Strathmore
UNIVERSITY

THE IMPACT OF INFLATION AND UNEMPLOYMENT ON ECONOMIC GROWTH IN KENYA

Maina Nicole Gachoki

099625

Submitted in partial fulfillment of the requirements for the Degree of Bachelor of Business Science in Financial Economics at Strathmore University

Strathmore Institute of Mathematical Sciences

Strathmore University

Nairobi, Kenya

February, 2021

DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

MAINA NICOLE GACHOKI ..... [*Name of Candidate*]

..... [*Signature*]

10/02/2021 ..... [*Date*]

This Research Project has been submitted for examination with my approval as the Supervisor.

GILLIAN KIMUNDI ..... [*Name of Supervisor*]

..... [*Signature*]

10th Feb 2021 ..... [*Date*]

Strathmore Institute of Mathematical Sciences

Strathmore University

Contents

Abstract

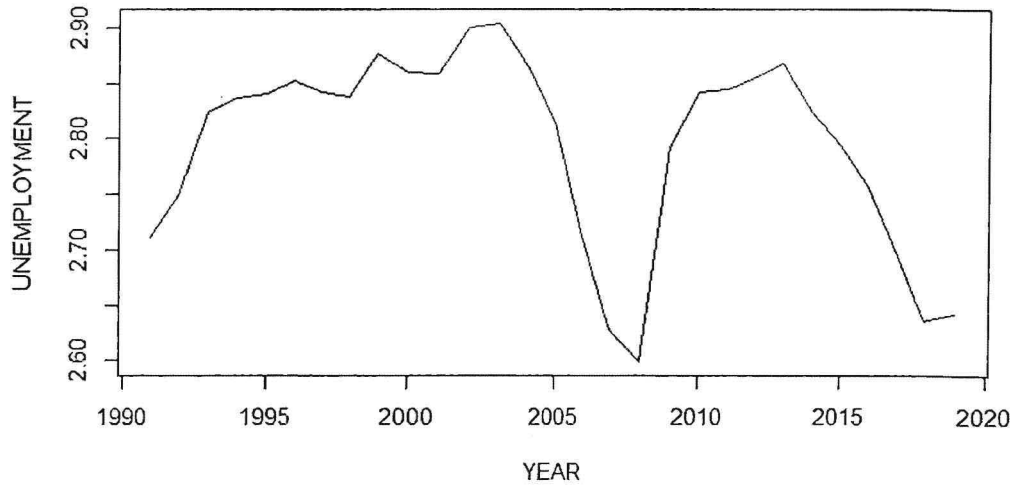
The main objectives of this study include; to determine the feedback effects between inflation, unemployment, and the growth of the economy in Kenya and to determine whether there is a long-run relationship between inflation, unemployment, and growth in the economy in Kenya. The target population for this study is the performance of inflation and unemployment in Kenya from the year 1960 to 2019. Population of this data is annual secondary data from the World Bank. The study adopted unit root test to test for stationarity whereby some variables were stationary at first difference and others at second difference. The Johansen cointegration test suggests that there are two cointegrating equations in this model. Vector Error Correction Model is used to estimate the short run and long effects. According to the results, GDP per capita growth does not seem to have a direct long run relationship with unemployment and neither does unemployment have a direct long run relationship with GDP per capita growth. The impulse response graphs display the main macroeconomic variables in the study i.e.: inflation, GDP per capita growth and unemployment response to a positive shock.

Chapter 1: Introduction

1.1 Background

To date, the biggest hurdle facing Kenyan economic growth has been the high rates of unemployment caused by political instability and high rates of corruption. Among the youth in the country a large proportion are encountering joblessness as compared to the rest of the population (Pollin et al, 2007). The unemployment rate of the youth was approximately 25% in the year 2005/6 while the general unemployment rate in the country was 12.7% which is half of the youth. There was a reduction of the unemployment rate by 15.8% 13.1% among the age of 15-19 and 20-24 respectively. The total unemployment rate reduced by 8.6%. Between the rural and urban areas, the rate of unemployment varies significantly. The youth unemployment seemed to dominate unlike that of the working-age population. For instance, in 2009, the overall unemployment rate was about 11.0% in the urban areas relative to youth unemployment rate of 19.1% (Brown 2015).

According to the World Bank, Kenya has among the highest unemployment rates. As compared to its neighboring countries (Tanzania and Uganda) having a rate of unemployment of 6%. One out of six Kenyan youth is unemployed, a ratio that is almost triple Kenya's two neighbors. 832,900 new job opportunities were created in 2016 whereby 90% was in the informal sector while 10% in the modern sector according to the economic survey. Employment opportunities in the modern sector dropped drastically by a third in 2016, compared to the previous year.



The rate of unemployment is a measurement of labor force percentage that is actively looking for job opportunities but are jobless and available for employment. Unemployment data is available yearly, whereby it is updated every month of December of each subsequent year having an average of 2.84%. In 2019, the unemployment rate increased by 0.01% i.e.; from 2.63% to 2.64%. The highest rate of unemployment was in 2003 which was at 2.9% whereas the lowest was in 2008 at 2.6%. Total population as of 2018 December was at 47.8 million and the earnings per month totaled to 591.84 USD as of 2018 June. As of December 2019, the labor force participation rate in the country increased to 74.70%. The rate of unemployment was at an all-time high in 2003. This was due to a peaceful hand over power which informed political stability. Many investors pitched their organizations in the country which in turn created formal and informal jobs for millions of Kenyans across the country. Unemployment declined the lowest in 2008 because of political instability. Many investors relocated abroad while others closed down during the unrest. So many people, the majority of the working class were displaced to move to different regions.

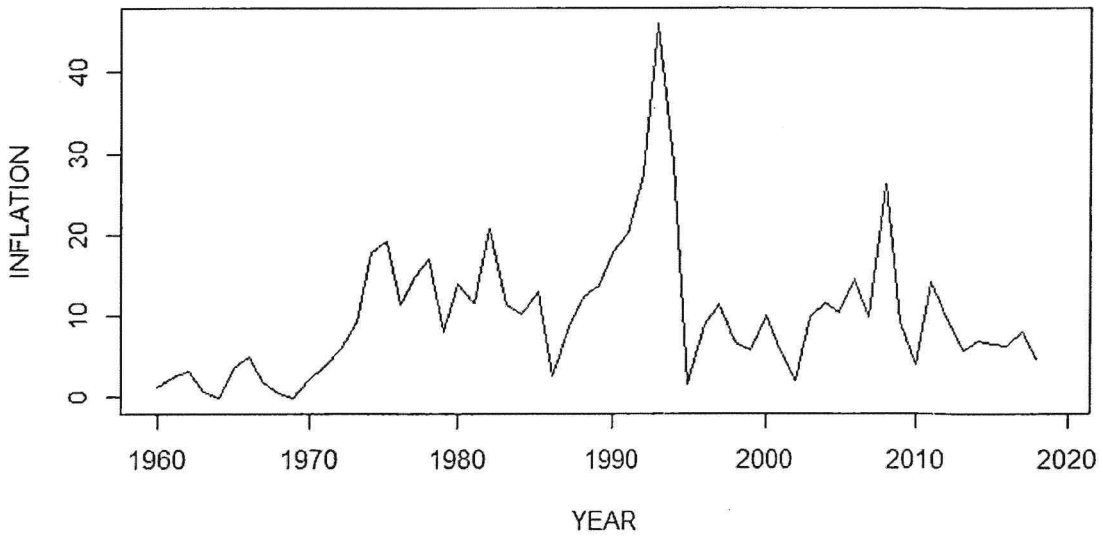
According to Meyer (2010), the country has experienced inflation imbalance from 1970 to 2013. According to the World Bank, inflation rate is the consumer price index. Refers to the yearly increment of services and goods cost purchased in the economy by

consumers. Therefore, the rate of inflation measures the progressions over a given period the purchasers cost or the GDP deflator which considers the cost of goods and services produces in the country. The consumer price index estimates the cost of living among the people in the nation.

Davis (2012), inflation is the general rise in prices as opposed to relative changes in the price of services and goods.In economics, there are various abnormalities depending on the level of development that are tied to different nations and regions. In these different regions and nations inflation can be attributed by factors such as excess demand in public expenditure, labor market changes, cost changes and oil prices increases.

According to the Economic survey, low inflation rates were experienced in Kenya whereby the growth of the economy was relatively stable till the inflation rate rose to 16.3% in 1974. Various factors attributed to the rise of inflation which included oil crisis, poor rainfall and the global world recession. As a consequence, the inflation rate drastically rose and among the industrial countries faced a recession. To curb this effect, the government had to implement some policies that would control the inflation rate. Government intervention was evident whereby there was a rise the taxation of petroleum goods, import duty and sales tax. This would in turn reduce the consumption of the related goods. Atkinson and Micklewright (2011) assert that the year 2002 had an inflation of 2% which was lowest rate of inflation in the 2000s. This was as a result of the monetary policy that was implemented, stability of the shilling, stability of the prices of oil, food prices being low, demand of imports reducing and investor confidence in the country in light of the democratic and peaceful transition of the government takeover (Neumark & Wascher, 2005). The post-election violence attributed to the increased inflation rate in 2008 which was at 15.1%. This was characterized by the rise in the exchange rates as well as the rise the prices of food in the country. Between 2011 and 2012, there was a reduction in the rate of inflation that was as a result of heavy rainfall received in the country, fall in the oil prices and implementation of the monetary policy. According to the World Bank Report (2013), electricity prices decreased as a result of the increased rainfall that was experienced. The Central Bank of Kenya increased its rate to 18% from 6% in 2011 so as counter the situation. Inflation in Kenya is measured through various methods which include; using the Gross Domestic Price deflator,

Consumer Price Index (CPI) or the Wholesale Price Index (WPI). Spotting inflation in the economy is an easy task however, the challenge comes about when choosing the method which is influenced by the information available (Lilien, 2017). In 1961, CPI was adapted (Brown, 2015).



In 1993, the economy was beset by severe problems of drought and excessive money supply, which led to high inflation. The combined impact severely affected the living standards of ordinary Kenyans. The real GDP growth rate recorded was 0.4%. This scenario was the result of a prolonged drought since 1991, low effective demand, and foreign exchange shortage during the first half of the year, and this led to a high inflation rate of 45.8% (the Republic of Kenya, 1994).

Because of this extraordinary rise in inflation, the government was forced to introduce significant economic reforms to be able to boost economic activities including; the abolition of licensing imports, export retention schemes were introduced and price controls were removed (the Republic of Kenya, 1994). The inflation rate dropped to 29% after rising rapidly to 45.8% in 1993. This was as a result of the shilling depreciating against major currencies, favorable weather conditions that prevailed in the year, and the measures pursued by the monetary authorities to contain expansion in

domestic supply of money and budget deficits (the Republic of Kenya, 1995). The continued pursuit of tight monetary policy measures by the central monetary authorities and the lowering of VAT from a rate of 18% to 15% in the 1995/96 budget resulted in a continued decline in inflationary pressures. The inflation rate fell to a single-digit level of 0.8% (the Republic of Kenya, 1996).

The inflation rate was at 4.7% in the year 2018. Kenya's inflation rate in the recent years has fluctuated substantially, whereby from 1999 - 2018 it has increased ending at 4.7% in 2018.

As of May 2020, the annual inflation rate dropped to 5.47% from 5.62%. Prices decreased mainly for food and beverages, transport, restaurants, hotels, miscellaneous goods and services and social protection.

1.2 Problem Statement

The economy of Kenya is buckling as a result of weak economic policies. Recent Growth Domestic Product estimates shows that the growth of the economy in the last decade has been declining steadily, whereby in the year 2019 it was projected to be 5.6% from 6.2%. The major factor in this drop is rising inflation. Over the recent months, there has been a steady rise in the rate of inflation. In history, Kenya for the first time has purchased more commodities from countries in Africa as compared to what it has sold to the continent at large thus creating an unprecedented trade deficit.

This situation has forced Kenya just like Somalia, to be dependent on the diaspora remittances to be its largest source of the dollar so as to sustain itself (Brown 2015). Another major problem facing the country is Unemployment. It's hard to tell exactly how many people are unemployed in Kenya. 78% of the Kenyan population is under 35 years of age. Among the Kenyan population, 800,000 youth seek for employment opportunities annually however the economy is not able to provide the job opportunities, both formal and informal (Brown 2015). An estimated 70% of young people are jobless. Kenya may experience stagflation if the economic policies existing do not change whereby there shall be high inflation, unemployment and low growth. With these problems in mind, this paper intends to strike a balance and provide readily available

solutions to the Kenyan hurting economy. Hence, finding the correlation between inflation, unemployment, and economic growth in Kenya.

1.3 Research Questions

1. What are the feedback effects between inflation, unemployment, and growth of the economy in the country?
2. Is there a long-run relationship between inflation, unemployment, and growth of the economy in the country?

1.4 Research Objective

1. To determine the feedback effects between inflation, unemployment, and the growth of the economy in Kenya.
2. To determine whether there is a long-run relationship between inflation, unemployment, and growth in the economy in Kenya.

1.5 Significance of the research

This study intends to benefit the government to come up with favorable economic policies, business investors, various stakeholders, and economists. Future researchers will also benefit from the research as they could use it as a source to further their research.

Chapter 2: Literature review

2.1 Theoretical literature review

2.1.1 Keynesian Theory

Keynesian economics states that the demand should be increased by the government to boost growth (Pollin, 20017). Keynesians argued that in every economy, the major driving force is the demand of the consumer. Thus, the Keynesian theory supports the expansionary fiscal policy. The main tools for Keynesian theories include unemployment benefits, education and spending on infrastructure by the government. One disadvantage that comes about with the Keynesian theory, is that when it is overdone, inflation increases. Philip (1958) argues that the Keynesian analysis of inflation is based on the fluctuations in aggregate supply and effective demand. If investment hikes, the consequence is a rise in effective demand but not a rise in prices. However, there will be an increase in production until full employment is reached. Beyond the level of full employment, any expansion in total demand in terms of money will cause prices to rise and hence inflation will occur.

According to Keynesian theory, if there exists underemployment an expansion in the money increase in output, aggregate demand and employment (Pollin, 2017). As from depression, when there is an increase in the money supply, output at first rises proportionately. However, employment and aggregate demand output increase, returns start to diminish and a given bottleneck appears and prices rise. This process continues until the full employment level is reached. In the year 1958, Keynes carried out a study of the statistical relationship between unemployment and wage rate. Phillips (1958) also analyzed this relationship and found that if inflation rate is high, it results to unemployment being low, thus positively affects growth. The study found out that wage, inflation and unemployment in the United Kingdom were inversely related over a hundred-year period. This relationship was strong and relatively stable. However, there have been arguments that the Phillips curve over time does not remain stable and relates only to the short run. It shifts with changes in expectation of inflation in the long run hence there is no tradeoff between inflation and unemployment. This stable tradeoff between unemployment and inflation was shattered in the late 1960s and early 1970s whereby the attack took the form of the natural rate hypothesis of Friedman and Phelps.

According to the study done by Friedman and Phelps (1965), the concept of nominal variables, for instance, inflation or money supply, could affect real variables permanently, like unemployment or output, was not necessary. Real forces in the long run determine the behavior of real variables.

Keynesian macroeconomics argues that the solution to a recession is an expansionary fiscal policy that shifts the aggregate demand curve to the right. The other side of Keynesian policy occurs when the economy is operating above potential GDP (Friedman and Phelps, 1965). The Keynesian response would be a contractionary fiscal policy that shifts aggregate demand to the left. The contractionary fiscal policy consists of tax increases or cuts in government spending designed to decrease aggregate demand and reduce inflationary pressures. The expansionary fiscal policy consists of tax cuts or increases in government spending designed to stimulate aggregate demand and move the economy out of recession (Philip 1958).

2.1.2 Neoclassical Theory

Past studies done on the implication of supply in the macro economy, the authors referred to the work of a famous French economist called Jean-Baptiste Say. According to Meyer (2010), Say's Law applies that with supply demand arises. It is very evident that Say did not invent this law since it distorts his convictions, however it is useful in the present day.

The instincts behind Say's Law, in Meyer's words, is that when services and goods are produced and sold, an income is generated which is obtained by somebody who could be an employee, an employer, or people who are employees, and employers at firms that supply inputs along the chain of production. The forces of demand and supply in unitary markets will result in rising or falling of prices. This means that every sale made is an income to somebody else, hence, according to Say's Law "in value created by supply must be reflected equally in demand in the same economy (Meyer 2010)". A number of 19th century authors which included Jean-Baptiste Say, and Adam Smith, referred to modern economists or classical economists, who borrowed this perception on the advantages of supply for recognizing the size of the market were referred to as neoclassical economists.

Certainly, regardless of whether supply consistently makes an equivalent measure of total demand, the economy could even still experience circumstances whereby few firms acquire benefits while others firms endure misfortunes. Be as it may, a recession isn't where disappointments of businesses are balanced by a counterbalancing number of achievements. Card and Krueger (2015) believe that "A recession is a circumstance where the economy at large is shriveling, business fails, thus numerous associations enduring immense misfortunes bringing about retrenchment of employees. Modern economists however argue that "The idea represented by Say's Law which states that where there is supply demand is inevitable applies in the long run. As time goes by over the years, and the power of productiveness in an economy to supply services and goods soars, total demand in the economy increases at exactly the same pace. But, over a shorter time span, a few months or years, where as a whole firms lack demand of their products in the market, depressions or even recessions will occur.

2.1.3 Solow's Model

Atkison and Micklewright (2011) explain that "Growth comes from additional labor inputs, capital, new technology and new ideas". From 2000, almost thirty developing countries have improved the standard of living by 6%annually. Developing countries are now at the center and the pillar holding the global economy, with about two-thirds of global growth. The governments that have been stable provide essential infrastructure and services, pursue prudent economic policies, and take a long-term perspective (Atkison & Micklewright, 2011). These countries prey on the opportunities given by markets globally and have a very vibrant and competitive private sector.

The Solow model holds that a sustained rise in investments in capital will definitely expand the rate of growth slightly. This is due to the ratio of capital to labor will go up. However, the two authors (Atkison and Micklewright) pointed out that the marginal product of additional units of capital may decrease if there is diminishing returns and thus an economy goes back to a long-term growth path, with real GDP expanding simultaneously as growth of the workforce and a factor to reflect improving

productivity. A straight growth path is achieved when output, capital, and labor are all growing at the same rate, that means the output per worker and capital per worker are constant. Ryan (2002), examines that "Neo-classical economists believe that to raise the trend rate of growth requires an increase in the labor supply, a higher level of productivity of labor and capital. Technological advancement differs between countries; hence this explains much of the variation in growth rates that we see. Therefore, the Solow Model features the idea of catch-up growth when a poorer country is catching up with a richer country often because of a higher marginal rate of return on invested capital in faster-growing countries. The Solow model predicts some convergence of living standards measured by per capita incomes but the extent of catch up in living standards is questioned.

2.1.4 Okun's Law

According to the study done by Fashioyin and Tiraboschi (2012), they summarize Okun's law as a decreased structure connection between recurrent unemployment and output". It tends to answer the question of how much a nation's output is lost when unemployment surpasses its characteristic or pattern rate. The relationship gives a connection between the work and products advertised over the business cycle and is frequently viewed as a key experimental normality. Fashioyin and Tiraboschi (2012) believe that "It is a centerpiece of numerous macroeconomic models, where the total supply function is obtained from merging OL with the Phillips curve which further connects to policy trade-offs. The relationship additionally bears suggestions for macroeconomic approach: it records what pace of development prompts a decrease in unemployment; also, it shows that the adequacy of disinflation strategy relies upon the responsiveness of unemployment on the pace of output development. One normal and convincing analysis of Okun's relationship however is the supposition of linearity. Numerous studies rather recommend that the relationship is described by nonlinearities and asymmetries. Additionally, it might influence other perceived monetary connections, for example, the cost and pay Phillips bends (Fashioyin and Tiraboschi 2012).

2.1.5 The Quality Theory of Money

In the study done by Fredman (2008), the author defines quantity theory of money as the general price level of services and goods is proportional to the supply of money in an economy. According to the theory, price level doubles in the same proportion as the amount of money in the economy doubles.

Thus, the consumer pays double the amount for the same quantity of services and goods. The author observes that when price levels increase, the inflation level will also go up.

We can conclude therefore, that inflation is an estimate of the rate of prices of services and goods going up in an economy. Baro and Gordon (2003), in their study of the quality theory of money found out that "the general price level of services and goods is proportional to the supply of money in an economy. According to Christiano, "although most modern economists are still very skeptical about the basic pillars of the quantity theory of money, they challenge the norm that economic policies that are put in place to affect the supply of money in the economy are still the most effective and efficient way to address economic growth (Christaino et al, 1998)". He examines that "the forces that influence commodities are the same forces that influence money when it comes to demand and supply, and when money supply rises in the economy its marginal value falls".

According to Mishkin (2004) the amount of money in circulation has an impact on the economy of a country. Hence, when the supply of money is altered slightly, it will result in a large price levels change or a large change in the supply of services and goods in the market. According to Sine (2010), he observes that when the money supply is altered in the economy all other activities will be altered as well because money supply is the pillar that holds all other forces in the market, therefore governments stakeholders are advised to come up with policies to regulate the supply of money in the market so as to strengthen the economic growth.

2.1.6 Philip's Curve

To sum it up, this theory is of the school of thought that whenever there is progress in the economy, inflation is inevitable. And once inflation kicks in, there shall be more jobs and less unemployment in the economy. That is to say, there is a prediction when it

comes to unemployment change in the economy whereby the inflation will result in a downward slope. When inflation goes up unemployment will automatically fall, and vice versa. But if the energy is channeled on decreasing unemployment inflation will go up (Phelps, 2007). Hoover (2008), in his book *'The Concise Encyclopedia of Economics'* describes stagflation as occurring when the growth in the economy is stagnant, the price inflation is high and the rate of unemployment is high. This is contrary to the theory behind the Phillips curve. When the central bank increases inflation to solve the unemployment problem, the Phillips curve along the short run shifts, when this happens, workers will adapt to the new normal and consumer expectations will change forcing them to adjust, and there will be an outward shift in the Phillips curve in the long run. This is especially thought to be the case around the natural rate of unemployment or NAIRU (Non Accelerating Inflation Rate of Unemployment), which basically represents the normal rate of frictional and institutional unemployment in the country. So when there is stagflation, employees may begin to soberly expect an increase in the inflation rate.

2.2 Empirical Literature

Unemployment is described as an challenge in the economy to the country as well as a socio-political problem Christaino et al (2009). Lack of a job can result into the wastage of human skills, which may lead to various crimes such as robbery, theft, terrorism, mental illness like depression and in most cases death as a result of murder, (Muth, 2011). In developed as well as developing countries, unemployment in the world is continuing to surge. Statistics indicate that in 2014, over 201 million people were unemployed globally, thus 31 million more than people before the 2007 financial crisis were unemployed (Sherman & Sherman, 2016). According to Phelps, (2017) the United States hit a record high of 9.6% rate of unemployment in 2010. This however declined to the lowest of 5.9% in 2014. Europe was at 11.9% unemployment rate in 2013. Greece experienced a 27.5% unemployment rate in 2013. In 2014 about 5.9% of the total labor force was unemployed with wide variations in different countries (Sherman & Sherman, 2016). Most East African countries however recorded low levels of unemployment compared to Kenya. Rwanda had an average unemployment rate of 1.3% whereas Tanzania had a rate of 11.5% between 2001 and 2013 (Davis, 2012). The rate of

unemployment is still a problem that the economy of Kenya is facing despite the government of Kenya implementing policies to curb the issue such as Kazi Kwa Vijana. For instance, looking at the 17-year time series from 1999 to 2016 the averaged unemployment rate was 22.43%. In 2006, the unemployment level was down at 12.7% and rose to 40% in 2011, 46% in 2013 and 47% up in 2014. It went down to 41% in 2015. However, in 2016, the rate was forecasted to rise to about 46%, (Henderson, 2008). The concern therefore arose on the contribution of the macroeconomic variables to the rate of unemployment situation in Kenya. For instance, according to Blanchard and Gali, (2005) suggests that it is necessary to understand the effects of changes in variables like inflation, real interest rates, and population growth on unemployment.

King et al, (2018) states that Inflation on the other hand is a general price increase of different commodities rather than a single commodity. Omolo (2010) explains that the level of unemployment and inflation have an inverse relationship. Kenya has not had a stable rate of inflation. For instance, in March 2009, the level of inflation went up to 17.07% and down to 3.93% in January 2011 while in January 2016, it was decreased as 6.77% (Omolo, 2010). On the other hand, according to Lilien (2017), the level of unemployment in Kenya in 2006 to 2009 was 12.7% before rising to 40% in 2011, 46% in 2013 and 47% in 2014. In 2015 the level of unemployment decreased to 41%. However, in 2016, the rate was predicted to go up to about 46%, (Lilien (2017). Theoretically, the relationship between unemployment and inflation, therefore, seemed to have existed in the short run between 2009 and 2011, since inflation rate decline was as a result in the level of unemployment rising. According to the result of the study done by (Macharia & Otieno, 2015) the economic survey conducted in Kenya in 2014, an average of 11.8 million Kenyans was employed in the informal sector while only 2.4 million were in the formal sectors.

Deriving feedback using a data set for 15 years (1996-2011), Ryan (2002) investigated the interconnection between population, unemployment and growth of the economy. In the findings of his study, the two variables, economic and economic growth were established to be crucial variables of unemployment in the economy. Another study done

by (Mankew, 2010) with a different time series of 10 years (2001-2011) examined the drivers of unemployment. The feedback from these studies showed that the GDP growth rate had a greater effect to lessen unemployment. Other macroeconomic variables such as population, private investment, and economic growth, could also affect unemployment. High unemployment was attributed to the fact that there was low investment and economic growth. According to Brown (2015), drivers such as productivity and inflation were established to positively affect the unemployment level among the youths, while investment and economic growth had negative effects within a long term period of observation. The study used Gross Fixed Capital Formation (Neumark & Wasche, 2005). The result of the study done by Macharia and Otieno, (2015) indicates that there exists a long run of interconnection between economic growth and unemployment. Their study explored how unemployment affected the South African economy. Further, their study adopted descriptive design and regression analysis for testing to examine if there existed relationships among the experimental and explanatory variables. From the outcomes of the study, a negative association was realized between economic growth rate and unemployment. Macharia and Otieno recommended a discrete to the existing support growth policies from the policies of minimization of unemployment rates, because the first policies depended on government spending while the second policies depended on raising awareness and motivating investment so that more jobs would be created. The study outcomes revealed occurrence of a long run association between growth and progress of economy, expenditure by the government and inflation. Further, the study realized that in the short run both the inflation indicator (CPI) and government disbursements directly affects the progress of economic growth.

The trade-off between the two variables is that as the rate of unemployment declines, laborers are empowered to demand higher salaries and wages, in return, the producers or the employees transfer the added cost to the consumers by raising the prices of the goods (Fashoyin and Tiraboschi, 2012). In the economy, the level of inflation increases. From Phillips curve, (Philip 1958), policymakers can only solve one problem at a time. A policy maker can only reduce unemployment and raise inflation or increase unemployment and reduce the inflation but not both (Card & Krueger, 2015). In the

1960s, Monetarists and the Keynesians differed in their view towards unemployment and the inflation (Card & Krueger, 2015). Monetarists emphasized on low inflation while the Keynesians, on the contrary, emphasized on the job creation hence creating a predicament, (Christaino et al, 2009). Mankew (2010) analyzed the real situation to relate unemployment and inflation. In his findings, the employees who anticipate an increase in the commodity prices demand that their wages be increased at the same rate hence maintaining their purchasing power. Forder (2014) evaluated the empirical relationship between the level of unemployment and the inflation rate in Malaysia using the error correction model. His results indicated that between the level of unemployment and inflation there exists an equilibrium relationship in Malaysia, according to the Phillips curve.

Contrary to his findings, Umair, and Ullah (2013) in their study explored the impacts of the inflation rate on the GDP and the inflation rate in Pakistan using a longitudinal approach. According to the study the inflation rate effect at the 10% level of significance was insignificant on unemployment and GDP. There was a positive correlation in the economy between inflation and unemployment hence the findings failed to support the Phillips curve concept. Although these studies were carried out only in developed countries and gave contradicting findings, hence raising concerns on the nature of the relationship between such variables in the developing economies.

(Mankew, 2010) in his study concluded that the relationship between inflation and GDP is positive in south Asian countries that included India, Bangladesh, Sri Lanka, and Pakistan. He used cointegration and Error Correction Models (ECM) to examine the extent to which economic growth is related to inflation. His results showed that growth rate and inflation rates were cointegrated and there existed a long-run relationship between growth rates and inflation rates in all four countries. In addition, Mankew, (2010) argued that attempts to reduce inflation to lower rates by policy makers would likely affect economic growth. Fashoyin and Tiraboschi, (2012) also shared a similar view in their study. They noted that higher inflation is associated with moderate gains in domestic products. Atkinson and Micklewright, (2011) investigated the existence of threshold effects in the inflation and growth relationship in the Nigerian economy. They

found that there exists a threshold level of 6%. Below this level, there existed a significant positive relationship between inflation and economic growth, while above this threshold level inflation diminishes growth performance. The study suggested that bringing down the optimal inflation rate to a low digit should be the goal of the monetary policy. Blanchard and Gali, (2005) in their study explains that monetarists view the practice of controlling inflation in efforts to facilitate investment and growth to be more imperative and will lead to an escalation in employment in the long run. Keynes, on the other hand, according to the two authors argues that smoothing out of the cycles in the business by manipulating the aggregate demand is more imperative in reducing the unemployment rate. According to Omollo (2010), in his study he stated that even though the policies were formulated by the government, the economic growth as the principal means of creating employment, had a feeble contribution to job creation, hence raising the need to determine the effects of other macroeconomic variables on unemployment.

Pollin et al, (2007) in their study examined the effects of positive steady state inflation in New Keynesian models subject to the zero-bound on interest rates. In an attempt to solve for the optimal inflation rate, they derived a utility based welfare loss function, considering the effects of positive steady state inflation. Their findings revealed a 2% optimal inflation rate even after factoring in a variety of extensions that included optimal stabilization policy, price indexation, state dependent price stickiness, capital formation and downward nominal rigidities (Pollin et al, 2007). In a similar study carried out by Barro et al, (2013), there was evidence that adverse effects of inflation came from the experience of high inflation. For instance, the study explains that the decrease in GDP lowered the standards of living over long run periods.

Kenya has experienced fluctuating growth rates over the past five decades (Omolo, 2010). According to the World Bank (1990), the Kenyan economy was hit by world oil price shocks and balance of payments problems in 1970 that negatively affected the economy and reduced the growth rate to -4.7%. The shortage of oil therefore caused the prices to go up thereby escalating the inflation rates. In the years that followed, 1971-1975 Kenya experienced a commodity boom in its major export crops which were tea and coffee. This increased Kenya's economic output and boosted GDP rate to 23%

(Davis, 2012). However, a rise in inflation occurred in the early 1990's. This was as a result of monetary expansions coupled with relaxation of rules governing the exchange of the Kenyan shilling with other currencies. As a result, there was a flood of Kenyan shillings into the domestic market causing the Kenyan shilling to depreciate in value resulting in a drastic increase in inflation (Omolo, 2010). Growth rates declined at an average between 4% and -0.8% (Davis, 2012).

During the same period, there was an acute food shortage of major staple foods which included maize and sugar causing their prices to shoot up. The monetary policy responded to this crisis by abandoning financial liberalization and opting for use of monetary instruments. It therefore targeted the interest rates and directly controlled the prices of goods (Omolo, 2010). However, the economic environment was able to stabilize again in the beginning of 1995 though the growth rate was slow. Other historical events that negatively affected the Kenyan economic outlook included the 2007-2008 post-election violence, the global financial crisis in 2008 as well as terrorist attacks in 2013 (Davis, 2012). According to Omolo's findings, "the harmful impact was mainly felt in the investment and tourism sectors that later resulted in a decrease in the country's output". The growth rate of the past ten decades has generally been high compared to the 1990's period mainly due to the prudent monetary policy mechanisms that the country put in place after forming the Monetary Policy Committee in 2008. Among its major objectives was maintaining price stability. Therefore, the policy aimed at keeping inflation low at an allowable margin of 2.5% points on either side of the targeted medium inflation rate of 5%. Although the Monetary Policy Committee has managed to keep inflation low at the allowable margin, it is yet to achieve Kenya's vision 2030 that targeted an annual growth rate of 10% per annum (Davis, 2012).

Chapter 3: Methodology

3.1 Research design

This study employs the causal research design. Considering the objective of the study, the research employs the VAR model, test for Cointegration and Vector Error Correction models. Hence the models shall capture the short run feedback effects between the variables and the long run relationships among the variables.

3.2 Population and sampling

The target population for this study is the performance of inflation and unemployment in Kenya from the year 1960 to 2019.The population of this data is annual secondary data from the World Bank.

3.3 Data Sources

This study uses secondary time series data. The secondary data is from the Development Indicators of the World Bank; World Development Indicators. The data is annual data from 1960 to 2019. Other control variables in the study include; real interest rates, population growth rates, private investments, government policies, government expenditure and human development index as summarized in the table below;

Variables used in the study		
Variable	**Measurement**	**Source**
Inflation	Consumer Price Index (CPI)	World Bank Database
Unemployment	Percentage of the total labor force that are jobless but seeking for opportunities and are available for jobs.	World Bank Database
GDP per capita growth	Growth in the GDP per capita.	World Bank Database

Real interest rate	T-bill rate	Central Bank of Kenya
Gross fixed capital formation, private Investment	Percentage of GDP	World Bank Database
General government final consumption expenditure	Percentage of GDP	World Bank Database

3.4 Data Analysis

3.4.1 VAR Models

Vector Auto Regression (VAR) is described as a multivariate forecasting algorithm used when two or more time-series influences each other.

The VAR model is established based on the statistical properties of data. In the VAR model, each endogenous variable in the system is considered as the lagged value of all endogenous variables in the system; thus the univariate autoregressive model is generalized to the vector autoregressive model consisting of multivariate time series variables. The general model specification for the study considers Inflation, Unemployment and Economic growth, and the remaining control variables as exogenous.

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \cdots + \beta_k Y_{t-k} + \gamma_1 X_{t-1} + \cdots + \gamma_k X_{t-k} + u_t$$

Y_t *is a* 3×1 vector of endogenous variables: Inflation, Unemployment and Economic growth

X_t *is a* $g \times 1$ vector of exogenous variables (g is the number of exogenous control variables)

β_j *is a* 3×3 matrix of parameters/coefficients on the different lags of the endogenous variables

γ_j *is a* $g \times g$ matrix of parameters/coefficients on the different lags of the exogenous variables

3.4.2 Granger Causality Tests

The structures of the causal relationships between variables are analyzed through the Granger causality test. This is a statistical hypothesis test for establishing whether one time-series is practical for forecasting another. This is done using a block significance test that tests whether the lags of one variable are jointly significant in predicting another variable. The null hypothesis of the test is that there is no Granger causality. The null hypothesis restrictions are such that the lags are jointly equal to zero.

The Granger Causality test uses the Wald Statistic to test the joint significance. If the corresponding probability value is less than the 5% level of significance, then the null hypothesis would be rejected at that level, indicating Granger Causality.

3.4.3 Impulse Response Functions and Variance Decompositions

Impulse response functions can be described as the display effects of shocks on the adjustment path of the variables. Forecast error variance decompositions measure the contribution of each type of shock to the forecast error variance. Both computations are useful in assessing how shocks to economic variables are repeated through a system. Impulse response functions (IRFs) and forecast error variance decompositions (FEVD) can be produced after using the VECM or VAR commands.

3.4.4 Tests of Cointegration: Johansen Cointegration Test

A cointegration test is used to establish if there is a correlation between several time series in the long term i.e.: to determine whether there is a long run relationship between the variables. Cointegration tests recognize scenarios in which two or more non-stationary time series are integrated in a way that they cannot diverge from equilibrium in the long term. This test is relevant in distinguishing the level of affectability of two factors to a similar normal cost over a predefined time-frame.

Johansen Test

This is a test used to assess cointegrating correlation among several non-stationary time-series data. It is subject to asymptotic properties with large sample size because small sample size would create questionable outcomes. There are two fundamental structures of Johansen, for instance. Trace tests Johansen and Maximum Eigenvalue test Johansen.

Trace tests

This test is used in assessing how many linear combinations are there in a time series data, i.e., X to be equal to the value X_0, and the hypothesis for the value X to be greater than X_0. It is illustrated as follows:

H_0: $X = X_0$

H_0: $X > X_0$

If you want to use this test to evaluate for cointegration in a sample, then X_0 should be set to zero to evaluate whether the null hypothesis will be rejected. If it's rejected, then we can assume that the sample has a cointegration relationship.

Maximum Eigenvalue test

Corporate Finance Institute defines maximum eigenvalue as a non-zero vector which, when a linear transformation is applied to, it changes by a scalar factor. This test is indistinguishable from the first test. The only difference between them is the null hypothesis result.

H_0: $X = X_0$

H_0: $X = X_0 + 1$

If $X=X_0$ and the null hypothesis is rejected, such a situation would only mean a single possible outcome to produce a stationary process. But, where X_0 = m-1 and the null hypothesis is rejected, this situation would mean that there are several possible linear combinations.

3.4.5 Vector Error Correction Model

Following the underlying literature, this study employs a Vector Error Correction Model (VECM). The VECM model posits a set of relationships between past lagged values of all variables in the model and the current value of each variable in the model. The model contains the following variables i.e.; inflation rate, unemployment rate, and GDP per capita growth, real interest rate, gross fixed capital formation private sector and general government final consumption expenditure.

CHAPTER 4: Results and discussions

4.1 Descriptive statistics

The descriptive statistics summarizes the measure of central tendency (mean), measure of dispersion (variance) and measure of normality (skewness and kurtosis).

Variable	Mean	Variance	Skewness	Kurtosis	Minimum	Maximum
Unemployment	8.79	14.88	-0.35	2.29	1	15
Real interest rate	24.55	189.79	-0.05	1.80	1	47
Gross fixed capital formation, private sector	24.04	202.25	0.01	1.78	1	48
Inflation	29.73	283.34	-0.03	1.80	1	58
General government final consumption expenditure	28.68	253.20	-0.03	1.86	1	56
GDP per capita growth	29.85	287.37	-0.03	1.78	1	58

Table 1: Descriptive statistics summary

Unemployment, real interest rate, inflation, general government final consumption expenditure and GDP per capita growth have negative skewness hence have a long left tail. Whereas gross fixed capital formation, private sector has a skewness of 0.0 thus its distribution is symmetric around its mean, this mirrors a normal distribution. All the variables as shown in the table above have a kurtosis value of less than 3, hence they display platykurtic kurtosis properties whereby the curve is flattened. GDP per capita growth has the highest mean while unemployment has the lowest mean.

4.2 Unit root (Augmented Dickey Fuller test)

Variable (at level)	MacKinnon approximate p-value for Z(t)	Stationary or non-stationary
Unemployment	0.0710	Non-stationary
Real interest rate	0.0172	Stationary
Gross fixed capital formation, private sector	0.0883	Non-stationary
Inflation	0.0075	Stationary
General government final consumption expenditure	0.2559	Non-stationary
GDP per capita growth	0.0000	Stationary

Table 2: Augmented Dickey Fuller unit root test results at level

Real interest rate, inflation and GDP per capita growth are stationary in level, integrated of order 0.

Variable (at first difference)	MacKinnon approximate p-value for Z(t)	Stationary or non-stationary
Unemployment	0.0071	Stationary
Gross fixed capital formation, private sector	0.0000	Stationary
General government final consumption expenditure	0.0001	Stationary

Table 3: Augmented Dickey Fuller unit root test results at first difference

Unemployment, Gross fixed capital formation (private sector) and General government final consumption expenditure are stationary after the first difference, integrated of order 1.

4.3 Test for cointegration

Johansen test for cointegration					
Trend:	constant		Number of Observations		= 25
Sample:	1994-2018		Lags		= 2
Maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	42	445.64164	.	128.6525	94.15
1	53	470.79394	0.8663	78.3479	68.52
2	62	490.33242	0.79051	39.2709*	47.21
3	69	499.58892	0.52313	20.7579	29.68
4	74	506.84132	0.44021	6.2531	15.41
5	77	508.96336	0.15613	2.009	3.76
6	78	509.96787	0.07722		

Table 4: Johansen test for cointegration results

H_0: There is at most "***rank #"*** cointegrating relationships

H_1: There are more than "***rank #***" cointegrating relationships

From the trace statistic, we have a maximum of 2 cointegrated equations whereby we reject the null hypothesis since the trace statistic > 5% critical value. Since the series is cointegrated, there exists a long run relationship thus we estimate the vector autoregressive (VAR) and the vector error correction (VECM).

Lag Selection

lag	LL	LR	Df	p	FPE	AIC	HQIC	SBIC
0	-572.916				8.8e+11	44.532	44.6156	44.8224*
1	-518.738	108.36	36	0.000	2.4e+11	43.1337	43.7189	45.166
2	|-492.655	52.166	36	0.040	8.4e+11	43.8965	44.9834	47.6708
3	|-406.857	171.6*	36	0.000	1.1e+11*	40.066*	41.6544*	45.5822

Table 5: varsoc results

Based on the above results, the appropriate lag is lag 3.

4.4 VECM model estimation

4.4.1 Short Run Coefficients

D_GDPPERCAPITAGROWTH	Coef.	Std. Err.	z	P>|z|	[95% Conf.Interval]	
GDPPERCAPITAGROWTH						
LD.	-.6996946	.2416945	-2.89	0.004	-1.173407	-.225982
L2D.	-.8689366	.3402243	-2.55	0.011	-1.535764	-.2021091
GCFP						
LD.	-.1716288	.5744425	-0.30	0.765	-1.297516	.9542579
L2D.	.3181163	.4462709	0.71	0.476	-.5565587	1.192791
GGFC						
LD.	-.660818	.7126054	-0.93	0.354	-2.057499	.7358629
L2D.	.2741114	.6675634	0.41	0.681	-1.034289	1.582512
UNEMPLOYMENT						
LD.	-.5310491	1.586292	-0.33	0.738	-3.640123	2.578025
L2D.	2.502061	1.569829	1.59	0.111	-.5747469	5.578869
REALINTERESTRATE						
LD.	-.0589826	.5105116	-0.12	0.908	-1.059567	.9416019
L2D.	-.0786292	.3263258	-0.24	0.810	-.7182161	.5609577
INFLATION						
LD.	-.1751044	.191672	-0.91	0.361	-.5507748	.2005659
L2D.	-.081665	.1774508	-0.46	0.645	-.4294621	.2661321
_cons	2.407598	3.160705	0.76	0.446	-3.787269	8.602465

The differenced GDP per capita growth has a statistically significant relationship with the differenced lag GDP per capita growth and difference of the second lag of GDP per

capita growth. Both the difference of the lag of GDP per capita growth and the difference of the second lag of GDP per capita growth have negative coefficients hence, when the difference lag of GDP per capita growth and difference of the second lag GDP per capita growth decreases, the differenced GDP per capita growth increases.

D_GCFP	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
GDPPERCAPITAGROWTH						
LD.	-.318946	.1503149	-2.12	0.034	-.6135577	-.0243343
L2D.	-.1400536	.2115926	-0.66	0.508	-.5547675	.2746603
GCFP						
LD.	-.0732276	.3572578	-0.20	0.838	-.7734399	.6269848
L2D.	-.3159319	.2775452	-1.14	0.255	-.8599105	.2280467
GGFC						
LD.	-.3223652	.4431841	-0.73	0.467	-1.19099	.5462598
L2D.	-.6166429	.4151716	-1.49	0.137	-1.430364	.1970785
UNEMPLOYMENT						
LD.	1.204882	.9865477	1.22	0.222	-.7287164	3.13848
L2D.	1.490269	.9763093	1.53	0.127	-.4232622	3.4038
REALINTERESTRATE						
LD.	-.5153264	.3174978	-1.62	0.105	-1.137611	.1069579
L2D.	-.1441346	.2029488	-0.71	0.478	-.5419071	.2536378
INFLATION						
LD.	.1386303	.1192048	1.16	0.245	-.0950069	.3722675
L2D.	.0268571	.1103603	0.24	0.808	-.1894451	.2431594
_cons	-1.649593	1.965708	-0.84	0.401	-5.50231	2.203123

The differenced gross fixed capital formation (private sector) has statistically significant relationship with the first lag of difference of GDP per capital growth. The difference of the lag of GDP per capital growth has a negative coefficient hence the difference of the lag of GDP per capita growth increases, the differenced gross fixed capital formation decreases. This is opposed to what would happen in reality since when GDP per capita growth increases there would be more capital formation in the economy.

D_GGFC	Coef.	Std. Err.	z	P>|z|	[95% Conf.Interval]	
GDPPERCAPITAGROWTH						
LD.	-.0230941	.1485214	-0.16	0.876	-.3141907	.2680024
L2D.	-.038423	.209068	-0.18	0.854	-.4481887	.3713427
GCFP						
LD.	-.2374065	.3529951	-0.67	0.501	-.9292642	.4544512
L2D.	-.0239995	.2742336	-0.09	0.930	-.5614875	.5134886
GGFC						
LD.	-.1424998	.4378962	-0.33	0.745	-1.000761	.715761
L2D.	-.1065037	.4102179	-0.26	0.795	-.910516	.6975087
UNEMPLOYMENT						
LD.	-.8668785	.9747766	-0.89	0.374	-2.777406	1.043649
L2D.	.312694	.9646603	0.32	0.746	-1.578006	2.203394
REALINTERESTRATE						
LD.	.2900572	.3137096	0.92	0.355	-.3248023	.9049166
L2D.	.0402298	.2005273	0.20	0.841	-.3527965	.4332562
INFLATION						
LD.	-.0281407	.1177825	-0.24	0.811	-.2589902	.2027088
L2D.	.057775	.1090435	0.53	0.596	-.1559464	.2714964
_cons	-.7168885	1.942254	-0.37	0.712	-4.523636	3.089859

The differenced general government final consumption expenditure does not have a statistically significant short run relationship with any of the variables.

D_UNEMPLOYMENT	Coef.	Std. Err.	z	P>|z|	[95% Conf.Interval]	
GDPPERCAPITAGROWTH						
LD.	-.0365993	.0276406	-1.32	0.185	-.0907739	.0175753
L2D.	.0197762	.0389087	0.51	0.611	-.0564834	.0960357
GCFP						
LD.	.0380829	.0656943	0.58	0.562	-.0906755	.1668413
L2D.	-.0929282	.0510363	-1.82	0.069	-.1929576	.0071011
GGFC						
LD.	-.0335588	.0814948	-0.41	0.680	-.1932857	.1261681
L2D.	.0073099	.0763437	0.10	0.924	-.1423211	.1569408
UNEMPLOYMENT						
LD.	.0409468	.1814111	0.23	0.821	-.3146123	.396506
L2D.	-.4710487	.1795284	-2.62	0.009	-.8229179	-.1191795
REALINTERESTRATE						
LD.	.2127715	.058383	3.64	0.000	.0983429	.3272001
L2D.	.1470914	.0373192	3.94	0.000	.0739471	.2202356
INFLATION						
LD.	-.0401523	.02192	-1.83	0.067	-.0831146	.00281
L2D.	-.053744	.0202936	-2.65	0.008	-.0935186	-.0139693
_cons	-.2516332	.3614637	-0.70	0.486	-.960089	.4568227

The differenced unemployment has a statistically significant relationship with the difference of the second lag of unemployment, difference of the lag of real interest rate and the difference of the second lag of real interest rate, difference of the lag of inflation and the difference of the second lag of inflation. Real interest rates have a positive coefficient hence when real interest rates increase the rate of unemployment increases, this may be due to an increase in the cost of credit in the economy, leading to reduced investments.

Gross fixed capital formation private sector has a negative coefficient meaning that when the rate of unemployment increases, the gross fixed capital formation private

sector decreases. This is true, since there shall be less workforce in the economy. Inflation has a negative coefficient hence when inflation increases, the rate of unemployment decreases, as the Phillips curve postulates inflation and unemployment have an inverse relationship.

D_REALINTERESTRATE	Coef.	Std. Err.	z	P>|z|	[95% Conf.Interval]	
GDPPERCAPITAGROWTH						
LD.	.1057052	.2973853	0.36	0.722	-.4771593	.6885696
L2D.	.3003731	.4186181	0.72	0.473	-.5201033	1.12085
GCFP						
LD.	-.4042446	.7068044	-0.57	0.567	-1.789556	.9810666
L2D.	-.6388555	.5490998	-1.16	0.245	-1.715071	.4373604
GGFC						
LD.	.0565944	.8768025	0.06	0.949	-1.661907	1.775096
L2D.	.4792598	.821382	0.58	0.560	-1.130619	2.089139
UNEMPLOYMENT						
LD.	-.2666929	1.951802	-0.14	0.891	-4.092154	3.558768
L2D.	.1277157	1.931546	0.07	0.947	-3.658044	3.913476
REALINTERESTRATE						
LD.	-.1853886	.6281427	-0.30	0.768	-1.416526	1.045748
L2D.	.1867547	.4015172	0.47	0.642	-.6002045	.9737139
INFLATION						
LD.	-.2304161	.2358367	-0.98	0.329	-.6926476	.2318154
L2D.	-.1450091	.2183386	-0.66	0.507	-.5729449	.2829267
_cons	.5563755	3.888988	0.14	0.886	-7.0659	8.178651

According to the above results, the differenced real interest rate does not have a statistically significant short run relationship with the variables.

D_INFLATION	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
GDPPERCAPITAGROWTH						
LD.	-.5922812	.3954186	-1.50	0.134	-1.367287	.182725
L2D.	-.2238177	.5566159	-0.40	0.688	-1.314765	.8671295
GCFP						
LD.	.0596483	.939803	0.06	0.949	-1.782332	1.901628
L2D.	.0943023	.7301109	0.13	0.897	-1.336689	1.525293
GGFC						
LD.	-1.440217	1.165841	-1.24	0.217	-3.725224	.8447891
L2D.	.4314063	1.092151	0.40	0.693	-1.709171	2.571983
UNEMPLOYMENT						
LD.	.2945774	2.595214	0.11	0.910	-4.79195	5.381104
L2D.	-1.851226	2.568281	-0.72	0.471	-6.884964	3.182513
REALINTERESTRATE						
LD.	-.0876404	.8352104	-0.10	0.916	-1.724623	1.549342
L2D.	-.0814121	.5338776	-0.15	0.879	-1.127793	.9649688
INFLATION						
LD.	-.8660904	.3135805	-2.76	0.006	-1.480697	-.251484
L2D.	-.3940039	.2903141	-1.36	0.175	-.963009	.1750013
_cons	.5459182	5.170995	0.11	0.916	-9.589046	10.68088

The differenced inflation has a statistically significant relationship with the difference lag of inflation, which has a negative coefficient. When the difference lag of inflation increases the differenced inflation decreases.

4.5 Long-Run Coefficients

Identification: beta is exactly identified

Johansen normalization restrictions imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
GDPPERCAPITAGROWTH	1	.	.	.	.	.
UNEMPLOYMENT	0	(omitted)				
INFLATION	-2.596903	1.15317	-2.25	0.024	-4.857075	-.3367312
GCFP	-6.366757	1.587065	-4.01	0.000	-9.477347	-3.256167
GGFC	-2.546515	1.745459	-1.46	0.145	-5.967552	.8745215
REALINTERESTRATE	10.23595	1.397806	7.32	0.000	7.496304	12.97561
_cons	-13.28602	.	.	.	.	.
_ce2						
GDPPERCAPITAGROWTH	0	(omitted)				
UNEMPLOYMENT	1	.	.	.	.	.
INFLATION	1.002242	.4462226	2.25	0.025	.1276619	1.876822
GCFP	2.995159	.6141195	4.88	0.000	1.791507	4.198812
GGFC	2.714491	.6754106	4.02	0.000	1.390711	4.038272
REALINTERESTRATE	-4.936745	.5408854	-9.13	0.000	-5.99686	-3.876629
_cons	-36.09307	.	.	.	.	.

The error correction terms associated with the above long run coefficients are as follows:

$$\mathbf{GDPPERCAPITAGROWTH} - 13.28 - 2.59\,\mathbf{INFLATION} - 6.36\,\mathbf{GCFP} - 2.54\,\mathbf{GGFC} + 10.23\,\mathbf{REALINTERESTRATE}$$

$$\mathbf{UNEMPLOYMENT} - 36.09 + 1.002\mathbf{INFLATION} + 2.99\,\mathbf{GCFP} + 2.71\,\mathbf{GGFC} - 4.93\,\mathbf{REALINTERESTRATE}$$

GDP per capita growth has a statistically significant long run relationship with inflation, gross fixed capital formation and real interest rates, however GDP per capita growth does not seem to have a direct long run relationship with unemployment. Unemployment has a statically significant long run relationship with inflation, gross fixed capital formation, general government final consumption expenditure and real interest rates, however unemployment does not seem to have a direct long run relationship with GDP per capita growth.

Inflation, gross fixed capital formation and real interest rates are statistically significant, since the p values are less than 0.05. General government final consumption expenditure has a p value greater than 0.05 hence it is statistically insignificant.

The following coefficients for _ce1 have a negative sign; inflation, gross fixed capital formation, and general government final consumption expenditure while inflation for _ce2 which is the required sign of the adjustment coefficients. While on the other hand, for _ce1 inflation has a positive sign for the adjustment coefficients while for _ce2 inflation, gross fixed capital formation, and general government final consumption expenditure have positive coefficients which is not the required sign for the adjustment coefficients.

In the long run, inflation, gross fixed capital formation, and general government final consumption expenditure have a positive effect on GDP per capita growth while real interest rate has a negative effect on GDP per capita growth. Thus, when inflation, gross fixed capital formation, and general government final consumption expenditure increase, the GDP per capita growth also increases and when real interest rate increase GDP per capita growth decreases.

Inflation, gross fixed capital formation, and general government final consumption expenditure have a negative effect on unemployment in the long run while real interest rate has a positive effect on unemployment in the long run. Thus, when inflation, gross fixed capital formation, and general government final consumption expenditure increase, unemployment decreases while when real interest rate increase the rate of unemployment increases.

Adjustment coefficients results

alpha	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_GDPPERCAPITAGROWTH						
_ce1						
L1.	.102933	.1124464	0.92	0.360	-.117458	.323324
_ce2						
L1.	.1531183	.2781163	0.55	0.582	-.3919796	.6982161
D_UNEMPLOYMENT						
_ce1						
L1.	-.0199632	.0128596	-1.55	0.121	-.0451675	.0052411
_ce2						
L1.	.0226556	.0318059	0.71	0.476	-.0396828	.0849939
D_INFLATION						
_ce1	.					
L1.	.0429812	.1839653	0.23	0.815	-.3175842	.4035466
_ce2						
L1.	.0963199	.4550055	0.21	0.832	-.7954745	.9881142
D_GCFP						
_ce1						
L1.	.1599431	.0699328	2.29	0.022	.0228774	.2970089
_ce2						
L1.	.2727186	.1729663	1.58	0.115	-.0662891	.6117263
D_GGFC						
_ce1						
L1.	-.0295732	.0690984	-0.43	0.669	-.1650035	.1058571
_ce2						
L1.	.0077757	.1709025	0.05	0.964	-.3271871	.3427385
D_REALINTERESTRATE						
_ce1						
L1.	-.060514	.1383561	-0.44	0.662	-.3316871	.210659
_ce2						
L1.	.07175	.3421993	0.21	0.834	-.5989483	.7424482

The adjustment coefficients from the Vector Error Correction Model are tabulated above. These are loadings associated with the aforementioned error correction terms. The adjustment coefficients indicate whether there is a convergence or divergence to the long run equilibrium relationship between the variables.

$$\mathbf{GDPPERCAPITAGROWTH} - 13.28 - 2.59\,\mathbf{INFLATION} - 6.36\,\mathbf{GCFP} - 2.54\,\mathbf{GGFC} + 10.23\,\mathbf{REALINTERESTRATE}$$

$$\mathbf{UNEMPLOYMENT} - 36.09 + 1.002\mathbf{INFLATION} + 2.99\,\mathbf{GCFP} + 2.71\,\mathbf{GGFC} - 4.93\,\mathbf{REALINTERESTRATE}$$

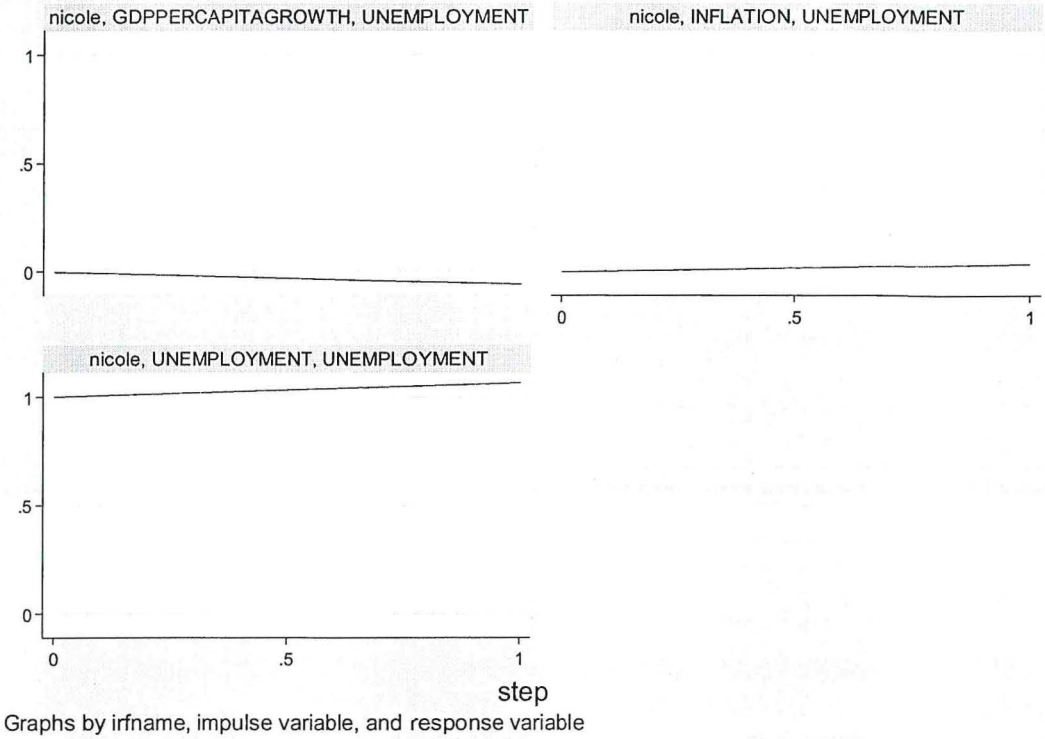
Both the adjustment coefficients on the GDP per capita growth, inflation and gross capital formation equations are positive (albeit insignificant for the GDP per capita growth equation and inflation equation). For the GDP per capita growth equation, the positive coefficients indicate some divergence from the equilibrium since if it is too high in the previous period, the adjustment is still upwards in the next period. For the Inflation equation, the first positive adjustment coefficient indicates convergence to the equilibrium relationship with GDP per capita growth, since the inflation will be reduced when it is too high. However, the second positive adjustment coefficient implies a divergence from the equilibrium relationship with unemployment. The same inference applies for gross capital formation with regards to its equilibrium relationship with unemployment.

The general government consumption equation and real interest rate equation present negative adjustment coefficients on the first error correction term, although they are all significant. Given the error correction term above, the negative adjustment terms on general government final consumption expenditure implies a divergence, as they continue to raise the values of the variable, even when it is too high. On the other hand, the negative adjustment coefficient for real interest rate implies convergence as it reduced the variable when it is too high. For the unemployment equation, the coefficient on the second adjustment term is positive, also indicating a divergence, as it raises the value of unemployment, even when it is already high and out of equilibrium.

4.6 Impulse Response Functions

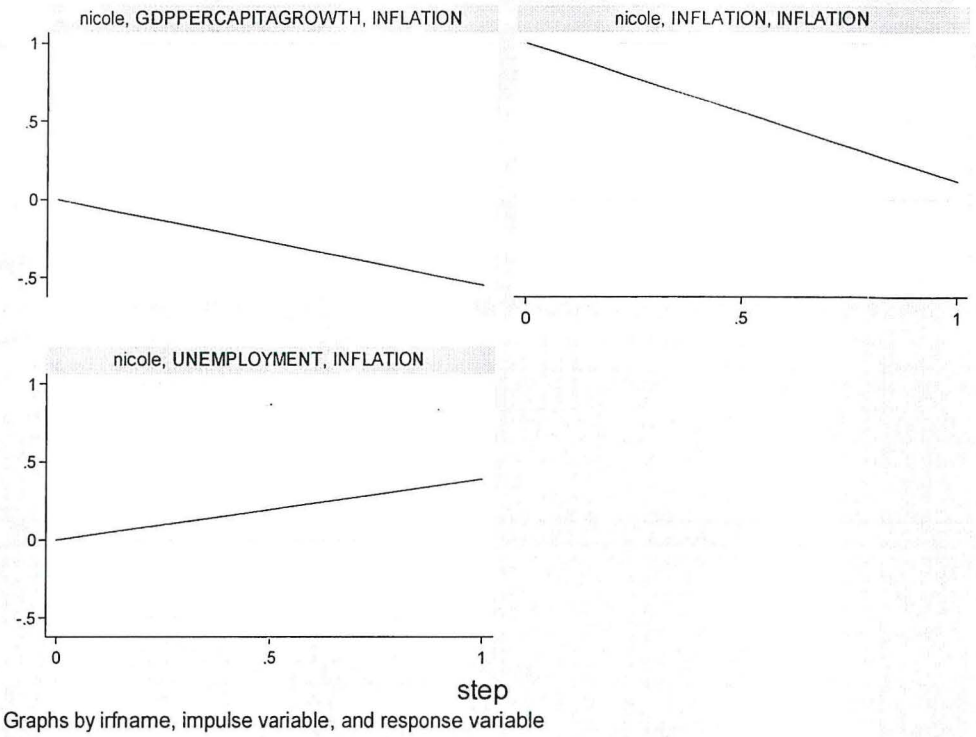
The impulse response graphs below focus on the three main macroeconomic variables in this study – Inflation, GDP Growth and Unemployment. The results are presented for each response variables, where each of the variables is exposed to a positive unit shock.

Response Variable: Unemployment



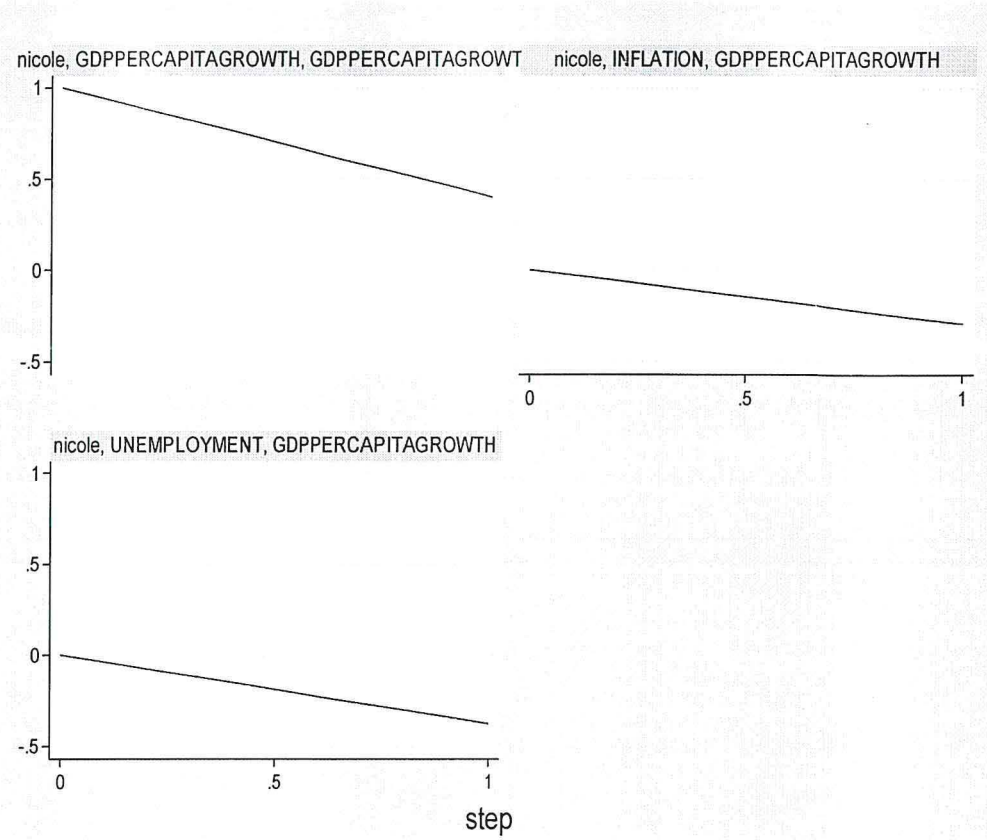
From the above impulse response graphs, a shock in GDP per capita leads to a slight decrease in unemployment. This is expected since when there is more GDP per capita in the economy, the more production and consumption takes place thus decreasing the rate of unemployment. A shock in inflation leads to a slight increase in unemployment. This is contrary to the Phillips curve, which postulates that inflation and unemployment are inversely related. A shock in unemployment leads to a slight increase in unemployment, which is expected.

Response Variable: Inflation



A shock in GDP per capita growth leads to a decrease in the inflation rate. This is an unexpected result since when there is a positive shock on GDP per capita growth, inflation is expected to rise. A shock in inflation leads to a decrease in inflation. A shock in unemployment leads to an increase in inflation. This is an unexpected result, which is contrary to the Phillips curve, whereby the theory suggests that unemployment and inflation are inversely related.

Response Variable: GDP Per Capita Growth



A shock in GDP per capita growth leads to a decrease in the GDP per capita growth. A shock in inflation leads to a decrease in GDP per capita, this is expected since the price level is increasing hence less would be consumed leading to a decrease in GDP per capita growth. A shock in unemployment leads to a decrease in GDP per capita growth. This is also an expected result since there is less workforce in the market hence leading to a decrease in GDP per capita growth.

Chapter 5: Conclusion and recommendation

This study focuses on the impact of unemployment and inflation of the economic growth of Kenya, from 1960 to 2019. From the results of the study, real interest rate, inflation and GDP per capita growth are stationary at level while unemployment, gross fixed capital formation (private sector) and general government final consumption expenditure are stationary at first difference. Furthermore, there exists two cointegrating equations in the dataset.

From the analysis in the short run, the Kenyan economy has a unique observation whereby when difference of the lag of GDP per capita growth increases, the differenced gross fixed capital formation decreases. This is opposed to what would happen in reality since when GDP per capita growth increases there would be more capital formation in the economy. In addition to this, when inflation increases, the rate of unemployment decreases, as the Phillips curve postulates.

GDP per capita growth does not seem to have a direct long run relationship with unemployment and neither does unemployment have a direct long run relationship with GDP per capita growth. According to the study, the Kenyan economy is contrary to the Phillips curve since a positive unit shock in unemployment leads to an increase in inflation as well as a shock in inflation leads to a slight increase in unemployment.

The policy recommendations include; the government creating more job opportunities and encouraging creation of industries that require more labor as opposed to machines. This would decrease the rate of unemployment as well as increase the GDP per capita growth in the country. Another policy through the monetary policy would be inflation targeting whereby for a given time horizon the inflation rate target of the country is publicly announced to the citizens. Through methods such as family planning and enacting laws that are against teenage pregnancy, the population growth rate can be controlled. The general government final consumption expenditure should be used to create more job opportunities in different sectors of the industry.

References

Atkinson, A. B., & Micklewright, J. (2011). Unemployment reimbursement and labor market shift: a critical review. *Journal of economic literature*, *29*(4), 1679-1727.

Blanchard, O., & Gali, J. (2005). *Real wage rigidities and the New Keynesian model* (No. w11806). National Bureau of Economic Research.

Barro, Robert J., and David B. Gordon. (2013) "Monetary policy in a natural market rate model." *Journal of political economy* 91, no. 4 (1983): 589-610.

Boateng, K. (2000). Economics of the Labour Market and the Ghanaian Experience. *Department of Economics, University of Ghana*.

Brown, C. (2015). Minimum wage laws: Are they overrated? *Journal of Economic Perspectives*, *2*(3), 133-145.

Card, D., & Krueger, A. B. (2015). *(The New Economics of the Minimum Wage-Twentieth) Anniversary Edition*. Princeton University Press.

Christiano, L. J., Eichenbaum, M., & Evans, C. L. (1999). Monetary policy revelation: The critical study. Handbook of macroeconomics, 1, 65-148.

Davis, S. J. (2012,). Variations in the wake of labor reallocation. In *Carnegie-Rochester Series on Public Policy* (Vol. 27, pp. 335-402). North-Holland.

Fashoyin, T., & Tiraboschi, M. (2012). Youth unemployment and joblessness: The real debate. *Tyne: Cambridge Scholars Publishing*.

Forder, J. (2014). *Macroeconomics myth and measures*. OUP Oxford.

Friedman, M. (2008). The role of monetary policy. American *Economic Review*. New York, 58.

Gordon, R. J. (2011). The background of the Phillips curve: Consensus and forficate. *Economica*, 78(309), 10-50.

Henderson, D. R. (2008). *Labor market innuendo. Liberty Fund.*

Hoover, K. D. (2008). Phillips curve. *The Succinct Encyclopedia of Economics.*

Humphrey, T. M. (2015). The evolution and policy implications of Phillips curve analysis. Economic Review, 71(2), 3-22.

King, R. G., Plosser, C. I., & Rebelo, S. T. (2018). The role of monetary policy. *Journal of monetary Economics,* 21(2/3), 196-232.

Lilien, D. M. (2017). Sectoral shifts and cyclical unemployment. *Journal of political economy*, *90*(4), 777-793.

Macharia, M. K., & Otieno, A. (2015). Effect of Inflation on Unemployment in Kenya. Nairobi University Publishers. Kenya

Mankiw, N. G. (2010). A quick refresher course in macroeconomics (No. w3256). *National Bureau of Economic Research.*

Meyer, B. D. (2010). *Unemployment insurance and unemployment spells* (No. w2546). National Bureau of Economic Research. Johannesburg Pub. S.A

Muth, J. F. (2011). Theory of price movements in the modern economy. *Econometrica: Journal of the Econometric Society*, 315-335.

Neumark, D., & Wascher, W. (2005). Minimum-wage effects on school and work transitions of youth. *The American Economic Review*, *85*(2), 244-249.

Omolo, J. (2010). The dynamics and trends of employment in Kenya. Longhorn Publisher. Kenya

Phelps, E. S. (2017). Phillips curves, expectations of inflation and optimal unemployment over time. *Economica,* 254-281.

Phillips, A. W. (1958). The relation between unemployment and the money wage rates in the United Kingdom, 1861-1957. *economica*, 25(100), 283-299.

Pollin, R., Githinji, M., & Heintz, J. (2007). An Employment-Targeted Economic Perspective for Kenya.

Sabot, R. (2013). Employment, incomes, and equality: A strategic way to increase productive employment in Kenya: Geneva: ILO, 1972. Pp. xx+ 600. [UK pound] 3.96. *World Development*, *1*(6), 78-80.

Shapiro, C., & Stiglitz, J. E. (1984). Equilibrium unemployment. *The American Economic Review*, *74*(3), 433-444.

Sherman, H. J., & Sherman, H. J. (2016). *Stagflation: a radical study of unemployment and inflation.* New York: Harper & Row.

Ryan, T. C. I. (2002). *Time-series data for Kenya and Policy implementation:* Kenya Institute of Public Policy Research and Analysis.

Republic of Kenya (1994), Sessional Paper No.1 of 1994 on Economic Management for Renewed Growth, Nairobi: Government Printer

Umair, M., & Ullah, R. (2013). Impact of Economic growth and inflation on unemployment rate: A study of Pakistan economy in 1990-2008. *Business Research,* 2(2), 388.

World Bank, (1990), Trends in Developing Countries, Washington D.C.: World Bank.