IMPACT OF POPULATION GROWTH ON ECONOMIC GROWTH OF TANZANIA

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IMPACT OF POPULATION GROWTH ON ECONOMIC GROWTH OF TANZANIA

By

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A dissertation submitted in partial fulfilment of the requirements for the degree of Master of Science in Finance and Investment of the Institute of Accountancy Arusha

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CERTIFICATION

I, the undersigned certify that I have read and hereby recommend for acceptance by Institute of Accountancy the dissertation entitled: *"Impact of Population Growth on Economic Growth of Tanzania",* in partial fulfilment of the requirements for the degree of Master of Science (Finance and Investment) of the Institute of Accountancy Arusha

…………………………………………...

Dr. Cairo Mwaitete

(Supervisor)

Date ……………………………

DECLARATION

I, **Patrick Robert**, declare that this dissertation is my own original work and that it has not been presented and will not be presented to any university for similar or any other degree award.

Signature……………………

Date………………………….

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My appreciation also goes to all my classmates and friends for everything they have done to me throughout my course with Patrick Luanda getting a special mention in this category, may the Almighty God protect them all.

Special thanks go to my wife, Grace Kephas, and my sons, Jaden Patrick and Braiden Patrick for their patience, love and encouragement throughout this journey.

DEDICATIONS

This work is dedicated to my lovely family, my wife Grace Kephas, and my two sons, Jaden Patrick and Braiden Patrick.

ABBREVIATIONS

ADF	-	Augmented Dickey Fuller
BOT	-	Bank of Tanzania
CFI	-	Corporate Financial Institute
GDP	-	Gross Domestic Product
IMF	-	International Monetary Fund
NBS	-	National Bureau of Statistics
QTM	-	Quantity Theory of Money
UN-WPP	-	United Nation World Population Prospects
VAR	-	Vector Auto-regression Model
VECM	-	Vector Error Correction Model
WB	-	World Bank

ABSTRACT

This study investigates the impact of population growth on economic growth of Tanzania using granger causality and cointegration. Time series data for the period of 1991 to 2019 were used to validate the findings on granger causality and cointegration. Data were obtained from the World Bank, and were processed using Stata software. Vector Error Correction Model (VECM) was applied to examine the long run and short run causality. Gross Domestic Product growth rate (GDP) was used as a proxy for economic growth.

The study is of interest that population in Tanzania has been rising steadily, however the same could not be asserted on economic growth as the economy maintained a cyclical growth, therefore pronouncements that economic growth prospects in Tanzania is a result of its growing population has been a challenge. Furthermore, no any researcher from Tanzania have used time series data with causality approach to find out the impact of population growth on economic growth.

The study reveals that there is cointegration between population growth, inflation and economic growth given the time period. Moreover, VECM model shows that there is a long run causality running from population growth and inflation to economic growth and also there is short run causality (unidirectional causality) running from population growth and inflation to economic growth.

Based on the findings the study recommends that the government should encourage population growth with caution. They have to make sure that the population is well educated to equip them with capability to engage into economic activities through consumption, investment, employment opportunities and exploitation of resources wisely. Furthermore, the government should carefully design a population growth strategy combined with institutional and policy changes to ensure population growth becomes beneficial to the country. On top of that, the government should also ensure that the economy is growing at a higher rate than the growth of population. This will ensure that the increased demand for goods and services generated by population growth is met.

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CHAPTER ONE

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 Introduction

This chapter describes the background of the study, identifies the research problem, explains the objectives of the study and state the hypothesis, also in this chapter the researcher will clearly give reasons as to why this study is significance, state the limitation and delimitation of the study, outline the scope of the study, and lastly give a layout of the proposal.

1.2 Background of the study

The impact of population growth on economic growth has long been debated ever since Malthus's pioneering work in 1798. (Agwanda and Amani 2014).

Malthus (1798) pointed out that the population tends to increase geometrically, while food supplies only grow arithmetically. Higher economic growth stimulates population growth by promoting early marriages, high birth rates, and lowering mortality rates from malnutrition. On the other hand, higher population growth depresses economic growth through diminishing returns (by reducing output per capita). According to Malthusian theory, a high population growth is associated with food problem (malnutrition and hunger), however, Bloom and freeman (1998) differ with the theory noting that food problem relates to the problem of poverty and insufficient income as opposed to high population growth.

Advocates of positive side to population growth have been suggesting that, larger population increases demand for goods and services and thus stimulates technological advancement which in-turn increases labor productivity, income per capita and living conditions. Additionally, population growth encourages competition in business activities and increases the size of the country's potential market; this motivates entrepreneurs to launch new businesses (Klasen and Nestmann 2006).

In this very aged debate, other scholars believe that population growth is a neutral factor in economic growth and is measured outside of conventional growth models (Thornton 2001; Bloom et al 2010)

1.2.1 Population Growth in Tanzania

In 1800, the world population was about a billion and increased to around 2.5 billion in 1950. (Martin 2009). In the year 2013 7.1 billion and is projected to rise to 9.2 billion and is projected to rise to 9.2 billion by 2050, with almost all population growth projected to take place in developing areas. (Todaro and Smith 2006; Thuku et al 2013).

In Tanzania by 2012 according to the national census, the total population was 44,929,002 compared to 34,443,603 in 2002. Population of Tanzania-Mainland according to the same census was 43,625,434 as compared to 33,461,849 in 2002. This implies that the population of Tanzania has grown by 10,485,399 people equivalent to 30.4% since 2002. This translates into a growth rate of 2.7 percent per annum for Tanzania during the intercensal period of 2002-2012 relative to 2.9 percent per annum in the previous period of 1988-2002.

As of 2019, Tanzania population was estimated at 58,005,463 people (World Bank 2020), and According UN-WPP (2015) it is projected that by 2050 Tanzania will have a population of 137,136 million people.

1.2.2 Economic Growth in Tanzania

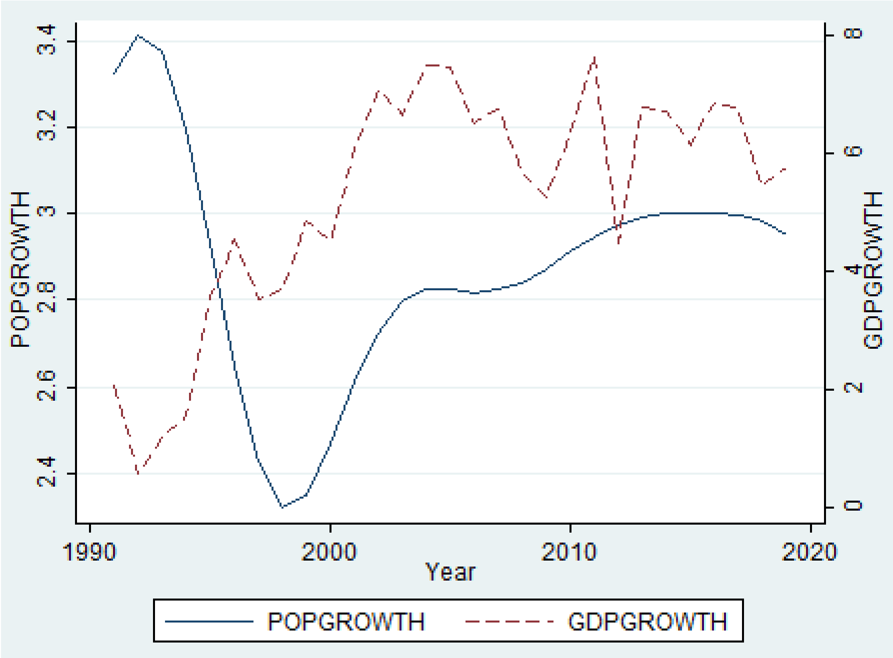
In East Africa, the United Republic of Tanzania is one of the fastest growing economies. Economic growth which is projected to have reached 7.1 percent in 2015 by the National Bureau of Statistics (2016) was powered by good performance in the information and communication, public administration and defense, financial and insurance, mining and quarrying sectors.

In 2019, real GDP growth was estimated at 6.8% down slightly from 7% in 2018 and is projected to be broadly stable at 6.4% in 2020 and 6.6% in 2021, however, this is subject to favorable weather conditions, prudent fiscal management and the implementation of reforms aimed at improving the business environment.

1.2.3 Trends in population growth and economic growth in Tanzania

The trend in population growth and Gross Domestic Product (GDP) in Tanzania from 1991 to 2019 is shown in figure 1.1 below;

Figure 1. 1 Trend of population growth and economic growth in Tanzania 1991 -2019



Source: Researcher 2020

The figure shows that in 1992 the country recorded the highest population growth rate of 3.41 percent. The growth rate was falling from 1993 and in 1998 the country recorded the lowest growth rate of 2.31 percent. In 2019 the growth rate increased to 2.87 percent from a growth rate of 2.35 percent in 1999. From 2014 to 2016 the growth rate was 3.0 percent and from 2017 growth rate declined from 2.99 percent to 2.95 in 2019 (World Bank 2020; NBS 2012, NBS 2018)

During the same period the country experience an all-time low growth of 0.58 percent in 1992. Between 1993 and 2002, the economy grew from 1.21 percent to 7.09 percent before experience a fall to 6.67 in 2003. Though the economy improved in 2004 to 7.50 percent, it declined from 7.47 in 2005 to 6.33 in 2010 before experiencing an all-time high of it 7.67 in 2011. The economy in 2012 however fell to 4.5 percent before rising to settle at 5.79 percent in 2019.

1.3 Statement of research problem

In Tanzania, population has been rising steadily, however the same could not be asserted on economic growth, as the economy maintained a cyclical growth. It is therefore difficult to pronounce that economic growth prospects in Tanzania is a result of its growing population.

Additionally, no any researcher from Tanzania have used time series data with causality approach to find out the impact of population growth on economic growth to ease the pronouncements.

Furthermore, the existing theories does not provide a clear-cut generalization as to the impact of population growth on economic growth of developing nations such as Tanzania (Garza-Rodriguez et al 2016). Some theories began with the Malthusian population trap showing that high population growth results into food problem and limit the development of saving, foreign exchange and human resources. As demand for food increases, natural resources which are key for the survival of a nation tends to decreases. Other negative impact of population growth include poverty caused by low per capita incomes, famine and disease, because rapid population growth complicates the task of providing and sustaining the infrastructure, education and healthcare required in modern economies (Mankiw et al 1992). Contrary to Malthusian, the Revisionist schools of thought believe that large population would result into high number of labor force, productivity and even positive impacts such as economies of scale and specializations which leads to economic growth. Therefore, there is divergence of opinion on the desirability of population growth as some scholars considers rapid population growth to be a real problem, others assert that it is not a matter of grave concern (Afzal, 2009).

This study used time series data covering the period 1991-2019 and applied causality approach on the same period to find out the impact of population growth on economic growth of Tanzania, and examine short run and long run relationship. Johansen Co-integration model of estimation assisted the researcher to find that relationship.

1.4 Research objectives

The study was conducted to achieve the following objectives;

1.4.1 Main Objective

To assess the impact of population growth on economic growth of Tanzania.

1.4.2 Specific Objectives

i. To ascertain the magnitude of impact of population growth on economic growth.
ii. To investigate causal relationship between population growth and economic growth.
iii. To determine whether long run relationship exist between population growth and economic growth.

1.5 Hypothesis

The hypotheses to be tested in this study are;

i. Population growth has no significant impact on economic growth.

ii. There is no causal relationship between population growth and economic growth.

iii. There is no long run relationship between population growth and economic growth.

1.6 Significance of the study

i. To academicians and students, since there is a continuing divergence of views on the impact of population growth on economic growth, this study will therefore serve as a critical contribution to knowledge by offering information regarding the same subject but from perspective of Tanzania

ii. To policy makers the results of this study will provide useful information on various explanatory variables that can be targeted in the evaluation of policy changes and new policy provisions to improve the desired level of economic growth.

iii. The study can help provide the private and public agencies with useful information in planning projects and programs that can help balance population growth and economic growth.

iv. To the government, this study will help them to know if there is a need to start emphasizing on population control mechanism such as family planning or not.

1.7 Scope

This study focused on the impact of population growth on economic growth for the period 1991-2019. Secondary data was used, and were obtained from World Bank (WB). The study focused on 29-year span because of availability of the trend data that were helpful for the study.

1.8 Organization of the study

This study is organized into five chapters in line with the requirements of the Institute of Accountancy Arusha research dissertation guidelines. In summary the contents of this research dissertation are;

Chapter one; describes the background of the study, identifies the research problem, explains the objectives of the study and state the hypothesis, also in this chapter the researcher clearly gives reasons as to why this study is significance, outline the scope of the study and lastly summarizes the organization of the study.

Chapters two; covers the review of relevant theories on population growth, inflation and economic growth, detailed analysis of the previous studies carried out by other researchers on the same topic, conceptual framework and lastly establishes a gap on the work done by other scholars on the same study that the research is interested to fill.

Chapter three; discusses the research design, identifies the research area, outline the type and source of data, explains on the reliability and validity of data and lastly provide data analysis methods.

Chapter four; covers presentation and discussion of findings in relation to research objectives and hypothesis.

Chapter five; provides a brief summary of findings and gives out conclusion and policy implications. This chapter also highlights areas for further study and provides a critical evaluation of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapters covers the review of relevant theories on population growth, inflation and economic growth, detailed analysis of the previous studies carried out by other researchers on the same topic, conceptual framework and lastly establishes a gap on the work done by other scholars on the same study that the research is interested to fill.

2.2 Theoretical literature review

This section discusses the old theories relating to population theories, economic theories and inflation.

2.2.1 Theories of population growth

Population growth theories includes Malthusian theory, Marxist theory, Boserup theory and Liberal theory.

According to Malthus (1798), population tends to increase at a faster rate than their food supply. While population is growing at a geometrical rate (i.e. 1, 2, 4, 8…) production capacity or food is only increasing arithmetically (i.e. 1, 2, 3, 4…). The theory claimed that, population growth is expected to lower per capita production, as demand growth cannot keep pace with population growth. Therefore, Malthus noted that in absence of regular checks on population growth, in a short period of time, scarce resources will thus have to be shared among an increasing number of individuals. However, there are some checks that can ease the burden of population explosion.

Malthus pointed out two checks to maintain a natural balance of population and avoid a stand-still, the preventive checks and positive checks. Preventive checks consist of voluntary restrictions on population growth i.e. fertility reduction. Positive checks are a direct result of lack of preventive control. If the society does not actively restrict population growth, illness, famines and wars will reduce the size of population and provide balance with resources i.e. Mortality rates (Chang et al 2014).

The Malthusian population theory ignited so much debate on the connection between population and economic growth. Three common views regarding the nexus of population-economic growth emerged from the population debates. The pessimistic theorist (or Malthusian theory), optimistic theorists (Marxist theory, Boserup theory and Simon) and Liberal theorist. (Peter and Bakari 2018).

Marxist theory (1848) claimed that rapid population growth enables economies of scale and encourages technological advances that will inevitably promote growth. According to theory, the working-class people's pervasive poverty and misery was due not to an immutable law of nature as propounded by Malthus, but to society's misconceived organization. Karl Marx went a step further and argued that the unequal distribution of wealth and its accumulation by capitalists caused hunger. It has absolutely nothing to do with the community. (Maganga and Omwenga 2018). The theory argued that the capitalist system has the capacity to produce food and other necessities but the underproduction was as the result of unequal distribution of social and economic resources. Marxist totally rejected the Malthusian theory as it did not fit in the socialist economy.

Boserup theory (1965), suggested that, population growth is an autonomous factor that affects rather than being affected by agricultural productivity as suggested by Malthusian theory. The study argued that Malthus prediction of declining labor returns was not long-term, as higher populations could lead to a more productive division of labor and better agricultural practices. The study concluded that soil fertility should not be treated as fixed and nature-given, but can be enhanced by replacing agricultural technology with a better one, which is likely to result from population increase. Simon (1977) in support of Boserup theory noted that because of the above opportunities, growth tend to have a positive effect on the standard of living. The supporters of Boserup theory strongly criticized the Malthusian theory by claiming that technological advancement will have a positive effect on productivity, thus neutralizing any potential threat to food supply from growing population (Aidi et al 2016).

The liberal (neutralist) theorist claim that the population itself has no positive or negative effect on economic growth, leaving all factors constant. Contemporary empirical research on the subject either favored the optimists or the pessimists, but the opinion of the neutralists remained largely unfounded (Hamza 2015).

2.2.2 Theories of Economic growth

The theories of economic growth include classical economic theory, Solow Model, Schumpeter's model, Endogenous growth theory and Harrod-Domar Model.

Classical growth theory, the theory postulates that with an increasing population and limited resources, the economic growth of a nation would decline. Such a postulation is a consequence of the assumption of the economists of classical growth theory who think that a temporary increase in real GDP per individual inevitably leads to an explosion of population which would restrict the resources of a country, thereby reducing real GDP. (CFI 2020)

Solow model (1956) viewed the population as an exogenous variable, and thought that population growth generally followed an arithmetic trend rather than a geometrical pattern. According to the model country's economic production (output) is as a result of capital and labor inputs, coupled with technological change. The standard production function used indicates that economic output depends on the amount of labor, capital inputs and the degree of technological advancement. In the Solow model, the growth rate is entirely determined by information developments or technological advances. According to Klassen and Lawson (2007), the Solow model have two distinct effects on demand growth from the increase in population growth rate. On the one hand, an increase in the rate of population growth would, in his view, increase the amount of labor and thus both the absolute level of production and the steady rate of growth of the state economy. On the other hand, it will also reduce physical capital stock per worker; thus, a decrease in productivity and production per worker in the steady state. This means that, to simplify the argument, higher population growth per se would be harmful to economic development.

Schumpeter model (1934), Contrary to the classics, the model did not regard capital accumulation as the main driving force behind economic growth. He attributed great importance to the entrepreneur-innovator concept. In his view, entrepreneurs' innovation and creativity determined economic development. After an innovation has been launched, an inventor earns great profits, but over time the competition copies the invention, and the profits begin to decline. Piętak (2014) noted that Schumpeter's proposed theory of economic growth is based on assumptions of a competitive market, private property and the performance of financial markets which could support new innovations. Nevertheless, these requirements are often not met in countries which lack a democratic system. Schumpeter's principle is thus applied to the countries that are democratic and economically developed.

Endogenous growth theory (1980) the theory argues that; economic growth is induced not by external forces but by forces within a system. In particular, it argues that economic growth is the result of human capital policies, internal processes and investment. Therefore, a country's economic growth on the basis of endogenous growth is due to government policies that promote innovation, investment in human capital, and information development that constitutes internal technology that drives economic growth.

Harrod-Domar Model (1939), suggests that economic growth rates depend on savings levels (higher savings for higher investment) and capital-output ratios. A lower ratio of capital output means more efficient investment, and a higher rate of growth. A simpler Harrod-Domar model is given as; Rate of economic growth (g) $\frac{\text{Level of savings (s)}}{\text{Capital-output ratio (k)}}$. Level of savings (s) = Average propensity to save (APS) – Which is the national savings ratio to the national income. The capital-output ratio = $\frac{1}{\text{marginal product of capital}}$. The capital-output ratio is the amount of capital required to increase production. A high return on capital means low investment. The capital output ratio also has to take into consideration the depreciation of existing capital

2.2.3 Theories of Inflation

The theories of inflation include the quantity theory of money, demand pull theory, cost push theory and structural inflation theory.

Quantity theory of money (QTM). This theory is one of the oldest economic theories. Simply put, it states that changes in the general level of prices are primarily determined by changes in the quantity of money in circulation. (Totonchi 2011). According to QTM money supply is directly proportional to price level in an economy, therefore when supply of money changes price level changes and vice-versa. It is supported by fisher equation; MV = PT, where M is money in circulation, V is velocity of money, P is price level and T is the volume of transactions in the economy. (Hunte 2012).

Demand pull theory. The theory states that aggregate demand is the major cause of demand-pull inflation. Aggregate demand is made up of investment, consumption and government expenditure. When aggregate demand is greater than aggregate supply at full employment level, then demand pull inflation arises. The larger the gap, the more rapid the inflation (Dmitrieva and Ushakov 2011).

Cost push theory. The theory asserts that inflation occurs when costs of production increase. Increase in costs of production or operations is mainly due to increase in wages, increase in cost of raw materials or increased cost of imported components. (Dmitrieva and Ushakov 2011).

2.3 Empirical Literature Review

Nwosu et al (2014) use annual time series data to investigate the relationship between population growth and economic growth in Nigeria from 1960 to 2008. The researchers used OLS regression and the granger test for causality. The findings indicate a positive relationship between population growth and economic growth in Nigeria. Tartiyus et al (2015) looked at the effect of population growth on Nigeria's economic growth from 1980 to 2010. They used descriptive statistics and regression analysis to analyze data, and real gross domestic product (RGDP), population growth rate, fertility rate, birth life expectancy, crude mortality rate, and export growth were used as variables of interest. The findings showed a positive relationship between Nigeria's economic growth (proxied by GDP growth) and population growth. The authors are not talking about the impact of population growth on economic growth from the context of Tanzania.

Akintunde et al (2013) used five-year average to analyze the relationship between population dynamics and economic growth in sub-Saharan African countries from 1975 to 2005. The researchers used both pooled OLS and dynamic panel techniques on data collected in the sub-Saharan countries from thirty-five (35) countries. Gross capital formation (as a percentage of GDP), gross domestic product per capital, primary school enrolment, mortality rate, fertility rate among others are among the variables mentioned in the model. The findings of empirical research showed that high fertility rates have an inverse impact on economic growth while life expectancy at birth has been shown to have a positive relationship with economic growth over the period considered. The researchers concluded that population growth needs to be adequately addressed in order to achieve economic growth and development in the studied economies. The researcher never used granger causality and cointegration and also the author is not talking about the impact of population growth on economic growth from perspective of Tanzania. In the 35 countries, Tanzania was not selected.

Dao (2012) analyzed the population to economic growth relationship in Africa using data that covered selected 45 African economies. The researcher used panel data regression analysis for the study. Fertility rate, per capita GDP growth, trade openness and dependence ratio (old and youth) are among the variables mentioned in the model. From the results the researcher deduced that the relationship between population growth and per capita GDP growth is linear and inverse. However, the results showed that fertility rates have a negative impact on economic growth, and that the old dependency ratio has a positive effect on GDP growth per capita. The author never used granger causality and cointegration and also the author is not talking about the impact of population growth on economic growth from perspective of Tanzania.

Rutger and Jeroen (2011) studied the impact of population dynamics (age-structure) in developing countries from 1997 to 2008 on economic growth. Asset (wealth) index (used as proxy for district GDP), work-age share growth rate, urbanization rate, landlocked, life expectancy trade openness were the variables that were included in the model. The study result showed a strong positive effect on GDP growth rate from working population. The researchers therefore suggested the need for government to create a favorable investment climate, as this will provide more jobs that can absorb the increasing population of young people. Though Tanzania was included in the study, the surveyed years and surveyed districts were so limited i.e. only 5 years from 1999-2004, and 8 districts from a total of 169 districts. Furthermore, there is inconsistency in the surveyed years and districts in other countries relative to surveyed data of Tanzania. For instance, In Indonesia, surveyed years were from 2003-2007 and districts surveyed were 26, in Vietnam surveyed years were from 2002-2006 and districts used were 8 while in Uganda 2001-2006 data were used with reference to 4 districts. Additionally, the authors never used granger causality and cointegration.

Bloom et al (2010) analyzed empirically the relationship between aging population and economic growth in Asia between 1960 and 2005, using both descriptive statistics and a fixed (dynamic) panel regression model. The variables used in the analysis include per capita RGDP, capital stock, average high school enrollment, trade transparency, life expectancy and dummies (used in Asia's proxy regions). The study findings include an inverse relationship between aging population and economic growth; a positive relationship between economic growth and capital stock, openness to trade and other institutional variables included in the regression model. The study focused on Asia and lacks information about population growth and economic growth in Tanzania also, the researcher never used granger causality and cointegration.

Kothare (1999) aimed at developing the relationship between population growth and India's economic growth. The research included all of India's provinces and covered a period from 1988 to 1998. The study used the combination of descriptive and empirical statistical tools on the data gathered from various parameters of interests. The study result showed that during the timeframe examined, population growth substantially and positively impacted economic growth. The researcher further clarified that the study's findings are relevant both for the short and long run. The 10-year time frame to analyses the impact of population growth in economic growth in a densely populated nation like India is small. India as of 1998 had a population of 1.016 billion (World Bank 2019). furthermore, the study lacks information about Tanzania and never used granger causality and cointegration.

Hamza (2015) found a negative relationship between population parameters and developing countries’ economic growth. Population parameters includes birth rates, death rates and net migration; in the parameters only death rates were statistically insignificant. The study analyzed data from 30 developing countries that were selected from Africa, Asia and Latin-America over a 14-year period (2001-2014). Death rates affects economic growth, and decline in mortality rates have been previously associated with rise in economic growth from the studies of Kalemli-Ozcan et al (1998), Banister and Zhang (2005) and Bhalotra (2006). The study was not talking about population growth from Tanzania's perspective.

Kelley (1988) claimed that lower level of population growth would help boost economic growth at a higher rate. The study elaborated that, in the situation of slower population growth, economic growth would be higher, even though the effect of population growth in many countries was small. The image of economic growth is closely associated with population and per capita income. Lower population growth and higher per capita income suggest the nation is meeting its growth targets. Countries with population growth below 1 per cent could increase their per capita income at a rate of 2.5 per cent per annum. Countries with population growth above 2 per cent had a slight increase of less than 2 per cent in per capita income.

For the period 1950-2007, Furuoka (2010) examined the relationship between population growth and economic growth in Philippine. The study employed OLS technique and found that in Philippine, economic development has a positive impact on population growth. Empirical results support the key outcomes of the study, which was the hypothesis that economic developments tend to induces population growth. The study never used granger causality and cointegration, and was not talking about population growth mainly from Tanzania

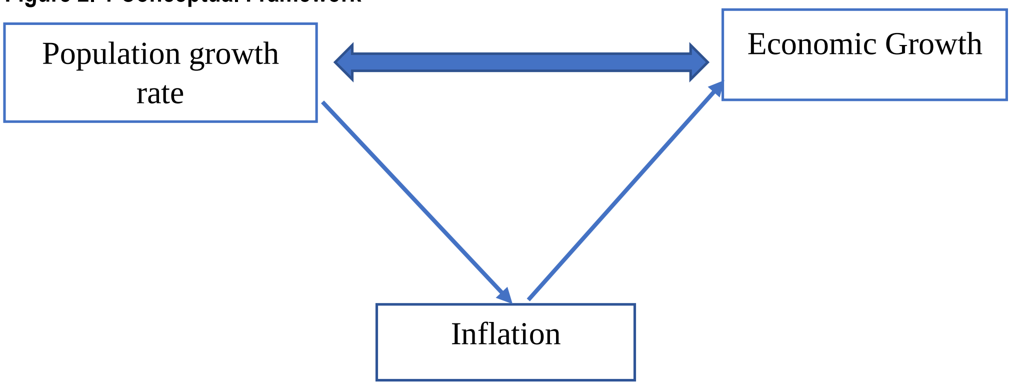
Aidi et al (2016) by employing granger causality test and using data from 1970-2013 to assess the relationship between population growth and economic growth in Nigeria, concluded that population growth neither granger cause economic growth nor economic growth granger cause population growth during the period under study. Though the author used granger causality and cointegration, the study was not talking about population growth mainly from Tanzania therefore the results cannot be generalized.

Klasen and Lawson (2007) combined macro and micro-econometric approach to analyze the relation between population and per capita economic growth, and poverty in Uganda using panel data. Uganda is claimed for having one of the world's highest levels of population growth. The study findings indicate that both theoretical implications and solid empirical evidence suggest that the current high population growth in Uganda places a significant break on prospects for per capita growth. In addition, it contributes significantly to low poverty reduction achievement, and is correlated with persistently poor households falling into poverty. Consequently, this is likely to make significant improvements in poverty reduction, and per capita growth quite difficult. The study focused on the relationship between population, per capita economic growth and poverty in Uganda and was not talking about population growth from the context of Tanzania, thus the results cannot be generalized.

2.4 Conceptual framework

Conceptual framework portrays the relationship between independent variables and dependent variable. In this study population growth and inflation will be the independent variable and economic growth will be the dependent variable.

Figure 2. 1 Conceptual Framework



Source: Researcher, 2020

From the above conceptual framework, there can be a unidirectional or bidirectional relationship between population growth and economic growth.

2.5 Research gap

No any researcher from Tanzania have used time series data with causality approach to find out the impact of population growth on economic growth.

Furthermore, existing theories have not provided a clear-cut generalization as to the impact of population growth on economic growth of developing nations such as Tanzania and it is therefore difficult to pronounce on the potential economic growth prospects of Tanzania due to its growing population.

This study intends to fill that gap by using time series data with causality approach to find out the impact of population growth on economic growth of Tanzania from 1991-2019, and examine short run and long run relationship. Johansen Co-integration model of estimation will assist the researcher to find that relationship.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research design, identifies the research area, outline the type and source of data, explains on the reliability and validity of data and lastly provide data analysis methods.

3.2 Research design

To get the necessary information, the study adopted a Causal research design. The researcher selected this research design as the primary objective of causal research is to establish cause and effect relationships between variables. Data were obtained from the World Bank.

3.3 Research area

The study was conducted in Tanzania. Tanzania has been chosen because no any researcher from Tanzania have used time series data with causality approach to find out the impact of population growth on economic growth of Tanzania.

3.4 Variables and their measurement

3.4.1 Population

According to Majid (2019), in a particular point in time, the population of a nation is the total number of all people alive. In the Higgs (1963), a country's population is the number of its inhabitants and whatever variations in quantity are considered, they are of consistency in close relation to quantities. Thus, population can be viewed as a mark for a human aggregate. Two significant measures of a population are population size which is the number of individuals, and population density which means the number of individuals per unit area or volume.

2.2.2 Population growth

Population growth refers to increase in the number of people living in a territory or state. In other words, population growth occurs when the number of people inhabiting a territory or state is rising. Population growth rate is the average annual rate of population change over a given period, usually given in percentage. (Sibly and Hone 2002).

2.2.3 Economic growth

Kuznets (1973) described the economic growth of a country as the long-term increase in its ability to provide increasingly diverse economic products to its population. Adewole (2012) supports Kuznets (1973) by noting that economic growth represents an increase in the capacity of a nation to produce goods and services. Rihab et al (2014) stated that Gross Domestic Product (GDP) of the country in one year is used as a measure for economic growth. GDP is the total amount of final goods and services produced within a country in one year.

2.2.4 Inflation

Inflation is usually a broad measure, such as the overall rise in prices or the rise in the cost of living in a country. But it can also be more narrowly measured for certain goods such as food stuffs or for services such as haircut, for instance. Regardless of the context, inflation indicates how much more expensive the relevant set of goods and services has become over a given period usually a year. Inflation is measured by consumer price index. (IMF 2020).

3.5 Types and source of data

The study used secondary annual time series data for the period of 1991 to 2019 from World Bank Development Indicators. The data are GDP growth rate as a proxy for economic growth, population growth rate and inflation rate.

3.6 Reliability and validity of data

3.6.1 Reliability of data

Reliability of data involves the repeatability of findings, meaning that when the study has to be done on the second time, it should provide similar outcomes (Patton, 2005).

To ensure reliability, data were obtained from a reliable source (World Bank Development Indicators) and the researcher also repeatedly perform the test several times to ensure consistency.

3.6.2 Validity of data

Validity refers to the extent to which the study measures truly what it purports to measure or in other words the extent to which research results are true. (Kothari, 2004; Patton, 2005).

To ensure the study is valid, several tests were performed to justify the findings including test for autocorrelation and normality.

3.7 Data analysis methods

To find out accurately, whether changes in one variable will have an impact on changes on another variables, we need to apply the Granger Causality Test (Granger, 1969). Therefore, to investigates the impact of population growth on economic growth of Tanzania, this study used time series data with causality approach.

In principle, the concept is as follows; If X causes Y, then, changes of X happened first then followed by changes of Y. In most regressions, it is difficult to discuss causality. Usually regression only tells us there is some relationship between the variables, but does not tell you the nature of relationship, such as whether one variable causes each other. For instance, the significance of the coefficient β in the regression $Y = \beta_0 + \beta_1 X_i + \mu$ only tells the occurrence of X and Y, not that X causes Y. Put it simply, the regression only tells us that there is some relationship between X and Y however it does not tell us the nature of the relationship, such as whether X causes Y or Y causes X. (Mwaitete 2016)

To test causality, the study adopted Vector Auto Regression (VAR) model. VAR model is one of the most successful and versatile models for the analysis of multivariate time series. Three variables were used for the purpose, annual Gross Domestic Product growth rate (GDP) as a proxy for economic growth, population growth and Inflation rate.

The model adopted by the researcher is expressed below;

$GDP_t = \beta_1 POP_{t-i} + \beta_2 INF_{t-k} + \varepsilon$

$POP_t = \beta_3 GDP_{t-i} + \beta_4 INF_{t-k} + \mu$

$INF_t = \beta_5 GDP_{t-i} + \beta_6 INF_{t-k} + e$

Where

GDP_t = Gross Domestic Product at time t (Proxy for Economic growth)

POP_t = Population growth at time t

INF = Inflation rate at time t

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ = Coefficients

$_{t-i}$ and $_{t-k}$ = Time lag

ε, μ, e = Error term

Assumption of the model: GDPt, POPt and INFt are stationary if they are not stationary, we have to make them stationary to test for granger causality. It is also assumed that ε, μ and e are uncorrelated.

The model was therefore, subjected to a Unit root test using Augmented Dickey fuller test for intercept, model trend and intercept and no trend and intercept.

Johansen test for cointegration was applied in the study to examine whether variables have long-run relationship or are stable overtime, as a result of their different order of integration.

Vector Error Correction Model was applied to determine the speed of adjustment towards equilibrium and lastly diagnostic checking was applied to test for validity of the findings.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF FINDINGS

4.1 Unit Root Test

To avoid spurious results when using time series data, it is important to ensure that such data are stationary. This study used time series data for 29 observations covering the period 1991 to 2019 obtained from the World Bank; since time series data were used it became important to establish stationarity or in what order data were integrated to ensure validity and reliability of the results.

To assess stationary, data for economic growth, population growth and inflation were put to a unit root test. The popular Augmented Dickey-Fuller (ADF) was used and results obtained showed that all the variables were valid in the model.

The results for Validity (intercept, model trend and intercept only, no trend no intercept) for both population growth and economic growth are presented in table 4.1 to table 4.18.

4.1.1 Economic Growth

Unit root test for economic growth was guided by the following hypothesis;

Hypothesis

H_0: Economic Growth has unit root or not stationary

H_1: Economic Growth does not have a unit root or is stationary

Decision Criteria

Reject the null hypothesis when absolute value of test statistics is greater than absolute value of critical value at 5%.

Table 4. 1 Intercept only

Augmented Dickey-Fuller test for unit root   Number of obs = 24

	Test Statistic	Interpolated Dickey-Fuller: 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-5.781	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.0000

D.dddgdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dddgdp						
L1.	-7.297833	1.262402	-5.78	0.000	-9.950041	-4.645625
LD.	4.682343	1.14219	4.10	0.001	2.282692	7.081994
L2D.	2.860586	.8672076	3.30	0.004	1.038651	4.682522
L3D.	1.440966	.5045982	2.86	0.011	.3808441	2.501087
L4D.	.5258174	.1879598	2.80	0.012	.1309285	.9207063
_cons	-.1926296	.2930784	-0.66	0.519	-.8083645	.4231052

Since the results show that the test statistics is 5.781which is greater than 3.000 at 5% critical value, we thus reject the null hypothesis and accept the alternative hypothesis that economic growth has no unit root or is stationary; the model is also valid at L1.

Table 4. 2 Model trend and intercept

Augmented Dickey-Fuller test for unit root   Number of obs = 24

	Test Statistic	Interpolated Dickey-Fuller: 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-5.583	-4.380	-3.600	-3.240

MacKinnon approximate p-value for Z(t) = 0.0000

D.dddgdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dddgdp						
L1.	-7.259064	1.300306	-5.58	0.000	-10.00247	-4.515659
LD.	4.644918	1.177157	3.95	0.001	2.161334	7.128502
L2D.	2.827799	.8951487	3.16	0.006	.9392005	4.716398
L3D.	1.419386	.5217641	2.72	0.015	.3185602	2.520212
L4D.	.5172015	.1945843	2.66	0.017	.1066646	.9277384
_trend	.0143338	.0437293	0.33	0.747	-.0779268	.1065945
_cons	-.4286946	.780408	-0.55	0.590	-2.075211	1.217822

Since the results show that test statistics is 5.583which is greater than 3.600 at 5% critical value, we therefore reject null hypothesis and accept alternative hypothesis. This implies that Economic growth has no unit root or is stationary; the model is also valid at L1.

Table 4. 3 No trend no intercept

Augmented Dickey-Fuller test for unit root Number of obs = 24

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-5.842	-2.660	-1.950	-1.600

D.dddgdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dddgdp						
L1.	-7.253622	1.241623	-5.84	0.000	-9.852368	-4.654876
LD.	4.645115	1.123603	4.13	0.001	2.293387	6.996843
L2D.	2.8361	.8533581	3.32	0.004	1.050001	4.622199
L3D.	1.428092	.4966239	2.88	0.010	.3886466	2.467538
L4D.	.5214749	.1850146	2.82	0.011	.134235	.9087148

The results show that the test statistics is at 5.842which is greater than 1.950 at 5% critical value, we thus reject the null hypothesis and accept the alternative hypothesis. This means that economic growth has no unit root or is stationary and also the model is valid at L1.

4.1.2 Population Growth

Unit root test for population growth was guided by the following hypothesis;

Hypothesis

H_0: Population Growth has unit root or not stationary

H_1: Population Growth does not have a unit root or is stationary

Decision Criteria

Reject the null hypothesis when absolute value of test statistics is greater than absolute value of critical value at 5%.

Table 4. 4 Intercept only

Augmented Dickey-Fuller test for unit root — Number of obs = 24

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-5.196	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.0000

D.dddpop	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dddpop						
L1.	-1.088797	.2095344	-5.20	0.000	-1.529013	-.6485818
LD.	.4073505	.1491845	2.73	0.014	.0939255	.7207755
L2D.	.6236887	.1495176	4.17	0.001	.3095638	.9378136
L3D.	.317141	.0958315	3.31	0.004	.1158066	.5184755
L4D.	.1164823	.0706508	1.65	0.117	-.0319496	.2649141
_cons	-.0013814	.0034264	-0.40	0.692	-.0085801	.0058173

The results show that test statistics is 5.196 which is greater than 3.000 at 5% critical value, we therefore reject the null hypothesis that population growth is not stationary and accept the alternative hypothesis that population growth is stationary. The model is valid at L1

Table 4. 5 Model trend and intercept

Augmented Dickey-Fuller test for unit root — Number of obs = 24

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-4.922	-4.380	-3.600	-3.240

MacKinnon approximate p-value for Z(t) = 0.0003

D.dddpop	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dddpop						
L1.	-1.110218	.2255578	-4.92	0.000	-1.586104	-.634333
LD.	.4179538	.1567495	2.67	0.016	.0872412	.7486664
L2D.	.6265059	.1536707	4.08	0.001	.302289	.9507228
L3D.	.3242063	.1008685	3.21	0.005	.1113924	.5370202
L4D.	.120822	.0737959	1.64	0.120	-.0348738	.2765179
_trend	-.0001728	.0005506	-0.31	0.757	-.0013346	.0009889
_cons	.0015836	.0100785	0.16	0.877	-.0196803	.0228474

The results show that test statistics is at 4.922 greater than 3.60 at 5% critical value, we therefore reject the null hypothesis and accept the alternative hypothesis.

his means that population growth is stationary or has no unit root. The model is also valid at L1

Table 4. 6 No trend no intercept

Augmented Dickey-Fuller test for unit root   Number of obs = 24

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-5.385	-2.660	-1.950	-1.600

D.dddpop	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dddpop						
L1.	-1.097438	.20379	-5.39	0.000	-1.523975	-.6709005
LD.	.4138804	.1449975	2.85	0.010	.1103972	.7173636
L2D.	.6220939	.1461342	4.26	0.000	.3162315	.9279562
L3D.	.3197052	.0934891	3.42	0.003	.1240303	.5153801
L4D.	.1178926	.0689915	1.71	0.104	-.0265083	.2622935

The results show that the test statistics is 5.385 which is greater than 1.950 at 5% critical value, we thus reject the null hypothesis that population growth has unit root, and accept alternative hypothesis that population growth has no unit root or is stationary. The model is valid at L1

4.1.3 Inflation

Unit root test for inflation was also guided by the following hypothesis;

Hypothesis

H0: Inflation has unit root or not stationary

H1: Inflation does not have a unit root or is stationary

Decision Criteria

Reject the null hypothesis when absolute value of test statistics is greater than absolute value of critical value at

Table 4. 7 Intercept only

```
Augmented Dickey-Fuller test for unit root         Number of obs   =        24

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -4.227            -3.750            -3.000            -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0006
```

D.dddinf	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dddinf						
L1.	-5.165871	1.222035	-4.23	0.001	-7.733271	-2.598471
LD.	3.008668	1.054975	2.85	0.011	.7922468	5.225089
L2D.	1.668162	.7938709	2.10	0.050	.0003011	3.336023
L3D.	.7640546	.4461852	1.71	0.104	-.1733458	1.701455
L4D.	.1753363	.1911792	0.92	0.371	-.2263163	.5769888
_cons	.1608043	.898331	0.18	0.860	-1.726519	2.048128

The results show that test statistics is 4.227 which is greater than 3.000 at 5% critical value, we therefore reject the null hypothesis that inflation is not stationary and accept the alternative hypothesis that inflation is stationary. The model is valid at L1

Table 4. 8 Model trend and intercept

```
Augmented Dickey-Fuller test for unit root         Number of obs   =        24

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -4.043            -4.380            -3.600            -3.240
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0076
```

D.dddinf	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dddinf						
L1.	-5.189268	1.283623	-4.04	0.001	-7.897476	-2.481061
LD.	3.028429	1.107175	2.74	0.014	.6924931	5.364365
L2D.	1.68208	.831128	2.02	0.059	-.0714471	3.435606
L3D.	.7714659	.4663012	1.65	0.116	-.2123437	1.755275
L4D.	.1780999	.199045	0.89	0.383	-.2418484	.5980481
_trend	.0122792	.1360797	0.09	0.929	-.2748238	.2993822
_cons	-.042422	2.43442	-0.02	0.986	-5.178599	5.093755

The results show that test statistics is at 4.043 greater than 3.60 at 5% critical value. We therefore reject the null hypothesis and accept the alternative hypothesis. This means that inflation is stationary or has no unit root. The model is also valid at L1

Table 4. 9 No trend no intercept

Augmented Dickey-Fuller test for unit root   Number of obs   =   24

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-4.340	-2.660	-1.950	-1.600

D.dddinf	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dddinf						
L1.	-5.166942	1.190485	-4.34	0.000	-7.658656	-2.675227
LD.	3.008126	1.027747	2.93	0.009	.8570271	5.159225
L2D.	1.665665	.7732652	2.15	0.044	.0472021	3.284127
L3D.	.7616282	.4344706	1.75	0.096	-.1477291	1.670986
L4D.	.1737648	.1860492	0.93	0.362	-.2156407	.5631703

The results show that test statistics is 4.340 which is greater than 1.950 at 5% critical value, we thus reject the null hypothesis that population growth has unit root, and accept alternative hypothesis that inflation has no unit root or is stationary. The model is valid at L1

4.2 Lag Selection Criteria

Table 4. 10 Lag selection criteria

Selection-order criteria

Sample: 1995 - 2019   Number of obs   =   25

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-104.02				1.04924	8.56157	8.60213	8.70783
1	-79.5939	48.851	9	0.000	.307955	7.32751	7.48978	7.91257
2	-52.1053	54.977	9	0.000	.072868	5.84843	6.1324	6.87228
3	-37.8401	28.53	9	0.001	.052627	5.42721	5.83289	6.88986
4	-11.3134	53.053*	9	0.000	.015756*	4.02507*	4.55245*	5.92652*

Endogenous: dddeco dddpop dddinf
Exogenous: _cons

The researcher used four lags as the most optimal lag length, because it was supported by all the selection criteria (LR, FPE, AIC, HQIC and SBIC)

4.3 Vector Auto Regression Model (VAR Model)

The results from VAR are presented in Table 4.11 below;

Table 4. 11 Vector Autoregression Results for dddGDP, dddPOP and dddINF

```
Vector autoregression

Sample:  1995 - 2019                          No. of obs      =         25
Log likelihood = -11.31341                    AIC             =   4.025073
FPE            =  .0157562                    HQIC            =   4.552453
Det(Sigma_ml)  =  .0004962                    SBIC            =   5.926519
```

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dddgdp	13	1.35855	0.9200	287.476	0.0000
dddpop	13	.019048	0.8535	145.7041	0.0000
dddinf	13	4.25112	0.8875	197.1598	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dddgdp						
dddgdp						
L1.	-1.618575	.1912758	-8.46	0.000	-1.993469	-1.243681
L2.	-1.182652	.3198409	-3.70	0.000	-1.809528	-.5557748
L3.	-.5243122	.2630138	-1.99	0.046	-1.03981	-.0088147
L4.	-.06666	.1337481	-0.50	0.618	-.3288013	.1954814
dddpop						
L1.	-4.162696	7.991288	-0.52	0.602	-19.82533	11.49994
L2.	.3277518	6.301329	0.05	0.959	-12.02263	12.67813
L3.	17.22113	5.544554	3.11	0.002	6.354008	28.08826
L4.	3.56456	6.337798	0.56	0.574	-8.857296	15.98642
dddinf						
L1.	-.1772168	.0505	-3.51	0.000	-.276195	-.0782386
L2.	-.0844385	.0737368	-1.15	0.252	-.22896	.0600829
L3.	-.0526021	.0609417	-0.86	0.388	-.1720456	.0668414
L4.	-.0639308	.0451205	-1.42	0.157	-.1523654	.0245038
_cons	-.1173905	.1944549	-0.60	0.546	-.4985151	.2637342

Table 4.11 Vector Autoregression Results for dddGDP, dddPOP and dddINF

dddpop						
dddgdp						
L1.	-.000388	.0026818	-0.14	0.885	-.0056443	.0048683
L2.	.0030078	.0044844	0.67	0.502	-.0057814	.011797
L3.	-.0000709	.0036876	-0.02	0.985	-.0072986	.0071567
L4.	-.0008983	.0018752	-0.48	0.632	-.0045737	.0027771
dddpop						
L1.	.7563689	.1120432	6.75	0.000	.5367682	.9759696
L2.	-.3319778	.0883489	-3.76	0.000	-.5051384	-.1588172
L3.	-.0676699	.0777384	-0.87	0.384	-.2200344	.0846945
L4.	-.2615568	.0888602	-2.94	0.003	-.4357195	-.087394
dddinf						
L1.	.0001724	.000708	0.24	0.808	-.0012153	.0015602
L2.	-.0004403	.0010338	-0.43	0.670	-.0024666	.001586
L3.	-.0002607	.0008544	-0.31	0.760	-.0019354	.001414
L4.	-.0020288	.0006326	-3.21	0.001	-.0032687	-.0007889
_cons	.0006706	.0027264	0.25	0.806	-.004673	.0060142

dddinf						
dddgdp						
L1.	1.477684	.5985306	2.47	0.014	.3045851	2.650782
L2.	2.098672	1.00083	2.10	0.036	.1370806	4.060263
L3.	.8960862	.8230095	1.09	0.276	-.7169829	2.509155
L4.	.0193297	.4185178	0.05	0.963	-.80095	.8396095
dddpop						
L1.	-33.3708	25.00594	-1.33	0.182	-82.38154	15.63994
L2.	66.64501	19.7178	3.38	0.001	27.99883	105.2912
L3.	3.996837	17.34974	0.23	0.818	-30.00803	38.00171
L4.	-12.49045	19.83192	-0.63	0.529	-51.36031	26.3794
dddinf						
L1.	-1.304537	.1580221	-8.26	0.000	-1.614255	-.9948196
L2.	-1.257879	.2307334	-5.45	0.000	-1.710108	-.8056495
L3.	-.9149614	.1906956	-4.80	0.000	-1.288718	-.5412048
L4.	-.5740786	.1411889	-4.07	0.000	-.8508039	-.2973534
_cons	.0999167	.6084786	0.16	0.870	-1.09268	1.292513

From the above results, the first part of economic growth (dddgdp) is explained as follows;

dddgdp L1 shows the effect of first lag of economic growth on economic growth. The p-value of this first lag is 0.000 which is less than 5% significant level, this means that the first lag of economic growth is significant. Since the coefficient of first lag is (-1.618575) and the lag is significant, this implies that economic growth is negatively affected by its first lag value with coefficient of (-1.618575).

dddgdp L2 indicates the effect of second lag of economic growth on economic growth. Since the p-value of thissecond lag is 0.000 which is lessthan 5% significant level, this implies that the second lag of economic growth is significant. Given the coefficient of second lag is (-1.182652) and the lag is significant, this suggests that economic growth is negatively affected by its second lag value with coefficient of (-1.182652)

dddgdp L3 highlights the effect of third lag of economic growth on economic growth. Since the p-value of this third lag is 0.046 which is less than 5% significant level, this implies that the third lag of economic growth is significant. Given the coefficient of second lag is (-0.5243122) and the lag is significant, this suggests that economic growth is also negatively affected by its third lag value with coefficient of (-0.5243122)

dddgdp L4 shows the effect of fourth lag of economic growth on economic growth. Since the p-value of this fourth lag is 0.618 which is greater than 5% significant level, this implies that the fourth lag of economic growth is insignificant, then economic growth is not affected by fourth lag value of economic growth.

dddpop L1 explains the effect of first lag of population growth on economic growth. The p-value of this first lag is 0.602 which is greater than 5% significant level which means that the first lag of population growth is insignificant. Since the lag is insignificant then we can conclude that economic growth is not affected by first lag value of population growth.

ddpdop L2 measures the effect of second lag of population growth on economic growth. The p-value of this second lag is 0.959 which is greater than 5% significant level this implies that the first lag of population growth is insignificant. Therefore, economic growth is not affected by second lag value of population growth.

ddpdop L3 indicates the effect of third lag of population growth on economic growth. Since the p-value of this third lag is 0.002 which is less than 5% significant level, this implies that the third lag value of economic growth is significant. Given the coefficient of second lag is 17.22113 and the lag is significant, this suggests that economic growth is positively affected by third lag value of population growth with coefficient of 17.22113

dddpop L4 explains the effect of fourth lag of population growth on economic growth. The p-value of this fourth lag is 0.574 which is greater than 5% significant level which means that the fourth lag of population growth is insignificant. Since the lag is insignificant then we can conclude that economic growth is not affected by fourth lag value of population growth.

dddinf L1 shows the effect of first lag of inflation on economic growth. The p-value of this first lag is 0.000 which is less than 5% significant level, this means that the first lag of inflation is significant. Since the coefficient of first lag is (-0.1772168) and the lag is significant, this implies that economic growth is negatively affected by first lag value of inflation with coefficient of (-0.1772168).

dddinf L2 measures the effect of second lag of inflation on economic growth. The p-value of this second lag is 0.252 which is greater than 5% significant level this implies that the second lag of inflation is insignificant. Therefore, economic growth is not affected by second lag value of inflation.

dddinf L3 highlights the effect of third lag of inflation on economic growth. The p-value of this third lag is 0.388 which is greater than 5% significant level which means that the third lag of inflation is insignificant. Since the lag is insignificant then we can conclude that economic growth is not affected by third lag value of inflation.

dddinf L4 explains the effect of fourth lag of inflation on economic growth. The p-value of this fourth lag is 0.157 which is greater than 5% significant level which means that the fourth lag of inflation is insignificant. Since the lag is insignificant then we can conclude that economic growth is not affected by fourth lag value of inflation.

The second part of population growth (dddpop) is explained as follows;

dddgdp L1 shows the effect of first lag of economic growth on population growth. The p-value of this first lag is 0.885 which is greater than 5% significant level which means that the first lag of economic growth is insignificant. Since the lag is insignificant then we can conclude that population growth is not affected by first lag value of economic growth.

dddgdp L2 provides the effect of second lag of economic growth on population growth. The p-value of this second lag is 0.502 which is greater than 5% significant level which means that the second lag of economic growth is insignificant. Since the lag is insignificant then we can conclude that population growth is not affected by second lag value of economic growth.

dddgdp L3 present the effect of third lag of economic growth on population growth. The p-value of this third lag is 0.985 which is greater than 5% significant level which means that the third lag of economic growth is insignificant. Since the lag is insignificant then we can conclude that population growth is not affected by third lag value of economic growth.

dddgdp L4 explains the effect of fourth lag of economic growth on population growth. The p-value of this first lag is 0.632 which is greater than 5% significant level which means that the fourth lag of economic growth is insignificant. Since the lag is insignificant then we can conclude that population growth is not affected by first lag value of economic growth.

dddpop L1 highlights the effect of first lag of population growth on population growth. The p-value of this first lag is 0.000 which is less than 5% significant level, this means that the first lag of population growth is significant. Since the coefficient of first lag is (0.7563689) and the lag is significant, this implies that population growth is positively affected by its first lag with coefficient of (0.7563689).

dddpop L2 shows the effect of second lag of population growth on population growth. The p-value of this second lag is 0.000 which is less than 5% significant level, this means that the second lag of population growth is significant. Since the coefficient of second lag is (-0.3319778) and the lag is significant, this implies that population growth is negatively affected by its second lag with coefficient of (-0.3319778)

dddpop L3 explains the effect of third lag of population growth on population growth. The p-value of this first lag is 0.384 which is greater than 5% significant level which means that the third lag of population growth is insignificant. Since the lag is insignificant then we can conclude that population growth is not affected by its third first lag.

dddpop L4 measures the effect of fourth lag of population growth on population growth. The p-value of this fourth lag is 0.003 which is less than 5% significant level, this means that the fourth lag of population growth is significant. Since the coefficient of fourth lag is (-0.2615568) and the lag is significant, this implies that population growth is negatively affected by its fourth lag with coefficient of (-0.2615568).

dddinf L1 gives the effect of the first lag of inflation on population growth. The p-value of this first lag is 0.808 which is greater than 5% significant level which means that the first lag of inflation is insignificant. Since the lag is insignificant then we can conclude that population growth is not affected by inflation.

dddinf L2 provides the effect of the second lag of inflation on population growth. The p-value of this second lag is 0.670 which is greater than 5% significant level which means that the second lag of inflation is insignificant. Since the lag is insignificant then we can conclude that population growth is not affected by inflation.

dddinf L3 explains the effect of the third lag of inflation on population growth. The p-value of this third lag is 0.760 which is greater than 5% significant level which means that the third lag of inflation is insignificant. Since the lag is insignificant then we can conclude that population growth is not affected by inflation.

dddinf L4 shows the effect of the fourth lag of inflation on population growth. The p-value of this fourth lag is 0.001 which is less than 5% significant level which means that the fourth lag of inflation is significant. Since the coefficient of fourth lag is (-0.0020288) and the lag is significant, this implies that population growth is negatively affected by fourth lag of inflation with coefficient of (-0.0020288).

The third part of inflation (dddinf) is explained as follows;

dddgdp L1 explains the effect of the first lag of economic growth on inflation. The p-value of this first lag is 0.014 which is less than 5% significant level which means that the first lag of economic growth is significant. Since the coefficient of first lag is 1.477684 and the lag is significant, this implies that inflation is positively affected by first lag of economic growth with coefficient of 1.477684.

dddgdp L2 measures the effect of the second lag of economic growth on inflation. The p-value of this second lag is 0.036 which is less than 5% significant level which means that the second lag of economic growth is significant. Since the coefficient of second lag is 2.098672 and the lag is significant, this implies that inflation is positively affected by second lag of economic growth with coefficient of 2.098672.

dddgdp L3 provides the effect of the third lag of economic growth on inflation. The p-value of this third lag is 0.276 which is greater than 5% significant level which means that the third lag of economic growth is insignificant. Since the lag is insignificant then we can conclude that inflation is not affected by the third lag of economic growth.

dddgdp L4 shows the effect of the fourth lag of economic growth on inflation. The p-value of this fourth lag is 0.963 which is greater than 5% significant level which means that the fourth lag of economic growth is insignificant. Since the lag is insignificant then we can conclude that inflation is not affected by the fourth lag of economic growth.

dddpop L1 explains the effect of the first lag of population growth on inflation. The p-value of this first lag is 0.182 which is greater than 5% significant level which means that the first lag of population growth is insignificant. Since the lag is insignificant then we can conclude that inflation is not affected by the first lag of population growth.

dddpop L2 measures the effect of the second lag of population growth on inflation. The p-value of this second lag is 0.001 which is less than 5% significant level which means that the second lag of population growth is significant. Since the coefficient of second lag is 3.996837 and the lag is significant, this implies that inflation is positively affected by second lag of population growth with coefficient of 3.996837

dddpop L3 provides the effect of the third lag of population growth on inflation. The p-value of this third lag is 0.818 which is greater than 5% significant level which means that the third lag of population growth is insignificant. Since the lag is insignificant then we can conclude that inflation is not affected by the third lag of population growth.

dddpop L4 explains the effect of the fourth lag of population growth on inflation. The p-value of this fourth lag is 0.529 which is greater than 5% significant level which means that the fourth lag of population growth is insignificant. Since the lag is insignificant then we can conclude that inflation is not affected by the fourth lag of population growth.

dddinf L1 shows the effect of the first lag of inflation on inflation. The p-value of this first lag is 0.000 which is less than 5% significant level which means that the first lag of inflation is significant. Since the coefficient of first lag is (-1.304537) and the lag is significant, this implies that inflation is negatively affected by its first lag with coefficient of (-1.304537)

dddinf L2 explains the effect of the second lag of inflation on inflation. The p-value of this second lag is 0.000 which is less than 5% significant level which means that the second lag of inflation is significant. Since the coefficient of second lag is (-1.257879) and the lag is significant, this implies that inflation is negatively affected by its second lag with coefficient of (-1.257879)

dddinf L3 gives the effect of the third lag of inflation on inflation. The p-value of this third lag is 0.000 which is less than 5% significant level which means that the third lag of inflation is significant. Since the coefficient of third lag is (-0.9149614) and the lag is significant, this implies that inflation is negatively affected by its third lag with coefficient of (-0.9149614)

dddinf L4 shows the effect of the fourth lag of inflation on inflation. The p-value of this fourth lag is 0.000 which is less than 5% significant level which means that the fourth lag of inflation is significant. Since the coefficient of fourth lag is (-0.5740786) and the lag is significant, this implies that inflation is negatively affected by its fourth lag with coefficient of (-0.5740786).

4.4 Stability test of VAR

The key property of the VAR model is that the model must be stable for it to be valid. If the modulus is less than one in each eigenvalue of a companion matrix, VAR is stable.

Table 4. 12 Stability test of VAR

Eigenvalue stability condition

Eigenvalue		Modulus
.6963665 +	.6047758i	.922323
.6963665 -	.6047758i	.922323
.03393091 +	.85443675i	.855041
.03393091 -	.85443675i	.855041
-.6967684 +	.4860363i	.84954
-.6967684 -	.4860363i	.84954
-.3563206 +	.7639313i	.842944
-.3563206 -	.7639313i	.842944
-.8073012		.807301
-.273563 +	.4350653i	.513925
-.273563 -	.4350653i	.513925
-.1667331		.166733

All the eigenvalues lie inside the unit circle.
VAR satisfies stability condition.

In the VAR model, the modulus of each eigenvalue is less than one, so the estimates satisfy the stability condition of the eigenvalue. This implies, therefore that the approximate VAR model is robust and guarantees a meaningful interpretation of the results.

4.5 Granger Causality Wald Test

This test is carried out to examine whether lagged values of economic growth causes population growth and inflation or lagged values of population growth causes economic growth and inflation or lagged values of inflation causes population growth and economic growth (Unidirectional causality) or lagged values of economic growth, population growth and inflation cause each other (bilateral causality).

Decision criteria

If probability of chi-square is less than 5% significant level reject the null hypothesis

Table 4. 13 Granger Causality Wald Test

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
dddgdp	dddpop	14.025	4	0.007
dddgdp	dddinf	15.362	4	0.004
dddgdp	ALL	41.953	8	0.000
dddpop	dddgdp	7.0067	4	0.136
dddpop	dddinf	16.616	4	0.002
dddpop	ALL	19.58	8	0.012
dddinf	dddgdp	9.1821	4	0.057
dddinf	dddpop	17.607	4	0.001
dddinf	ALL	25.59	8	0.001

Case One Hypothesis

H_0: Lagged (4) population growth does not granger cause economic growth

H_1: Lagged (4) population growth granger causes economic growth.

The results from table 4.13 shows that the probability value is 0.007 which is less than 0.05 level of significant, therefore we reject the null hypothesis and conclude that lagged (4) population growth causes economic growth

Case Two Hypothesis

H_0: Lagged (4) inflation does not granger cause economic growth

H_1: Lagged (4) inflation granger causes economic growth.

The results from table 4.13 shows that the probability value is 0.004 which is less than 0.05 level of significant, therefore we reject the null hypothesis and conclude that lagged (4) inflation causes economic growth

Case Three Hypothesis

H_0: Lagged (4) economic growth does not granger cause population growth

H_1: Lagged (4) economic growth granger causes population growth

The results show the probability value of 0.136 which is greater than 0.05 (significant level), therefore we fail to reject the null hypothesis and conclude that lagged (4) economic growth does not granger causes population growth.

Case Four Hypothesis

H_0: Lagged (4) inflation does not granger cause population growth

H_1: Lagged (4) inflation granger causes population growth.

The results from table 4.13 shows that the probability value is 0.002 which is less than 0.05 level of significant, therefore we fail to accept the null hypothesis and conclude that lagged (4) inflation granger causes population growth

Case Five Hypothesis

H_0: Lagged (4) economic growth does not granger cause inflation

H_1: Lagged (4) economic growth granger causes inflation

The results show the probability value of 0.057 which is greater than 0.05 (significant level), therefore we fail to reject the null hypothesis and conclude that lagged (4) economic growth does not granger causes inflation.

Case Six Hypothesis

H0: Lagged (4) population growth does not granger cause inflation

H1: Lagged (4) population growth granger causes inflation.

The results from table 4.13 shows that the probability value is 0.001 which is less than 0.05 level of significant, therefore we reject the null hypothesis and conclude that lagged (4) population growth granger causes inflation.

4.5 Johansen test for cointegration

This test was applied in the study to examine whether variables have long-run relationship or are stable overtime, as a result of their different order of integration.

The test was guided by the following hypotheses;

H0: There is no cointegration among variables

H1: There is cointegration among variables

Table 4. 14 Johansen test for cointegration

Johansen tests for cointegration

Trend: constant Number of obs = 25

Sample: 1995 - 2019 Lags = 4

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	30	-63.776815	.	104.9268	29.68
1	35	-29.711199	0.93447	36.7956	15.41
2	38	-19.31186	0.56480	15.9969	3.76
3	39	-11.313412	0.47264		

maximum rank	parms	LL	eigenvalue	max statistic	5% critical value
0	30	-63.776815	.	68.1312	20.97
1	35	-29.711199	0.93447	20.7987	14.07
2	38	-19.31186	0.56480	15.9969	3.76
3	39	-11.313412	0.47264		

When we start at 0 maximum rank it is observed that the trace statistics is 104.9268 which is greater than the critical value of 29.68; we therefore, reject the null hypothesis that there is no cointegration among the variables and we accept the alternative hypothesis that there is cointegration among variables.

Also, when there is 1 maximum rank, we observe that trace statistics is 36.7956which is greater than the critical value of 15.41; we thus reject the null hypothesis and accept the alternative hypothesis that there is cointegration among variables.

This means that the three variables have long run relationship, they move together in the long run. Therefore, the three variables are cointegrated.

The same approach can be applied when comparing maximum rank, using max statistics and critical value. When we start at 0 maximum rank it is observed that the max statistics is 68.1212 which is greater than the critical value of 20.97; we therefore, reject the null hypothesis that there is no cointegration among the variables and we accept the alternative hypothesis that there is cointegration among variables. Also, when there is 1 maximum rank, we observe that max statistics is 20.7987 which is greater than the critical value of 14.07; we thus reject the null hypothesis and accept the alternative hypothesis that there is cointegration among variables.

Therefore, as stated before the two variables are cointegrated.

4.6 Vector Error Correction Model (VECM)

The results from VAR are presented in Table 4.15 below;

Table 4. 15 Vector Error Correction Model

Vector error-correction model

Sample:	1996 - 2019	No. of obs =	24
		AIC =	3.445845
Log likelihood =	2.649865	HQIC =	4.018831
Det(Sigma_ml) =	.0001609	SBIC =	5.60561

Equation	Parms	RMSE	R-sq	chi2	P>chi2
D_dddgdp	14	.752504	0.9936	1554.375	0.0000
D_dddpop	14	.018528	0.7716	33.78158	0.0022
D_dddinf	14	5.58523	0.9405	157.9495	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_dddgdp						
_ce1						
L1.	-5.858297	.745523	-7.86	0.000	-7.319495	-4.397099
dddgdp						
LD.	2.897269	.6199518	4.67	0.000	1.682185	4.112352
L2D.	1.372593	.4283035	3.20	0.001	.5331334	2.212052
L3D.	.9437085	.2706666	3.49	0.000	.4132118	1.474205
L4D.	.4778958	.1063482	4.49	0.000	.2694571	.6863345
dddpop						
LD.	-37.37478	7.827502	-4.77	0.000	-52.7164	-22.03316
L2D.	11.94201	4.971681	2.40	0.016	2.197695	21.68633
L3D.	20.00895	3.816524	5.24	0.000	12.5287	27.4892
L4D.	26.82805	4.161267	6.45	0.000	18.67212	34.98399
dddinf						
LD.	1.998862	.2771212	7.21	0.000	1.455714	2.54201
L2D.	1.412088	.1998929	7.06	0.000	1.020305	1.80387
L3D.	.8306017	.1164631	7.13	0.000	.6023383	1.058865
L4D.	.4160503	.0612549	6.79	0.000	.2959928	.5361077
_cons	.1356095	.159461	0.85	0.395	-.1769283	.4481474

Table 4.15 Vector Error Correction Model

D_dddpop						
_ce1						
L1.	-.0244932	.0183558	-1.33	0.182	-.0604699	.0114834
dddgdp						
LD.	.0198998	.015264	1.30	0.192	-.0100172	.0498167
L2D.	.012506	.0105454	1.19	0.236	-.0081626	.0331746
L3D.	.002384	.0066642	0.36	0.721	-.0106775	.0154455
L4D.	-.0019093	.0026184	-0.73	0.466	-.0070413	.0032227
dddpop						
LD.	-.0424137	.1927234	-0.22	0.826	-.4201445	.3353172
L2D.	.0364797	.1224093	0.30	0.766	-.2034381	.2763976
L3D.	-.2494856	.0939678	-2.66	0.008	-.4336592	-.0653121
L4D.	-.2793345	.1024559	-2.73	0.006	-.4801443	-.0785247
dddinf						
LD.	.0101903	.0068231	1.49	0.135	-.0031827	.0235633
L2D.	.0078683	.0049216	1.60	0.110	-.0017779	.0175145
L3D.	.0043763	.0028675	1.53	0.127	-.0012439	.0099964
L4D.	.0004568	.0015082	0.30	0.762	-.0024992	.0034128
_cons	-.0014658	.0039261	-0.37	0.709	-.0091608	.0062293

D_dddinf						
_ce1						
L1.	4.381489	5.53342	0.79	0.428	-6.463815	15.22679
dddgdp						
LD.	-1.988428	4.601405	-0.43	0.666	-11.00702	7.030161
L2D.	.6045567	3.178953	0.19	0.849	-5.626078	6.835191
L3D.	.4068317	2.008941	0.20	0.840	-3.530621	4.344284
L4D.	.0167985	.7893376	0.02	0.983	-1.530275	1.563872
dddpop						
LD.	86.93817	58.09727	1.50	0.135	-26.9304	200.8067
L2D.	11.72439	36.90081	0.32	0.751	-60.59986	84.04865
L3D.	33.43636	28.327	1.18	0.238	-22.08354	88.95626
L4D.	-20.34956	30.88575	-0.66	0.510	-80.88452	40.18541
dddinf						
LD.	-3.17587	2.056849	-1.54	0.123	-7.207219	.8554796
L2D.	-2.76206	1.483645	-1.86	0.063	-5.669951	.1458303
L3D.	-1.79256	.8644122	-2.07	0.038	-3.486777	-.0983432
L4D.	-1.063156	.4546464	-2.34	0.019	-1.954246	-.1720655
_cons	.1813097	1.183551	0.15	0.878	-2.138408	2.501028

Table 4.15 Vector Error Correction Model

Cointegrating equations

Equation	Parms	chi2	P>chi2
_ce1	2	40.23061	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
dddgdp	1	.	.	.	.	.
dddpop	8.626055	2.038327	4.23	0.000	4.631008	12.6211
dddinf	.427907	.0686458	6.23	0.000	.2933638	.5624502
_cons	.0372258	.	.	.	.	.

Table 4.15 above shows the long run and short run causality among variables the population growth, economic growth and inflation.

4.6.1 Long Run Causality

The VECM model shows the long run causality existing between economic growth, population growth and inflation. It shows the coefficient is negative at L1(Cel) i.e. -5.858297 with a probability value of 0.000 which is significant at 5% level. Therefore, we can say that there is long run causality running from population growth and inflation to Economic growth.

There is however no long run relationship running from economic growth and inflation to population growth, because at L1(Cel) though the coefficient is negative (-0.244932), the probability value is 0.182 which is insignificant at 5% level; Also there is no long run relationship running from economic growth and population growth to economic growth because at L1(Cel) the coefficient is positive4.38149 and the probability value isinsignificant at 5% level (i.e. 0.428)

4.6.2 Short Run Causality

The short run causality concept was guided by the following hypothesis;

- H_0: There is no short run causality running from population growth and inflation to economic growth
- H_1: There is short run causality running from population growth and inflation to economic growth

Table 4. 16 Test for short run causality

```
( 1)  [dddgdp]L.dddpop = 0
( 2)  [dddgdp]L2.dddpop = 0
( 3)  [dddgdp]L3.dddpop = 0
( 4)  [dddgdp]L4.dddpop = 0
( 5)  [dddgdp]L.dddinf = 0
( 6)  [dddgdp]L2.dddinf = 0
( 7)  [dddgdp]L3.dddinf = 0
( 8)  [dddgdp]L4.dddinf = 0
( 9)  [dddgdp]L.dddgdp = 0
(10)  [dddgdp]L2.dddgdp = 0
(11)  [dddgdp]L3.dddgdp = 0
(12)  [dddgdp]L4.dddgdp = 0

          chi2( 12) =  287.48
        Prob > chi2 =    0.0000
```

Based on the above shot run output it shows that the P-value is 0.000 which is less than 5% significant level and therefore we reject the null hypothesis and accept the alternative hypothesis that there is short run causality running from population growth and inflation to economic growth.

4.7 Diagnostic Checking

4.7.1 Test for Auto correlation

The test for autocorrelation was guided by the following hypothesis

- H0: There is no autocorrelation
- H1: There is autocorrelation

Table 4. 17 Test for autocorrelation

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	11.0050	9	0.27537
2	2.2371	9	0.98714
3	10.7483	9	0.29336
4	11.6516	9	0.23367

H0: no autocorrelation at lag order

The results show that the probability values for each of the four lags is greater than 0.05 significant level (i.e. 0.27537, 0.98714, 0.29336 and 0.23367) are all greater than 0.05 level of significant) thus we cannot reject the null hypothesis and hence we conclude that there is no autocorrelation at lag order and our VECM Model as a whole has no autocorrelation.

4.7.2 Test for normality

Test whether the residuals are normally distributed. The researcher used Jarque-Bera statistic and was guided by the following hypothesis.

H0: Residuals are normally distributed

H1: Residuals are not normally distributed

Table 4. 18 Test for normality

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_dddgdp	0.282	2	0.86864
D_dddpop	0.801	2	0.66994
D_dddinf	0.262	2	0.87740
ALL	1.344	6	0.96915

When we start at dddgdp it is observed that the p-value is 0.86864 which is greater than 0.05 level of significant we thus fail to reject the null hypothesis and therefore conclude that the residuals are normally distributed.

when considering dddpop it is observed that the p-value is 0.66994 which is greater than 0.05 level of significant, therefore we accept the null hypothesis and conclude that that the residuals are normally distributed.

Additionally, when looking at dddinf it is observed that the p-value is 0.87740 which is greater than 0.05 level of significant, therefore we accept the null hypothesis and conclude that that the residuals are normally distributed.

Lastly when taking all the variables, the results shows that the p-value is 0.96915 which is greater than the level of significant (0.05) thus we fail to reject the null hypothesis which means that the residuals are normally distributed.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a brief summary of key findings, gives out conclusion, and recommendations and suggests areas for further studies.

5.2 Summary of the key findings

This study reviewed and elaborated on the empirical issues relating to economic growth and the impact of growing population on the economy. Population growth plays an important role in the economic growth of Tanzania. This is evidenced from the findings that granger causality exists between population and economic growth. There is also cointegration between population growth and economic growth at 4 lags. VECM model shows that there is a long run causality running from population growth to economic growth furthermore there is short run causality (unidirectional causality) running from population growth to economic growth. This study therefore validates that population growth has significance impact on economic growth given the time period. Policy makers and government officials needs to develop good policies to utilize the growing and help achieve more economic growth in Tanzania.

5.3 Conclusion

The main purpose of this study was to assess the impact of population growth on economic growth of Tanzania. The methodology employed was Johansen cointegration, VAR and granger causality.

Third difference of the GDP growth rate has been used as a measure of economic growth and third difference of population growth as a measure of population growth to assess the impact. The data were obtained from World bank open data.

The Augmented Dickey Fuller test was used to conduct stationary tests, and the variables were found to be stationary in the third difference. This means that the variables used in the analysis were integrated of order three. Test for cointegration was also carried out and results showed that cointegration between population growth, inflation and economic growth existed for the period under study.

The results of cointegration are consistent with the findings of Nwosu et al (2013) and Behera (2014). This means that there is a stable long-term relationship between population growth and economic growth, also between inflation and economic growth. Since the variables were cointegrated we run VECM. We showed the speed of adjustment towards equilibrium. The VAR analysis shows that there is a significant positive relationship between population growth and economic growth, supported by Thuku et al (2013). By using the VAR Granger causality test at 4 lags, as selected by lag selection criteria, efforts were made to check the direction of causality between the two variables. The Granger causality test shows that there is a unidirectional causality running from population growth to economic growth and as well as from inflation to population growth.

These findings are consistent with several studies reviewed in the literature which show that population growth has impact on economic growth. Policy makers and government officials needs to develop good policies to utilize the growing and help achieve more economic growth in Tanzania.

5.4 Recommendations

Given the size of the country and available resources, the study reveals that Tanzania still need more people in order to develop. It shows that population growth granger cause economic growth. The higher the population more consumption for goods and services and hence more industries, jobs, etc. are created to the economy. Therefore, the study recommends the following;

- The government should encourage population growth with caution. They have to make sure that the population is well educated to equip them with capability to engage into economic activities through consumption, investment, employment opportunities and exploitation of resources wisely.
- The government should carefully design a population growth strategy combined with institutional and policy changes to ensure population growth becomes beneficial to the country.
- The government should also take steps to ensure that the economy is growing at a higher rate than the growth of population. This will ensure that the increased demand for services generated by population growth is met. Having a larger, healthier, and better-educated workforce will only bear economic fruit if jobs can be found for additional workers.
- The average growth rate of population in Tanzania should be maintained and the government should make concerted efforts to track the rate of population growth. Any

population growth that happens too rapidly would have declining returns or build a situation where economic growth stagnates.

5.5 Suggested areas for further studies

Given the wide scope of the topic of population, the study concentrated only to the study of population growth for the period of 1991-2019, this left out other measures of populations such as population density, size structure, and population aging. Therefore, there is room for further studies on the effects of these other measures of population on economic growth.

Future studies could also assess the impact of population growth on economic growth by adding more variables such as the unemployment rate by which the population might relate to economic growth.

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APPENDIX

Appendix 1: Research data

Year	Economic Growth	Population Growth	Inflation
1991	0	0	0
1992	-1.487666077	0.085351688	-6.848805327
1993	3.596810829	-0.206562756	17.12802813
1994	-2.368762469	-0.024666669	-4.903540537
1995	1.900006863	0.063748125	-20.83736067
1996	-2.668184315	0.062003284	15.66673128
1997	-0.965748375	0.085085571	1.358868185
1998	3.195865559	0.043291857	0.031782773
1999	-0.230203261	0.031778777	-3.214123641
2000	-2.470550034	-0.047115291	4.56126823
2001	3.391534053	-0.071558767	-1.752869253
2002	-2.420739732	-0.055043264	-0.243120417
2003	-0.915154891	0.000596785	-1.131491858
2004	2.694221835	-0.015499779	-0.368864224
2005	-2.10995022	0.01703215	1.420030758
2006	-0.058082231	0.027709572	1.051100446
2007	2.097014144	0.018563834	-4.359494654
2008	-2.498843833	-0.004645979	5.920198423
2009	1.983238884	0.003902076	-4.867382924
2010	0.819923061	-0.00657276	-6.41686075
2011	-1.216515963	-0.010122042	20.23879146
2012	-4.775847711	-0.006596854	-15.61357456
2013	9.961067799	0.001028922	-8.259805453
2014	-7.783989689	-0.001613394	17.83175547
2015	1.807846411	0.001685842	-5.195596373
2016	1.801029879	0.005765039	-1.065622952
2017	-2.066244021	-0.00066314	0.427311432
2018	-0.471352895	-0.005462071	-2.525560319
2019	2.946392626	-0.007699183	3.762286978