

# Lending Interest, Inflation and Foreign Exchange Rates Relationship with Loan Delinquency in the Tea Subsector in Kenya

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**Abstract:** *Delinquent loans are in the rise both globally and locally leading to closures, receiverships and even collapse of institutions receiving and offering agricultural loans. The agricultural sector plays a very critical role in economic development, employment and wealth creation and as a source of revenue. The state of tea sector in Kenya currently is a combination of a number of factors; colonial history, socio-economic environment, regional economic relations, resource endowments and the general policy environment. This study therefore sought to determine the relationship between three macroeconomic variables namely, lending interest, inflation and foreign exchange rates; and delinquency of loans in the tea manufacturing companies managed by Kenya Tea Growers Association for the period Quarter 1, 2008 to Quarter 4, 2017. The study adopted explanatory research design approach and the population of study was 16 tea manufacturing companies. Secondary data on the macro-economic variables and delinquency of loans was collected and analyzed using E-Views software. The study findings reveal that at 95% level of confidence, the independent variables have no significant relationships ( $p=0.38$ ). In the short-run, Error Correction Model depicts a significant relation between loan delinquency and the three macroeconomic for the period under study. Regression analyses depict negative relationships between lending interest rate, foreign exchange rate; and loan delinquency. Inflation rate reflected a positive relationship. The results of Autoregressive Distributed Lag Model revealed sufficient evidence of insignificant relationships between loan delinquency and the selected macroeconomic variables in the long run. This study notes that macro-economic environment should therefore, be monitored by the regulators and should take fiscal and monetary measures to ensure management of loan delinquency in the tea sector, and the economy as a whole.*

**Keywords:** Loan delinquency, lending interest rate, foreign exchange rate, inflation rate, Kenya Tea Growers Association

## 1. Background of the Study

Following global financial Crisis, recession has left institutions and individuals in debts, leading to loan delinquency and subsequently non-performance of loans. According to Addae-korankye (2014), loan delinquency 'results into loan default where a debtor has not met his or her legal obligation according to the debt contract'. The concept of loan delinquency is not new. For the European Union as a whole, NPLs was at over 9% of GDP 2014 end. In the United State of America, the percentage of NPLs to total loan was 2.21 percent in 2008 rising to 5.3 percent in 2010, after which there was a decrease from 4.5 percent in 2011 to 1.67 in 2015. The same pattern was experienced in the United Kingdom where the percentage rose from 1.56 in 2008 to 3.96 in 2011, followed by a decline to 1.04 percent in 2015. Germany recorded 2.85 percent of the total loans as NPL s in 2008, 3.03 percent in 2011 then 2.34 percent in 2014 (Statistica, 2017).

Agricultural credit institutions in developing and developed countries have been plagued by high default and delinquency rates. Delinquency rate for loans to finance agricultural production farm loans in Commercial banks in the USA was recorded at 1.19, 2.37, 3.04, 2.11, 1.56, 1.45, 0.9 and 0.84 percent for year 2008 to 2015 respectively (Board of Governors of Federal Reserve System of the US, 2017). 40 per cent of the borrowers in Sirsa district of Haryana, India repaid approximately 50 per cent of loan. 5 per cent of the borrowers repaid more than 70 per cent of

agriculture loan (Bala, 2015). In the developing world, out of Naira (₦)7,188,575,000 loans granted to farmers registered under Agricultural Development Programmes (ADP) in their states in Nigeria, between years 2009-2012, only ₦ 3,523,018,005 of the total loan granted was repaid giving a default rate of 51 % (Obasi, 2015). Oladele and Ward (2016) concluded that 29.3 percent of loan beneficiaries from Micro Agricultural Financial Institution in North West Province, South Africa, did not repay their loan while 44 percent made partial repayment.

Agricultural firms offering agricultural credit in Kenya have not been an exception. For example, the rate of group loan default to farmers by Agricultural Finance Corporation (AFC), Eldoret Branch, has been on the rise from 0.5% in 2006 to 89% in 2008. The default rate in 2013 stood at 68% (Amwayi, Omete, & Asakania, 2014). According to Nyanumba (2012), AFC has written off Ksh.6 billion of non-performing debt portfolio owed by farmers as at December 2011. AFC puts the amount of non-performing portfolio debt comprising of 1,632 clients at a close to Ksh.7 billion as at April, 2010. In November, 2016, the Kenyan Government bailed out coffee farmers from Sh2.4 billion owed to cooperative societies. This was the second bailout by the Government after Sh1.2 billion shillings was released early 2016 to help revive the sector (Mugo, 2016).

### 1.1 Problem Statement

According to Food and Agricultural Organisation (2016), 10% of the Kenya's population depend on tea and it contributes 4% of the country's GDP and leading export earner (26% of total export earnings). Tea industry contributes to the livelihoods of over 400,000 farmers and it gives employment to over two million Kenyans. Kenya accounts for 22% of the total world tea exports, making it the leading exporter of black tea with its major markets being Pakistan, Egypt, United Kingdom, Afghanistan, Yemen and Sudan (Export Promotion Council, 2016). Despite the major contributions of tea to our Kenyan economy, literature has shown that the tea sub-sector is still faced with delayed and non-repayment of loans. As at 30<sup>th</sup> June, 2017, Greenland Feather Limited, a subsidiary of KTDA recorded a 22% (KShs.11,898,263) loan default by tea manufacturers (Greenland Feather Limited, 2017). According to the World Bank Group (2016), delinquent loans globally skyrocketed after 2007 to 2015, rising from 2.992 percent in 2008 to 4.342 percent in 2015. In Kenya, total gross NPLs rose from 108 billion shillings in 2014 to 139.9 billion shillings by November 2015. This is the highest figure in six years. The trend of NPLs in the agriculture sector between 2009 and 2015 rose from KShs 5.45 billion to KShs 8.384 billion (CBK supervisory reports 2009-2015).

The problem of NPLs in a number of sectors has been linked to economic factors. Past studies, for example in the banking sector, Muriithi (2013) investigated on the effects on NPLs in Commercial banks in Kenya. The study revealed that NPLs of Commercial banks in Kenya are positively correlated with inflation rate and negatively correlated with real interest rate. Bucur and Dragomirescu, (2014) found unemployment rate, Money supply growth rate and market foreign exchange rate and credit risk are negatively related in Romanian banking sector. In the mortgage sector, Franco, (2014) concluded that there existed significantly strong and positive correlation between unemployment, real interest rates and Non-Performing loans in mortgage firms in Kenya.

Given the increasing trend of loan delinquency in the agriculture sector generally, this study did seek to investigate the relationship between macro-economic variables and loan delinquency in this sector with specific reference to tea sub-sector which is the leading foreign exchange earner in Kenya. Central Bank Rate (CBR) is the lowest rate of interest Central Bank of Kenya (CBK) charges banks and microfinance banks and its movements, both in direction and magnitude, signals the monetary policy stance (Central Bank of Kenya, 2015). For example, CBK raised the Central Bank Rate (CBR) from 8.5 per cent to 10.0 per cent in June, then to 11.5 per cent in July, 2015 to contain inflationary pressures and stem exchange rate volatility (Kenya Bureau of Statistics, 2016). Though there is no literature review on a study that has employed CBR as moderating variable, this research used CBR as the moderating variable to determine the moderating effect of CBR on the relationship between loan delinquency and the explanatory variables. The objective of this study was therefore, to investigate the relationship between lending interest, inflation and foreign exchange rates; and loan

delinquency in the tea manufacturing companies managed by KTGA.

### 1.2 Specific Objectives

The specific objectives were;

- To determine the relationship between lending interest rate and loan delinquency in the tea manufacturing companies managed by KTGA.
- To determine the relationship between inflation rate and loan delinquency in the tea manufacturing companies managed by KTGA.
- To determine the relationship between foreign exchange rate and loan delinquency in the tea manufacturing companies managed by KTGA.
- To determine the moderating effect of the Central Bank Rate on loan delinquency in the tea manufacturing companies managed by KTGA

## 2. Literature Review

This section analyzes the empirical work of a number of studies in relation to loan delinquency, lending interest rate, inflation rate and foreign exchange rate.

### 2.1 Loan Delinquency

According to the Consultative Group to Assist the Poor (CGAP) (2009), loan delinquency means failure to make loan payments when they are due, hence, the loan is in arrears. A number of studies have been done on loan delinquency. Ochami (2004) investigated NPLs in Housing Finance Company of Kenya (HFCK) Limited. The study attributed external environment to NPLs. While investigating the causes of NPL in the 43 Commercial Banks in Kenya, Muriithi (2013) for the period 2008-2012, the study adopted descriptive design and applied multiple regressions. It concluded that NPLs are positively related to inflation rate (0.316) and negatively with real interest rate (-0.468). Nkurrumah (2014), investigated the factors that affect NPLs at the Commercial Bank of Africa (Kenya). The study adopted a partly descriptive and a partly correlational research design. The population of the study included 451 staff members currently working for CBA - Kenya. From this population a sample size of 122 individuals was derived and to these the data collection instrument, semi-structured questionnaire was administered. It was found that the prevailing economic conditions were the major economic factor affecting the levels of NPLs. Using a logit model, Mashatola and Darroch (2003) concluded that the farm size and off-farm income affects repayment pattern for 83 medium scale sugarcane farmers in Kwazulu-Natal, South Africa. Another study, Kohansal and Mansoori (2009) investigated the factors influencing on repayment behavior of farmers that received loan from agricultural bank by using a logit model and a cross sectional data of 175 farmers of Khorasan-Razavi province, Iran, in 2008. Results showed that loan interest rate is the most important factor affecting on repayment of agricultural loans. Addae-korankye (2014), a study that analyzed the causes and control of loan delinquency/default in microfinance institutions in Ghana employed Random sampling technique to select twenty-five microfinance institutions and two

hundred and fifty clients for the study. The study found high interest rate, inadequate loan sizes, poor appraisal, lack monitoring and improper client selection affecting loan delinquency in micro-finance institutions in Ghana.

## 2.2 Lending Interest rate

A number of studies support a positive relationship between interest rates and loan delinquency. Khemraj and Pasha (2009) estimated on data covering the period 1994 to 2004 using a fixed effect model to explore on the determinants of NPLs in the Guyanese banking sector. The findings from this study reveal that higher interest rates leads to higher NPLs. Espinoza and Prasad (2010) examined the macroeconomic determinants of NPLs in the Gulf Cooperation Council banking system using a sample of 80 banks. According to the study, interest rates have a positive relationship with loan defaults though not significant. In Malaysia, a study, Adebola, Yusoff and Dahlan (2011) explored the determinants NPLs covering the period 2007 to 2009. An ARDL approach was applied in this study and the study concluded a positive relationship. Messai and Jouini (2013) conducted a study on Italy, Greece and Spain from 2004-2008 to identify the determinants of NPLs for a sample of 85 banks. The study applied Fixed Effect model and found a positive relationship of real interest rate with NPLs. Warue (2013), a study on 44 Commercial Banks in Kenya, found similar results with significance in affecting NPLs in commercial banks.

Franco (2014), a study to identify the major macroeconomic causes of nonperforming loans in the mortgage institutions in Kenya. Using descriptive survey research design and analysis of variance, the study found a significant strong and positive correlation between real interest rates and non-performing loans with a correlation coefficient of 0.7209 and a probability of 0.0001 which was less than the significance level of 5%. Addae-korankye (2014) investigated the causes and regulators of loan delinquency in microfinance institutions in Ghana. Employing random sampling technique with a sample of two hundred and fifty clients and twenty-five microfinance institutions, the study concluded on high interest rate as one of the causes of loan delinquency. Using descriptive research design and Ordinary Least Square Model for the year 1988 to 2013, Ting, Qun, Yee, Wei, and Cheng (2015), investigated on the relationship between bank credit risk with inflation rate, interest rate, gross domestic product (GDP), bank performance and required reserve in Malaysia banking sector. Inferential analyses showed interest rate is insignificantly but positively related to credit at 10% significance level. These confirms other past studies (Dash and Kabra, 2010; Ngetich and Wanjau, 2011).

Other studies showed a negative relationship. Park and Zhang (2012) investigated the effects of Bank-Specific Determinants of the U.S NPLs and macroeconomic variables. The results showed that the coefficient for interest rate was negative in relation to credit risk. Using fixed effect model, Gezu (2014) the found statistically significant negative impact of lending interest rate on NPL in Ethiopia. Using nine macroeconomic variables and time series data of NPLs ratio from 1990-2011 and OLS to test macroeconomic

variables as determinants of NPLs in Pakistan, Ahmad and Bashir (2013) proved negative and significant association of interest rate with NPLs ( $r=-0.58$ ).

## 2.3 Inflation Rate

Several studies have found inflation rate as a significant variable explaining loan delinquency with a positive relationship. Using panel vector autoregressive (VAR) estimation for the period 1998 to 2009 for a sample of 26 advanced economies, Nkusu (2011), found empirical evidence of positive correlation between inflation and NPLs. The study concluded one to one relationship between inflation and NPLs by the fourth year. Mileris (2012) employed an OLS regression model for 22 European Union countries in years 2007-2011 and concluded on positive relationship between inflation and NPLs. Using a well-structured questionnaire Farhan *et al.* (2012) also concluded that Pakistani bankers perceive a positive relationship in top 10 Pakistani banks. Furthermore, Badar and Javid (2013), assessed dynamics between NPLs and macroeconomic variables from January 2002 to December 2011 of 36 commercial banks in Pakistan. The analysis was conducted by employing co-integration, Granger causality and vector error correction models. The study concluded a weak short run positive relationship between non-performing loans with inflation and exchange rate. Clementina and Isu (2014) proved that during inflation, borrowers find it difficult to pay back loans due to increasing cost of capital. Prasanna (2014) investigated the determinants NPLs in the Indian banking system by applying panel data modelling approach. By analyzing 31 Indian banks for the period of 2000 to 2012, the study found that higher interest and inflation rates contribute positively to rising NPLs. This is according to (Turan & Koskija, 2014). This study confirms previous studies by (Bonilla, 2012; Derbali, 2011; Ting *et al.* 2015).

However, inflation can also make debt servicing easier by reducing the real value of outstanding loans, hence negative relationship. Taking a descriptive design, Mboka (2013) sought to establish the effects of macro-economic variables on NPLs in 15 commercial banks in Kenya for the period 2003-2012 and found a negative relationship between inflation rate and NPLs in the banking sector. Taking a descriptive design, the study was based on a population of fifteen banks out of the existing forty-four commercial banks for the period of ten years 2003-2012. Systematic random sampling was employed, where secondary data was used as obtained from CBK database as all banks are expected to file their annual financial results with CBK. The research was both quantitative and qualitative in nature. The study found that a strong correlation existed between inflation and current account deficit. Using Fixed Effect Model and seven Central and Eastern European countries, Skarica (2014) studied on the determinants of NPLs in Central and Eastern European countries from 2007 to 2012. The findings reveal that inflation has negative impact. Similar findings were concluded in a recent study, (Washington (2014). The study claims that business will pass on the burden of inflation to the consumers during when inflation increases. This ensures the business can still repay their debts.

Contrary to the above findings, Okenyuri (2013) found no relationship between inflation and NPLs. Using annual data for the period 2003-2012, the study employed quantitative research design to find out the relationship between lending interest rate, interest rate spread, inflation rate and real GDP growth rate; and NPLs in the banking industry in Kenya. Based on quarterly data covering the period 2001:Q1 to 2014: Q2 and employing Vector Autocorrelation model, (Sheefeni, 2015), concluded that inflation rate is not significant in explaining non-performing loans in Namibia.

## 2.4 Foreign Exchange Rate

The increase in foreign exchange rate can reduce the competitiveness of export firms and unfavorably affect their ability to repay their loans. However, it can also improve the loan repayment ability of borrowers who borrow in foreign currency (Fofack, 2005). Using a simple linear regression function, Khemraj and Pasha (2009) investigated the determinants of NPLs in Guyana from 1994-2004. The study concluded a positive relationship. Zribi and Boujelbene (2011) analyze the internal and external factors determining the levels of bank credit risk-taking in Tunisia. The sample consists of a panel of 10 commercial banks over the period 1995 to 2008. The results showed that foreign exchange rate is statistically significant at a level of 1% with bank credit risk. Castro (2013) analyzed the link between banking credit risk and macroeconomic developments in Greece, Ireland, Portugal, Spain and Italy (GIPSI). By employing dynamic panel data approaches to these five countries over the period 1997q1-2011q3, the study found a positive relationship. While studying the factors affecting NPLs at the Commercial Bank of Africa (Kenya), Nkurrenah (2014) adopted a partly descriptive and a partly correlation research design and a population of 451 staff members working for CBA - Kenya. The study concluded that increase in exchange rate increases NPLS, hence positive relationship. Akinlo and Emmanuel (2014) looked at the determinants of NPLs in Nigeria utilizing annual data over the period 1981-2011. Employing logistic regression, the study concluded that in the short run, credits to the private sector, exchange rate, lending rate and stock market index are the main determinants of NPLs. Ouhibi, Ghabri, and Hammami (2017) analyzed the determinants of financial soundness indicators (non-performing loans) of the banking system in the Southern Mediterranean countries. In particular, a sample of six out of ten countries of the Southern Mediterranean (Tunisia, Morocco, Egypt, Lebanon, Jordan and Turkey) was analyzed. An ordinary least square (OLS) technique was applied on a general panel regression on the annual frequency for the period 2000 to 2013. A similar relationship was concluded.

Other studies have concluded on contrary findings. Beck, Jakubik, and Piloju (2013) is a research that used a panel data technique to study the real GDP, exchange rates, lending interest rates, share prices and total banks' credit and nonperforming loans (NPLs) across 75 countries. The study concluded that exchange rate depreciation during 2007-2008 crisis contributed to a significant increase in NPLs in Ukraine in 2009 and 2010. Using a descriptive and a multidimensional statistical analysis for Romanian banking system from 2008 to 2013, Bucur and Dragomirescu (2014)

the study found a negative and significant relationship. (Nursechafia, 2014) is a study on Islamic financing sustainability, specifically in Indonesia using cointegration and vector auto regression (VAR). Monthly data for the period October 2005 to May 2012 were used for analysis. It is found that the exchange rate negatively influence credit risk rate. Using annual data of all the 43 Commercial banks in Kenya for the period of 1990 to 2013 and OLS as the regression equation and applying an error correction Model on the equation and testing the values at 5% significance level, Washington (2014) found that in the long run, exchange rate is negatively and significantly related to credit risk.

The literature reviewed above varies significantly in terms of findings though there is a consensus regarding the macroeconomic factors affecting non-performing loans as identified in several studies. Notably, there are also different methodological approaches used in the studies. However, there seem to be no study on macroeconomic determinants for delinquent loans in the tea manufacturing companies in Kenya. Hence, this study intended to fill the gap and add to empirical literature for Kenya.

## 3. Research Methodology

This section defines the research design employed, the data collected and the model employed to explain the lending interest, inflation and foreign exchange rates relationship with loan delinquency in the tea manufacturing subsector in Kenya.

### 3.1 Research Design

The study adopted explanatory research design. According to Saunders, Lewis and Thornhill (2009), explanatory research emphasizes on studying a situation to explain (rather than just describing) the relationships between the variables. The study seeks to establish and explain the relationship between macroeconomic variables and loan delinquency in tea manufacturing companies managed by KTGA. The data was analysed using statistical techniques and determine the causal relationships through the analysis of correlations between variables.

### 3.2 Empirical Model

In order to explain the relationship of the macro-economic variables and delinquency of loans, the study employed multiple time series estimation based on Autoregressive Distributed Lag (ARDL) co-integrated technique. The regression model of the form below was applied, consistent with (Gezu, 2014; Chebiwott, 2010; Ting et al., 2015; Washington, 2014);

$$Y_t = \beta_0 + \beta X_t + \epsilon_t$$

Where: -  $Y_t$  is the dependent variable in quarter 't',  $\beta_0$  is the constant term,  $\beta$  is the coefficient of the independent variables of the study,  $X_t$  is the independent in quarter 't' and  $\epsilon_t$  the error term. The coefficients of the explanatory variable were estimated by the use of an Error Correction Model (ECM) to analyze the dynamic short term-

relationships due to existence of co-integration. Based on the conceptual framework, the estimated model used was;

$$LD_t = \beta_0 + \beta_1 \Delta LIR_t + \beta_2 \Delta IR_t + \beta_3 \Delta FER_t + e_t$$

Where:

$LD_{it}$  = The ratio of total gross delinquent loans to total gross loan and advances at quarter t;  $\beta_0$  is a constant which captures all other explanatory variables which affect loan delinquency, but are not captured in the model;  $\beta_{1-3}$  = Regression coefficients of LIR, IR and FER  $\Delta$  = Difference operator;  $LIR_t$ ,  $IR_t$ ,  $FER_t$  represented average lending interest rate, average inflation rate and average Foreign Exchange rate at quarter t respectively;  $e$  the error term which is a disturbance, is the amount at which the equation may differ during empirical analysis due to intentionally/unintentionally omitted or added variables.

### 3.3 Target Population and Data Collection

The population for this research was all the 16 tea manufacturing companies managed by KTGA. This formed the sampling frame for the study. These includes; James Finlay (Kenya) Limited, Williamson Tea K Limited (Changoi/Lelsa) Estate, Williamson Tea K Limited (Tinderet) Estate, Williamson Tea K Limited (Kaimosi) Estate, Kapchorua Tea Limited, Sotik Tea Company Limited, Kaisugu Limited, Nandi Tea Estates Limited, Kipkebe Limited, Karirana Tea Estates Limited, Kamiti Tea Limited, Gakoe Tea Limited, Mogusii Farmers Company Limited, Kerumbe Farm, Itibo Estate, and Emrok Tea (EPZ) Factory Limited (Kiarii, 2017). The study employed a census survey by studying all the 16 tea manufacturing companies managed by KTGA during the period under study.

The study used quarterly time series secondary data for the period 2008 to 2017 from the 16 tea manufacturing companies under KTGA. Secondary data on loan delinquency was collected using document review schedules from the companies under study, data on inflation and foreign exchange rates were collected from the KNBS website and data on CBR was collected from CBK website. The data was then fed in the schedules in readiness for data analysis.

## 4. Results and Discussion

### 4.1 Empirical Results

Three independent variables (lending interest rate, inflation rate and foreign exchange rate) were regressed against loan delinquency which is the dependent variable. Long run relationship was determined using the general ARDL model. Secondly, both short run and long run effects were conducted using ECM mechanism which is considered to be the best fit model to obtain both short and long term relationships in one equation. The ARDL long run model was in the form of the following equation;

$$LD_{it} = \beta_0 + \beta_1 LIR_{it} + \beta_2 IR_{it} + \beta_3 FER_{it} + e_{it}$$

The relations between loan delinquency and the three independent variables were as follows;

$$\text{Loan delinquency} = 12.2 - 0.54 \text{ LIR} + 0.004 \text{ IR} + 0.043 \text{ FER} + e$$

The coefficient of determination ( $R_2$ ) indicated that the explanatory variables explained 63.54% of the loan delinquency. The p-value (F-statistic) of 0.00000, which is less than at 5 % significance level, showed that the explanatory variables in the model are jointly statistically significant. A one unit change in lending interest rate produces a 0.54 unit negative change in loan delinquency, though statistically insignificant ( $p=0.51$ ). A one unit change in inflation rate produces a 0.004 unit positive change in loan delinquency, though statistically insignificant ( $p=0.99$ ). A one unit change in foreign exchange rate produces a 0.04 unit positive change in loan delinquency, though statistically insignificant ( $p=0.76$ ). After the ARDL Cointegration equation was identified, the ARDL model of the cointegrating equation was reparametrized into an Error Correction model (ECM) which combines short-run dynamics (traditional ARDL) and long run relationship of the variables of a single model.

Employing Error Correction mechanism (ECM), objectives of the study were determined. The ECM, considered to be the best fit model, was derived from ARDL model through a simple linear transformation. The associated ECM model employed the three optimal lags and differenced values of the variables to capture the data generating process. The model was in the form of the following equation;

$$LD_{it} = \beta_0 + \beta_{1\Delta} LIR_{it} + \beta_{2\Delta} IR_{it} + \beta_{3\Delta} FER_{it} + e_{it}$$

The relations between loan delinquency and the three independent variables were as follows;

$$LD = -0.71 - 2.01 LIR_{t-1} - 6.25 LIR_{t-2} + 0.26 IR_{t-1} + 0.15 FER_{t-1} - 0.22 FER_{t-2} - 0.20 e_{t-1}$$

The  $R_2$  indicated that the explanatory variables explain 64.31% of the loan delinquency. This indicates that the regression model had a significant strong explanatory power as only 35.69% of variation in loan delinquency was not explained by the model. This significant correlation between dependent and explanatory variables was also concluded by other studies (Franco, 2014). The model had a p-value of 0.000295 indicating that the explanatory variables in the model are statistically significant and can influence loan delinquency jointly. All the three explanatory variables are significantly associated with non-performing loans as described below. This therefore means the model was fit.

The first objective of the study sought to determine the relationship between lending interest rate and loan delinquency. Lending interest rate is the basic factor that affects the repayment of loans. The regression results showed that there is a negative but significant relationship with a beta coefficient of -6.25 and a probability of 0.0024. The beta coefficient showed that a one unit increase in lending interest rate produces a 6.25 unit decrease in loan delinquency. The theoretical justification for this significant association is that higher lending rate curtails ability to borrow, which decreases the amount of loan and therefore reduces loan delinquency. These findings confirm other

studies that found both negative and statistically significant relationship (Ahmad & Bashir, 2013; Gezu, 2014).

The second objective was to determine the relationship between inflation rate and loan delinquency. The findings indicate that the inflation rate and loan delinquency have positive and statistically significant ( $p=0.0034$ ) relationship. A beta coefficient of 0.26 means a one unit increase in inflation rate leads to a 0.26 unit increase in loan delinquency. This may be explained by the fact that increased inflation can weaken the loan payment capacity of the borrowers by reducing the real income. Badar and Javid (2013) state that increase in inflation will force monetary regulators to conduct contractionary monetary policy. Central bank will raise interest rate to control inflation, however this action will lead to an increase in the cost of borrowing thus will decrease the borrower's ability to repay the loan. Nkusu (2011) further explains that inflation reduces the debt servicing capability as lenders adjust the lending interest rates to adjust their real return. Studies (Clementina and Isu 2014; Ting *et al.*, 2015) similarly found positive and significant relationship between the two variables. Clementina and Isu (2014) conclude that the borrowers are difficult to repay their existing loans because the rising cost of capital during inflation period. (Farhan *et al.*, 2012), a study on the economic determinants of non-performing loans in Pakistan, concluded on a positive ( $\beta = 1.381$ ) and highly significant ( $p = 0.000$ ) with non-performing loans.

The third objective of the study sought to determine the relationship between foreign exchange and loan delinquency. The findings indicate that the foreign exchange rate and loan delinquency have a negative, yet statistically significant ( $p=0.0003$ ) relationship. A beta coefficient of -2.01 means that a one unit increase in foreign exchange produces a 2.01 unit decrease on loan delinquency. This is because as the real exchange rate increases, the tea sector earns more from exports and they are able to repay loan borrowed, hence decrease in loan delinquency; and the vice versa is true. Other studies confirm the same findings of negative and significant relationships (Beck *et al.*, 2013; Bucur & Dragomirescu, 2014). Washington (2014) concluded on a positive though insignificant relationship between the two variables.

## 4.2 Diagnostic Tests

### 4.2.1 Stationarity/ Unit Root Test

In order to determine the model applicable for this research, the study conducted a stationarity test. Data is stationary when there is a constant pattern over time or inclination fluctuating around the average value (Gujarati & Porter, 2009). The study employed Augmented Dickey-Fuller (ADF), similar to Chebiwott (2010), to determine the existence of a unit root using the null hypothesis;  $H_0$  = Non-stationary/ unit root present. If the value of the ADF test statistic is less than Mackinnon critical value at 5 % significance level, the study rejected the null hypothesis, meaning the data is stationary, hence no unit root. From the unit root test, two variables (IR and CBR) were stationary at level (IR; t-statistic of -4.61 > critical value of -2.94, CBR; t-statistic of -3.41 > critical value of -2.94) and the other three

variables (LD, LIR and FER) were non-stationary at level or original values leading to first difference. The first difference of the three variables showed that they were integrated of order 1 and significant at 5 % in the ADF test. Other studies also had similar stationarity findings (Chebiwott, 2010; Washington, 2014). Chebiwott (2010) found all the variables (NSE 20 Share Index, Foreign exchange rate, Interest rate, money supply and Gross Domestic Product) were integrated of order 1, i.e.  $I(1)$ , except for inflation which was integrated of order zero,  $I(0)$ . This stationarity test where some variables are integrated of order zero  $I(0)$ , and other variables integrated of order 1  $I(1)$ , indicated the use of Autoregressive Distributed Lag (ARDL) model to estimate the extent of relationship between macroeconomic variables and loan delinquency in tea manufacturing companies managed by KTGA.

### 4.2.2 Multicollinearity Test

Multicollinearity indicates the existence of exact linear association among some or all explanatory variables in the regression model. It reduces the individual explanatory variables' predictive power because they share almost same information, hence highly correlated. (Theodoros, 2011). The study employed Karl Pearson's coefficient of correlation ( $r$ ) to determine presence or otherwise of multicollinearity. +1 indicates a perfect positive relationship, -1 a perfect negative relationship and 0 shows no correlation at all. 0.5 indicates no multicollinearity and those greater than 0.5 show degree of collinearity. Excess of 0.8 indicates serious multicollinearity (Bedru & Seid, 2005). Correlation coefficients showed no multicollinearity between the explanatory or independent variables since all the correlation coefficients ( $r$ ) were below 0.5, except for lending interest rate and Central Bank Rate where the correlation coefficient was above 0.5 ( $r=0.74$ ). To avoid multicollinearity, CBR was dropped at this point and therefore the model was run without a control variable.

### 4.2.3 Co-integration Test

According to Nkoro and Uko (2016), Cointegration is an econometric concept that explores the presence or otherwise of a long-run equilibrium amongst economic time series that converges over time. Existence of long run relationship means that the means and variances are constant and not depending on time. Bound Cointegration testing technique was used to determine existence or otherwise of cointegration.  $H_0$ : No cointegration. Decision Rule: If the Wald F-Statistic, which is the computed F-statistic is above the upper critical value, Reject  $H_0$ , meaning there is cointegration and therefore, long run relationships. If the Wald F-Statistic is between the lower and upper bound critical value, it is inconclusive. If the Wald F-Statistic is below the lower bound critical value, do not reject the  $H_0$ , hence there is no co-integration (Bahmani-Oskooee & Ng, 2002). Given the study had less than 100 observations, the critical values provided by Narayan (2007) were used.

In this study, the Wald F-Statistic was 5.20 above the upper critical value of 4.803, indicating existence of Cointegration and therefore long run relationships. Given the existence of Cointegration and hence long run relationships, ARDL model was found fit to run a long run model to determine the long run relationships between the explanatory and

dependent variables. ARDL Cointegration technique is preferred when dealing with variables that are integrated of different orders, 1(0), 1(1) (Nkoro & Uko, 2016).

#### 4.2.4 Determination of optimal Lag

According to Gujarati and Porter (2009), a lag is a lapse of time in responding to the dependence of a dependent variable on another explanatory variable. Determining the optimal lag helps to ensure normal error terms do not suffer from non-normality, autocorrelation and heteroscedasticity. For this study, the selection of optimal lag was based on the shortest lag of Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC). The model gave three lags with the lowest AIC and SIC which were employed in the study.

#### 4.2.5 Normality test

Histogram-normality test was done to check whether the error terms are normally distributed around a zero mean. Absence of this implies the estimates are BLUE but the study cannot assess their statistical reliability by classical test of significance. Jarque-Bera (JB) statistic was used with the following null hypothesis.  $H_0$ : Error term is normally distributed. Decision Rule: Reject  $H_0$  if p-value (probability) of JB statistic is less than significance level of 5%, otherwise, do not reject  $H_0$ . The probability (p-value) of JB was 0.55, which is greater than the 0.05 significance level, and thus fails to reject the null hypothesis and conclude that the residuals are normally distributed. Similar finds were concluded by a number of studies (Ahmad & Bashir, 2013; Chebiwott, 2010 (p= 0.7889); Washington, 2014). The errors were independently and identically distributed with zero mean and constant variance and therefore, the coefficient estimators were normally distributed with means equal to the corresponding coefficients and therefore the ARDL model fit for analysis.

#### 4.2.6 Heteroscedasticity test

Heteroscedasticity is a situation where the variance of each error term is not the same for all values of the independent variable (Bedru & Seid, 2005). Presence of this makes hypotheses testing unreliable since the variances and errors are underestimated. This study used Breusch-Pagan-Godfrey test statistic which is a chi-squared test to test for Heteroscedasticity.

$H_0$ : There is no Heteroscedasticity problem in the model. Decision Rule: Reject  $H_0$  if p-value is less than significance level of 5%. Otherwise, do not reject  $H_0$ . The p-value of the test statistic (p= 0.98), was greater than the significance level of 0.05 (5%), therefore, there was no heteroscedasticity. Similar finds were concluded by a number of studies (Ahmad & Bashir, 2013; Chebiwott, 2010; Ting *et al.*, 2015).

#### 4.2.7 Autocorrelation test

Autocorrelation is assumed that an independently distributed error term for a particular observation (or period) is not related to the error term of another observation (or period) i.e zero covariance, otherwise, the assumption of independence of error term will not hold (San, Yee, Sin, & Yi, 2015). According to Ting *et al.*, 2015, where autocorrelation exist, the parameters in the model may lead to misleading results on the significance of parameters in the

model. Breusch-Godfrey Serial Correlation LM Test was used to detect autocorrelation problem. The statistic is statistically more powerful than other statistics like Durbin-Watson's statistic.  $H_0$ : There is no autocorrelation problem in the model. Decision Rule: Reject  $H_0$  if p-value is less than significance level. The Breusch-Godfrey Serial Correlation LM Test showed a probability of the F-statistic (p= 0.38) greater than significance level of 0.05; therefore, there is no autocorrelation. Similar findings were concluded by a number of studies (Ahmad & Bashir, 2013; Chebiwott, 2010; Ting *et al.*, 2015; Washington, 2014). This therefore means that the significance of parameters in the model will be accurate and not misleading since an independently distributed error term for a particular observation (or period) is not related to the error term of another observation.

## 5. Conclusion

Non-performing loans are dangerous not only for the economy of one country but also for the whole world as we have seen the financial crisis created by these loans in East Asian countries, America and Sub-Saharan Africa, so there is the need of the era to identify the factors responsible for non-performing loans; as researchers believe that once we identify these factors then we can make policies to prevent any future happenings of these loans (Adebola, Wan Yusoff, & Dahalan, 2011). A huge volume of non-performing loans serve as preface to financial fragility. The purpose of this study was to investigate the relationship between lending interest, inflation and foreign exchange rates; and loan delinquency in the tea manufacturing companies managed by KTGA. Regression analyses depict negative relationships between lending interest rate, foreign exchange rate; and loan delinquency. Inflation rate has a positive relationship with loan delinquency. The p values ( 0.0025 for lending interest rate, 0.0034 for inflation rate and 0.0044 for foreign exchange rate), depicts statistically significant relationships between the three independent variables and loan delinquency as the dependent variable.

From the findings above, macro-economic environment is very critical for loan delinquency in the tea sector in Kenya. The above findings are an eye-opener to the regulators even as they regulate the market to ensure stability and growth of economy; to ensure the above macroeconomic variables are regulated to limit or avoid loan delinquency in the tea sector. For example, in order to minimize loan delinquency, the regulations can increase lending interest rate. Increased inflation rate translates to increased loan delinquency. The regulators should regulate the economy to curb inflation. These above aspects must be monitored by the regulators and they should take fiscal and monetary measures in a such a way that the macroeconomic variables may be recovered back and could not hurt the tea sector profitability and liquidity to a greater extend, affecting loan delinquency in the sector.

From the analyses, all the three explanatory variables are significant in influencing loan delinquency in the tea sector. However, lending interest rate has the greatest impact on loan delinquency. A unit increase in lending interest rate produces a 6.25 unit decrease in loan delinquency as per the results of the study. The policy makers can use this

information to adjust lending interest rate accordingly. Inflation rate comes second with a positive 0.26 unit change on loan delinquency. Foreign exchange produces a negative 0.22 unit change on loan delinquency in the tea sector. The Government should therefore regulate the three variables in order of coefficients given all depicts significant relationships.

Lending institutions can also lend more to the tea sector when foreign exchange rate is high because tea being a leading export earner, the tea manufacturing companies earn more from higher foreign exchange rate and are likely to repay their loans more. The above study was done for a period of ten years on quarterly time series. It was also based on three macroeconomic variables on Tea Sector. Other studies can be done for longer period and a different sector based on more economic variables. Besides macroeconomic forces, there are other factors contributing to loan delinquency in the tea sector, which can be ascertained in future research such as regulatory weaknesses, internal factors, corruption, mergers and acquisitions and institutional stability.

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