550	3.67e-08	***	0.471
INTEREST	-0.1101	-2.911	0.0036	**	-0.104
REP_PERD	0.0769	26.950	< 2e-16	***	0.067
SECTOR_CONSUMER	-0.2533	-0.935	0.3502		-0.223
SECTOR_IMARA	0.6086	2.528	0.0116	*	0.837

Source: Author's calculation

However, to test if there is any significant difference between the two equations, the study used the model without gender. Table 4.5 above shows that the consumer sectors indicated by the sectors become significant in explaining the loan amount to customers when interest rate is not considered in the equation. It is important to note that removal of

the variable gender leads to a drastic change in the results implying that there is multi-collinearity between the variable gender and the other variables. This can be explained by the fact that in Table 4.3, the standard errors for the various sectors are inflated leading to a misleading conclusion that the sectors are statistically insignificant where as they are significant.

The study uses the analysis of variance, ANOVA which has an F-distribution to select the model used in the analysis. The F-test statistic is 9.3202 and a p-value 0.002327 which is significant at 5 per cent. The linear regression models 1 and 2 and presented in the below;

Model 1:

$$\text{Log}(\text{LOAN AMOUNT}) = \alpha_0 + \beta_1\text{REGION} + \beta_2\text{INTEREST} + \beta_3\text{REP_PERD} + \beta_4\text{SECTOR} + \beta_5\text{GENDER} + \varepsilon$$

Model 2:

$$\text{Log}(\text{LOAN AMOUNT}) = \alpha_0 + \beta_1\text{REGION} + \beta_2\text{INTEREST} + \beta_3\text{REP_PERD} + \beta_4\text{SECTOR} + \varepsilon$$

4.3 Analysis and discussion of key findings

The results above indicate that region and the repayment period are significant in explaining the amount of credit to the individual customers. It is important to note that after correcting for heteroskedasticity, the interest rate charged on loans is still significant in explaining borrowing by Equity Bank's customers. It can be seen that a unit increase in the interest rate level leads to a 10 percent decline to the amount of loan to customers. Therefore, the study concludes that the borrowing pattern as exhibited by the Equity

Bank customers is sensitive to interest rate regime. The effect for region is positive and statistically significant for the final outcome of the regression results. The results indicate that being in Nairobi and in the Rift Valley increases the probability of accessing loans by 58 per cent and 47 per cent respectively compared to the base region which is Central Kenya. This attribute is unexpected despite the region having numerous commercial and economic activities including trade and agriculture. However, it is important to note that there are no region specific credit preferences for customers.

It is also important to note that the sector that the customer belongs to does significantly affect the amount of credit issued to the customer. This could be explained by the fact that customers will borrow depending on their needs and also the maximum amount set by the bank or the ability to repay the loan. Additionally, it can also be observed that the gender does not influence the amount of loan issued by the bank to the customer. This can be explained by the fact that the sample had a 75 percent of the total population being male customers hence the amounts borrowed amongst customers did not vary greatly across gender.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

With the increasing need for financial access in the context of devolved governments in the country, the study examined the effect of interest rate on loans taken in Equity Bank. In this chapter, the results are used to provide policy guidelines for financial deepening and inclusion in the country.

5.2 Conclusion and Policy Recommendations

The study established that the rate of interest is a strong predictor of loan amount to Equity Bank's customers. In the absence of knowledge on the interest rate spread amongst customers, it can be seen that the need to meet the financial obligations will force customers obtain credit facilities at any interest rate. This could lead to a significant rise of unregulated money lenders in the country since a unit increase in the interest rate levels leads to a 10 percent decline in the amount of loan taken by Equity Bank customers. At the same time, it can be seen that gender of the borrower does not significantly influence the amount of loan to customers.

The study has also established that the region and the repayment period influence the amount of loan borrowed by customers from Equity Bank. A longer period of repayment ensures flexibility and thus huge amounts can be borrowed. The region specific factors also affect the loan amount from banks as areas where more commercial activities can be established and people are more entrepreneurial, there is likely to be an increased amount

of borrowing. This calls for monetary policies aimed at increasing credit access and sensitive to the interest rate changes.

5.2 Policy Recommendations

Based on the findings of this study, the following policy recommendations are made for increasing financial access and ensuring that the interest rate changes do not affect the borrowing:

1. Ensuring that the reference rate used by commercial banks as a benchmark for setting the interest rate is robust. That is, it insulates the prevailing interest rate regime from adverse shocks to the economy. For instance, the revision of the Kenya Bank's Reference Rate which is a 2 month weighted moving average of the 91 day Treasury Bill plus a variable K (KBRR + k). The current situation has the interest rate level pegged on the government borrowing which is susceptible to changes both in the domestic and international economy.
2. For the greatest impact of interest rates to be realized, there is need for increased the focus on the "Duplum rule" which will make borrowers within the specific regions and sectors conscious of the amount they are paying as part of the interest on the principal amount.
3. The results indicated that increase in the repayment period increases the loan amount by 6.68 per cent ($e^{0.0647} - 1$)*100. It is therefore important to recommend strategies that will make commercial banks issue products with longer repayment periods such as mortgage.

5.3 Limitations and areas of further research

The study considered the effect of interest rate on the amount borrowed at a given point in time using cross-sectional data. It must be noted that Equity Bank has different loan products that have been designed for different customer segments. However, this has limitations especially when a specific borrower has different loan products. The study therefore suggests that the bank be able to capture more customer information such as income group, credit worthiness and age in the system that can be used for more targeted analysis.

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APPENDIX

Table 4.6: Correlation Matrix

	<i>AMT</i>	<i>REGION</i>	<i>INTEREST</i>	<i>GENDER</i>	<i>REP_PERD</i>	<i>SECTOR</i>
<i>AMT</i>	1					
<i>REGION</i>	-0.08873	1				
<i>INTEREST</i>	-0.20069	0.197131	1			
<i>GENDER</i>	0.020495	-0.06317	-0.02791	1		
<i>REP_PERD</i>	0.326526	0.009449	-0.22291	0.079265	1	
<i>SECTOR</i>	-0.14837	0.039579	0.656161	0.176733	-0.08091	1

Normality Test using the QQ Plot

QQ Plot showing that the lower tails of the studentized residuals are normally distributed

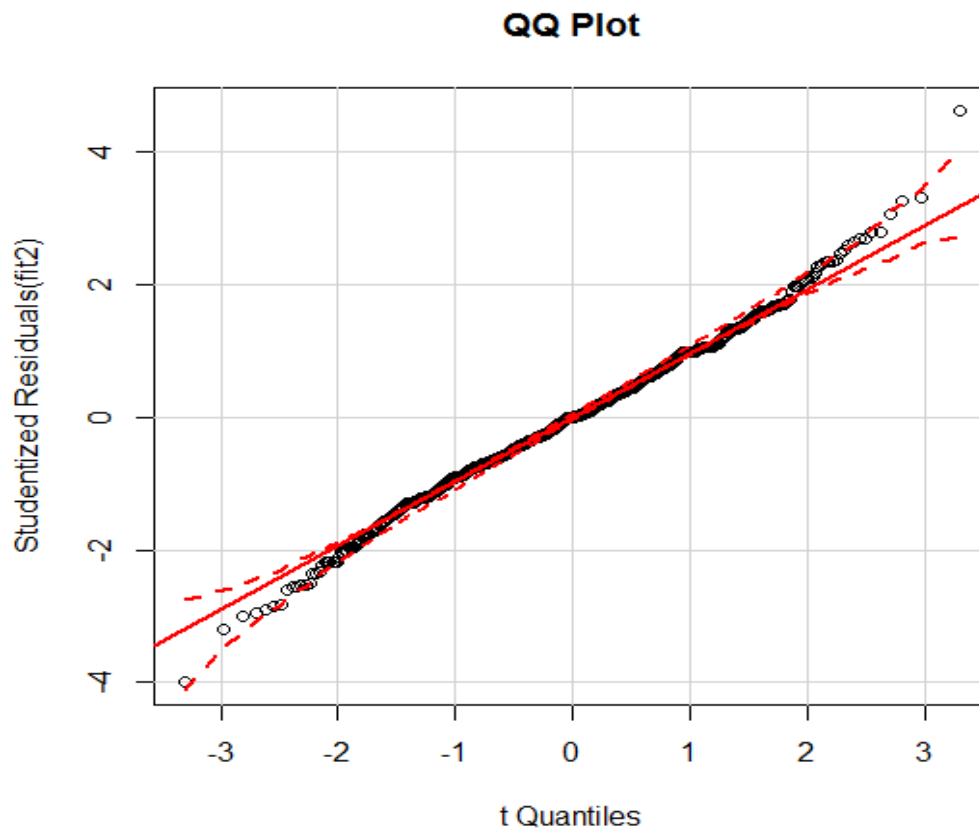


Figure 4.4: QQ Plot of the regression residuals.