EFFECT OF MACROECONOMIC VARIABLES ON UNEMPLOYMENT IN KENYA

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ABSTRACT

Unemployment is a global challenge facing both the developed and developing economies. High levels of unemployment indicate that there are deficiencies in the labour market, rising poverty levels, low standards of living and increased social evils (World Bank, 1994). This study sought to investigate the effects of selected macroeconomic variables on unemployment in Kenya. The study was guided by four objectives; to establish the effect of GDP growth on unemployment, to find out the effect of inflation on unemployment, to investigate the effect of exchange rate on unemployment and to find out how interest rates affect unemployment in Kenya. The study adopted quantitative research design, taking into consideration 35 observations, annual data for the period 1984 to 2018. Secondary data used by the study was obtained from Central Bank of Kenya, Kenya National Bureau of Statistics, International Labour Organization and the World Bank. Data analysis was conducted using STATA and E-views data analysis tools and the findings presented using figures and tables. The analysis included diagnostic tests so as to avoid estimation of spurious relationships and possible biasness. A Cointegration test using the ARDL bounds test was conducted and a long run relationship was established. The Error Correction Model was adopted to estimate the short run model and a long run OLS model was also estimated. In the short run, the study established that only GDP and previous levels of unemployment have significant effect on unemployment. In the long run, GDP growth rate, exchange rate and commercial banks' lending rates were found to have significant influence on unemployment whereas inflation rate was found to be insignificant. The study thus recommended formulation and adoption of policies regarding GDP growth, exchange rates and commercial banks' lending rates that would reduce unemployment levels in Kenya. Further studies were recommended by the study as the coefficient of determination was not 100% and only four macroeconomic variables were studied.

Key Words: *GDP Growth, Inflation, Exchange Rate, Interest Rate, Unemployment*

INTRODUCTION

Unemployment is an issue of global concern that affects both the developed and underdeveloped economies. Unemployment refers to the situation in which one is out of work, wants, is seeking a job seriously and willing to take up an opportunity offered in two weeks' time (ILO). Unemployment rate on the other hand is the proportion of labour force that is not in employment. Government institutions measure unemployment in two ways; claimant count by counting the number of persons who claim unemployment benefits or through labour force surveys where the agencies go out and interview people (Mankiw & Mark, 2011). According to the Keynesian economists' unemployment arises due market failure while the Neo classical economists argue that unemployment is as a result of exogenous shocks into the labor market. Unemployment is undesired due to its consequences as it increases poverty levels, slows economic growth, and promotes crime and other social evils.

Kenya is one of the countries that adopted the SDGs and is working towards achieving the various set objectives of each goal by 2030.SDG 8 specifically has the role of reviewing and implementing the ILO's Global Labour Pact. The goal's progress was reviewed in 2017 and as at 2016, global unemployment in Kenya was at 5.7%. Unemployment rate among men was lower compared to that of women and unemployment rate among the youths was three times higher than the unemployment rate among adults.

Economic growth is the increase in a country's potential Gross Domestic Product (GDP) or national output. Economic growth can also be said to occur when there is an outward shift of the production frontier which results from raising production potential (Griffiths and Stuart, 1999).

Inflation refers to the persistent increase in general price levels. It includes the prices of various commodities rather than of one commodity (Hall, 2009). There are three major theories explaining the causes of inflation; cost-push inflation where increased cost of production causes inflation; demand-pull inflation which explains that inflation results from excess demand and monetarism which argues that inflation is a result of increased money supply in the economy (Anderton, 2008).

Interest rates are the costs of borrowing money and the gains on savings. The Central Bank of Kenya is responsible for regulating interest rates in Kenya. The interest rates categories released include the commercial banks interest rates and the CBK interest rates. Commercial banks' interest rates are weighted average monthly lending, deposit, overdraft and savings rate. The CBK interest rates comprise the Repo, Reverse Repo, Central Bank Rate (CBR), interbank rate and rate on government securities (CBK, 2018). CBR which is the rate at which CBK lends to commercial banks influences other interest rates since if CBK raises this rate, commercial banks borrow at high rates and in turn increase their lending rates to customers. CBR affects other interest rates indirectly.

Foreign exchange rate refers to the price of the domestic currency in relation to that of a foreign country. In Kenya the exchange rate is released daily by the Central Bank of Kenya so as to enable those buying or selling currencies know the value of their respective currencies. The exchange rate that is mostly used to gauge the performance of Kenya shilling is the US dollar to Kenya shilling (CBK, 2018).

Kenya has a flexible exchange rate regime whereby the markets forces and the economic conditions determine the changes in exchange rates and hence the monetary and fiscal policies are expected to support a stable exchange rate (Manyara, 2017).

Statement of the Problem

Unemployment in Kenya is very high.1.4 million Kenyans who are part the country's labour force were seeking employment opportunities according to the

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2015/16 Kenya Household Integrated Budget Survey (KHIBS). As at the time of the survey Kenya had a labour force of approximately 19.3 Million people. The working labour force according to the survey comprised; 63.2%employed full time, 13.9% seasonally while 9.5% were in part time jobs (KIBHS, 2015/2016).

Kenya's economy blue print is Vision 2030 that comprises three pillars; social political and economic pillar. The economic pillar aims at achieving an average annual GDP growth rate of 10 percent, (2008). To attain this rate, the country has to maintain an average annual unemployment rate of 4 percent, Mose (2014). If the government is to achieve this target it needs to formulate and implement relevant policies. To do this there is need to know which macroeconomic have the biggest impact on unemployment and hence this study.

Unemployment is an issue of concern to the policy makers not only in developing countries but also in the developed nations, Oniore *et al* (2015). This is because of its potential social and economic adverse effects on an economy. According to the work of Gyeke and Kyei (2011) unemployment is an economic evil due to its effect on the welfare of an economy, promotion of crime and other social evils.

Researchers have related unemployment to macroeconomic variables like inflation, GDP growth, interest rates and exchange rates. It is however not clear which of these has the biggest impact on unemployment in Kenya and hence this study. Aungrazeb (2013) in a study to determine macroeconomic variables affecting unemployment, establishes that GDP growth, inflation and population growth area significantly related to unemployment however does not specify the variable with the greatest impact. Tunah (2012) finds out that changes in real GDP, consumer price index and previous unemployment rates had significant impact on the

present unemployment rate however exchange rate had no significant effect on the same.

Objectives of the Study

The general objective of this study was to establish the effect of selected macroeconomic variables on unemployment in Kenya. The specific objectives were:-

- To establish the effect of GDP growth on unemployment in Kenya.
- To find out the effect of inflation on unemployment in Kenya.
- To investigate the effect of exchange rate on unemployment in Kenya.
- To find out how commercial banks' lending rate affects unemployment rate in Kenya.

LITERATURE REVIEW

Theoretical Literature Review

Okun's Law

Okun's law explains the inverse relationship between unemployment and the growth rate of an economy. It takes into account how unemployment rates in a country change with growth in a county's output. More specifically, the law relates unemployment gap, difference between actual and equilibrium unemployment to the output gap, difference between real GDP and its long run trend, Burda and Wyplosz (2013)

Okun's law indicates that heightened economic growth results to a decline in unemployment rates in a country.

Mose (2014) carried out a research in Kenya to establish the Okun's law coefficient in Kenya. The research employed co integration and error correction model as the observations were normally distributed and co integrated of order 1. To establish the relationship between economic growth rates and labour a Cobb Douglas function was employed. The study further estimated unemployment rates for the period 2012 to 2012 from the relationship established

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between the two Okun's law variables. For the period considered, 1992 to 1992 Okun's coefficient was found to be 0.12 and not the conventional 3.00. Further the unemployment rate would fall to 3.38% in 2017/8 from 9.2% in 2012 if the economy grew at the projected GDP growth rate. However, as at 2017 the estimated unemployment rate in Kenya was 7.0 % according to Kenya National Bureau of Statistics.

Phillips Curve

In 1958, A.W. Phillips conducted a published a comprehensive study for the United Kingdom about wage behavior for the period 1861 to 1957.The findings were summarized as Phillips curve which shows the inverse relationship between inflation and unemployment. When inflation rises, unemployment falls and when inflation falls, unemployment rises implying that we cannot attain low levels of inflation and low unemployment rate at the same time. The findings were accepted universally however, with different interpretations, Anderton (2008).

This tradeoff is a huge challenge to policy makers. Phillips curve which became an important tool in macroeconomic policy making calls for policy makers to settle for different levels combinations of unemployment and inflation. For instance, they could choose low inflation rates as long as the unemployment rate is acceptable and bearable for the economy.

Keynesian General Theory of Employment, Interest and Money

In 1936 when Keynes came up with the general theory of employment, interest and money, unemployment was considered the most serious economic issue at the time. This was due to the magnitude and extremity of the great depression. Neo-classical economists associated this with inelasticity in the labour market. However, Keynes argued that it is natural for workers to resists wage cuts and inflation could help reduce unemployment if only employees did not attempt to recompense price

increases with money wage increases (Anderton, 2008). Keynes thus concluded that the only solution to large numbers of unemployment is increase the overall demand since labour is 'derived' demand, where demand for goods and services increase then demand for labour increases resulting to new employment opportunities.

The Mundell-Fleming Model

This is an open economy model that was developed in the 1960s.The model was developed in order to expand the Closed Economy Keynesian IS-LM model and to analyze an economy's performance taking into consideration external shocks. Mundell adopted the IS-LM curve, however realized that the Keynesian model did not accommodate open economies that experienced exchange rate volatilities, currency shocks and capital flows.

This model shows that the success of macro policies in an economy is influenced significantly by exchange rates. In an economy that is not closed the real exchange rates influence levels of imports and exports and hence income. The current account of an economy comprises net exports which is the difference between exports and imports.

Conceptual Framework
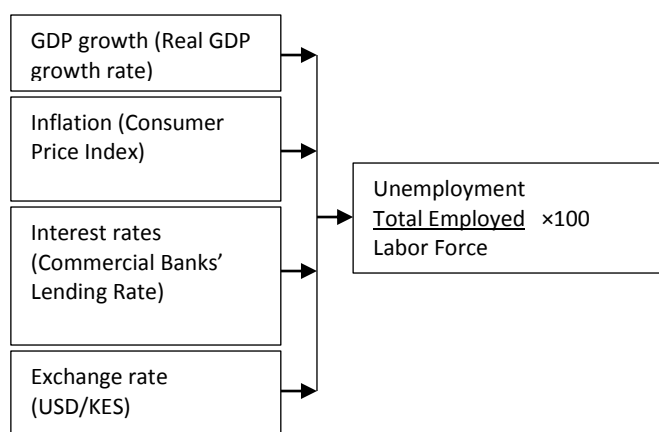
Independent Variables   Dependent Variable
Figure 2.1: Conceptual Framework
Source: Author (2019)

Empirical Literature Review

GDP growth rate and Unemployment rate

Aurangzeb, 2013 investigates the relationship between unemployment and Gross Domestic Product growth rate in Pakistan for the years 1987 to 2009. A significant positive relationship was established which is contrary to economic theory where there is an inverse relationship between GDP growth and unemployment. The study further explains the positive relationship with poverty being a contributing factor to this theory non complying relationship in Pakistan. The recommendation was that Pakistan ought to utilize the growth optimally so as to reduce unemployment rates when there is GDP growth. The findings of this study are in contrary to theory hence the need to carry out this study.

Inflation rate and Unemployment rate

An examination of the Phillips curve conducted for the new European States, Pallis, 2006, concluded that policies applied across the countries ought to take into consideration the effect on inflation and unemployment due to their indirect relationship. The period 1994 to 2004 was considered for 10 EU member states. Nonlinear squares method was used and analysis using E-Views. The study factored in three variables; employment rate, GDP price deflator and compensation per worker.

Interest rates and Unemployment rate

Bierens & Broes (1987) in a study to establish the relationship between unemployment and interest rates in the Netherlands indicated a granger casual relation between the two variables. Berument et al (2018) in a study to find out how various macroeconomic variables affect unemployment in Turkey found out that a direct relationship exists between unemployment and interest rate.

Exchange rate and unemployment rate

Tunah (2012) studied macroeconomic factors affecting unemployment in Turkey. Quarterly data was sampled from 2000 to 2008 and ADF, Phillip-Pheron, co integration and causality tests were conducted for analysis. From the analysis, real effective exchange rate was found not to have any significant effect on unemployment. This study will investigate whether there is a significant relationship between exchange rates and unemployment in Kenya.

METHODOLOGY

This study adopted diagnostic research design. Diagnostic or descriptive design describes the characteristics of a variable and its association with another or other variables under consideration. The study targeted the entire country, Kenya focusing on key macroeconomic indicators; unemployment rate as the dependent variable and real GDP growth, inflation rate, commercial banks weighted lending interest rate and KES /USD exchange rate, as the independent variables. The study relied on secondary data from various government published sources; Central Bank of Kenya and Kenya National Bureau of Statistics releases. International publications and reports from the World Bank and ILO were also referred to. Multiple regression analysis was used to establish the relationship between unemployment and the four macroeconomic variables. STATA and E-views analysis tools were used to analyze the data.

FINDINGS

Descriptive Statistics

Table 1 below presented the summary statistics of the variables employed by the study. Unemployment for the 35 years averaged 10.74 with the minimum rate being 10% and highest rate 12.17% in 2009. The high rate in 2009 could be explained by the economic strain experienced in the country due to the post-election violence that was experienced after 2007 general elections. GDP growth ranged from -0.799 to 8.40 percentage with a mean of 4.02%. Inflation rate was highest in 1993 at 45.42% and lowest in 1995 at 1.62% with an average of 11.04%. Exchange rate and Commercial Banks' Lending Rates averaged 62.22%

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and 18.83% respectively for the 35 years. Exchange rate had the highest standard deviation and this is explained by the large spread of its data set.

Table 1: Descriptive Statistics

	UE	GDP	INFR	ER	CBLR
Mean	10.73500	4.029225	11.03989	62.21659	18.82989
Median	10.42400	4.406217	9.640000	70.32622	16.55963
Maximum	12.17000	8.405699	45.42000	103.3739	36.24000
Minimum	10.00000	-0.799494	1.620000	14.41388	12.53167
Std. Dev.	0.698345	2.328152	8.734723	28.07910	6.470125
Skewness	0.826334	-0.399453	2.240208	-0.486338	1.305360
Kurtosis	2.158328	2.213643	8.690588	2.012178	3.585561
Jarque-Bera	5.016264	1.832554	76.49968	2.802755	10.43983
Probability	0.081420	0.400006	0.00000	0.246258	0.005408
Sum	375.7250	141.0229	386.3962	2177.581	659.0462
Sum Sq. Dev.	16.58131	184.2899	2594.043	26806.82	1423.326
Observations	35	35	35	35	35

Trend Analysis
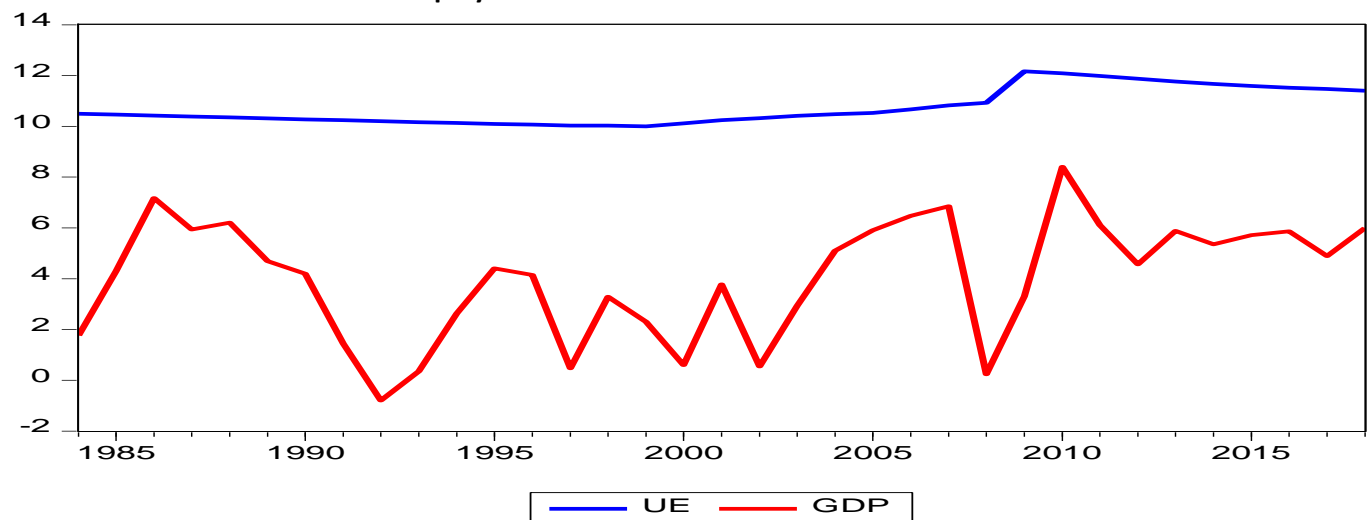
Gross Domestic Product and Unemployment

Figure 2: Trend Analysis for GDP and Unemployment

Various reforms in Kenya had resulted to sustained economic growth. The reforms were political, social and even structural even though poverty and unemployment remain as huge challenges to the economy, World Bank (2018). GDP rose gradually from the year 2002 to 2007 before a significant drop of the same in 2008 and 2009 due to the post-election political, social and economic instabilities. In 2012, there was a decline in the growth due to the uncertainties of the 2013 general elections and regime transition.

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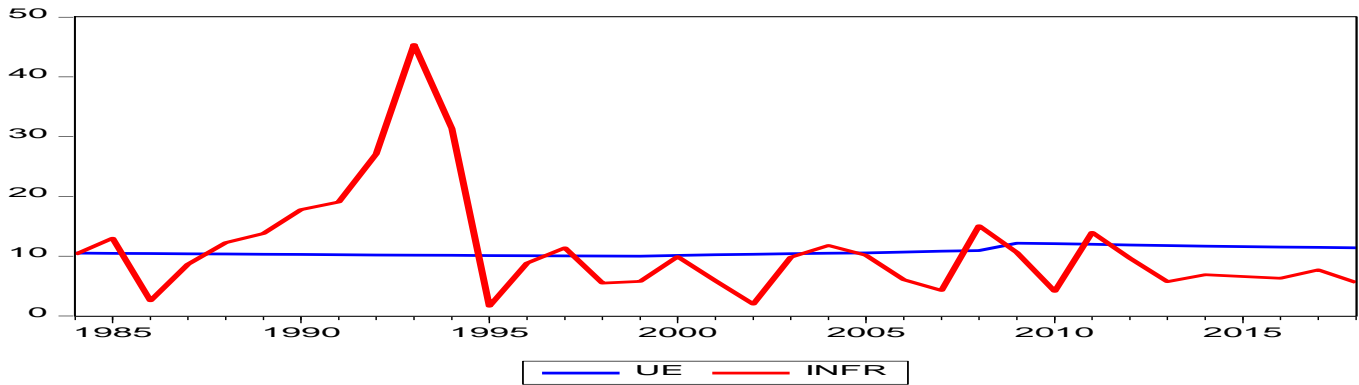
Inflation Rate and Unemployment

Figure 3: Trend Analysis for Inflation Rate and Unemployment Rate

Kenya's inflation rate had been experiencing fluctuations. The highest inflation rate was experienced in 1993 at 45.42% and this could be attributed to excess money supply, exchange rate depreciation, low aggregate demand and decline in investor confidence, Economic Survey (1994). The government adopted tight monetary policies, liberalized foreign exchange and trade regimes resulted to a fall in exchange rate in 1994. The early 2000s were characterized by significantly low inflation rate due to the monetary policy implementation, stabilization of the domestic currency, unfluctuating world oil prices and there was a rise in investor confidence due to the peaceful government transitions, Economic Survey (2003).

In 2008 the inflation rate rose to 15.1% due to the post-election violence experienced in the country in 2008 following the 2007 general elections. A reduction in food and oil prices resulted to a fall in inflation rate in the subsequent years, Economic Survey (2010).

Exchange Rate and Unemployment

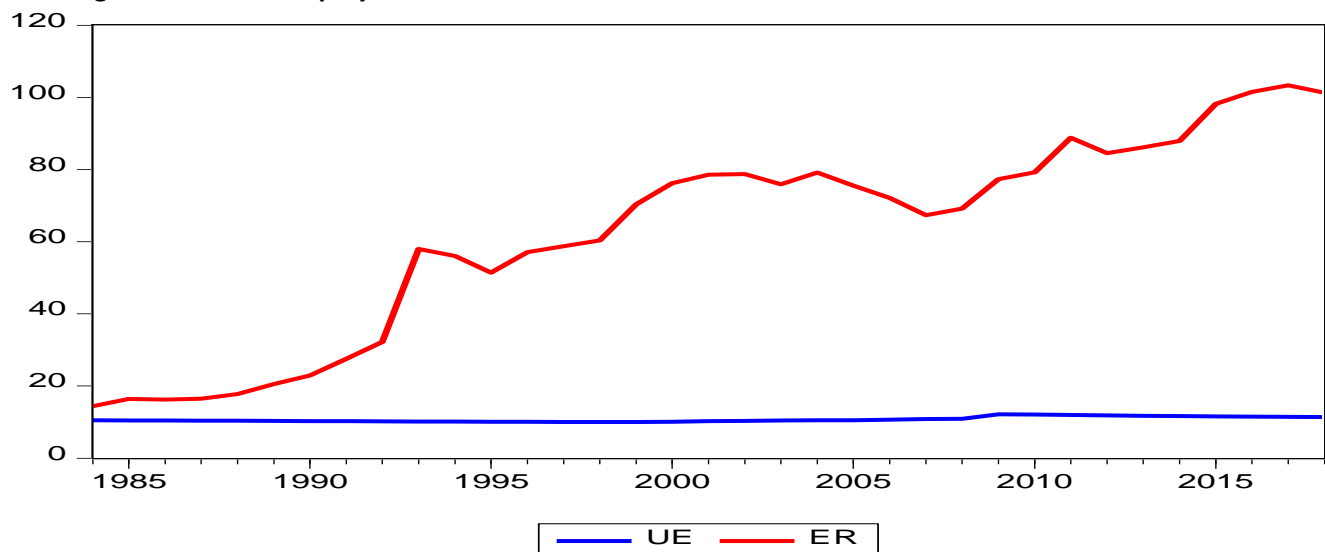**Figure 4: Trend Analysis for Exchange Rate and Unemployment Rate**

The figure above represented the trend of the USD/KES exchange rate from 1984 to 2018. The exchange rate was relatively constant from 1980 to 1993 for the period between Kenya since it was on a

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fixed exchange rate regime. In 1994, the government removed all restrictions on current account transactions and adopted all article VIII of the International Monetary Fund (IMF) articles of agreement. In 1995, the government also removed many of the current account controls. Kenya has continued to have a flexible exchange rate, which is considered to be better than the fixed exchange rate despite the continued rise, Njoki (2017).

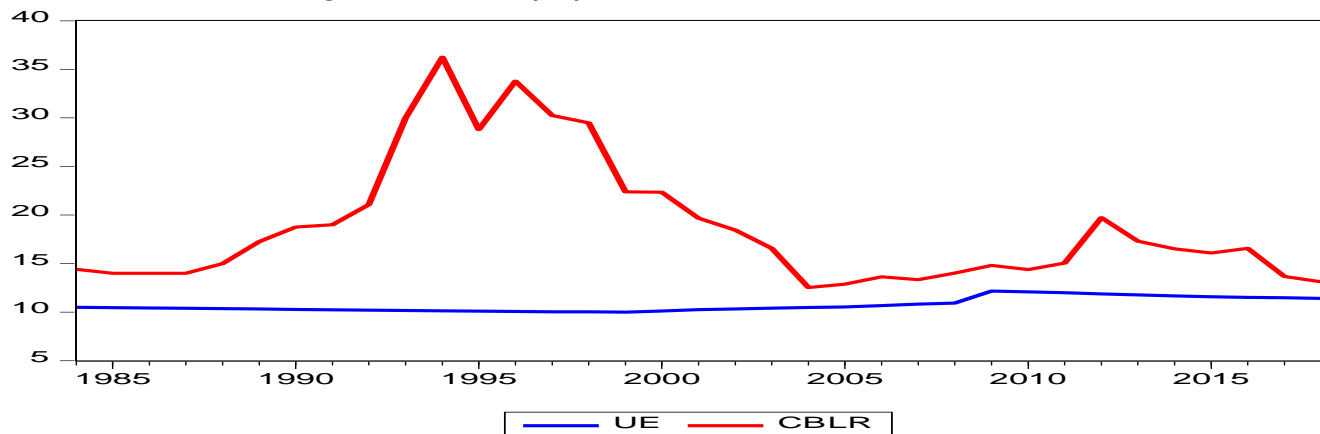**Commercial Banks Lending Rate and Unemployment**

Figure 5: Trend Analysis for Commercial Banks' Lending Rate and Unemployment Rate

Reviews in the interest rates had been done over time with the major changes having taken place in June 1984, January 1988, April and November 1989 and April 1990, Odhiambo (2009). The actual liberalization which had resulted to fluctuations in the rates of interest rates was in July 1991, Kariuki (1995). The average lending rate for the period 1984 to 2017 had been around 18% which was not encouraging to investors. The highest weighted commercial banks' lending rate was in 1994 at 36.24% with the lowest at 12.53 in 2004.

The lending rates were more flexible upwards but sticky downwards when responding to policy implementation, Were and Wambua (2013).

Correlation Analysis

Table 2: Correlation Analysis

	UE	GDP	INFR	ER	CBLR
UE	1.0000				
GDP	0.4925	1.0000			
INFR	-0.2606	-0.5032	1.0000		
ER	0.5854	0.1677	-0.2719	1.0000	
CBLR	-0.4943	-0.4713	0.3967	-0.0871	1.0000

Table 2 displayed the pairwise serial correlation. GDP growth rate and exchange rate were found to be positively correlated to unemployment while inflation rate and commercial banks' lending had negative correlation to unemployment.

Diagnostic Tests

Test for Stationarity

The study used a time series model therefore, the data had to be tested for stationarity. Unit root test was done using Augmented Dicky Fuller(ADF) test for

all the five variables considered by the study. The ARDL Cointegration test that, adopted by the study, works on the assumption that the variables are I (0) or I(1) hence the need to establish the order of integration for all the variables using unit root test, Belloumi, (n.d.)

Table 3: Unit Root Tests at Level

	ADF Test	1% Critical	5% Critical	10% Critical	p-value	
UE	-1.791763	-4.252879	-3.548490	-3.207094	0.6866	Non-Stationary
GDP	-3.378049	-4.262735	-3.552973	-3.209642	0.0718	Non-Stationary
INFR	-3.002561	-4.284580	-3.562882	-3.215267	0.1476	Non-Stationary
ER	-1.807599	-4.252879	-3.548490	-3.207094	0.6789	Non-Stationary
CBLR	-3.977064	-4.339330	-3.587527	-3.229230	0.0222	Stationary

H_0: The variable is not stationary

H_1: The variable is stationary

At level commercial banks' lending rate was found to be stationary. The p value, 0.0222 was less than 0.05 implying that we reject the null hypothesis that CBLR has a unit root and conclude that the data is stationary at level. Unemployment was found to be non-stationary at level using ADF test as illustrated above. The p value is 0.6866 which is greater than 0.05. The MacKinnon p-value was 0.1476 for inflation rate which is greater than 0.05 implying that the null hypothesis is not rejected and thus inflation rate had a unit root. ADF test was carried out on GDP growth and the p-value was 0.0718 as illustrated above and a conclusion drawn that GDP growth was not stationary at level. Exchange rate was also not stationary at level since it's p-value was 0.6789.

Table 4: Unit Root Tests at First Difference

	ADF Test	1% Critical	5% Critical	10% Critical	p-value	
UE	-5.001680	-4.262735	-3.552973	-3.209642	0.0016	Stationary
GDP	-4.633272	-4.296729	-3.568379	-3.218382	0.0045	Stationary
INFR	-6.778276	-4.273277	-3.557759	-3.212361	0.0000	Stationary
ER	-5.329605	-4.262735	-3.552973	-3.209642	0.0007	Stationary

H_0: The variable is not stationary

H_1: The variable is stationary

First difference of the variables that were not stationary at level was tested for stationarity. The table above showed the unit root test results at first difference.

The four variables, Unemployment, GDP, Inflation rate, Exchange rate and Commercial banks' lending rate were found to be stationary at first difference. The Mac-Kinnon p-values of the four variables at first difference were less than the critical value (5%).

H_0: Residuals are normally distributed
H_1: Residuals are not normally distributed

Skewness/Kurtosis tests for Normality

Skewness measures the asymmetry of a distribution about its mean while Kurtosis represents the height and sharpness of the central peak relative to that of a standard bell curve.

The hypothesis when testing for normality;

Significance level: 5% or 0.05
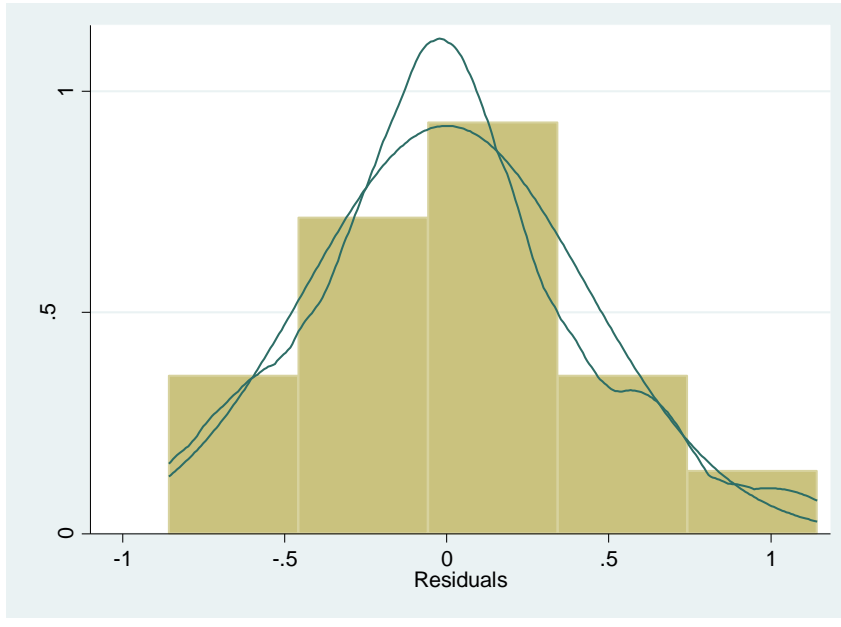
Series	Residuals
Sample	1984 - 2018
Observations	35
Mean	9.05e-10
Minimum	-.8577241
Maximum	1.14221
Std. Dev.	.4788649
Skewness	0.3248
Kurtosis	0.3513

Variable	Prob>chi2
MyResidual	0.3729

Figure 6: Test for Normality

The figure above showed a bell-shaped distribution of the residuals where the X-axis represents the residuals and the Y-axis is the density of the set. The histogram thus shows normality in the distribution of the residuals.

The skewness p-value, 0.3248, was greater than 0.05 implying that skewness was distributed normally (p-value of skewness>0.05). The kurtosis p-value, 0.3513, similarly showed that the kurtosis was asymptotically distributed. Chi (2), 0.3729, was greater than the critical value thus was significant and null hypothesis is not rejected at 5% significance level. Therefore, the residuals of the model exhibit a normal distribution confirming one of the OLS assumptions.

Multicollinearity

Multicollinearity problem arises when there is a high correlation between ant two independent variables. Presence of multicollinearity is detected using Variance Inflation Factor (VIF). VIF measures how much the variance of the estimated regression coefficients are inflated as compared to when independent variables are not related linearly.

If VIF β_i >5 multicollinearity exists

Table 5: Multicollinearity Test

Variable	VIF	1/VIF
GDP	1.52	0.657675
ER	1.47	0.678544
INFR	1.35	0.742693
CBLR	1.08	0.923402
Mean VIF	1.36	

From Table 5 above, for all coefficients of the variables under study, the VIF<5 hence multicollinearity does not exist in the model.

Heteroskedasticity

OLS assumes that the variance of the error term is constant. Heteroskedasticity is a systematic pattern where the variances of the error term are not constant. To establish whether the variances of the residuals in this study were constant, Breusch-Pagan / Cook-Weisberg test for heteroskedasticity, was used.

Hypothesis;

H_0: *Constant variance*

H_1: *Variance is not constant*

Significance level, α=5% or 0.05

Decision Rule: Fail to reject H_0 if p-value of chi2 is greater than α which means there is no heteroscedasticity.

Table 6: Breusch-Pagan / Cook-Weisberg Test for Heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	
chi2(1)	2.91
Prob > chi2	0.0879

The p-value of chi2 was greater than 0.05, therefore the null hypothesis was not rejected and a conclusion arrived at that the residuals had a constant variance.

Autocorrelation

One of the assumptions of Linear Regression is that the error terms of different periods are independent, that is, there is no autocorrelation. This study used the Breusch-Godfrey LM test to establish whether autocorrelation is present.

Hypothesis;

H_0: *No serial correlation*

H_1: *There is serial correlation*

Significance level, α=5% or 0.05

Decision Rule: Fail to reject H_0 if p-value of chi2 is greater than α which means there is no autocorrelation.

Table 7: Breusch-Pagan / Cook-Weisberg Test for Autocorrelation

Breusch-Godfrey LM test for autocorrelation			
lags(p)	Chi2	Df	Prob > chi2
1	0.573	1	0.4489

The p-value of the chi-squared was 0.4489 which was greater than α=0.05, the null hypothesis was not rejected which implied that there was no autocorrelation.

ARDL Bounds Test for Cointegration

The Cointegration test was developed by Pesarin and Shin (1999) and Pesaran et. Al (2001) so as to establish whether there exists a long run relationship between variables that are not stationary at level. In this study, four variables, unemployment rate, GDP growth, exchange rate and inflation rate were found to be stationary at first difference while commercial banks' lending rate was stationary at level. According to Harris and Sollis (2003), the ARDL is advantageous in that it does not require all variables to be integrated of the same order, it is applicable when dealing with small samples and it results to an unbiased long run model.

The optimal number of lags for this study was 1 since at lag one AIC and SC were lowest compared to at other lags as shown in the table 8 below. Therefore, the model having lag 1 was the best model.

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Table 8: Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-18.3840	NA	0.294727	1.612691	1.848432	1.686522
1	2.270063	32.76166*	0.0076186*	0.257237*	0.540126*	0.345834*
2	2.453930	0.278970	0.080892	0.313522	0.643559	0.416885
3	2.592453	0.200620	0.086270	0.372934	0.750119	0.491064
4	2.820634	0.314732	0.091579	0.426163	0.850496	0.559059
5	2.833940	0.017436	0.098845	0.494211	0.065692	0.641873
6	2.878970	0.055899	0.106680	0.560071	1.078700	0.722499

The ARDL (p,q) model specification is given as follows:

$$\Delta UE_t = \alpha_{01} + \phi_2 GDP_{t-i} + \phi_3 X_{t-i} + \phi_4 X_{t-i} + \varphi_5 X_{t-i} + \sum_{i=1}^{p} \beta i \Delta Y_{t-i} + \sum_{i=1}^{q} \beta_1 \Delta X_{t-i} + \sum_{i=1}^{q} \beta_2 \Delta X_{t-i} + \sum_{i=1}^{q} \beta_3 \Delta X_{t-i}$$

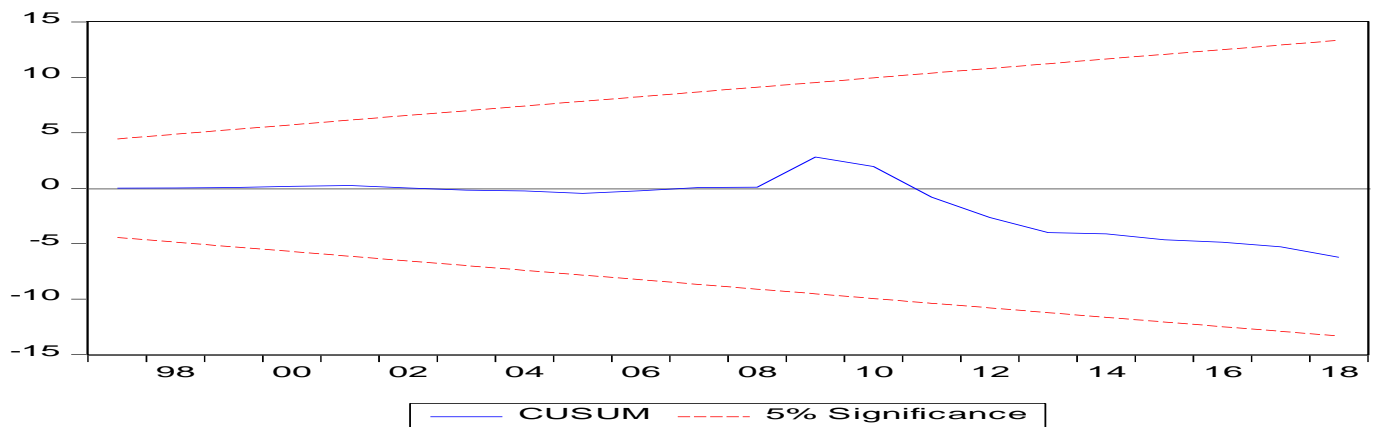$$+ \sum_{i=1}^{q} \beta_4 \Delta X_{t-i} + \varepsilon_{1t}$$

Figure 7: ARDL Model Stability Test

The blue line (CUSUM) lies within the bounds of 5% significance level thus the model is stable. A joint bounds test was conducted for the long run coefficients so as to establish whether they were statistically significant. The Wald test was used and the results were as shown by table below.

Table 9: Wald Bounds Test for Cointegration

Test Statistic	Value	Df	Probability
F-statistic	14.97927	(5, 23)	0.0000
Chi-square	74.89636	5	0.0000

$$H_o = UE_{1i} = GDP_{1i} = INFR_{3i} = ER_{4i} = CBLR_{5i} = 0 \quad \text{(No Cointegration)}$$
$$H_o \neq UE_{1i} \neq GDP_{1i} \neq INFR_{3i} \neq ER_{4i} \neq CBLR_{5i} \neq 0 \quad \text{(Cointegration exists)}$$

The statistical significance of the F value is not based on the probability but rather on the value itself. The critical values at 5% significance are determined with the first and second levels calculated on the assumption that ARDL model is integrated of order zero and one respectively, Pesaran et. Al (2003). The null hypothesis that there is no Cointegration is accepted if the F Statistic value is smaller than lower bound while it is rejected and a conclusion drawn that there is Cointegration if it is larger than the

upper bound. At 5% significance level with unrestricted intercept and unrestricted trend, the lower bound is 3.47 while the upper bound is 4.57. The F statistic, 14.97927, is greater than the upper

bound therefore the null hypothesis is rejected and a conclusion drawn that the model has a long run relationship.

Regression

Table 10: Short Run Model Table

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005638	0.003572	1.578532	0.1275
D(LNUE(-1))	0.391401	0.159522	2.453591	0.0218
D(LNGDP(-1))	-0.010635	0.002654	-4.007614	0.0005
D(LNINFR(-1))	0.003937	0.003834	1.026809	0.3147
D(LNER(-1))	-0.073444	0.048545	-1.512921	0.1434
D(LNCBLR(-1))	0.001738	0.027086	0.064162	0.9494
ECT(-1)	-0.009653	0.007838	-1.231662	0.0023
R-squared	0.225354	Mean dependent var		0.001399
Adjusted R-squared	0.173013	S.D. dependent var		0.012559
S.E. of regression	0.011421	Akaike info criterion		-6.034646
Sum squared resid	0.009653	Schwarz criterion		-5.855994
Log likelihood	247.3858	Hannan-Quinn criter.		-5.963019
F-statistic	4.305501	Durbin-Watson stat		2.139776
Prob(F-statistic)	0.001713			

Table above presented the results of the multiple regression model estimated from the annual data on the five variables for 35 years using VECM. From the findings, previous level of unemployment influenced unemployment level positively with the lnUE coefficient being 0.3941. The effect was significant as the P-Value is 0.0218 which was less than 0.05. Similarly, GDP significantly reduces unemployment

with a percentage growth in GDP reducing unemployment level by 0.0106 percentage units. The finding was consistent with theoretical expectation by Okun's Law which states that unemployment is inversely related to GDP growth rate

In the short run, inflation, exchange rates and commercial banks' lending rates were found not have a significant relationship with unemployment rate in Kenya.

Table 11: Short Run Model Correlation Test

F-statistic	3.119493	Prob. F(1,23)	0.0906
Obs*R-squared	3.702379	Prob. Chi-Square(1)	0.0543

$H_0: No\ serial\ correlation\ at\ up\ to\ 1\ lag$
$H_1: There\ is\ serial\ correlation\ at\ up\ to\ 1\ lag$

There was no evidence of serial correlation as the P-Value was greater than 0.05, therefore, the null hypothesis was not rejected.

Short Run Model Stability
The blue line (CUSUM) lied within the bounds of 5% significance level thus the short run model is stable as illustrated below.
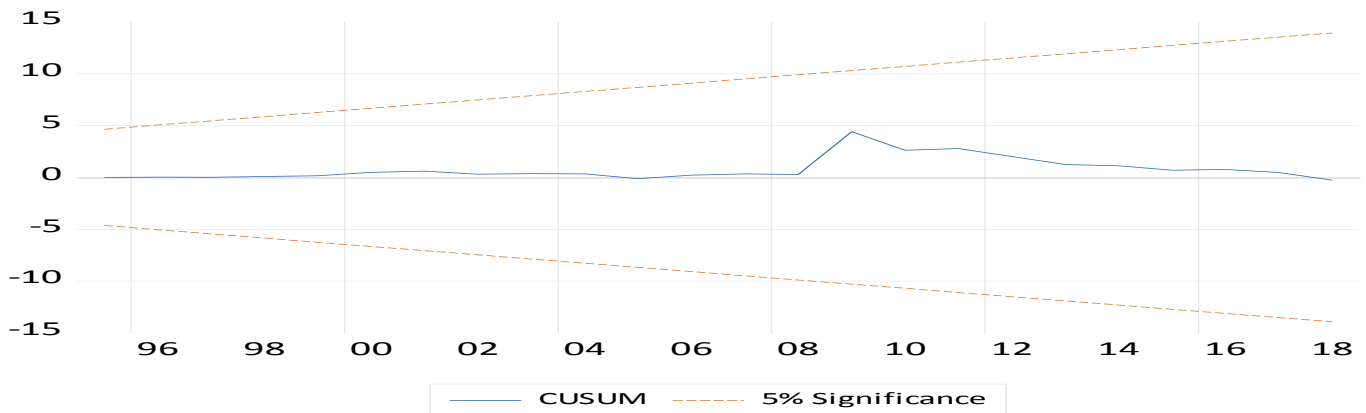
Figure 8: Short Run Model Stability Test

Table 12: Short Run Model Stability Table

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.05804	0.440889	22.81308	0.0000
GDP(-1)	0.098869	0.042494	2.326641	0.0272
INFR(-1)	0.016257	0.011135	1.459986	0.1550
ER(-1)	0.014077	0.003045	4.622396	0.0001
CBLR(-1)	-0.040897	0.014436	-2.833026	0.0083

The estimated long run model in equation form;

UE=10.0580+0.0989 GDP +0.0163 INFR +0.0141 ER-0.0409 CBLR + ε_t

The significance level chosen was 5% therefore null hypothesis is rejected if the p-value was less than 0.05.

The value 0.0989 implied that when GDP increases by one percentage unit unemployment rate increases by 0.0989 percentage units. This was not consistent with Okun's law which states that unemployment is inversely related to GDP growth rate. The p-value=0.0272 was less than 0.05 implying that GDP was significantly affects unemployment rate in Kenya. Mose (2019) concludes that Okun's law holds partially in Kenya with a 10 percent GDP growth resulting to a 1 percent reduction in unemployment which is lower than the expected 3 percent. Omolo (2010) arrives at a conclusion that even though economic growth is associated and is expected to create new opportunities for the unemployed it is not always the case.

The exchange rate coefficient, 0.0141, showed that if the exchange rate of US Dollar to Kenya Shilling rises by one percentage unit, unemployment rate rises on average by 0.0141 percentage units. This is consistent with expectation from theory that when exchange rate increases, unemployment is expected to increase. The p-value is 0.0001 therefore effect of exchange rate on unemployment in Kenya is statistically significant. Belke (2001) in a study to establish how foreign exchange volatility affects employment in Germany, found out that for the period 1973-1994, exchange rate volatility is negatively related to changes in employment. Setzer and Belke (2003) concludes that exchange rate volatility has significant positive effect on unemployment in Hungary, Poland, Ctech and Slovak republics. Ncwadi (2013) carried out a study in to establish how exchange rate volatility influences

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unemployment for 10 years starting 2000.The study that adopted co integration, VAR and GATCH models found out that exchange rate volatility had significant relation to unemployment in South Africa.

A percentage unit increase in commercial banks' lending rates decreases unemployment rate by an average of 0.0409 percentage units. This conclusion is not expected by theory since employment opportunities depend to a large extent on investments. Investments are dependent on interest rates, if interest rates go up, investments decline. Berument et al. (2018) conducted a research to establish how macroeconomics variables influence unemployment in Turkey for nine sectors for the period 1998 to 2004 using quarterly data. Vector Autoregressive Model (VAM) was run and a direct relationship between interest rates and unemployment existed. Nyahokwe and Ncwadi (2013 established that there exists a positive and significant long term relationship between the two variables implying that an increase in real interest rates increases unemployment in South Africa.

0.0163 is the coefficient of unemployment due to changes in inflation rate. A unit change in inflation rate increases unemployment by 0.0163 percentage units. This does not confirm the existence of the Phillips Curve in Kenya for the period 1984 to 2018. This effect is however not significant since the p-value,0.1550, is greater than 0.05. Folawewo and Adeboje (2017) examined the Phillips curve for West African countries and found out that the theory does not hold for the countries considered by the study. This was in support of previous findings in the same region (Elliot, 2015: Umoru &Anyiwe, 2013).

Table 13: Fitness of the Long Run Model

Number of obs	35
F (4, 30)	12.0200
Prob > F	0.0000
R-squared	0.6158
Adj R-squared	0.5646
Root MSE	0.4608

The coefficient of determination, R^2 of the estimated model is 0.6158 which was approximately 61.58%. The coefficient explains the variations in rate unemployment in Kenya that are explained by the four selected macroeconomic variables. Therefore, the model explains 61.58% changes in unemployment while the 38.42% is accounted for by other variables, represented by the error term, other than GDP growth, inflation rate, exchange rate and commercial banks' lending rates. A significant F-Statistics, with a P-Value less than 5%, is also used to evaluate the estimated model's fitness. The P-Value of this study's model is 0.0000 which is less than 5% implying that the model is significant as one or more of the independent variables influence the dependent variable.

CONCLUSION

The general objective of the study was to establish the effect of macroeconomic variables on unemployment in Kenya. From the findings the selected macroeconomic variables were found to significantly influence unemployment.

Based on objective one, the study concluded that GDP growth has a significant inverse relationship with unemployment rate in the short run while in the long run the relationship is positive. In the short run and long run, GDP growth results to decrease and in unemployment rate respectively.

Based on objective two, inflation does that significant influence on unemployment rate in Kenya both in the long run and in the short run. Theory postulated that

the relationship between inflation and unemployment is negative but the study established positive relationships.

Based on objective three, exchange rate does not influence unemployment significantly in the short run, however, it had a statistically significant long run positive relationship with unemployment rate in Kenya.

Based on objective four, Commercial banks' lending rates have a significant inverse long run relationship with unemployment but does not influence it significantly in the short run.

RECOMMENDATIONS

GDP growth significantly reduces unemployment rate in Kenya in the short run. From the findings it is evident that GDP growth in Kenya does not necessary result to reduced rates of unemployment in the long run. It is important that optimal levels of GDP growth that will reduce unemployment in the short run be established.

Exchange rate significantly influences unemployment; a positive relationship exists such that currency depreciation makes exports cheaper to the international market and imports expensive so that locals buy less imported goods. The demand for domestically produced goods influences the level of unemployment in a country. Policies and efforts towards ensuring exports growth through monitoring of KES/USD should be employed.

Commercial banks' lending rate has a significant long run inverse effect on unemployment. Policy makers should come up with investment strategies for borrowers that will result to employment opportunities.

Inflation increases unemployment rate in Kenya, however since the effect is not significant, optimal level that would significantly reduce unemployment should be arrived at.

Areas for Further Research

This study established effect of macroeconomic variables on unemployment in Kenya using OLS.A different model can be adopted so as to support the findings of the study.

Further study can be done on the study so as to establish the reason behind the insignificant GDP and unemployment relationship in the long run whereas the short run relationship is statistically significant.

More macroeconomics variables can be included so as to expand the study. Some of these variables include; population, broad money supply, foreign direct investments, oil prices among others.

The study covered only thirty-five years. A longer time span could be covered by other researchers.

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