FACTORS AFFECTING NON-PERFORMING LOANS:

A case study of KCB Bank Kenya Limited Nairobi Region

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DECLARATION

I declare that this is my original work and has not been presented in any university for the award of degree.

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DEDICATION

I dedicate this research project to my entire family and especially to my lovely husband and my dear son. Thank you for your encouragement and your continued support over the years.

ABSTRACT

The study aimed at identifying the major factors affecting non-performing loans of KCB Bank Kenya Limited. To achieve this research objective quantitative research design was used and data was collected mainly through secondary sources. The data was retrieved from CBK Supervisory reports and also from KCB annual reports, bulletins, manuals, directives and procedures issued by the bank. The data was analyzed using multiple regression using E-views version 9. This study provided policy implication and areas for further research. The study found out that interest rate significantly influence non-performing loans whereas credit size, bank size, gender and age did not significantly influence non-performing loans in KCB bank. The study recommended that there is also need for the bank to control the interest rate as there is some evidence to suggest that high interest rates lead to increased non-performing loans. The study further recommended that there is need for the KCB top management to initiate policies that controlled the amount of loans they have.

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ABBREVIATIONS

CAR Capital Adequacy Ratio

CBK Central Bank of Kenya

DBE Development Bank of Ethiopia

GDP Gross Domestic Product

IJSRP International Journal of Scientific & Research Publications

KCB Kenya Commercial Bank

KDIC Kenya Deposit Insurance Corporation

LTA Loan to Asset Ratio

MBA Masters in Business Administration

NBE National Bank of Ethiopia

NIM Net Interest Margin

NPLs Non-Performing loans

OECD Organization for Economic Co-operation & development

OLS Ordinary Least Square

ROA Return on Assets

ROE Return on Equity

SMEs Small Medium Enterprises

CHAPTER ONE

INTRODUCTION

1.0 Background of the problem

In the 1980s and early 1990s a number of developed economies, developing countries, and economies in transition experienced severe banking crises. These crises disrupted the flow of credit to households and enterprises and some firms went into bankruptcy (IMF, 1998). Several developed countries in the recent past including the USA experienced banking crisis. For example the Citibank group alone, has written-off more than $39 billion in losses due to non-performing loans (Elliot, 2008).

According to Central Bank of Kenya (CBK, 2003), there was a 4.5% decline in pre-tax profit for the banking industry in the year 2002. The risk of non-performing loans mainly arose due to the external economic environment becoming worse off such as economic depressions (Sinkey and Greenwalt, 1991).

In Kenya, the level of non-performing loans in 1998 was estimated at Shs.80 billion or 30% of advances, up from 27% in 1997 as compared to 81.3 billion or 33.4% of total loans in November 2001. This can be compared with levels of NPLs in other countries. According to Taiwan News (2002), the NPLs ratio among Taiwanese banks was estimated at 7.7% by the end of 2001, while the ratio among grassroots financial institutions was 16.37%. In the Philippines non-performing loans ratio as at July 15, 2001 stood at 16.81% of the total loan portfolio, up from 16.76% a month before (Batino, 2001). In Kenya, the ratio of non-performing loans was 33% as at end of year 2000 in comparison with other African economies, the ratio is much lower in Zimbabwe (24%), Nigeria (11%) and South Africa (3%) (CBK, 2001).

An increase in non-performing loans seems to be taking toll on bank profits with some financial institutions posting flat profits. This is partly explained by the higher interest rates regime and the political uncertainty in the country. Banks have also not pay attention to calls by the monetary authorities to lower interest rates. Credit has long been recognized as one of the important tool that supports the success of development project which contributes towards economic development (IJSRP, Vol.6, Issue 5th May, 2016). According to the Central Bank of Kenya (CBK, 2013), the banking sector's gross loans and advances increased to Sh1.45 trillion in June 2013 from Sh1.4 trillion in March the same year, translating to a growth of 3.6%.

1.1 Brief overview of the banking industry in Kenya

Banking industry in Kenya has got 43 registered and licensed commercial banks that provide banking and financial services to customers across Kenya and East Africa region and beyond (CBK 2015). The banking sector plays a vital role in the economic growth of a country. The economic progress of a nation and development of banking is invariably interrelated. Through its intermediary activities, the banking sector foster the production, distribution, exchange and consumption processes in the economic system (Siraj K.K, 2014).

Banks stimulate the flow of funds in the economy and fuels economic growth. The efficiency of banking system, thus determines the pace of development of the economy. Similar to any other business enterprise, the efficiency of a bank is evaluated based on profitability and quality of asset it possess (Siraj K.K, 2014). The importance of bank's stability in a developing economy is noteworthy as any distress affects the development plans (Rajaraman &Vasishtha, 2002) thereby the economic progress (Thiagarajan, et al, 2011).

Lending represents the heart of the banking industry and loans are the dominant assets as they generate the largest share of operating income. Loan however exposes the banks to the greatest level of risk. Prudent credit risk assessment and creation of adequate provisions for bad and doubtful debt can cushion the banks risk. However, when the level of non-performing loans is very high, the provisions may not be adequate cover (Kirui, 2014).

Currently the major problem facing commercial banks in Kenya is the increasing amounts of non-performing loans which have to be provided for in the financial institutions income statement or written-off thereby impacting on the performances of banking sector. A robust banking industry should be able to withstand negative economic shocks and contribute to the general stability of the financial sector and the wider economy (Muasya B. W, 2009).

Banking industry in Kenya has undergone numerous challenges and transformations through massive failure of various institutions since 1980s. In 1990s there was an issue of Goldenberg scandal which left several banks in distress, this brought several banks under the statutory management of Central Bank of Kenya. In the recent past the banking sector has experienced a lot of challenges of the non-performing loans which has led to the closure of some banks here in Kenya; such as Imperial bank, Dubai Bank, the National Bank of Kenya and Chase Bank which is the most recent bank placed under receivership (CBK, 2015; CBK, 2016). According to Kenya Deposit Insurance Corporation (KDIC), Dubai Bank had 99% non-performing loans due to insider lending (The People's daily 17th June, 2016). This is an indication of a problem in banking sector and for the banks to restore back the confidence to the general public then they need to do something to reverse this worrying trend.

The problems encompassing the stated banks above is due lack of risk management and control measures on the banks' assets and the depositors savings which later on leads to huge non-performing facilities and in the long run leads to bank closure. Through this, most banks now have realized that recovering outstanding loans is becoming a tedious and expensive exercise. This has prompted the researcher to further study on what other researchers have done so that the banks can be able manage their loan book more effectively. Most of the default arose from poor management procedures, loan diversion and unwillingness to repay loans among others, because of this, the lenders must give various institutional methods that aimed to reduce the risk of loan default (Ahmmed et al, 2012).

To achieve the objectives of circulating more and more financial resources to meet the increasing demand for credit and to keep the Banks in sound financial position, the loans extended to various sectors of the economy must be recovered in full. Both the principal which is used for re-lending as well as the interest to meet the operating costs must be recovered (IJSRP, Vol.6, Issue 5, May, 2016).

However, for the last many years the Bank's loan repayment performance has been very slow due to various factors. These factors may explain among others the loan repayment behavior of borrowers and lending behavior of the Bank. This has an impact on the sustainable provision of credit to the potential investors and existence of the bank as a financial institution (DBE Annual Report, 2014). Becoming aware of these factors will help the Bank in its continuous efforts to recover its existing loans and to set ideals for forthcoming ones. Loan recovery, therefore, is considered as a crucial factor affecting the liquidity and profitability of the bank.

In the recent past many researchers have tried to look onto ways of assisting lending institutions to see how they can effectively control and monitor the risks associated with the loan defaulting, however, there are still a lot of gaps which needs to be looked at. For instance, Njeri (2005) conducted a study to investigate the determinants of NPLs and she found out that poor credit management was the main cause that leads to NPLs. Saba et al (2012) also conducted a study on the same and he found out that macro-economic factors had an impact on NPLs. They both used regression model in their studies.

Studies from across the world, like the paper that was done by IMF on the non-performing loans (NPLs) in Central, Eastern and South-Eastern Europe (CESEE) in the period of 1998–2011 indicated that NPLs were attributed to both macroeconomic conditions and banks' specific factors, though the latter set of factors was found to have a relatively low explanatory power. The examination of the feedback effects broadly confirms the strong macro-financial linkages in the region such as GDP growth, unemployment, and inflation (IMF Working Paper no.13/72).

Most studies did not cover variables such as gender and age as borrowers' specific factors thus the rationale for undertaking this study, it also appears that adequate researches have not been done that comprehensively to assess the determinants of non-performing loans in banking industry in general. Besides, most of the prior studies conducted in other countries focused on bank specific and macro-economic determinates of NPLs none of the studies covered borrowers' specific factors specifically on the gender and age thus the need for this study to investigate whether gender and age contribute to loan default.

Thus, this study will attempts to identify the determinants of loan repayment performance of projects financed by KCB Bank Kenya Limited. Identifying these factors which affects non-performing loans would enable the bank's management to tackle and minimize the risks and consequently it will enhances its loan recovery process more effectively.

1.2 Statement of the problem

Financial sector need to manage the credit risk inherent in the entire portfolio as well as the risk in individual credits and transactions. Non-performing loans offer the greatest risk to the banking industry not only in Kenya but globally as well (Onsarigo, *et al.,* 2013). Given the fact that banks depend to the greatest extent on performing loans for their revenues, unmanaged or high levels of non-performing loans may precipitate the collapse of not only one bank but also the entire banking system and the economy (Waweru and Kalani, 2009). The identification of the underlying causes of non-performing loans is necessary for the minimization of the chances of occurrence of such bad loans in Kenyan banks (Collins and Wanjau, 2011). Furthermore, an assessment, of various mechanisms that have been implemented and are being implemented in order to address the problem of non-performing loans in Kenyan banks is vital, as this will enable conclusions to be drawn concerning their effectiveness. Little literature exists that has categorically assessed these areas of concern.

Issues of NPLs has gained increasing attentions in the past few decades, as data shows an increasing form, and only show a low decreasing amount. Bad loans will contribute to NPLs. It is crucial for every bank to manage bad loans. If it is well managed, it will increase their profitability and sustainability in the future. If banks failed to do so, it will be a major threat to their performance and profitability. According to a cross section of commercial banks' un-audited financial statements, the level of NPLs in the industry appears to be on the rise. Kenya

Commercial Bank's net non-performing loans and advances grew by 72 percent to Sh. 8.81 billion for the half-year ended June 30th 2013, up from Sh.5.1 billion in a similar period in 2012 (CBK Quarterly Reports, September 2013).

When looking at the asset quality of KCB Bank, the average NPLs ratio for the last five years covering from 2010/2011 up to 2013/2014 was at 8% (CBK supervisory report, 2015). This clearly indicates that there is a problem in loan repayment as it is highly deviated from the accepted standard 3% of the total outstanding loan as per the KCB credit policy (Lending Manual) which forms part its strategic plan. The increasing level of non-performing loans may lead to very serious implications. For instance, it discourages the financial institutions to refinance the defaulting client, which put the defaulters once again into vicious circle of low productivity. Even if default is random and influenced by unpredictable behaviours or it is influenced by certain factors in a specific situation needs an empirical investigation so that the findings can be used by any financial institutions to manipulate their credit program for the better.

Many studies have examined the causes of non-performing loans in several countries around the world; with some focusing on all commercial banks in Kenya, however, no known research has studied the causes of NPLs in Kenya Commercial Bank Group Limited. In fact, research findings of the causes of NPLs in the developed countries have often been used to explain the situation in sub-Saharan African countries and Kenya in particular (Waweru and Kalani, 2009). The fact that there are also borrower specific factors that precipitate NPLs has also been largely ignored by literatures that focus on NPLs in Kenyan banks (Collins and Wanjau, 2011). It is proper to assess whether the factors affecting non-performing loans are universal or specific to a country or an economy. Furthermore, there is lacking, a consensus in previous studies regarding what remedial mechanisms

can be implemented to effectively address the issue of non-performing loans (Richard, 2013). It is therefore imperative to identify the various factors which significantly affect the loan repayment performance from both borrowers and lender side by answering the research question ‘what are the factors that affects non-performing loans of KCB Bank Kenya Limited?

1.3 Objectives of the study

In general, the objective of the study was to identify the factors that affects non-performing loans in KCB Bank Kenya Limited.

1.3.1 Specific objectives

Specifically, the study attempted to achieve the following:

i) To identify the effect of interest rates on non-performing loans of KCB Bank Kenya Limited.

ii) To determine the effect of credit size on non-performing loans in KCB Bank Kenya limited.

iii) To determine the effect of bank size on non-performing loans in KCB Bank Kenya limited.

iv) To determine the effect of gender on non-performing loans in KCB Bank Kenya limited.

v) To determine the effect of age on non-performing loans in KCB Bank Kenya limited.

1.3.2 Research questions

i) What are the effects of interest rates on non-performing loans of KCB Bank Kenya Limited?

ii) What are the effects of credit size on non-performing loans in KCB Bank Kenya Limited?

iii) How does bank size affect non-performing loans in KCB Bank Kenya Limited?

iv) What are the effects of gender on non-performing loans in KCB Bank Kenya Limited?

v) How does age affect non-performing loans in KCB Bank Kenya Limited?

1.4 Research hypothesis

The hypothesis statement is the statistical hypothesis that is actually being tested (Brooks, 2008 p.52). Based on reviewed related literatures, the following null hypotheses was developed to estimate the sign relationship of bank specific and borrowers' specific determinants with non-performing loans of commercial banks in Kenya based on empirical evidence reviewed in the literature parts. The following hypotheses was tested:-

***H_{01}**: Gender has statistical insignificant effect on non-performing loans (NPLs).*
***H_{02}**: Age has statistical insignificant effect on non-performing loans (NPLs).*
***H_{03}**: Interest rate has statistical insignificant effect on non-performing loans (NPLs).*
***H_{04}**: Credit size has statistical insignificant effect on non-performing loans (NPLs).*
***H_{05}**: Bank size has statistical insignificant effect on non-performing loans (NPLs).*

1.5 Significance of the study

The study results will provide a useful reference document to loan policy makers. The study will be helpful to the investors in that they can identify level of non-performing loans equally affects their return on investment and hence not to ignore the NPLs element when making their investment decisions. The study will make KCB banks' officers appreciate the need to monitor and control non-performing loans which also affects the financial performance through loan provisions. KCB Bank region's staff involved in the day-to-day operating activities will draw inference from the study by appreciating the need for controlling operational losses as it affects profitability and their future benefits in the bank. The relationship managers (RMs) and credit officers will find the document relevant in the management of loan delinquency. This study will help other consultants to be in a position to advise on the best investment decisions based on not only the financial losses position but also by considering the inherent non-performing loans as they also impacts on the profitability of the bank. The study will provide background information to other researchers and scholars who would like to investigate more on factors contributing to loans defaulting.

1.6 Scope of the study

This study cover one commercial bank in Kenya which is regulated by Central Bank of Kenya. KCB Bank Kenya Limited was taken as a case study for this study as it is the largest bank by assets in Eastern Africa region and also it is top-tier lender in Kenya. KCB bank is a financial institution engaged in providing short, medium and long term development credits by financing viable projects from the priority areas of the government, individuals, SMEs, corporate among other sectors of the economy. The institution mobilizes its funds from both domestic and

foreign sources. The study will concentrate on Nairobi Region as it constitutes the largest portfolio of about (60%) in the financial statements of KCB Bank Group. The study covered a span of 15 years that is from 2000-2015; the time span will reflect the trend that can be relied on both for projections and as representations of the entire population.

1.7 Definition of terms

Borrower's specific factors:-These are factors affecting loan repayment behavior of borrowers.

Bank specific factors: - These are factors affecting Lending behavior of the Bank. Bank specific factors are variables that are under the control of the regulator or the bank management.

A Non-performing loan:- A loan whose credit quality has deteriorated and the full collection of principal and/or interest as per the contractual repayment terms of the loan/advances is in question and delayed for more than 90 days (NBE, 2008).

Loan and advances: Any financial asset granted by banks to borrower on a contract of an obligation to repay the principal amount with usually its interest either on due date or on demand.

Borrower: The one who borrows money from the lender (Bank).

Lending: - Provision of loan by one party (Lender) to another party (Borrower).

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

A literature review scrutinizes recent or historically significant research studies, company data or industry reports that act as the basis for the proposed study. It is a body of text that aims to review the critical points of current knowledge on a particular topic. This chapter will bring together diverse streams of literature that touched on the determinants of non-performing loans from both locally and internationally empirical review.

2.1 Non-performing loan

According to the International Monetary Fund (IMF, 2009) a non-performing loan is any loan in which interest and principal payments are more than 90 days overdue; or more than 90 days' worth of interest has been refinanced. On the other hand Basel Committee (2001) defined non-performing loans as loans left unpaid for a period of more than 90 days.

A non-performing loan is a loan that is in default or close to being in default. A loan is said to be in default when it fails to make the repayments of principal and /or interest specified in its loan contract and has no intention of repaying in the future (Pilbeam, 1998). Many loans become non-performing after being in default for 3 months, but this can depend on the contract terms. A loan is non-performing when payments of interest and principal are past due by 90 days or more, or at least 90 days of interest payments have been capitalized, refinanced or delayed by agreement, or payments are less than 90 days overdue, but there are other good reasons to doubt that payments will be made in full. According to Vigano (1993), Non-performing loans are loans, especially mortgages that organizations lend to borrowers but do not capitalize on. In other

words the borrower cannot pay the loan back in full, or even enough for the bank to make a profit. When this happens, the bank can either workout a new payment option, or foreclose on what collateral the borrower has provided. Either option costs the bank money, so lenders try to avoid non-performing loans whenever possible.

According to Timothy (1994), loans are regarded as default when they are placed on non-accrual status or when the terms are significantly altered in a restructuring. Non-accrual means that banks deduct all interest on the loans that was recorded but not actually collected. Banks have traditionally stopped accruing interest when debt payments were more than 90 days past due. However, the interpretation of when loans qualified as past due varied widely. Many banks did not place loans on non-accrual if they were brought under 90 days past due by the end of the reporting period. Moreover, non-performing loans include loans and advances (i) that is not earning income; (ii) on which full payment can no longer be expected and payments are more than 90 days delinquent; (iii) total credits to the accounts are insufficient to cover interest charges over a three month period; or the maturity date has passed and payment has not been made (Eastern Caribbean Central Bank, 2009).

Similarly, Asari (2011) defined non-performing loan as defaulted loan in which banks are unable to profit from them. Generally, loan falls due if no interest has been paid within 90 days, however, different countries may have different experience in this regard. The long run relationship clearly revealed that interest rate has a significant impact on non-performing loans. Inversely, there exist insignificant relationship between inflation rate and non-performing loans. However in short run, both interest & inflation rates will not impact the non-performing loans, as confirmed by Asari (2011).

2.2 Measurement of non-performing loans

In recent years the global financial crisis and the subsequent recession in many developed countries have increased households' and firm defaults, causing significant losses for banks Wondimagegnehu (2012). In this study the non-performing loans will be measured based on banks internal factors and customer related factors.

2.3 Banks' internal factors causing non-performing loans

These internal factors affect lending behavior of the bank. Many literature review have examined the connection between these factors and NPLs in KCB Bank Kenya Limited. Literature on banks internal factors that affects non-performing loans are reviewed in the following sections:-

2.3.1 Bank size

Rajan & Dahl (2003) in their study of commercial banks in India they used panel regression analysis. Their study also indicates that bank size have significance on occurrence of NPLs. Sala & Saurina (2003) indicated that bank size is among the factors that explained variations in NPLs for Spanish banks. Besides, Bikker & Hu (2002) also shows that bank size is significantly related rate of occurrence of loan default.

2.3.2 Growth in loans

Many studies indicate that loan delinquencies are associated with rapid credit growth. Keeton (1999) used data from commercial banks in the United States from 1982 to 1996 and a vector auto regression model indicate this association between loan and rapid credit growth. Sinkey and Greenwalt (1991) also studied large commercial banks in the US and found out that

excessive lending explains loan loss rate. A study by Bercoff et al (2002) shows that asset growth explains NPLs.

2.3.3 Interest rate

The commercial banks that charge high interest rate would relatively face a high loan default rate. A study by Waweru & Kalini (2009) on commercial banks in Kenya using statistical analysis indicates that high interest rate charged by the banks is one of the internal factors that leads to incidence of non-performing loans. Bikker & Hu (2002) on 29 OECD countries, banks profit margin demonstrated by high interest rate affects occurrence of NPLs.

2.4 Customers related factors

These are factors affecting loan repayment behavior of the borrowers. Customer failure to disclose vital information during the application process leads to occurrence of non-performing loans (Brownbridge 1998). The following are some of the customer specific factors; diversion of funds by the borrower from the intended purpose, death of the borrower, loss of a job, age and gender among other factors contributes to loan default.

2.4.1 Diversion of funds.

Diversion of funds occurs when the funds borrowed have to be used only for a particular or the purpose it was intended for Ashiq (2003). Nevertheless, more often than not, such funds are not used for the primary purpose they were intended for and as such, many projects become halfway done, in such case the funds were meant for income generating project but the borrower decides to divert into a different project thus leading to loan overdue.

2.4.2 Loss of Job

Roche (2003) explains that loss of unemployment can be brought about by different circumstances such as retrenchment, retirement, sacking or firing due to events such as strikes and many others factors. When such a thing takes place and the individual affected had taken a loan from commercial bank, then such a lending institution is likely to lose money hence leads to loan default.

2.4.3 Illness or death of the borrower

Under certain circumstances of illness, the borrower instead of repaying the loan he/she uses the funds for medical expenses instead of the intended purpose. This can be seen in the illness such as HIV Aids, Cancer which can be very expensive to treat. Due to illness, such borrowers will find it difficult in honouring their loan obligation, Lehman and Neuberger (1998). In many cases where the borrower is terminally ill or dies, the borrower may end up not repaying the loan in good time or not even repay at all. This kind of problem could be more pronounced in cases where the borrower is either an individual or a principal partner of a company. The general health of the borrower should be taken into consideration and health of a close relative (Nzambi, 2010).

2.4.4 Gender

Gender can either be male or female. Which gender is prone to loan default regardless of their age group male or female? This study will seek to find answers for the above question. In the past, very few women used to work in the corporate world but this trend has since changed. These days we have more women in leadership positions both in the public and the private sectors. Presently most women have also become the bread winners of most families just like their male counterparts. Currently women play the roles men used to do because they have been

empowered through education. Nowadays women have equally have privileges to borrow from any financial institutions to satisfy both business and personal needs just like their male counterparts.

2.4.5 Age

Age may be defined as the number of years associated with a human individual's life. Age can either be male or female. KCB lending manual states that the persons who are eligible for borrowing a loan are persons who are 18 years of age or above. The study will investigate which age bracket is prone to loan default. The first age group who are eligible for borrowing are young, single professionals between the ages bracket of 18-24. This group is entering into the professional workforce for the first time and has access to a higher level of income than when they were in college. Young single professionals are at the age in their lives where they have little responsibilities or concerns (Clayton, 2011). The second age group is between the ages of 25-49 they are the married couples with children. This group are very busy with professional and personal life. They have more responsibilities and concerns than young adults and have a set of functional needs that go in line with their increased responsibility and family (Clayton, 2011). The third age group is retired couples 50 years and older. This group has more free time than at any other time in their adult lives and have the necessary income saved to travel and enjoy the remainder of their lives (Clayton, 2011).

2.4.6 Credit risk management

According to Eastern Caribbean Central Bank (2009), credit risk management is the process of controlling the impact of credit risk-related events on the financial institution and involves the identification, understanding, and quantification of the degree of potential loss and the consequential implementation of appropriate measures to minimize the risk of loss to the financial institution. In order to maintain successful credit risk management, the lending

institution should develop and implement all-inclusive credit risk management in line with its credit risk strategy. The credit risk strategy should reflect the institution's tolerance for risk and the desired level of profitability for incurring various credit risks. A successful credit risk management encompasses the implementation of clearly defined credit policy and processes to facilitate the identification and quantification of risks inherent in an institution's lending and investment activities. The firm's credit policy should be officially established in writing and approved by the board of directors, and should clearly set out the parameters under which credit risk is to be controlled.

The aim of credit risk management is to capitalize on a bank's risk-adjusted rate of return by retaining credit risk exposure within acceptable limits. Banks need to manage the credit risk inherent in the entire portfolio as well as the risk in individual credits or transactions. Banks should also consider the relationships between credit risk and other risks. The successful management of credit risk is a crucial element of a holistic approach to risk management and essential to the long-term success of any bank. In general, loans represent the largest and most apparent source of credit risk for most of the banks (Basel Committee, 1999).

Vigano (1993), credit risk appraisal is a complex process, which requires a careful examination of information regarding the borrower in order to estimate the probability that the loan will be regularly repaid. The probability of regular repayment depends on certain objective factors related to the borrower's operating environment, the borrower's personal attitude towards loan obligation, and the bank's ability to appraise these two issues through the information it has and to control credit risk specific contractual conditions. Accordingly, the key factors that influence credit risk are summarized by Vigano (1993) as follows: the borrower's ability and

willingness to pay, existence of positive external conditions, quality of information and the lender's capacity to ensure the borrowers willingness to pay.

2.5 Theoretical review

This presents review of some important theories that explains the effects of bank-and borrower's specific factors on non-performing loans of KCB Bank Kenya Limited. The theoretical reviews covered the following; Adverse Selection Theory, Moral Hazard Theory and Information asymmetry problem.

2.5.1 Adverse selection theory

Pagano and Jappelli (1993) shows that information sharing reduces adverse selection by improving banks information on credit applicants. The theory of asymmetric information states that it may be difficult to distinguish creditworthy from bad borrowers (Auronen, 2003) in Richard (2011), which may result into adverse selection and moral hazards problems. The theory explains that in the market, the party that possesses more information on a specific item to be transacted (in this case the borrower) is in a position to negotiate optimal terms for the transaction than the other party (in this case, the lender) (Auronen, 2003) in Richard (2011). 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. Adverse selection and moral hazards have led to significant accumulation of non-performing loans in banks (Bester, 1994; Bofondi and Gobbi, 2003).

2.5.2 Moral hazard theory

The moral hazard problem implies that a borrower has the incentive to default unless there are consequences for his future applications for credit. This result from the difficulty lenders have in assessing the level of wealth borrowers will have accumulated by the date on which the debt must be repaid, and not at the moment of application. If lenders cannot assess the borrowers' wealth, the latter will be tempted to default on the borrowing. Forestalling this, lenders will increase rates, leading eventually to the breakdown of the market Alary & Goller (2001).

2.5.3 Information Asymmetry Theory

This theory is relevant in situations where there is imperfect knowledge. It occurs in situation whereby one party has different information from another. Information Asymmetry is a problem in financial markets such as borrowing and lending. In these markets the borrower has much better information about his financial state than the lender. Akerlof (1970) first presented this theory in the easy; "The Market for Lemons". Information asymmetry describes the condition in which relevant information is not known to all parties involved in an undertaking (Ekumah and Essel, 2003).It has been used extensively to explain a diversity of concept, including those in different market condition (Misukin, 1991). According to Prof. Njuguna Ndung'u, the former governor of Central Bank of Kenya during annual address in year 2008, noted that the realization of credit information sharing in the banking sector will not only bring good news to the banks and the banking sector but also to the borrowers and the economy as a whole. This national success stands to significantly benefit the economy and is bound to stir changes in the way credit is managed in the industry in the sense that lenders will be in a position

to access comprehensive credit data and will be able to price risk accordingly for both good and bad borrowers hence reducing their bad debt portfolios (Mwengei, 2013).

2.6 Empirical review

This section presents evidence which identify the major factors affecting non-performing loans. Many researchers have conducted a lot of studies on determinants of non-performing loans (NPLs), due to its significance for the bank's failure. Accordingly, the first subsection, presents factors affecting non-performing loans in other countries. The second subsection discusses review of prior studies on factors of non-performing loans in Kenya and highlights the knowledge gap emerged from survey of empirical literature.

2.6.1 International empirical review

Jimenez & Saurina (2005) conducted a study on the Spanish banking sector from 1984 to 2003 NPLs are determined by lenient credit terms. The authors indicated that the causes for the leniency were attributed to disaster myopia, herd behaviour, moral hazard and agency problems that may entice bank managers to take risk and lend excessively during boom periods. This has been supported by Rajiv & Dhal (2003) who found that terms of credit determines occurrence of non-performing loans.

On the other hand, banks that charge high interest rate would relatively incur a higher default rate or non-performing loans. In this regard, a study by Sinkey & Greenwalt (1991) on large commercial Banks in US revealed that a high interest rate charged by banks is associated with loan defaults. Rajiv & Dhal (2003) who used a panel regression analysis indicated that financial factors like cost of credit have got significant impact on NPLs. Bloem and Gorter (2001) also indicated that "bad loans" may substantially rise due to abrupt changes in interest

rates. The authors discussed various international standards and practices on recognizing, valuing and subsequent treatment of non-performing loans to address the issue from view point of controlling, management and reduction measures. Similarly, a study by Espinoza and Prasad (2010) focused on macroeconomic and bank specific factors influencing NPLs and their effects in GCC Banking system found that higher interest rates increase non-performing loans but the relationship was not statistically significant.

Other studies such as Sinkey & Greenwalt (1991) indicated that loan delinquencies are associated with rapid credit growth. The authors found that excessive lending explain loan loss rate. This was confirmed later by Keeton (1999) who used data from commercial banks in the United States (from 1982 to 1996) using a vector auto regression model showed that there was association between default and rapid credit growth. Likewise, Salas and Saurina (2002) in their study on Spanish banks also revealed that credit growth is associated with non-performing loans.

Also, study by Bercoff et al (2002) confirmed that asset growth explains NPLs. Skarica (2013) also conducted a study on the determinants of NPLs in Central and Eastern European countries. By employing the Fixed Effect Model and seven Central and Eastern European countries between 2007-2012 periods, the study revealed that loan growth, real GDP growth rate, market interest rate, unemployment and inflation rate as determinants of NPLs. The results show that GDP growth rate and unemployment rate have statistically significant negative association with NPLs with justification of rising recession and falling during expansions and growth has impact on the levels of NPLs. This implies that economic developments have a strong impact on the financial stability. The result also discovered that inflation has positive impact on NPLs with a justification that inflation might affect borrowers' debt servicing capacities.

Similarly, Jimenez and Saurina (2005) provide evidence that non-performing loans are determined by GDP growth, high real interest rates and lenient credit terms. Meanwhile, Rajiv & Dhal (2003) utilize panel regression analysis and reported that favourable macroeconomic conditions and financial factors such as maturity, cost and terms of credit, banks size, and credit orientation impact significantly on the non-performing loans of commercial banks in India. Likewise, Keeton (1999) revealed evidence of a strong relationship between credit growth and impaired loans. Specifically, Keeton (1999) showed that rapid credit growth, which was associated with lower credit standards, contributed to higher loan losses in certain states in the US.

Boudriga et al (2009) studied on the lender specific factors and the role of the business and the institutional environment on loan default in the MENA countries for 2002-2006 periods using random-effects panel regression model for 46 countries. The variables included were credit growth rate, capital adequacy ratio, real GDP growth rate, ROA, the loan loss reserve to total loan ratio, diversification, private monitoring and independence of supervision authority on non-performing loans. They reported that credit growth rate was negatively related to non-performing loans. Capital adequacy ratio was positively and significantly affecting loan default implying that highly capitalized banks are not under regulatory pressures to reduce their credit risk and take more risks. In the contrary, their findings reported that ROA has negative and statistically significant influence on NPLs.

Makri *et al* (2014) identify the factors affecting NPLs of Euro zone's banking systems for 2000-2008 periods before the beginning of the recession exclusively pre-crisis period. The study includes 14 countries as a sample out of 17 total Euro zone countries. The variables included were growth rate of GDP, budget deficit (FISCAL), public debt, unemployment, loans to

deposits ratio, return on assets, and return on equity and capital adequacy ratio. The study utilized difference Generalized Method of the Moments (GMM) estimation and found as real GDP growth rate, ROA and ROE had negative whereas lending, unemployment and inflation rate had positive significant effect on NPLs. However, ROA & loan to deposit ratio, inflation, and budget deficit did not show any significant impact on NPL ratio. Similarly, Carlos (2012) on macroeconomic determinants of the non-performing loans in Spain and Italy found as inflation rate has insignificant effect on NPLs (Gadise, 2014).

Selma & Jouini (2013) conducted a study on three countries namely Italy, Greece and Spain for the period of 2004-2008 to identify the determinants of non-performing loans for a sample of 85 banks. The variables included both macroeconomic variables (GDP growth rate, unemployment rate and real interest rate) and bank specific variables (return on assets, loan growth and the loan loss reserves to total loans). They apply Fixed Effect model and found a significant negative relationship of ROA & GDP growth rate, and also positive relationships of unemployment rate, the loan loss reserves to total loans and the real interest rate with NPLs. For a significant positive association between NPLs and real interest rate, they justify that when a rise in real interest rates can immediately leads to an increase in non-performing loans especially for loans with floating rate since it decrease the ability of borrowers to meet their debt obligations. In addition, a significant negative relationship between ROA and the amount of NPLs justify that a bank with strong profitability has less incentive to generate income and less forced to engage in risky activities such as granting risky loans (Gadise, 2014).

Klein (2013) investigates the determinants and macroeconomic performance of NPLs in Central, Eastern, and South Eastern Europe (CESEE) for 1998 to 2011 period data for ten banks of each 16 countries. The study includes loan growth rate, inflation, unemployment rate and

GDP growth rate as explanatory variables of the study. The study was used fixed effect/ dynamic model and found as inflation has positive whereas loan growth rate, GDP growth rate have negative significant effect on the occurrences of NPLs. However, the study found as unemployment rate has no significant effect on NPLs (Gadise, 2014).

Sakiru *et al. (*2011) also study on macroeconomic determinants of non-performing loan on banking system in Malaysia. Their study was covered bank`s data for monthly time series of 2007:1 to 2009:12 period. In the study, lending rate, producer price and industrial production index were used as macroeconomic variables that affect the NPLs. The study utilized ARDL approach and the finding reveals that lending rate has a significant positive effect on NPLs and justifies that, during the period of high lending rate, NPLs is anticipated to increase causing a rise in the rate of default by borrowers (Gadise, 2014).

Hyun & Zhang (2012) investigated the impact of macroeconomic and bank-specific factors of non-performing loans in US for two distinct sub-sample periods that is from 2002-2006 (pre financial crisis) and 2007-2010 (during financial crisis).The variables included both macroeconomic factors namely GDP growth rate, unemployment rate and lending rate, and bank specific variables such as Return on Equity (ROE), solvency ratio, inefficiency, bank size and non-interest income. In pre-financial crisis period, the study found as solvency ratio, ROE, lending rate, GDP growth rate and unemployment rate negatively affect NPLs. Negative effect of lending rate on NPLs implies that an increase in lending rate curtail peoples'/business entity's' ability to borrow, which decreases the amount of loan and then reduce NPLs. Beside, statistically significant and negative solvency ratio effect on NPLs, implies that the higher the Solvency ratio, the lower the incentives to take riskier loan policies, and consequently, reduce the amount of problem loans. However, bank size has no effect. During financial crisis also solvency ratio,

GDP growth rate, unemployment rate and ROE all have a negative impact on NPLs while lending rate has no significant effect on NPLs. Size allows for more diversification opportunities as larger banks can compose less concentrated portfolios that include borrowers from different industries, geographical Locations, capital size and other customer segments (Gadise, 2014).

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 (Gadise, 2014).

Besides, Ahmed & Bashir (2013) conducted a study on the "Macroeconomic Determinants of non-performing loan of Banking Sectors in Pakistan": The study was conducted on 30 commercial banks from total of 34 banks in 1990-2011 periods. The main aim of the study was to investigate impact of inflation, credit growth, GDP growth rate, Unemployment rate, consumer price index and lending/interest rate, on non-performing loan. They found negative effect of lending rate and GDP growth rate on NPLs. Their justification for negative association between lending rate and NPLs implies that as lending rate increase, individuals with funds starts saving with the banks to earn on their funds but investors with the profitable projects feel reluctant to borrow and invest. Besides, existing borrowers pay back their loans to keep their credit rating good as to get loans in the future at discount rates. Similarly, on their study of banks specific factor of NPLs of banking sectors in Pakistan from 2006-2011 in 2013, they found positive significant effect of ROA but insignificant effect of ROE on NPLs. Their justification

for positive significant association between ROA and NPLs implies that in order to increase the short term earnings, banks management portray wrong picture to the investors relating the future profitability and positive return prospects. Consequently, investors start borrowing from the banks and invest in the less profitable projects. This results in the current good performance and profitability of the banks but because of the wrong forecasting, returns on the investments are not according to the investors' expectation, resulting in the inability of the investors in repayment of loans thus leading to the growth in NPLs (Gadise, 2014).

The study of Saba *et al.*,(2012) on the title of "Determinants of Non-performing Loan on US banking sector" also investigate the bank specific and macroeconomic variables of non-performing 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 (Gadise, 2014).

Louzis *et al.,* (2010) conduct 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 (Gadise, 2014).

Ali & 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, real 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 weak. And also inflation rate has insignificant effect on NPLs (Gadise, 2014).

Besides, Mileris (2012) on the title of "macroeconomic determinants of loan portfolio credit risk in banks" 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 (Gadise, 2014).

However, Swamy (2012) conduct 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 (Gadise, 2014).

Similarly, Farhan *et al* (2012) on the title of "Economic Determinants of Non-Performing Loans: 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 non-performing 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 non-performing loans (Gadise, 2014).

According to an Empirical Study made on Commercial Banks in Pakistan by Badar & Yasmin (2013) on the title of "Impact of Macroeconomic Forces on Non-performing Loans" the long and short run dynamics between non-performing 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 (Gadise, 2014).

Ranjan & Chandra (2003) analyze the determinants of NPLs of commercial banks' in Indian in 2002. The objective of the study was to evaluate how NPLs influenced by financial and economic factors and macroeconomic shocks. In the study, they 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. Besides, loan to deposit ratio had negative significant effect on NPLs justifying that relatively more customer friendly bank is most likely face lower defaults as the borrower will have the expectation of turning to bank for the financial requirements (Gadise, 2014).

However, Konfi (2012) who conducted study on the determinants of non-performing loans on the operations of Sinapi Aba Trust microfinance institutions in Ghana found as high

interest rate was not significant factors causing the incidence of NPLs. This study justifies as interest rate is only applicable to loan defaulters who have managed to pay off outstanding principal and are in default in only interest payment. If a borrower is in default of both principal and interest, then one cannot assert that high interest rate is the actually the cause of the loan default.

Shingjergji (2013) studied the impact of different bank specific factors on non-performing loans of Albanian banks by taking quarterly data from 2002-2012. Dependent variable used in the study is non-performing loans (NPLs) while independent variables include capital adequacy ratio (CAR), loan to asset ratio (LTA), return on equity (ROE), natural log of total loans, and natural log of net interest margin (NIM). Regression results obtained by using ordinary least square revealed negative insignificant relation of CAR with NPLs. Relation of loan to asset ratio has been found negative but total loans level is positively influencing the NPLs means increased loans level will result in increased level of NPLs. On the other hand, NIM and ROE are negatively linked with NPLs depicting that high NPLs deteriorate the performance of banks (Kirui, 2014).

Wondimagegnehu (2012) in his study "Determinants of NPLs on Commercial Banks of Ethiopia" revealed that underdeveloped credit culture, poor credit assessment, aggressive lending, botched loan monitoring, lenient credit terms and conditions, compromised integrity, weak institutional capacity, unfair competition among banks, wilful defaults by borrowers and their knowledge limitation, fund diversion for unexpected purposes and overdue financing has significant effect on NPLs. Conversely, the study indicated that interest rate has no significant impact on the level of commercial banks loan delinquencies in Ethiopia.

Similarly, Mitiku (2014) studied the "Determinants of Commercial Banks Lending: Evidence from Ethiopian Commercial Banks using panel data of eight commercial banks in the period from 2005 to 2011 with the objective of assessing the relationship between commercial bank lending and its determinants (Bank size, Credit risk, GDP, Investment, Deposit, Interest rate, liquidity ratio and Cash required reserve). Based on seven years financial statement data of eight purposively selected commercial banks and using Ordinary Least Square (OLS) technique, the study found that there was significant relationship between commercial bank lending and its size, credit risk, gross domestic product and liquidity ratio. While interest rate, deposit, investment, and cash reserve required do not affect Ethiopian commercial bank lending.

2.6.2 Empirical studies done in Kenya

Nasieku (2014) carried out a study on the title "Factors affecting non-performing loans (A case study of Commercial Bank of Africa)" at United States International University in Africa (USIU). The study found out that the prevailing economic conditions were the major factors affecting the level of NPLs and also the study found out that effective risk assessment was considered as the major remedial strategy of dealing with NPLs. The study adopted descriptive and correlational research design.

Jerotich et al., (2014) did a study on the determinant of non-performing personal loans in Kenya's Banking industry: An economic case study of tier one banks. Correlation analysis was used to show the relationship between personal loan non-performance and unemployment, GDP, inflation and interest rate spread. A regression analysis was also carried out to analyze the impact of selected independent variables on non-performance of personal loans for the period 2000 to 2012. The study found out a strong relationship between the four economic variables; GDP, Inflation, Unemployment and Interest rates as depicted by the correlation coefficient of 0.68.

GDP and unemployment are negatively related to loan non-performance while inflation and interest rates are positively related to loan non-performance. The coefficient of unemployment was found to be negative contrary to most empirical studies.

Nzambi (2010) conducted a study on the significance of factors contributing to non-performing loans in commercial banks in Kenya, (A census of commercial banks in Nairobi), Kenyatta University. The study found out that other factors which lead to non-performing loans were; Know Your Customer (KYC), Security issues, Company mergers and interbank competition also from the study, the factor identified to have the highest contribution to NPLs problem was the borrower's company dissolution.

Muriithi (2013) studied on the title "the causes of non-performing loans in Commercial Banks in Kenya". University of Nairobi. The study adopted the Descriptive Design and applied both multiple regression models on secondary data to determine the relationship between causes of Non-Performing Loans in Commercial Banks in Kenya. The study used secondary data for the period 2008-2012. The Interest rates, Inflation and growth in loans were used as independent variables. Non-performing loan was used as dependent variable. The population of this study comprised of 43 commercial banks in Kenya and data was analyzed using SPSS. The study revealed that non-performing loans of commercial banks in Kenya are positively correlated with inflation rate (0.316). The study also found that non-performing loans are negatively correlated with real interest rate (-0.468) and growth rate in loans (-0.013) respectively. Further the study indicated that the study variables jointly influenced the non-performing loans with an adjusted R_2 of 0.553. The study concludes that the independent variables considered in the study jointly caused the non-performing loans in commercial banks in Kenya. The study also found that the non-performing loans were

positively correlated to inflation rate. The study further concludes that non-performing loans are negatively correlated with real interest rate and growth rate in loans in Kenya.

2.6.3 Knowledge gap

Numerous researchers have done many research studies and they mainly concentrated on the macroeconomic determinants of NPLs. Mileris (2012) studied on the title "macroeconomic determinants of loan portfolio credit risk in banks" The study used multiple and polynomial regression models with cluster analysis, logistic regression and factor analysis for the prediction. The finding indicates that NPLs are highly dependent on macroeconomic factors. The above study is inadequate and inconsistent because it only dwelled on macroeconomic factors neglecting other factors such as bank-and borrowers' specific factors. Therefore, the essence of this study is to fill the knowledge gap by assessing the relationship between bank-and customer-specific factors (Gender and age to be specific) and their effects on level of non-performing loans (NPLs).

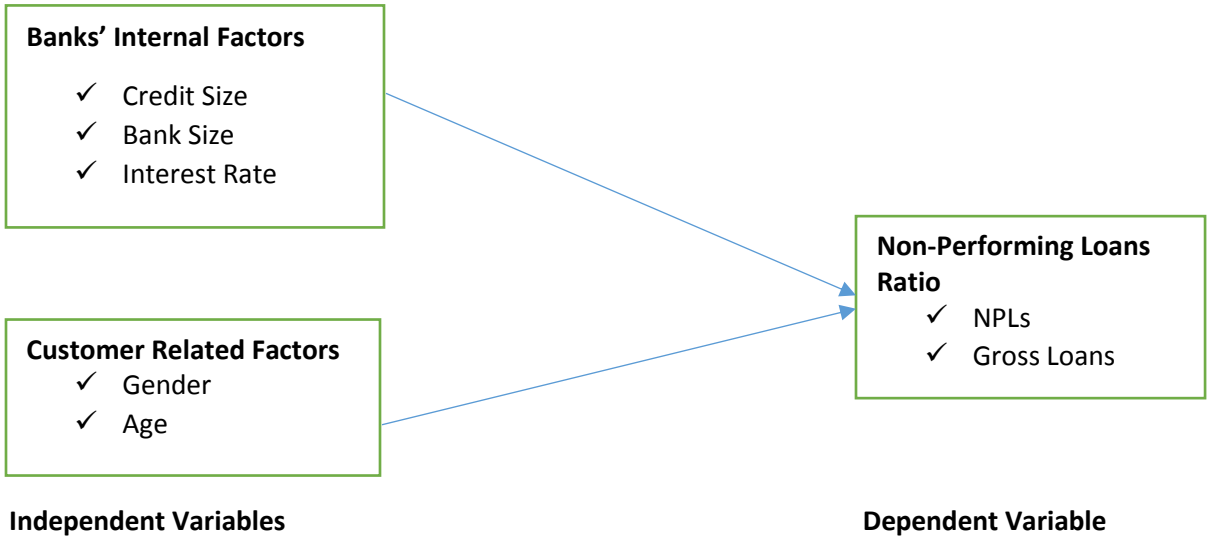
2.7 Summary of literature review

In view of the above discussions, numerous studies have been conducted on the determinants of non-performing loans. Most of these studies focused on bank specific and macro-economic determinates of NPLs. However, in the previous empirical analysis no study has been conducted on customer-specific factors influencing non-performing loans. Besides, most of the empirical studies reviewed and discussed in the above sections were conducted in other countries; and studies in Kenyan commercial banking sector are very scanty. Moreover, very few studies have been carried out in Kenya banking industry for instance, a study done by Jerotich at el (2014) on the determinant of non-performing loans in Kenyan's Banking Industry:

An economic case study of tier one banks, no further research has been conducted in the banking sector in general and on KCB Bank Kenya Limited in particular.

2.8 Conceptual framework

The aim of this study was to identify the major bank-and borrower-specific factors which causes the occurrence of NPLs more especially whether gender and age contributes to the loan defaults. Accordingly, based on the objective of the study, the following conceptual model has been developed. Non-performing loans are affected by bank specific, customer specific and macroeconomic factors as discussed in the literature review section above. Bank specific factors include the following:- Poor credit assessment and credit monitoring, credit size, aggressive lending, compromised integrity in approving and bank's great risk appetite, high interest rate, lenient/lax credit terms whereas customer/borrower specific factors are gender, age, loan diversion, poor credit culture of customers wilful defaulting as mentioned above by majority of researchers'. Therefore, the following conceptual model summarizes the main focus of this study:-



2.9 Operationalization of study variables

2.9.1 Dependent Variable

2.9.1.1 Non-performing loans

Non-performing loans include loans and advances (i) that is not earning income; (ii) on which full payment can no longer be expected and payments are more than 90 days delinquent; (iii) total credits to the accounts are insufficient to cover interest charges over a three-month period; or the maturity date has passed and payment has not been made (Eastern Caribbean Central Bank, 2009). It is measured by the amount of NPLs to Gross Loans.

$$\text{NPLs Ratio} = \frac{\text{NPLs}}{\text{Gross Loans}}$$

2.9.2 Independent Variables

2.9.2.1 Customers related factors: These are factors affecting loan repayment behavior of borrowers. Customer failure to disclose vital information during the application process leads to occurrence of non-performing loans (Brownbridge 1998).

Gender: The variable gender consists of two text values: Male and female. Gender can be sorted into two mutually exclusive and exhaustive categories such as Male and female. Observations could be labeled with the letters **M** and **F**.

Age: Age can be operationalized as continuous, categories or binary variables. Age can be operationalized as number of years associated with a human individual's life.

***2.9.2.2 Banks' internal factors*:-**These are factors affecting lending behavior of the bank.

Bank size: It's measured in terms the bank's assets that is the core capital of the bank.

Credit size: This is referred to as assets growth. It's measured in terms of the gross loans advanced to borrowers.

Interest rate: The interest rates are determined by the inflation rate which normally affects the aggregate pricing of goods and services. Inflation transfers resources from lenders and savers to the borrowers. As inflation increases, the cost of borrowing gets more expensive and deteriorates the quality of loan portfolio. Consumer price index is used to measure this rate. This rates are more often controlled by the Central bank of Kenya.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The aim of the study was to determine the factors affecting NPLs using quantitative research design. The data was collected from secondary sources. The data was initially analyzed using paire-wise correlation, stationarity test, Watson test, Shapiro-wilk test and White noise test. Finally multiple regression analysis was used to address the research objectives. The chapter is organized as follows: Research design, target population, sample size and sampling techniques used in collecting data, and as well as the techniques used to analyze the collected data.

3.1 Research design and approach

To achieve the objectives of the study, the study used quantitative research design to identify the factors that affects non-performing loans in KCB Bank. This is an explanatory research study as it examines the cause and effect relationship between the dependent and independent variables (Kothari, 2004). Quantitative approach was employed to answer the question about the relationships among measured variables with the purpose of explaining, predicting and controlling phenomenon. Thus, the study utilized data from 2000 to 2015 periods. This design provided as much information on the entire population under study in relation to factors contributing to loan default.

3.2 Target population

Population is the list of elements which the sample may be drawn (John, 2007). The population for the study comprised of all loans advanced to customers of Kenya commercial bank from the year 2000-2015 specifically from Nairobi region since the region contains all

sectors of industry and it represents about 60% of the existing portfolio. This study considered KCB bank amongst other 43 banks in Kenya because it is Kenya's biggest bank by assets.

3.3 Sample size and sampling procedures

Sampling is a technique of selecting a suitable sample for the purpose of determining parameters of the whole population. Accordingly, the study employed stratified sampling technique to select the required sample. The researcher pulled all the entire loan portfolio of KCB Bank, which was divided into different strata based on various regions. Nairobi region was selected because it constitutes of all sectors in the industry and also because of its viability in line with time and funds available for the study.

In order to achieve the objective of the study, the loans and advances were classified in terms of their performance status that is, into their asset classes in respect to the year and various sector. The data collected covered a period from 2000-2015. The study could have increased the sample size but that does not guarantee any increase in accuracy rather it makes the information unmanageable due to redundancy (Ayalew. 2001).

3.4 Nature of data and data collection techniques

Data collection is the process of gathering, assembling and accumulation of information; there are two methods of data collection, that is, the primary data and secondary data. For the purpose of this study, secondary data was used to complete the study. A secondary data was used in the study since it is less expensive in terms of time and money while collecting and also of its high quality data (Saunders et al (2007) cited in Belay (2012). Secondary data may either be published or unpublished data (Kothari, 2004). Secondary data was obtained from the audited annual financial statements of the KCB Bank. The data included both bank specific factors and

borrower's specific factors. The data was also obtained from the Central Bank of Kenya, which regulates the banking sector. This study used time series approach because it gives more informative and reliable data. The time series covered a period of 15 years from 2000-2015.

3.5 Initial methods of data analysis and presentation

The initial data analysis was done using the following methods: Normality, Stationarity, Heteroscedasticity, Auto-correlation and Multi-collinearity tests to evaluate whether the model used in the study is appropriate to address the research objectives and also to fulfill the assumption of classical linear regression model that is, its suitability, reliability and accuracy.

3.5.1 Normality test

The normality tests are supplementary to the graphical assessment of normality. The test will compare the scores in the sample to a normally distributed set of scores with the same mean and standard deviation; the null hypothesis is that "sample distribution is normal." If the test is significant, the distribution is non-normal that is, with zero mean and constant variance of 1.

The study assumed that the residual part of the linear model had a normal distribution. Since the sample size for the study is large enough, it is approximately considered as normally distributed. In the study test statistics used Kolmogorov-Smirnov test otherwise Shapiro-wilk test if the sample elements was less than 2000. If the P-Value is > 0.05 then this implies that residual are asymptotically normal or the opposite is true.

3.5.2 Stationarity test

A stationary time series is one whose statistical properties such as mean, variance, autocorrelation, etc. are all constant over time (Van, 2003). It is a condition of series in which the value at all points is the same. In this study the researcher carried out stationarity test using root

test by testing whether the data has the properties of stationarity or not. Besides this used a plot of the time series which in return will give an idea of the overall levels and variability of the series.

In this study, the null hypothesis states that the data is not stationary and alternative hypothesis is true if p-value is less than 0.05. However, in the case where the data is not displaying trends (invalidating first-order stationarity), or seasonality, or changes in variance (invalidating second-order stationarity), it can be manipulated using differencing, variable transformations such as taking logs or square roots to make it stationary.

3.5.3 Heteroscedasticity test

One of the basic assumptions in linear regression model is Homoscedasticity. This assumption states that the probability distribution of the disturbance term remains same for all observations, Gujarati (2004). That is, the variance of each error term is the same for all values of the explanatory variable. However, if the disturbance terms do not have the same variance, this condition of non-constant variance or non-homogeneity of variance is known as heteroscedasticity (Bedru and Seid, 2005). In order to detect the heteroscedasticity problems, the study utilized Breusch-Pagan or Cook-Weisberg test. This test states that if the P-value is significant at 95% confidence interval, the data has heteroscedasticity problem, whereas if the p-value is insignificant (greater than 0.05), the data has no heteroscedasticity problem.

3.5.4 Autocorrelation test

Further, the study tested the autocorrelation assumptions that imply zero covariance of error terms over time. That means errors associated with one observation are uncorrelated with the errors of any other observation. As noted by Gujarati (2004), the best test for detecting serial correlation is Durbin Watson test. If the computed value is nearest to 2 in application, it is assumed that there is no autocorrelation problem.

3.5.5 Multicolinearity test

The term multicolinearity indicates the existence of exact linear association among some explanatory variables in the regression model. When independent variables are multi collinear, there is overlapping or sharing of predictive power. Thus, if multicolinearity is perfect, the regression coefficients of the independent variables are undetermined and their standard errors are immeasurable (Gujarati, 2004). The multicolinearity makes significant variables insignificant by increasing P-value since increased P-value lowers the t-statistics value. Thus, the regression results with multicolinearity will shows significant variables as insignificant variables.

As noted by Gujarati (2004), the correlation analysis is made to describe the strength of relationship or degree of linear association between two or more variables. In Pearson correlation matrix, the values of the correlation coefficient range between -1 and +1. A correlation coefficient of +1 indicates that the two variables have perfect positive relation; while a correlation coefficient of -1 indicates as two or more variables have perfect negative relation. A correlation coefficient of 0, on the other hand indicates that there is no linear relationship between two variables (Bedru and Seid, 2005). Besides, as noted by Brooks (2008), zero correlation among explanatory variables is not occurring in any practical work. Thus, even if there is some indication for the existence of zero correlation among the explanatory variables, it does not have a great effect on the accuracy. The multicolinearity problem is solved by dropping highly correlated variables (Ahmad and Bashir, 2013).

3.6 Model specification

The aim of this study is to evaluate determinants of NPLs of KCB Bank. Similar to the most noticeable previous research studies conducted on the non-performing loans of financial sectors, the study used non-performing loans ratio as dependent variables whereas the

independent variables includes gender and age variables as borrower specific factors and interest rate and credit and bank size as bank specific factors. These variables were selected since they are widely existent for the KCB Bank. Accordingly, this study examined the determinants of NPLs of KCB Bank by adopting a multiple regression model. The regression model was as follows:

$$Y_{it} = \beta o + \beta_1 X_1 t + \beta_2 X_2 t + \beta_3 X_3 t + \beta_4 X_4 t + \beta_5 X_5 t + \varepsilon it$$

Where:-

Y_{it} = is the dependent variable for individual **i** at time **t** in this case the NPLs.

βo is the constant term (intercept).

$\beta_1 ... \beta_5$ are the coefficients of the independent variables of the study.

$X_1 t$ **….** $X_5 t$ are the independent variables (Age, Gender, Interest rate, Credit size and Bank size respectively).

εit is the normal error term.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.0 Introduction

The main objective of the study was to determine the factors affecting non-performing loans in KCB bank. The chapter presents findings of data analysis and their interpretations. It commences with the test of regression assumptions to determine the suitability of the data including test of normality, linearity, multicollinearity, stationarity, heteroscedasticity and autocorrelation tests. After the diagnostic testing, the chapter further applied a multiple regression analysis using time series analysis using data collected for a period of fifteen (15) years. The multiple regression was done using OLS (Ordinary Least Square) regression analysis to determine the influence of the independent variables on the dependent variable.

4.1 Response rate

All the data covering a period of 15 years, that is, from 2000-2015 was obtained from the audited annual financial statements of the KCB Bank and also from the Central Bank of Kenya, which regulates the banking sector representing 100% response rate. The data included both bank specific factors and borrower's specific factors. The response rate is considered satisfactory for the study. According to Mugenda *et al* (1999) a 50% response rate is adequate, 60% good and above 70% rated very good. Based on this assertion the response rate for this study can be said to be very good at 100%. The response rate demonstrates a willingness of the bank management to participate in the study.

4.2. Descriptive statistics

Table 4.1 presents the descriptive statistics and the distribution of the variables considered in this research: Non-performing loans portfolio, Interest rates, Credit size, Bank size, Gender and Age. The descriptive statistic considered were minimum, maximum, mean, standard deviation, skewness and kurtosis. Mean is a measure of central tendency used to describe the most typical value in a set of values. Standard deviation shows how far the distribution is from the mean. A small standard deviation implies that most of the sample means will be near the center population means thus the sample mean has a good chance of being close to the population mean and a good estimator of the population mean. On the other hand, a large standard deviation illustrates that the given sample mean will be a poor estimator of the population mean (Harvill, 1991). Skewness and kurtosis were also taken into account. Skewness is a measure of symmetry, or more precisely, the lack of symmetry. A distribution, or data set, is symmetric if it looks the same to the left and right of the center point. Kurtosis is a measure of whether the data are peaked or flat relative to a normal distribution. The pertinent results are presented in Table 4.1.

Table 4.1 Descriptive statistics

Statistics

		Y	X1	X2	X3	X4	X5	X6
N	Valid	15	15	15	15	15	15	15
	Missing	0	0	0	0	0	0	0
Mean		7.3966	234499359.3	18.7599	15.3757	41.0667	58.9333	37.8000
Std. Error of Mean		.45699	25775735.21	.08716	.63226	1.10180	1.10180	.56231
Median		6.8605	210269567.0	18.6682	14.5045	41.0000	59.0000	38.0000
Mode		4.65[a]	121974243.0[a]	18.38[a]	11.65[a]	41.00	59.00	39.00
Std. Deviation		1.76991	99828993.21	.33755	2.44872	4.26726	4.26726	2.17781
Variance		3.133	9965827885792802.000	.114	5.996	18.210	18.210	4.743
Skewness		.960	1.046	.832	.256	-.028	.028	.151
Std. Error of Skewness		.580	.580	.580	.580	.580	.580	.580
Kurtosis		1.083	.547	-.563	-1.314	-1.338	-1.338	-.222
Std. Error of Kurtosis		1.121	1.121	1.121	1.121	1.121	1.121	1.121
Range		6.96	345766930.0	1.04	7.83	13.00	13.00	8.00
Minimum		4.65	121974243.0	18.38	11.65	34.00	53.00	34.00
Maximum		11.61	467741173.0	19.42	19.48	47.00	66.00	42.00

a. Multiple modes exist. The smallest value is shown

Table 4.1 above shows that non-performing loans portfolio had a mean of 7.3966 and standard deviation of 1.76991. That is, non-performing loans is, on average, 7.3966 across all the years under study. Mean value of level of interest rates was 15.3757 which denotes that it, averagely KCB under the study period charged 15.3757 percent interest on credit facilities. Furthermore on average the credit size in all the fifteen years under study was 18.7599 meaning that banks advanced their customers this amount of money as loans for the period under study on average. Furthermore the mean of percentage of male customers was 58.9333 indicating male customers on average took more credit than their female counterparts. On average those who sought credit facilities were 37 years. The finding therefore implies that these factors are likely to

influence non-performing loans thus proceeded to determine this influence through the inferential analysis herein.

4.3 Tests of regression assumptions

The study performed the test of regression assumptions. The linearity of the parameter is assumed since the model applies linear ordinary least square (OLS). The objective of the model is to predict the strength and direction of association among the dependent and independent variables. Thus, in order to maintain the validity and robustness of the regression result of the research in classical linear regression model, it is better to satisfy basic assumption classical linear regression model. As noted by Brooks (2008), when these assumptions are satisfied, it is considered as all available information is used in the model. However, if these assumptions are violated, there will be data that left out of the model. Accordingly, before applying the model for testing the significance of the slopes and analyzing the regressed result, normality, multicolinearity, autocorrelation and heteroscedasticity tests are made for identifying misspecification of data if any so as to fulfill research quality.

4.3.1 Normality test

Statistical errors are common in scientific literature. Many of the statistical procedures including correlation, regression, t- tests and analysis of variance are based on the assumption that the data follows normal distribution. Thus, it is assumed that the populations from which the samples are taken are normally distributed. Normality is important because if the assumptions do not hold, it is the impossible to draw accurate and reliable conclusions about reality. Since the assumptions are not always the case, the test of normality is usually carried out to assess the extent to which the variables of interest assume a normal probability distribution. In the event

that normality is not achieved for some of the variables, then these variables would end up depicting the wrong picture of the relationships between the variables.

In this study, the Shapiro-Wilk and Kolmogorov-Smirnov statistics were used to test the fit of the variables to a normal distribution. For variables that assume a normal distribution, both the two statistics should be statistically insignificant. The results of the test for normality were as represented in Table 4.2.

Table 4.2 Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	Df	Sig.
Y	.183	15	.189	.933	15	.304
X1	.212	15	.067	.902	15	.101
X2	.193	15	.140	.884	15	.054
X3	.172	15	.200*	.937	15	.348
X4	.164	15	.200*	.933	15	.300
X5	.164	15	.200*	.933	15	.300
X6	.157	15	.200*	.964	15	.753

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

The results in Table 4.2 indicated that the results of the Shapiro-Wilk and Kolmogorov-Smirnov significance values were greater than the alpha level (P value > .05) and therefore had a good fit in the normal distribution.

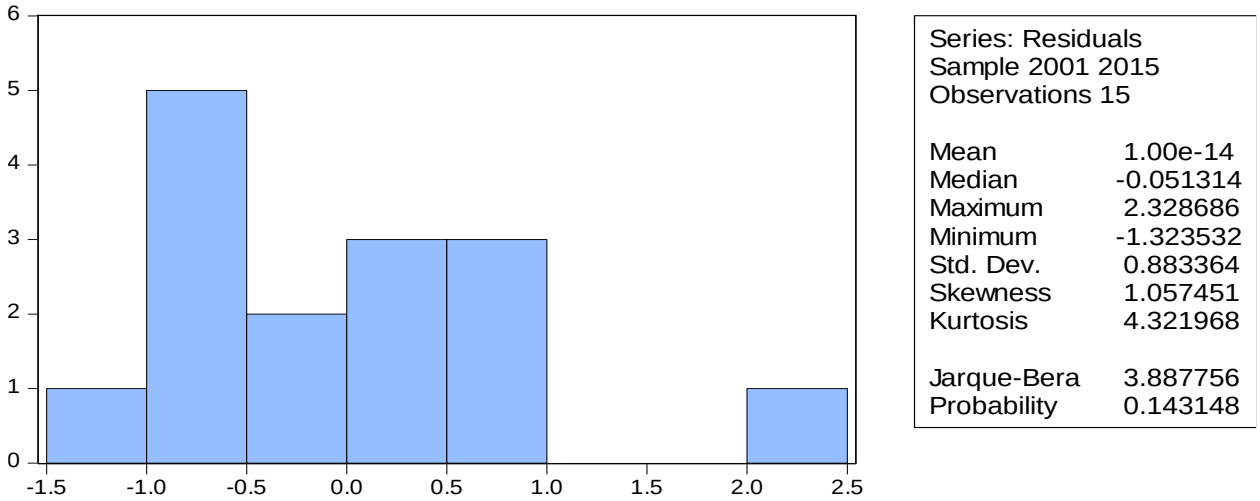
This study also relies on the Jargue-Bera test where a null hypothesis of normality is tested against the alternative hypothesis of non-normal distribution. For normal distribution the JB statistic is expected to be statistically indifferent from zero.

$\boldsymbol{H_0}$: JB = 0 (normally distributed)

H₁: JB ≠ 0 (not normally distributed)

Rejection of the null for any of the variables would imply that the variables are not normally distributed and a logarithmic transformation is necessary.

Figure 4.1 Normality test



From Figure 4.1 it's inferred that the JB (Jarque-Bera) statistic is not statistically significant from zero implying that the variables are all normally distributed. Normality rules out the possibility of getting non-standard estimators.

4.3.2 Linearity test

Standard multiple regression can only accurately estimate the relationship between dependent and independent variables if the relationships are linear in nature. As there are many instances in the social sciences where non-linear relationships occur, it is essential to examine analyses for non-linearity. Linearity was tested. If the relationship between independent variables (IV) and the dependent variable (DV) is not linear, the results of the regression analysis will under-estimate the true relationship. This under-estimation carries two risks: increased chance of a Type II error and in the case of multiple regression, an increased risk of Type I errors (over-estimation).

Table 4.3 Test of Linearity

Model Summary and Parameter Estimates

Dependent Variable: Y

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.294	5.402	1	13	.037	9.649	-9.606E-009		
Logarithmic	.261	4.592	1	13	.052	50.664	-2.254		
Inverse	.199	3.235	1	13	.095	5.282	427499095.730		
Quadratic	.294	2.495	2	12	.124	9.524	-8.558E-009	-1.000E-013	
Cubic	.451	3.010	3	11	.076	-3.973	1.605E-007	-1.006E-013	1.000E-013

The independent variable is X1.

Model Summary and Parameter Estimates

Dependent Variable: Y

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.334	6.631	1	13	.024	64.278	-3.032		
Logarithmic	.333	6.504	1	13	.024	174.961	-57.158		
Inverse	.332	6.475	1	13	.024	-50.040	1077.180		
Quadratic	.335	6.557	1	13	.024	35.699	.000	-.080	
Cubic	.346	3.176	2	12	.078	-438.240	36.906	.000	-.037

The independent variable is X2.

Model Summary and Parameter Estimates

Dependent Variable: Y

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.378	7.884	1	13	.015	14.225	-.444		
Logarithmic	.410	6.047	1	13	.016	26.814	-7.136		
Inverse	.443	5.320	1	13	.017	-.074	112.196		
Quadratic	.557	7.537	2	12	.008	52.397	-5.439	.160	
Cubic	.557	7.537	2	12	.008	52.397	-5.439	.160	.000

The independent variable is X3.

Model Summary and Parameter Estimates

Dependent Variable: Y

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.006	.082	1	13	.779	8.746	-.033		
Logarithmic	.008	.099	1	13	.758	12.850	-1.470		
Inverse	.009	.120	1	13	.735	5.793	65.199		
Quadratic	.034	.208	2	12	.815	41.978	-1.670	.020	
Cubic	.034	.208	2	12	.815	41.978	-1.670	.020	.000

The independent variable is X4.

Model Summary and Parameter Estimates

Dependent Variable: Y

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.006	.082	1	13	.779	5.459	.033		
Logarithmic	.006	.073	1	13	.791	-.034	1.824		
Inverse	.005	.065	1	13	.802	9.118	-100.937		
Quadratic	.034	.208	2	12	.815	74.547	-2.321	.020	
Cubic	.037	.233	2	12	.796	30.461	.000	-.021	.000

The independent variable is X5.

A look at the Sig. value of the squared term of the variables implies that they are greater than the chosen significance level 0.05. Hence, there is a statistically insignificant association between the variables that is not accounted for by the purely linear model. Therefore, it is concluded that it represents a linear association. The study therefore refutes the hypothesis that the association is curved and instead assumes that it is linear. The general rule is that, if a regression model where an independent variable is represented by both a squared and a non-squared term, and the squared term's regression coefficient has a Sig. value that is lower than the chosen significance level, then it must accept the hypothesis that the population association between the independent and the dependent variable is curved and refute the null hypothesis that the association is linear. If the Sig. value is not lower than the chosen significance level, the null hypothesis that the association is linear is not discarded.

4.3.3 Multicollinearity test

Multicollinearity is a test that evaluates whether the independent variables are highly correlated. It occurs when two or more predictors in the model are highly correlated leading to unreliable and unstable estimates of regression coefficients hence causing strange results when attempting to study how well individual independent variables constitute to an understanding of the dependent variable. The consequences of Multicollinearity are increased standard error of estimates of the Betas, meaning decreased reliability and often confusing and misleading results. The test for Multicollinearity was conducted to assess whether one or more of the variables of interest is highly correlated with one or more of the other independent variables. This was tested using correlations and results are presented in Table 4.4.

Table 4.4 Multicollinearity Tests

Correlations

		X1	X2	X3	X4	X5	X6
X1	Pearson Correlation	1					
	Sig. (2-tailed)						
	N	15					
X2	Pearson Correlation	.987**	1				
	Sig. (2-tailed)	.000					
	N	15	15				
X3	Pearson Correlation	.340	.372	1			
	Sig. (2-tailed)	.215	.172				
	N	15	15	15			
X4	Pearson Correlation	-.236	-.249	-.451	1		
	Sig. (2-tailed)	.397	.372	.092			
	N	15	15	15	15		
X5	Pearson Correlation	.236	.249	.451	-1.000**	1	
	Sig. (2-tailed)	.397	.372	.092	.000		
	N	15	15	15	15	15	
X6	Pearson Correlation	.230	.159	-.435	.532*	-.532*	1
	Sig. (2-tailed)	.410	.570	.105	.041	.041	
	N	15	15	15	15	15	15

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

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

Multi collinearity problem is found as independent variables such as X_1 to X_2 is strongly correlated with each other (r=.987). We also can see that there is strong association between X_5 and X_4 (r=-1.00). Therefore X_1, X_2 and X_5 are removed from the model. This multicollinearity problem can increase the variance of the coefficient estimates and make the estimates very sensitive to minor changes in the model. In other words, by overinflating the standard errors,

multicollinearity makes some variables statistically insignificant when they should be significant. Without multicollinearity those coefficients might be significant. The result is that the coefficient estimates are unstable and difficult to interpret. High association among independent variables reduces the impact of individual independent variables to the non-performing loan of the KCB bank.

4.3.4 Heteroscedasticity test

In the classical linear regression model, one of the basic assumptions is Homoscedasticity assumption that states as the probability distribution of the disturbance term remains same for all observations. That is the variance of each *ui* is the same for all values of the explanatory variable. However, if the disturbance terms do not have the same variance, this condition of non-constant variance or non-homogeneity of variance is known as heteroscedasticity (Bedru and Seid, 2005). Accordingly, in order to detect the heteroscedasticity problems, Breusch-Pagan test was utilized in the study. The results were as presented in table 4.5.

Table 4.5 Heteroscedasticity test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.492179	Prob. F(3,10)	0.6956
Obs*R-squared	1.801199	Prob. Chi-Square(3)	0.6147
Scaled explained SS	1.726267	Prob. Chi-Square(3)	0.6311

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 10/05/16 Time: 17:17
Sample: 2000 2015
Included observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.141835	1.205546	1.776651	0.1060
D(X3)	0.143632	0.561557	0.255775	0.8033
D(X4)	0.145114	0.250595	0.579077	0.5753
D(X6)	0.538383	0.536541	1.003433	0.3393

R-squared	0.128657	Mean dependent var	2.283013
Adjusted R-squared	-0.132746	S.D. dependent var	4.174691
S.E. of regression	4.443146	Akaike info criterion	6.055559
Sum squared resid	197.4154	Schwarz criterion	6.238146
Log likelihood	-38.38891	Hannan-Quinn criter.	6.038657
F-statistic	0.492179	Durbin-Watson stat	1.272589
Prob(F-statistic)	0.695594		

This test states that if the p-value is significant at 95% confidence interval, the data has heteroscedasticity problem, whereas if the value is insignificant (greater than 0.05), the data has no heteroscedasticity problem. Thus, as shown in Table 4.5, there is no heteroscedasticity problem for this study hence the p-value is 46.70% showing insignificant value.

4.3.5 Autocorrelation test

Furthermore, the researcher tested the autocorrelation assumptions that imply zero covariance of error terms over time. That means errors associated with one observation are uncorrelated with the errors of any other observation. As noted by Gujarati (2004), the best

renowned test for detecting serial correlation is Durbin Watson test. The null hypothesis of the test is that there is no serial correlation in the residuals up to the specified order. The results are as indicated in Table 4.6.

Table 4.6 Autocorrelation test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.316562	Prob. F(2,9)	0.0833
Obs*R-squared	5.896669	Prob. Chi-Square(2)	0.0524

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 10/05/16 Time: 17:15
Sample: 2002 2015
Included observations: 14
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X3)	0.062359	0.182985	0.340789	0.7411
D(X4)	-0.005745	0.083601	-0.068721	0.9467
D(X6)	-0.068521	0.195451	-0.350581	0.7340
RESID(-1)	-0.812008	0.316239	-2.567707	0.0303
RESID(-2)	-0.459621	0.370192	-1.241574	0.2458

R-squared	0.421191	Mean dependent var	-0.110732
Adjusted R-squared	0.163942	S.D. dependent var	1.563785
S.E. of regression	1.429866	Akaike info criterion	3.825492
Sum squared resid	18.40065	Schwarz criterion	4.053726
Log likelihood	-21.77844	Hannan-Quinn criter.	3.804364
Durbin-Watson stat	2.128376		

The results reveal that the coefficients are statistically significant and the fit is very tight. The test accepts the hypothesis of no serial correlation. The LM test indicate that the residuals are not serially correlated is 0.0524>0.05). Accordingly, if the d computed nearest to 2 in application, it is assumed that there is no autocorrelation problem. Thus, as shown in Table 4.6

the computed "d" in this study was 2.1283 which are nearest to 2 implying the absence of autocorrelation problem. Thus, this implies that error terms are not correlated with one another for different observation in this study.

4.3.6 Stationarity test

Since the study employs time series data, the test for stationarity and the order of integration is necessary thus the use of the Augmented Dickey-Fuller (ADF) test. This was done in order to change the variables to stationary as a key assumption in multiple linear regression analysis and other inferential statistics. Besides, working with highly collinear variables would yield spurious results from which further inference is insignificant? Thus, unit root tests were done using Augmented Dickey Fuller tests. The tests were done to test the null hypothesis that the variables were stationary around a deterministic trend. The results appended in Table 4.7.

Table 4.7 Stationarity tests

At level for Y (dependent variable): It is not stationary at level.

		t-statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.287641	
Y	1% level	-4.057910	0.0068
	5% level	-3.119910	
	10% level	-2.701103	
Augmented Dickey-Fuller test statistic		-4.669504	
X3	1% level	-4.121990	0.0042
	5% level	-3.144920	
	10% level	-2.713751	
Augmented Dickey-Fuller test statistic		-5.597991	
X4	1% level	-4.200056	0.0013
	5% level	-3.175352	
	10% level	-2.728985	
Augmented Dickey-Fuller test statistic		-4.209564	
X6	1% level	-4.057910	0.0077
	5% level	-3.119910	
	10% level	-2.701103	

The results none of the variables were stationary at levels. The study, thus, accepted the unit root null hypothesis indicating the presence of a unit root at levels and then proceeded to employ differentiation approach to establish the order of integration of the variables. All the variables (Y, X3, X4, and X6) were differenced to arrive at a stationary level (Test critical values are greater than the Augmented Dickey-Fuller test statistic) as shown in Table 4.5. From the Table 4.5, stationarity was achieved after differencing the variables. Thus, the variables of the model are integrated to higher order to achieve stationarity.

4.4 Final regression analysis

The study ran the overall regression analysis to determine the level of significance of the effects of bank's specific factors and borrower/customer factors on Non-performing loans. Bank's specific factors were interest rates, bank size and credit size whereas customer characteristics were age and gender.

4.4.1 Effects of firm specific factors on NPLs

The overall regression was conducted to determine the influence of bank's specific factors on non-performing loans. The results are as presented in Table 4.8.

Table 4.8 Regression analysis

Dependent Variable: D(Y)
Method: Least Squares
Date: 10/05/16 Time: 17:15
Sample (adjusted): 2002 2015
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X3)	0.506122	0.215260	2.351210	0.0384
D(X4)	-0.179747	0.095951	-1.873316	0.0878
D(X6)	-0.221187	0.203420	-1.087339	0.3001

R-squared	0.463719	Mean dependent var	-0.080714
Adjusted R-squared	0.366213	S.D. dependent var	2.141166
S.E. of regression	1.704598	Akaike info criterion	4.091945
Sum squared resid	31.96219	Schwarz criterion	4.228886
Log likelihood	-25.64361	Hannan-Quinn criter.	4.079268
Durbin-Watson stat	2.995934		

The results in Table 4.8 indicate that the relationship between interest rates (X_3) and Non-performing loans is strong, positive and statistically significant (r=.0384 P = 0.0384). However, the relationship between bank size and non-performing loans and credit size and non-performing loans is statistically insignificant (r=.0878 and .3001>0.05) respectively. This implies that the interest rate significantly influence non-performing loans whereas bank size and credit size have no statistical influence on non-performing loans. A study by Waweru & Kalini (2009) on commercial banks in Kenya using statistical analysis indicates that high interest rate charged by the banks is one of the internal factors that leads to incidence of non-performing loans. Bikker & Hu (2002) on 29 OECD (Organization for Economic Co-operation and development) countries, banks profit margin demonstrated by high interest rate affects occurrence of NPLs.

4.4.2 Effects of borrower specific factors on NPLs

The study also determined the relationship between customer specific factors on non-performing loans which included age and gender. Gender can either be male or female. One of the objectives of the study was to determine which gender and age is prone to loan default regardless of their age group male or female? This study will seek to find answers for the above question. The results indicated that gender and age are statistically insignificant in determining Non-performing loans in KCB bank as shown in the table 4.8 above.

Presently most women have also become the bread winners of most families just like their male counterparts. Currently women play the roles men used to do before because they have been empowered through education. Nowadays women have equally have chance to borrow from financial institutions to satisfy both business and personal needs just like their male counterparts. According to (Clayton, 2011), the first age group who are eligible for borrowing are young, single professionals between the ages of 18 and 24. Young single professionals are at the age in their lives where they have little responsibilities or concerns. The second age group is between the ages of 25-49 are the married couples with children. This group are very busy with professional and personal life. They have more responsibilities and concerns than young adults and have a set of functional needs that go in line with their increased responsibility and family.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter summarizes the study and makes conclusion based on the findings. The recommendations of the study and areas for further research are also presented. This section presents the findings from other studies in comparison to what other scholars have said as noted under literature review. This chapter is organized into the following sub-sections; Introduction, The summary of the findings, Conclusion, Recommendations, Limitations of the study and Suggestions for further studies.

5.1 Summary of findings

The main objective of the study was to determine the factors affecting non-performing loans of KCB bank in Kenya. The study used data for the period from 2000-2015. The Interest rates, credit size, bank size, gender and age were used as independent variables. Non-performing loan was used as dependent variable. The study used inferential analytical techniques to analyze the data obtained. The results showed that the assumptions of regression were met and subsequently the data were subjected to further statistical analysis including regression analysis.

The study ran the overall regression analysis to determine the level of significance of the effects of firm specific factors and customer factors on non-performing loans. Firm specific factors were interest rates, bank size and credit size whereas customer characteristics were age and gender. The results indicated that the relationship between interest rates and non-performing loans is strong, positive and statistically significant. However, the relationship between bank size and non-performing loans and credit size and non-performing loans is statistically insignificant.

The results also indicated that age and gender have no statistical influence on non-performing loans. This implies that the interest rate significantly influence non-performing loans whereas bank size and credit size have no statistical influence on non-performing loans.

5.2 Conclusion

According to the research findings, it was possible to document the factors affection non-performing loans in KCB bank as derived from the study findings. It is noteworthy that the research findings compare closely with previous findings in other parts of the world as well as findings of similar studies carried out in Kenya. The study concludes that the interest rates offered by the bank caused the non-performing loans in KCB bank but bank size and credit size did not influence non-performing loans statistically. The study concludes that customer factors gender and age did not significantly influence non-performing loans. A review of the related literature revealed a general consensus from the theoretical and empirical studies that there is indeed a relationship between factors affecting non-performing loans in KCB bank in Kenya.

5.3 Recommendations of the study

The study recommends that in order for the KCB bank in Kenya to improve the quality of its loan book, there is need for the Government to initiates measures that will control the real interest rate in Kenya. Lower interest rates would be more appropriate in order to reduce the level of non-performing loans in Kenya since they strongly influence non-performing loans. The study also recommends that there is also need for the bank to control the credit size as there is some evidence to suggest that credit size is likely to increased non-performing loans. The study further recommends that there is need for the KCB to initiate policies that will control the amount of loans they have.

5.4 Limitations of the study

The scope of the study was limited to only one commercial bank that is KCB Bank which was not inclusive enough. The researcher faced a problem with accessing financial data from the Central Bank of Kenya and commercial banks directly because of lengthy processed involved in obtaining the information and published financial statements and reports were used to extract data. Another problem was time factor, there was no enough time to collect the data since the researcher is equally an employee. The study also indicated the problem of multicolinearity between the dependent variable, independent variable and some control variables; this means that some variables had to be dropped from the study to avoid the problem of multicollinearity.

5.5 Suggestions for further studies

The study investigated the factors affecting non-performing loans in KCB Bank. The banking Industry in Kenya however is comprised of various other banks which differ in their way of management and have different settings. This warrants the need for another study to generalize the findings of all the banks in Kenya. The Study therefore recommends another study to be done with an aim to investigate the factors influencing non-performing loans of all commercial banks in Kenya. The study further recommends that a study to be carried out to determine the causes and management of non-performing loans on performance of commercial Banks in Kenya as a whole.

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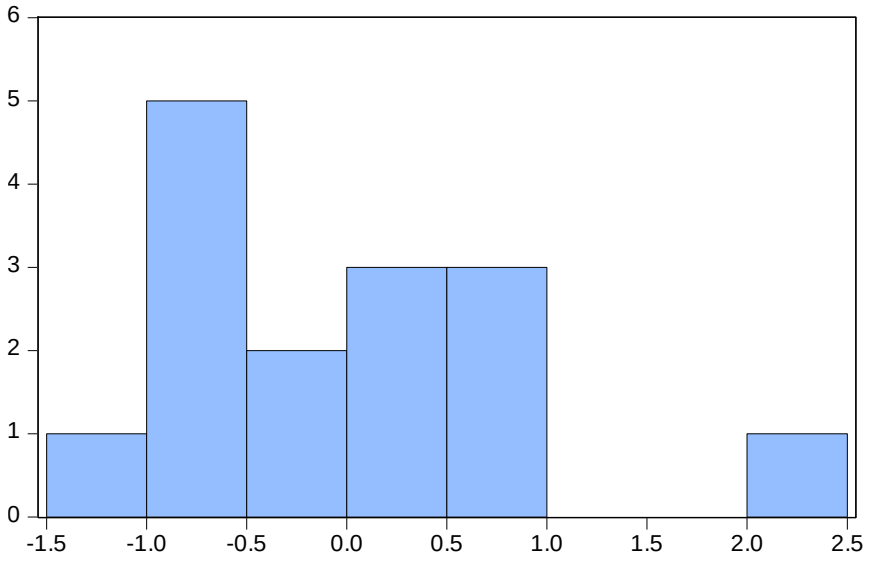
APPENDIX I: Results of Analysis

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Y	.183	15	.189	.933	15	.304
X1	.212	15	.067	.902	15	.101
X2	.193	15	.140	.884	15	.054
X3	.172	15	.200*	.937	15	.348
X4	.164	15	.200*	.933	15	.300
X5	.164	15	.200*	.933	15	.300
X6	.157	15	.200*	.964	15	.753

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction



Series: Residuals
Sample 2001 2015
Observations 15

Mean	1.00e-14
Median	-0.051314
Maximum	2.328686
Minimum	-1.323532
Std. Dev.	0.883364
Skewness	1.057451
Kurtosis	4.321968
Jarque-Bera	3.887756
Probability	0.143148

Stationarity Tests

At level for Y (dependent variable): It is not stationary at level.

Null Hypothesis: Y has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.451514	0.1467
Test critical values:	1% level	-4.004425	

	5% level	-3.098896
	10% level	-2.690439

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 10/05/16 Time: 16:10
Sample (adjusted): 2002 2015
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.689600	0.281296	-2.451514	0.0305
C	5.087346	2.163447	2.351500	0.0366

R-squared	0.333701	Mean dependent var	-0.080714
Adjusted R-squared	0.278176	S.D. dependent var	2.141166
S.E. of regression	1.819140	Akaike info criterion	4.166168
Sum squared resid	39.71124	Schwarz criterion	4.257462
Log likelihood	-27.16318	Hannan-Quinn criter.	4.157717
F-statistic	6.009922	Durbin-Watson stat	1.880825
Prob(F-statistic)	0.030509		

Null Hypothesis: Y has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.118097	0.1399
Test critical values:	1% level	-4.800080	
	5% level	-3.791172	
	10% level	-3.342253	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 10/05/16 Time: 16:12
Sample (adjusted): 2002 2015
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.893947	0.286696	-3.118097	0.0098
C	8.202984	2.704245	3.033374	0.0114

@TREND("2001")	-0.211227	0.122923	-1.718361	0.1137

R-squared	0.474707	Mean dependent var	-0.080714
Adjusted R-squared	0.379199	S.D. dependent var	2.141166
S.E. of regression	1.687045	Akaike info criterion	4.071243
Sum squared resid	31.30732	Schwarz criterion	4.208184
Log likelihood	-25.49870	Hannan-Quinn criter.	4.058567
F-statistic	4.970341	Durbin-Watson stat	2.039365
Prob(F-statistic)	0.028987		

Null Hypothesis: Y has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.613744	0.4333
Test critical values:	1% level	-2.740613	
	5% level	-1.968430	
	10% level	-1.604392	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y)
Method: Least Squares
Date: 10/05/16 Time: 16:13
Sample (adjusted): 2000 2015
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.045053	0.073406	-0.613744	0.5500

R-squared	0.026672	Mean dependent var	-0.080714
Adjusted R-squared	0.026672	S.D. dependent var	2.141166
S.E. of regression	2.112418	Akaike info criterion	4.402293
Sum squared resid	58.01003	Schwarz criterion	4.447940
Log likelihood	-29.81605	Hannan-Quinn criter.	4.398067
Durbin-Watson stat	2.440716		

At level for X2 (dependent variable): It is not stationary at level.

Null Hypothesis: X2 has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=3)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	3.410197	1.0000

Test critical values:	1% level	-4.121990
	5% level	-3.144920
	10% level	-2.713751

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 12

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X2)
Method: Least Squares
Date: 10/05/16 Time: 16:18
Sample (adjusted): 2004 2015
Included observations: 12 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X2(-1)	0.369160	0.108252	3.410197	0.0092
D(X2(-1))	-0.953668	0.345009	-2.764181	0.0245
D(X2(-2))	-0.814423	0.328136	-2.481964	0.0380
C	-6.726392	1.999746	-3.363623	0.0099

R-squared	0.599423	Mean dependent var	0.080000
Adjusted R-squared	0.449207	S.D. dependent var	0.081575
S.E. of regression	0.060542	Akaike info criterion	-2.509772
Sum squared resid	0.029322	Schwarz criterion	-2.348136
Log likelihood	19.05863	Hannan-Quinn criter.	-2.569615
F-statistic	3.990396	Durbin-Watson stat	1.921338
Prob(F-statistic)	0.052176		

Null Hypothesis: X2 has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.011753	0.9888
Test critical values:	1% level	-4.992279	
	5% level	-3.875302	
	10% level	-3.388330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 12

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X2)
Method: Least Squares
Date: 10/05/16 Time: 16:20
Sample (adjusted): 2004 2015
Included observations: 12 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

X2(-1)	-0.003054	0.259879	-0.011753	0.9910
D(X2(-1))	-0.743094	0.345918	-2.148177	0.0688
D(X2(-2))	-0.723613	0.308222	-2.347702	0.0513
C	0.008320	4.716840	0.001764	0.9986
@TREND("2001")	0.026838	0.017300	1.551286	0.1648

R-squared	0.701904	Mean dependent var	0.080000
Adjusted R-squared	0.531563	S.D. dependent var	0.081575
S.E. of regression	0.055832	Akaike info criterion	-2.638595
Sum squared resid	0.021821	Schwarz criterion	-2.436550
Log likelihood	20.83157	Hannan-Quinn criter.	-2.713399
F-statistic	4.120585	Durbin-Watson stat	2.163754
Prob(F-statistic)	0.049993		

Null Hypothesis: X2 has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.661043	0.9994
Test critical values:	1% level	-2.740613	
	5% level	-1.968430	
	10% level	-1.604392	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X2)
Method: Least Squares
Date: 10/05/16 Time: 16:21
Sample (adjusted): 2002 2015
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X2(-1)	0.003993	0.001091	3.661043	0.0029

R-squared	0.011973	Mean dependent var	0.074286
Adjusted R-squared	0.011973	S.D. dependent var	0.076833
S.E. of regression	0.076372	Akaike info criterion	-2.237663
Sum squared resid	0.075824	Schwarz criterion	-2.192016
Log likelihood	16.66364	Hannan-Quinn criter.	-2.241889
Durbin-Watson stat	2.082617		

At level for X3 (dependent variable): It is not stationary at level.

Null Hypothesis: X3 has a unit root

Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.242268	0.2015
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X3)
Method: Least Squares
Date: 10/05/16 Time: 16:23
Sample (adjusted): 2002 2015
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X3(-1)	-0.490909	0.218934	-2.242268	0.0446
C	7.333045	3.372799	2.174172	0.0504

R-squared	0.295269	Mean dependent var	-0.139286
Adjusted R-squared	0.236541	S.D. dependent var	2.226378
S.E. of regression	1.945323	Akaike info criterion	4.300297
Sum squared resid	45.41140	Schwarz criterion	4.391591
Log likelihood	-28.10208	Hannan-Quinn criter.	4.291846
F-statistic	5.027768	Durbin-Watson stat	1.535162
Prob(F-statistic)	0.044614		

Null Hypothesis: X3 has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.242268	0.2015
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X3)
Method: Least Squares
Date: 10/05/16 Time: 16:23

Sample (adjusted): 2002 2015
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X3(-1)	-0.490909	0.218934	-2.242268	0.0446
C	7.333045	3.372799	2.174172	0.0504

R-squared	0.295269	Mean dependent var	-0.139286
Adjusted R-squared	0.236541	S.D. dependent var	2.226378
S.E. of regression	1.945323	Akaike info criterion	4.300297
Sum squared resid	45.41140	Schwarz criterion	4.391591
Log likelihood	-28.10208	Hannan-Quinn criter.	4.291846
F-statistic	5.027768	Durbin-Watson stat	1.535162
Prob(F-statistic)	0.044614		

Null Hypothesis: X3 has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.613509	0.8344
Test critical values:	1% level	-2.771926	
	5% level	-1.974028	
	10% level	-1.602922	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 12

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X3)
Method: Least Squares
Date: 10/05/16 Time: 16:24
Sample (adjusted): 2004 2015
Included observations: 12 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X3(-1)	0.019440	0.031687	0.613509	0.5547
D(X3(-1))	0.096206	0.213024	0.451622	0.6622
D(X3(-2))	-0.394200	0.210665	-1.871219	0.0941

R-squared	0.264748	Mean dependent var	0.399167
Adjusted R-squared	0.101359	S.D. dependent var	1.707835
S.E. of regression	1.618970	Akaike info criterion	4.013776
Sum squared resid	23.58959	Schwarz criterion	4.135003
Log likelihood	-21.08266	Hannan-Quinn criter.	3.968893
Durbin-Watson stat	2.231640		

At level for X4 (dependent variable): It is not stationary at level.

Null Hypothesis: X4 has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.293752	0.1866
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X4)
Method: Least Squares
Date: 10/05/16 Time: 16:43
Sample (adjusted): 2002 2015
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X4(-1)	-0.629522	0.274451	-2.293752	0.0407
C	25.77596	11.38887	2.263258	0.0430

R-squared	0.304803	Mean dependent var	-0.214286
Adjusted R-squared	0.246870	S.D. dependent var	4.948637
S.E. of regression	4.294579	Akaike info criterion	5.884148
Sum squared resid	221.3209	Schwarz criterion	5.975442
Log likelihood	-39.18903	Hannan-Quinn criter.	5.875697
F-statistic	5.261298	Durbin-Watson stat	1.775072
Prob(F-statistic)	0.040655		

Null Hypothesis: X4 has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.768237	0.0626
Test critical values:	1% level	-5.124875	
	5% level	-3.933364	
	10% level	-3.420030	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 11

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X4)
Method: Least Squares
Date: 10/05/16 Time: 16:43
Sample (adjusted): 2005 2015
Included observations: 11 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X4(-1)	-1.597157	0.423847	-3.768237	0.0130
D(X4(-1))	0.781041	0.347141	2.249923	0.0743
D(X4(-2))	0.353555	0.282047	1.253533	0.2654
D(X4(-3))	0.707789	0.249661	2.834999	0.0365
C	75.09809	20.14987	3.726976	0.0136
@TREND("2001")	-0.985919	0.415570	-2.372451	0.0638

R-squared	0.800840	Mean dependent var	-0.545455
Adjusted R-squared	0.601680	S.D. dependent var	5.066826
S.E. of regression	3.197805	Akaike info criterion	5.465258
Sum squared resid	51.12978	Schwarz criterion	5.682292
Log likelihood	-24.05892	Hannan-Quinn criter.	5.328449
F-statistic	4.021091	Durbin-Watson stat	2.575763
Prob(F-statistic)	0.076460		

Null Hypothesis: X4 has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.363274	0.5352
Test critical values:	1% level	-2.740613	
	5% level	-1.968430	
	10% level	-1.604392	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X4)
Method: Least Squares
Date: 10/05/16 Time: 16:44
Sample (adjusted): 2002 2015
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X4(-1)	-0.011531	0.031743	-0.363274	0.7222

R-squared	0.008050	Mean dependent var	-0.214286
Adjusted R-squared	0.008050	S.D. dependent var	4.948637
S.E. of regression	4.928678	Akaike info criterion	6.096768
Sum squared resid	315.7943	Schwarz criterion	6.142415

Log likelihood	-41.67737	Hannan-Quinn criter.	6.092542
Durbin-Watson stat	2.313667		

At level for X6 (dependent variable): It is not stationary at level.

Null Hypothesis: X6 has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.783760	0.0856
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X6)
Method: Least Squares
Date: 10/05/16 Time: 16:46
Sample (adjusted): 2002 2015
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X6(-1)	-0.656388	0.235792	-2.783760	0.0165
C	25.11233	8.907187	2.819334	0.0155

R-squared	0.392384	Mean dependent var	0.357143
Adjusted R-squared	0.341750	S.D. dependent var	2.340517
S.E. of regression	1.898923	Akaike info criterion	4.252015
Sum squared resid	43.27093	Schwarz criterion	4.343309
Log likelihood	-27.76410	Hannan-Quinn criter.	4.243564
F-statistic	7.749322	Durbin-Watson stat	1.868824
Prob(F-statistic)	0.016535		

Null Hypothesis: X6 has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.593512	0.2873
Test critical values:	1% level	-4.800080	
	5% level	-3.791172	
	10% level	-3.342253	

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

Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X6)
Method: Least Squares
Date: 10/05/16 Time: 16:46
Sample (adjusted): 2002 2015
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X6(-1)	-0.648588	0.250081	-2.593512	0.0250
C	24.99063	9.317581	2.682094	0.0213
@TREND("2001")	-0.022994	0.133527	-0.172203	0.8664

R-squared	0.394018	Mean dependent var	0.357143
Adjusted R-squared	0.283839	S.D. dependent var	2.340517
S.E. of regression	1.980693	Akaike info criterion	4.392180
Sum squared resid	43.15459	Schwarz criterion	4.529121
Log likelihood	-27.74526	Hannan-Quinn criter.	4.379504
F-statistic	3.576174	Durbin-Watson stat	1.887788
Prob(F-statistic)	0.063611		

Null Hypothesis: X6 has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.439121	0.7953
Test critical values:	1% level	-2.740613	
	5% level	-1.968430	
	10% level	-1.604392	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X6)
Method: Least Squares
Date: 10/05/16 Time: 16:47
Sample (adjusted): 2002 2015
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X6(-1)	0.007308	0.016642	0.439121	0.6678

R-squared	-0.010093	Mean dependent var	0.357143
Adjusted R-squared	-0.010093	S.D. dependent var	2.340517
S.E. of regression	2.352299	Akaike info criterion	4.617412

Sum squared resid	71.93303	Schwarz criterion	4.663059
Log likelihood	-31.32189	Hannan-Quinn criter.	4.613187
Durbin-Watson stat	2.255518		

First Difference of the Variables

First difference for Y (dependent variable): It is stationary

Null Hypothesis: D(Y) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.287641	0.0068
Test critical values:	1% level	-4.057910	
	5% level	-3.119910	
	10% level	-2.701103	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 13

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y,2)
Method: Least Squares
Date: 10/05/16 Time: 16:48
Sample (adjusted): 2003 2015
Included observations: 13 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Y(-1))	-1.270827	0.296393	-4.287641	0.0013
C	-0.115576	0.624749	-0.184995	0.8566

R-squared	0.625645	Mean dependent var	0.130769
Adjusted R-squared	0.591613	S.D. dependent var	3.509916
S.E. of regression	2.243019	Akaike info criterion	4.594160
Sum squared resid	55.34245	Schwarz criterion	4.681076
Log likelihood	-27.86204	Hannan-Quinn criter.	4.576295
F-statistic	18.38386	Durbin-Watson stat	2.115063
Prob(F-statistic)	0.001282		

First Difference of x3

Null Hypothesis: D(X3) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.669504	0.0042
Test critical values:	1% level	-4.121990	
	5% level	-3.144920	
	10% level	-2.713751	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 12

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X3,2)
Method: Least Squares
Date: 10/05/16 Time: 16:55
Sample (adjusted): 2004 2015
Included observations: 12 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X3(-1))	-1.279993	0.274117	-4.669504	0.0012
D(X3(-1),2)	0.383880	0.210570	1.823052	0.1016
C	0.321821	0.469301	0.685746	0.5101

R-squared	0.728899	Mean dependent var	0.600000
Adjusted R-squared	0.668655	S.D. dependent var	2.798568
S.E. of regression	1.610928	Akaike info criterion	4.003816
Sum squared resid	23.35581	Schwarz criterion	4.125043
Log likelihood	-21.02290	Hannan-Quinn criter.	3.958934
F-statistic	12.09900	Durbin-Watson stat	2.231824
Prob(F-statistic)	0.002812		

Null Hypothesis: D(X3) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.494150	0.0204
Test critical values:	1% level	-4.992279	
	5% level	-3.875302	
	10% level	-3.388330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 12

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X3,2)
Method: Least Squares
Date: 10/05/16 Time: 16:56
Sample (adjusted): 2004 2015
Included observations: 12 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X3(-1))	-1.395885	0.310600	-4.494150	0.0020
D(X3(-1),2)	0.453798	0.229488	1.977435	0.0834
C	-0.804082	1.416628	-0.567603	0.5859
@TREND("2001")	0.129269	0.153151	0.844061	0.4232

R-squared	0.751068	Mean dependent var	0.600000
Adjusted R-squared	0.657719	S.D. dependent var	2.798568
S.E. of regression	1.637297	Akaike info criterion	4.085172
Sum squared resid	21.44594	Schwarz criterion	4.246808
Log likelihood	-20.51103	Hannan-Quinn criter.	4.025329
F-statistic	8.045764	Durbin-Watson stat	2.249866
Prob(F-statistic)	0.008454		

Null Hypothesis: D(X3) has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.936172	0.0001
Test critical values:	1% level	-2.771926	
	5% level	-1.974028	
	10% level	-1.602922	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 12

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X3,2)
Method: Least Squares
Date: 10/05/16 Time: 16:56
Sample (adjusted): 2004 2015
Included observations: 12 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X3(-1))	-1.305030	0.264381	-4.936172	0.0006
D(X3(-1),2)	0.398351	0.203885	1.953801	0.0792

R-squared	0.714734	Mean dependent var	0.600000
Adjusted R-squared	0.686208	S.D. dependent var	2.798568
S.E. of regression	1.567678	Akaike info criterion	3.888080
Sum squared resid	24.57614	Schwarz criterion	3.968898
Log likelihood	-21.32848	Hannan-Quinn criter.	3.858158
Durbin-Watson stat	2.086389		

X4 Second difference

Null Hypothesis: D(X4,2) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.597991	0.0013
Test critical values:	1% level	-4.200056	
	5% level	-3.175352	
	10% level	-2.728985	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 11

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X4,3)
Method: Least Squares
Date: 10/05/16 Time: 16:59
Sample (adjusted): 2005 2015
Included observations: 11 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X4(-1),2)	-2.571492	0.459360	-5.597991	0.0005
D(X4(-1),3)	0.705731	0.262226	2.691306	0.0274
C	-0.354532	1.705051	-0.207931	0.8405

R-squared	0.846884	Mean dependent var	-0.909091
Adjusted R-squared	0.808605	S.D. dependent var	12.87210
S.E. of regression	5.631372	Akaike info criterion	6.521584
Sum squared resid	253.6988	Schwarz criterion	6.630101
Log likelihood	-32.86871	Hannan-Quinn criter.	6.453179
F-statistic	22.12403	Durbin-Watson stat	1.745637
Prob(F-statistic)	0.000550		

Null Hypothesis: D(X4,2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.263599	0.0083
Test critical values:	1% level	-5.124875	
	5% level	-3.933364	
	10% level	-3.420030	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 11

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X4,3)
Method: Least Squares
Date: 10/05/16 Time: 17:00
Sample (adjusted): 2005 2015
Included observations: 11 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X4(-1),2)	-2.598293	0.493634	-5.263599	0.0012
D(X4(-1),3)	0.708211	0.278192	2.545760	0.0383
C	-2.130704	5.583070	-0.381637	0.7141
@TREND("2001")	0.197748	0.588082	0.336260	0.7465

R-squared	0.849318	Mean dependent var	-0.909091
Adjusted R-squared	0.784740	S.D. dependent var	12.87210
S.E. of regression	5.972149	Akaike info criterion	6.687378
Sum squared resid	249.6660	Schwarz criterion	6.832068
Log likelihood	-32.78058	Hannan-Quinn criter.	6.596172
F-statistic	13.15184	Durbin-Watson stat	1.763296
Prob(F-statistic)	0.002905		

Null Hypothesis: D(X4,2) has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.960284	0.0000
Test critical values:	1% level	-2.792154	
	5% level	-1.977738	
	10% level	-1.602074	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 11

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X4,3)
Method: Least Squares
Date: 10/05/16 Time: 17:00
Sample (adjusted): 2005 2015
Included observations: 11 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X4(-1),2)	-2.579404	0.432765	-5.960284	0.0002
D(X4(-1),3)	0.710657	0.246883	2.878521	0.0182

R-squared	0.846057	Mean dependent var	-0.909091
Adjusted R-squared	0.828952	S.D. dependent var	12.87210
S.E. of regression	5.323636	Akaike info criterion	6.345156
Sum squared resid	255.0699	Schwarz criterion	6.417500

Log likelihood	-32.89836	Hannan-Quinn criter.	6.299553
Durbin-Watson stat	1.728862		

X6 at first Difference

Null Hypothesis: D(X6) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.209564	0.0077
Test critical values:	1% level	-4.057910	
	5% level	-3.119910	
	10% level	-2.701103	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 13

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X6,2)
Method: Least Squares
Date: 10/05/16 Time: 17:01
Sample (adjusted): 2003 2015
Included observations: 13 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X6(-1))	-1.179654	0.280232	-4.209564	0.0015
C	0.222944	0.664060	0.335728	0.7434

R-squared	0.616997	Mean dependent var	-0.230769
Adjusted R-squared	0.582179	S.D. dependent var	3.654993
S.E. of regression	2.362554	Akaike info criterion	4.698002
Sum squared resid	61.39827	Schwarz criterion	4.784917
Log likelihood	-28.53701	Hannan-Quinn criter.	4.680137
F-statistic	17.72043	Durbin-Watson stat	1.977572
Prob(F-statistic)	0.001462		

Null Hypothesis: D(X6) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.989910	0.0392
Test critical values:	1% level	-4.886426	
	5% level	-3.828975	
	10% level	-3.362984	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 13

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X6,2)
Method: Least Squares
Date: 10/05/16 Time: 17:02
Sample (adjusted): 2003 2015
Included observations: 13 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X6(-1))	-1.185103	0.297025	-3.989910	0.0026
C	0.407315	1.655422	0.246049	0.8106
@TREND("2001")	-0.022784	0.185619	-0.122748	0.9047

R-squared	0.617574	Mean dependent var	-0.230769
Adjusted R-squared	0.541088	S.D. dependent var	3.654993
S.E. of regression	2.476003	Akaike info criterion	4.850342
Sum squared resid	61.30590	Schwarz criterion	4.980715
Log likelihood	-28.52722	Hannan-Quinn criter.	4.823545
F-statistic	8.074410	Durbin-Watson stat	1.972086
Prob(F-statistic)	0.008180		

Null Hypothesis: D(X6) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.375789	0.0003
Test critical values:	1% level	-2.754993	
	5% level	-1.970978	
	10% level	-1.603693	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 13

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X6,2)
Method: Least Squares
Date: 10/05/16 Time: 17:02
Sample (adjusted): 2003 2015
Included observations: 13 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X6(-1))	-1.164384	0.266097	-4.375789	0.0009

R-squared	0.613073	Mean dependent var	-0.230769
Adjusted R-squared	0.613073	S.D. dependent var	3.654993

S.E. of regression	2.273532	Akaike info criterion	4.554350
Sum squared resid	62.02740	Schwarz criterion	4.597808
Log likelihood	-28.60328	Hannan-Quinn criter.	4.545418
Durbin-Watson stat	1.983352		

Multicollinearity Tests

Correlations

		X1	X2	X3	X4	X5	X6
X1	Pearson Correlation	1					
	Sig. (2-tailed)						
	N	15					
X2	Pearson Correlation	.987**	1				
	Sig. (2-tailed)	.000					
	N	15	15				
X3	Pearson Correlation	.340	.372	1			
	Sig. (2-tailed)	.215	.172				
	N	15	15	15			
X4	Pearson Correlation	-.236	-.249	-.451	1		
	Sig. (2-tailed)	.397	.372	.092			
	N	15	15	15	15		
X5	Pearson Correlation	.236	.249	.451	-1.000**	1	
	Sig. (2-tailed)	.397	.372	.092	.000		
	N	15	15	15	15	15	
X6	Pearson Correlation	.230	.159	-.435	.532*	-.532*	1
	Sig. (2-tailed)	.410	.570	.105	.041	.041	
	N	15	15	15	15	15	15

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

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

Correlations

	X1	X2	X3	X4	X5	X6
X1	1.000000					
X2	0.986585	1.000000				
X3	0.339889	0.370397	1.000000			
X4	-0.235830	-0.247850	-0.450774	1.000000		
X5	0.235830	0.247850	0.450774	-1.000000	1.000000	
X6	0.229561	0.159610	-0.434882	0.531874	-0.531874	1.000000

Heteroscedasticity Tests

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.966695	Prob. F(4,10)	0.4670
Obs*R-squared	4.182780	Prob. Chi-Square(4)	0.3818
Scaled explained SS	3.087792	Prob. Chi-Square(4)	0.5432

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 10/05/16 Time: 15:07
Sample: 2001 2015
Included observations: 15

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.69700	22.86978	0.511461	0.6201
X2	-0.176261	1.341096	-0.131431	0.8980
X3	-0.312791	0.193844	-1.613624	0.1377
X4	-0.012752	0.112037	-0.113821	0.9116
X6	-0.061615	0.234496	-0.262756	0.7981

R-squared	0.278852	Mean dependent var	0.728310
Adjusted R-squared	-0.009607	S.D. dependent var	1.374028
S.E. of regression	1.380613	Akaike info criterion	3.744134
Sum squared resid	19.06092	Schwarz criterion	3.980150
Log likelihood	-23.08100	Hannan-Quinn criter.	3.741620
F-statistic	0.966695	Durbin-Watson stat	1.862552
Prob(F-statistic)	0.466975		

Autocorrelation Tests

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.218136	Prob. F(2,8)	0.0943
Obs*R-squared	6.687605	Prob. Chi-Square(2)	0.0353

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 10/05/16 Time: 15:04
Sample: 2001 2015
Included observations: 15
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.440116	14.81297	0.367253	0.7230
X2	-0.193878	0.874195	-0.221779	0.8300
X3	0.011841	0.122346	0.096781	0.9253
X4	0.023442	0.077055	0.304223	0.7687
X6	-0.079118	0.163773	-0.483096	0.6420
RESID(-1)	-0.802302	0.320180	-2.505788	0.0366
RESID(-2)	-0.564437	0.362597	-1.556648	0.1582

R-squared	0.445840	Mean dependent var	1.00E-14
Adjusted R-squared	0.030221	S.D. dependent var	0.883364
S.E. of regression	0.869914	Akaike info criterion	2.863880
Sum squared resid	6.054002	Schwarz criterion	3.194303
Log likelihood	-14.47910	Hannan-Quinn criter.	2.860360
F-statistic	1.072712	Durbin-Watson stat	2.439631
Prob(F-statistic)	0.449944		

FINAL REGRESSION ANALYSIS MULTIPLE REGRESSION RESULTS

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.492179	Prob. F(3,10)	0.6956
Obs*R-squared	1.801199	Prob. Chi-Square(3)	0.6147
Scaled explained SS	1.726267	Prob. Chi-Square(3)	0.6311

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 10/05/16 Time: 17:17
Sample: 2002 2015
Included observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.141835	1.205546	1.776651	0.1060
D(X3)	0.143632	0.561557	0.255775	0.8033

D(X4)	0.145114	0.250595	0.579077	0.5753
D(X6)	0.538383	0.536541	1.003433	0.3393

R-squared	0.128657	Mean dependent var	2.283013
Adjusted R-squared	-0.132746	S.D. dependent var	4.174691
S.E. of regression	4.443146	Akaike info criterion	6.055559
Sum squared resid	197.4154	Schwarz criterion	6.238146
Log likelihood	-38.38891	Hannan-Quinn criter.	6.038657
F-statistic	0.492179	Durbin-Watson stat	1.272589
Prob(F-statistic)	0.695594		

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.316562	Prob. F(2,9)	0.0833
Obs*R-squared	5.896669	Prob. Chi-Square(2)	0.0524

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 10/05/16 Time: 17:15
Sample: 2002 2015
Included observations: 14
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X3)	0.062359	0.182985	0.340789	0.7411
D(X4)	-0.005745	0.083601	-0.068721	0.9467
D(X6)	-0.068521	0.195451	-0.350581	0.7340
RESID(-1)	-0.812008	0.316239	-2.567707	0.0303
RESID(-2)	-0.459621	0.370192	-1.241574	0.2458

R-squared	0.421191	Mean dependent var	-0.110732
Adjusted R-squared	0.163942	S.D. dependent var	1.563785
S.E. of regression	1.429866	Akaike info criterion	3.825492
Sum squared resid	18.40065	Schwarz criterion	4.053726
Log likelihood	-21.77844	Hannan-Quinn criter.	3.804364
Durbin-Watson stat	2.128376		

Dependent Variable: D(Y)
Method: Least Squares
Date: 10/05/16 Time: 17:15
Sample (adjusted): 2002 2015
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X3)	-0.506122	0.215260	-2.351210	0.0384
D(X4)	-0.179747	0.095951	-1.873316	0.0878
D(X6)	-0.221187	0.203420	-1.087339	0.3001

R-squared	0.463719	Mean dependent var	-0.080714
Adjusted R-squared	0.366213	S.D. dependent var	2.141166
S.E. of regression	1.704598	Akaike info criterion	4.091945
Sum squared resid	31.96219	Schwarz criterion	4.228886
Log likelihood	-25.64361	Hannan-Quinn criter.	4.079268
Durbin-Watson stat	2.995934		

With Autocorrelation Problem

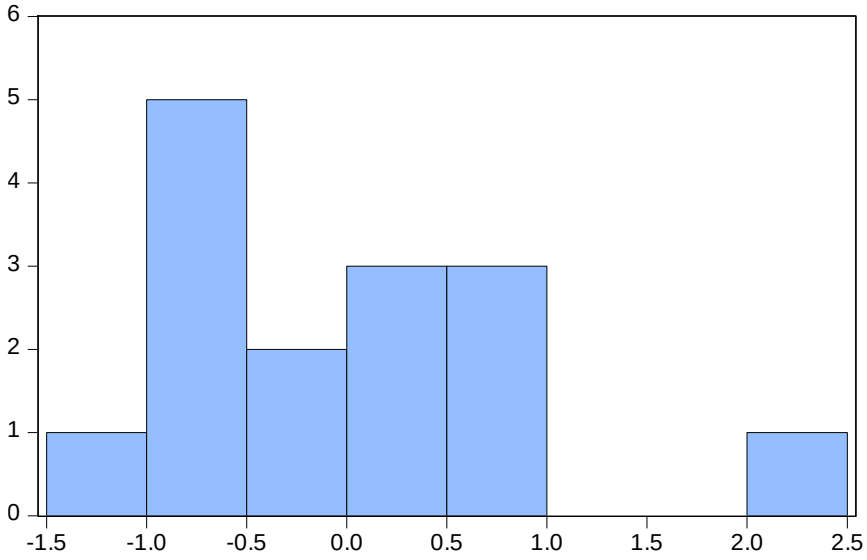
Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.966695	Prob. F(4,10)	0.4670
Obs*R-squared	4.182780	Prob. Chi-Square(4)	0.3818
Scaled explained SS	3.087792	Prob. Chi-Square(4)	0.5432

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 10/05/16 Time: 17:26
Sample: 2001 2015
Included observations: 15

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.69700	22.86978	0.511461	0.6201
X2	-0.176261	1.341096	-0.131431	0.8980
X3	-0.312791	0.193844	-1.613624	0.1377
X4	-0.012752	0.112037	-0.113821	0.9116
X6	-0.061615	0.234496	-0.262756	0.7981

R-squared	0.278852	Mean dependent var	0.728310
Adjusted R-squared	-0.009607	S.D. dependent var	1.374028
S.E. of regression	1.380613	Akaike info criterion	3.744134
Sum squared resid	19.06092	Schwarz criterion	3.980150
Log likelihood	-23.08100	Hannan-Quinn criter.	3.741620
F-statistic	0.966695	Durbin-Watson stat	1.862552
Prob(F-statistic)	0.466975		



Series: Residuals
Sample 2001 2015
Observations 15

Mean	1.00e-14
Median	-0.051314
Maximum	2.328686
Minimum	-1.323532
Std. Dev.	0.883364
Skewness	1.057451
Kurtosis	4.321968
Jarque-Bera	3.887756
Probability	0.143148

Dependent Variable: Y
Method: Least Squares
Date: 10/05/16 Time: 17:23
Sample: 2001 2015
Included observations: 15

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	63.89110	17.31386	3.690171	0.0042
X2	-1.772329	1.015294	-1.745631	0.1115
X3	-0.558847	0.146752	-3.808101	0.0034
X4	-0.151402	0.084819	-1.785003	0.1046
X6	-0.223144	0.177528	-1.256948	0.2373

R-squared	0.750556	Mean dependent var	7.397333
Adjusted R-squared	0.650779	S.D. dependent var	1.768698
S.E. of regression	1.045211	Akaike info criterion	3.187515
Sum squared resid	10.92465	Schwarz criterion	3.423532
Log likelihood	-18.90637	Hannan-Quinn criter.	3.185001
F-statistic	7.522309	Durbin-Watson stat	2.901931
Prob(F-statistic)	0.004590		