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**BANDIRMA ONYEDİ EYLÜL UNIVERSITY
INSTITUTE OF SOCIAL SCIENCES
DEPARTMENT OF ECONOMICS**

Master Thesis

**THE STUDY OF THE RELATIONSHIP
BETWEEN INFLATION, POPULATION
GROWTH, AND ECONOMIC
DEVELOPMENT IN THE IVORY COAST**

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Supervisor:

Assoc.Prof. Fatih AYHAN

Bandırma 2022

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ABSTRACT

THE STUDY OF THE RELATIONSHIP BETWEEN INFLATION, POPULATION GROWTH, AND ECONOMIC DEVELOPMENT IN THE IVORY COAST

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The principal aim of this thesis is to study the relationship between the GDP growth of the Ivory Coast and the variables that impact it, namely inflation and population growth. The study is composed of four chapters: the first chapter gives the background of the study. The second chapter presents brief statistical and comparative information on the Ivory Coast. The third chapter presents the empirical literature review on studies. The fourth chapter analyzes the time series data from 1961 to 2021 to reveal the relationship between GDP growth, inflation and population growth by conducting the ARDL, FMOLS and DOLS Models. The last part concludes the study by making some recommendations or suggestions to the Ivorian government for the durable economic growth.

Keywords: Inflation, Population Growth, GDP Growth, Ivory Coast, ARDL Model.

ÖZET

FİLDİŞİ SAHİLLERİNDE ENFLASYON, NÜFUS ARTIŞI VE EKONOMİK BÜYÜME İLİŞKİNİN İNCELENMESİ

Bountouraby CAMARA

Bu tezin temel amacı, Fildişi Sahili'nin GSYİH büyümesini etkileyen değişkenler olan enflasyon ve nüfus artışı ile olan ilişkisini incelemektir. Söz konusu çalışma dört bölümden oluşmaktadır. Birinci bölümde, araştırmanın arka planına yer verilmektedir. İkinci bölüm Fildişi Sahili hakkında istatistiksel ve karşılaştırmalı bir bilgi sunmaktadır. Üçüncü bölüm ise literatür taramasını sunmaktadır. Dördüncü bölümde ekonomik büyüme ile enflasyon ve nüfus artışı arasındaki ilişki 1961-2021 dönemi verileri ile ARDL, FMOLS ve DOLS modelleri kullanılarak analiz edilmektedir. Son bölümde ise kalıcı bir ekonomik büyüme için Fildişi Sahili hükümetine bazı tavsiyelerde veya önerilerde bulunmaktadır.

Anahtar Sözcükler: Enflasyon, Nüfus Artışı, Ekonomik Büyüme, Fildişi Sahili, ARDL Modeli.

PREFACE

First, I would like to thank the all-mighty God for everything he helped me to fulfill in this life. I also express my gratitude to my advisor, Assoc. Prof. Fatih AYHAN for his endless support, guidance, and encouragement throughout this thesis. It has been a great honor for me to have the opportunity to work with him.

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ABBREVIATIONS

ADF	: Augmented Dickey-Fuller
ADRL	: Autoregressive Distributed Lag
BBC	: British Broadcasting Corporation
BCEAO	: Central Bank OF West Africa
BEAC	: Central Bank of East Africa
BRICS	: Brazil, Russia, India, China, and South Africa
CEMAC	: Central African Economic and Monetary Community
CFA	: African Financial Community
CPI	: Consumer Price Index
DOLS	: Dynamic Ordinary Least Squares
ECT	: Error Correction Test
EU	: European Union
EUR	: The Currency and Monetary Unit of European Union
FMOLS	: Fully Modified Ordinary Least Squares
GDP	: Gross Domestic Product
INF	: Inflation
IMF	: International Monetary Fund
POP	: Population
PP	: Phillip-Perron
OLS	: Ordinary Least Squares
SE	: Standard Error
USA	: United States of America
USD	: United States Dollars
VECM	: Vector Error Correction Model
WAEMU	: West Africa Monetary Union
WB	: World Bank
WHO	: World Health Organization

1. INTRODUCTION

Economic growth is a crucial factor that has interested many scholars. It is a macroeconomic indicator that can be affected by many factors or other macroeconomic indicators such as inflation, population growth, investment, public debt, trade balance, etc.

However, this study considered two macroeconomic factors impacting economic growth: inflation and population growth. The inflation is an essential factor that policymakers take into consideration before making any decision for monetary policies, because some decisions of the central bank could cause inflation, like, a continuity of money supply in the economy or the interest rate of federal reserves (Taylor, 2022).

Inflation can be harmful or profitable for an economy. It is harmful when the rate is not moderated or when the monetary policies are not well managed because it can contribute to the depreciation of the currency, affecting all the sectors of economic activities negatively. But this situation can be prevented by the rise of labor supply, personal saving, capital supply, and productivity increase. At the same time, it is profitable when deflation exists or when the total labor or resources are not used in the economy. So, the economy is not rolling at capacity.

Furthermore, the population is a significant macroeconomic indicator because it represents the basic production factor of a nation. And its growth depends on factors like birth rate, fertility rate, mortality, migration, and immigration rate. Population growth is a rise in the number of people living in an area during a period that could lead to social challenge achievement and development because people go to a place for working propose, and that why industrial areas are tended to be very crowded in most of the countries. In that case, that will help the government to boost and keep its economic development and the lifestyle of its population because developed countries with a small

number of people need their population to increase their labor force to maintain their economic development.

Moreover, the Ivory Coast is one of the world's poorest nations and an emerging country in West Africa; the country is the first cocoa bean and cashews exporter in the world (BBC, 2020). Agriculture is among the leading sources of prosperity in the nation which represent 16% of GDP and 60% of total export approximately. It occupies 2/3, almost 66% of the population (World Bank, 2020).

In 2021, the GDP growth rate of the Ivory Coast was 7.2%, which saw robust economic development recently because of the growth rate average in the sub-Saharan region. The country noticed financial stability from 2013-2015, with a growth rate of 8.89, 8.79, and 8.84%. The inflation rate has been a single digit since 1996, which makes the country a reference for all France colony countries. In 2020, because of covid-19, the economic growth decreased to 1.95%, and the inflation increased to 2.4%, while it was - 1.1% in 2019, according to the World Bank.

Although, the government of the Ivory Coast settled on the objective of boosting economic growth before 2030. The different goals are below:

- The first objective is to reduce the poverty rate to less than 20% in the nation by doubly the GDP per capita and to promote the private sector, which was 39% in 2018.
- The second is to reduce unemployment by encouraging the employment of the youth and empowering women at the center of all activities that the government will organize,
- The third objective is to improve human capital by allowing every Ivorian access to electricity, water, house, hospital, road, etc.

These objectives were established in 2021 by the current prime minister of the country Patrick Achi (INFRICA, 2022). With all these aims that they have fixed themselves to fulfilled, the majority of the population will be middle-class citizens, and the country may be among the emerging countries in the world.

Despite this, the principal aim of this thesis is to reveal the effects of inflation and population growth on the GDP growth of the Ivory Coast, by doing a brief presentation of the country (geopolitical situation, social, and cultural situation), by studying the economic development of the country through the explanation of some macroeconomic indicators, by taking account its inflation and the category of goods and services that are most impacted by the inflation in the nation. By comparing the economy of the nation to the economies of its neighboring countries, the region, and the world, and comparing the results obtained from this study to the results of the studies of other authors that analyzed the same topic or on the factors separately. By determining between inflation and population growth, the variable that contributes the most to the development of the Ivory Coast. Finally, by giving some suggestions to the Ivorian government.

The study aims to:

- Analyze the relationship between the variables by using the ARDL, FMOLS and DOLS models.
- Explain the results and compare them to the studies in the empirical literature.
- Make some recommendations to the Ivorian government for durable economic development.

This thesis will analyze between inflation and population growth which variable impacts the most the economic development of the Ivory Coast by using annual time series data from 1961 to 2021. The time series data analysis is conducted in this thesis by applying Heteroscedasticity Test, Breusch-Godfrey Serial Test, and Ramsey Test, which are the ARDL diagnostic tests. The Unit Root test, Bound Test, ARDL, and the alternative tests are also conducted such as DOLS and FMOLS tests. The Heteroscedasticity test is to check if the error terms have fixed variance, the Breusch-Godfrey Serial Test is to determine if there is autocorrelation in the model, the Ramsey RESET Test is to check if there is a linear relationship between the variables, the unit root test is to see if all the variables are stationary in level, the Bound Test procedure is to find out if there is a

cointegration or not, the ARDL model is to investigate the relationship between GDP growth and independent variables (inflation, and population growth), and DOLS and FMOLS test are to confirm the result of the ARDL model.

This study or paper consists of five chapters: the first chapter discusses the topic's background by examining economic growth, inflation, and population growth. The second chapter presents a brief study of the country geographically, socio-politically, and economically; it also talks about its inflation and population growth. The second part compares the nation with its neighboring countries and the world by comparing their economic indicators and talking about their population growth and inflation. The third chapter summarizes the literature review on the empirical literature by studying some papers related to the topic of this thesis. The fourth chapter explains the methodology and the data analysis, focusing on the Unit Root test, Bound Test, ARDL diagnostic tests (Normality test, Multicollinearity test, Heteroscedasticity Test, Breusch-Godfrey Serial Test, and Ramsey Test), ARDL Test, DOLS and FMOLS tests. Then, the fifth chapter gives the conclusion of the study by summarizing it and giving some suggestions or recommendations to the Ivorian government.

CHAPTER 1

1. BACKGROUND OF THE TOPIC

Economic development is the fundamental aim of all states that want to have a word to say in the global economy. To be able to ameliorate the standard of living of their population by having funds from the International Monetary Fund (IMF), the World Bank (WB), the World Health Organization (WHO), and other international institutions, also by using those funds to invest in the public sectors of their countries.

1.1 THE ECONOMIC GROWTH THEORIES

Economic growth, which means the gross domestic product growth, represents the production of goods and services in a state for a given period. It can also be as a rise in the total output of goods and services of a nation, which include an increase in capital goods, labor force, human capital, and technology innovation which are the principal factors for economic development, without forgetting entrepreneurship and labor specialization.

Economic growth is the most significant, vital subject with complex issues in contemporary social sciences. Karl Marx, David Ricardo, Adam Smith, etc., who constitute the group of the classic economist, were preoccupied with the rise in the production of goods and services. So, by questioning themselves, they finished by understanding that the procedure of economic growth was the center of their study. However, one of the main questions of economic development is 'What determines the economic growth rate?'.

Classical economists investigated the problem of economic development because this issue challenged their nations. The Wealth of Nations, written by Smith in 1776, illustrated that demand and supply forces are the basic determinant of economic growth in a competitive market otherwise by "the invisible hand," following the development of physical capital, or investment, the division of labor, and technology.

Many authors have used a cross-country approach, time series, or panel data to study or solve economic growth problems. However, most of the papers of these authors

used the standard neoclassical growth theory or model that was popular between 1950 and 1960 because of Solow (1956). Recent scholars used the endogenous growth theory, and the economic growth theory took too much power from 1950 to 1960 and thirty years later from 1980 to 1990.

1.1.1 Classic Growth Theory

The classical economists developed traditional concept of economic growth such as Adam Smith, David Ricardo, and John Stuart Mill, the principal actors of classical theory. Their works also made an excellent allowance for modern ideas of growth. According to classical approaches, the primary source of development is the improvement of technology and the capital accumulation. Because all capital accumulation is subject to the extent and to do overproduction for reinvestment (Barry, 2022).

Adam Smith said that a lack of labor force and the reduction or insufficient wealth accumulation is a brake on growth, which is an endogenous economic growth process because labor supply depends on wage rates. Furthermore, the division of labor increases growth because everyone will specialize in the area where they are the most productive. Economic society, which involves capital, labor force, and land, is determined by reciprocal dependence. Now, the division of labor and the change in the mode of production impacts the evolution of incorporated technology.

Furthermore, the classical theory speaks of a long-run production of a stable economy, where the creation of goods and services will be durable. It means no growth, no evolution, or no changes at a certain point in economic development will exist. According to David Ricardo, one of the followers of the Classical school, it was unanimous that investment became a source of economic growth because entrepreneurial capitalists can use their savings to invest. So, investment depends on the redistribution of income. The higher the capitalists' income, the higher the investment will be. At the same time, the decrease in land profitability and the increase in income distribution have made investment unfavorable.

Three types of economic agents share national income: the landowners who receive the rent according to the fertility of their land. These households provide the labor force and receive their salary. Finally, the investors who receive their profit reinvest in the economy again to increase growth.

The law of diminishing returns is an economic rule that describes the increase of investment in a particular area that can stabilize its profit rate at a certain point if other variables remain constant. So, the impoverishment of lands results from their exploitation, which contributes to the decrease in agriculture while the population keeps increasing yearly. Since the fertility of cultivable land decreased, more people spent to have fertile land. That leads to an increase in the price of manufacturing by extending the prices of agricultural products. Moreover, following this increase in production, households demand a wage increase to meet their food needs. Despite the elevation of the costs of farming goods, when the prices are high, the capitalists' profits gradually decrease, so they can no longer invest enough, and the national production decreases progressively.

At this level of the economy, the classics have realized that the economy cannot be closed, which is why they limited themselves to the economic life actors, the households, the landowners, and the investors or capitalists. The economy must open up to the rest of the world by importing agricultural products to revive economic growth, from where David Ricardo's theory of comparative advantages came. This approach speculates that "Nations should focus on producing the good that cost them less and imports the good that cost them much, or they have to import the good that production cost is expensive" (Karol, 1956).

Malthus agreed with Ricardo in saying that the economy cannot have long-term growth, which means that it would have a slowdown to reach a standardized state since the ratio of population expansion is more significant than the growth ratio of the economy. So, to remedy this situation, it was necessary to encourage late marriage and chastity before marriage to limit the number of births, which showed how population expansion affects wealth creation (Harris, 2007).

1.1.2. The Keynesian Growth Theory

Unlike Smith's notion of savings (frugality), Keynesian economics held that to increase development; the government might raise the amount of consumption. The necessary condition of growth in the Keynesian idea is the consumer demand from its development concepts of labor, interests, and capital. Keynes trusted that the expansion of the global market generates economic growth. Then the change in economic activity level is described by the total consumption, the national income, savings, and investment. While consumption, savings, and investment are the basics of national income.

Hence, this theory of economic growth is on consumer demand. It means that the origin of the financial gain came from the consumption power of households in this context, and the higher the disposable income of families, the more they tend to consume a lot, which would increase demand or consumption. Conversely, the increase in demand by households makes companies increase the production of their goods and services to meet consumer demand, which is a mechanism to increase the profit of companies and, at the same time, raise investment in the nation's economy. Elsewhere, there will be an increase in the national wealth, which is economic growth or gross domestic product (GDP) growth. Expressly, if an economy is in the relaunch, many workers are employed, so the consumption expenditure of the population would increase.

According to McEachern (2016), the decrease in household income would decrease economic growth by decreasing household consumption expenditure and low business income. That talks about the mechanism of the contracting economy. In a contracting economy, many workers are unemployed, which means there is no income so the consumption expenditure would decrease. This situation would also reduce the production, investment, and profit that investors can make.

Accordingly, Keynes drew the attention of the states to intervene in economic activity by increasing aggregate demands and supporting businesses through government fiscal policy, public spending, or tax cuts. This theory supports the augmentation of the fiscal budget of a government so that it can spend on education, infrastructure, unemployment, etc., for its population. So, to reduce companies' production costs, the

government or the state should reduce taxes and lower the selling prices of products and services of primary use. For instance: the tax on foodstuffs such as oil, rice, chicken, etc. should be less, the services that can help the government to deal better with its population should be less, etc. The government can also use monetary policy to facilitate financial borrowing by lowering the central bank's policy rate for secondary banks to make lending easy for investment. Nevertheless, the government must invest in massive projects, such as constructing roads, airports, hospitals, and hydroelectric dams, to create jobs and facilitate investment (Dutt, 2001).

The Keynesian idea of growth relay on demand factors which means a rise in aggregate demand preconditioned the growth of an economic balance. Through aggregate order, an increase in investment will is the critical driver of economic expansion that can provide a route to boost the nation's income. Also, this approach needs to consider other manufacturing factors such as technology, labor qualification, and the reduction of unemployment. Usually, the Keynesian model is specifically for a depressed economy in a short period (McEachern, 2016). Moreover, an overdoing Keynesian policy will increase inflation.

However, the approach to short-term Keynesian economic growth (Keynes, 1936) made by the New Keynesians, such as the economists Domar (1946, 1947) and Harrod (1939, 1948), is for the long-term power of the economy in the capitalist market by referring to John Maynard Keynes's short-run statics. Both show that the relationship between the stock of labor and economic growth can justify the increase of the production capacity of a given economy through investment. While according to Keynes, aggregate demand impacts investment (a supply-side effect).

The Harrod-Domar (HD) theory assumes that the economy is closed and that there is the gross output of a homogeneous good Y . Since there is a closed economy, this output is utilized as an investment (I) or a consumption (C). Then in this concept, the ratio of economic growth hinges entirely on savings and production (the economy must save and invest part of the national income to achieve economic growth). The Harrod-Domar (H-D) concept investigated how well savings and investments perform in emerging markets.

Reserves enormously benefit from economic growth; according to the H-D theory, high earnings allow for more input in the evolution of productive capacity.

The model estimates a rate of population growth (n), a technology that contains fixed factors (capital "K" and labor "L"). Considering an economy made up of households and businesses, they establish the following input-demand mechanism with a constant technological factor:

$$Y_t = \min \left[\frac{K_t}{v}, \frac{E_t}{u} \right] \quad [1]$$

Where:

Y_t = total output (GDP) at time t

K_t = physical capital stock at time t

v = utilized capital-output ratio (constant, i.e., $\frac{K}{Y}$)

E_t = effective labor force at time t

u = employed effective labor-output ratio (constant, i.e., $\frac{L}{Y}$)

Taking a two-sector economy (households and firms), we can write the national income equation as follow:

$$Y_t = C_t + S_t \quad [2]$$

Where Y_t = GDP, C_t = consumption, and S_t = saving.

The gross investment (I_t) is counted to be the same as aggregate saving (S_t) in the Harrod-Domar growth model,

$$\text{This is} \quad I_t = S_t \quad [3]$$

Replacing equation [3] into equation [2] gives equation [4]

$$Y_t = C_t + S_t \quad [4]$$

The following equation writes the evolution of the capital stock over time:

$$K_{t+1} = (1 - \delta)K_t + I_t \quad [5]$$

Where δ is the rate of depreciation of capital stock by assuming that total saving (S_t) is some proportion (s) of GDP (Y_t),

$$S_t = sY_t \quad [6]$$

We know that $V = \frac{K}{Y}$ from this $K=vY$ and $I_t = S_t = sY_t$, it follows that we can rewrite equation [5] as:

$$vY_{t+1} = (1 - \delta)vY_t + sY_t \quad [7]$$

Dividing the two sides by v and subtracting Y_t from both sides from equation [7] gives the following equation.

$$Y_{t+1} - Y_t = \left(\frac{s}{v} - \delta\right) Y_t \quad [8]$$

Dividing both sides of the equation [8] by Y_t gives the following equation.

$$\frac{\Delta Y}{Y} = \left(\frac{s}{v}\right) - \delta, \text{ This gives } g_y = \left(\frac{s}{v}\right) - \delta \quad [9]$$

Equation (9) illustrates that the GDP growth rate included the savings rate divided by the capital/output rate. With rising savings, falling capital production, and falling interest rates, the economy grows faster (Snowdon & Vane, 2005).

1.1.3. The Neoclassical Growth Theory

Solow and Swan established the neo-classical growth theory in 1956, and Solow completed it in 1957 because it had technical problems. Hence, the neoclassical growth theory is the modern version of the classical approach, where management considers people's behavior. It shows that an organization is a social system that cannot be affected by human actions.

The neoclassical growth idea argues that consistent economic expansion is possible with these three factors: labor, capital, and technology because the Neoclassical theory is a long-term economic growth model. Production depends on household savings,

so households must save more to increase production. Thus, this increase allows more capital to accumulate in the economy. The theory also claims that modifying the labor force's quantity and production functions influenced by money can lead to an equilibrium. Technology advancements are essential for economic growth, which means that technological changes significantly impact the economy (Sanyang, 2019).

An increase in the GDP growth influenced the classification and the amount of capital equipment, labor, and other factors and the qualification of the labor force. When the economy touches an equilibrium, only an improvement in the workforce or an augmentation in the money supply may result in expansion (Gebbru, 2015).

However, the theory demonstrates that with the gradual decrease in marginal productivity in the case of capital stock, without technological progress, growth will gradually return to zero, and the economy may find itself in a situation where production no longer increases but stays stagnate.

Technical progress can improve capital productivity if it allows more production with the same number of factors. For example, a worker who manages to make more than he is used to can quickly reach his goal thanks to technical progress. Thus, technological progress improvement will maintain economic growth advancement to avoid stagnation.

Since savings are the source of growth, according to Solow, while according to Keynesians, in the short term, increasing savings results in lower spending, and in this case, the availability of services and products would improve against a falling-off in demand in the market. Consequently, this may result in a decline in output and a big ratio or amount of unemployment. On the contrary, according to Keynesian theory, a rise in demand makes companies produce more.

Although, the seasoned economist Solow established a model by emphasizing technical progress as the source of long-term growth without knowing the origin of technological advancement. Finally, the model did not determine the origin of the factors of long-term economic growth.

1.1.4. The Endogenous Growth Theory

The seasoned economists Lucas, Barro, and Romer are the founders of the endogenous growth theory. They demonstrated through their models that growth could sustain itself and is internal. In the middle of the 1980s, economists noticed the neo-classical growth model, which was theoretically an incomplete instrument to explain the long-term factors of GDP growth because of technological progress.

Endogenous growth is an economic subject that believes that productivity depends on innovation and spending on human resources. The public and commercial sectors must work together to boost innovative skills by giving individuals and companies the tools they need to be more inventive and successful. The hypothesis often centered on sectors that can be very influential, particularly in the telecommunications, software, and high-tech sectors, given how crowded and dominant they are in both developing and wealthy nations. According to economists Robert Solow and Trevor Swan, a steady state is when there is a decrease in its investment value, and the economy is in balance (Arvantids et al, 2009)..

Moreover, this theory has led to widening the range of production factors traditionally taken into account training, learning, human capital, public infrastructure, etc. The theories determine the conditions for obtaining purely endogenous growth, and they have studied the positive external effects on the role of knowledge in productivity growth. The endogenous growth models, therefore, incorporate mostly positive and negative externalities linked to the accumulation of knowledge and innovation and the imperfections related to market power, which allows corrective public interventions to modify the growth rate (Barro & Xavier, 1995).

Most endogenous growth models predicted the persistence of differences in the level of development. This point gave rise to abundant empirical literature to determine whether one could detect trends towards convergence after correcting for structural differences, whether one witnessed the formation of convergence clubs or whether growth trajectories remained explicitly national.

Nonetheless, there are three conditions in endogenous growth theories: Increasing returns, positive externalities, and the nation's duty in development. Endogenous economic models are on the accumulation of growth factors (capital, labor, and technology). While growth has an internal source and the economy creates economic growth, this is possible due to the accumulation of labor and the positive externality because economic growth is self-sustaining through capital accumulation.

According to Romer (1986), gathering physical resources would allow the investment and incorporation of modernization, which would lead to the accumulation of knowledge and, in return, would favor the new technology. Thus, it would always have growth. Lucas (1988) stipulated that building up human resources makes the society's population become workers with good academic levels and healthy. Consequently, the improvement of human resources will result from their knowledge and the incorporation of technology, which would lead to better population education. This educated population will work in different companies and bring new technology. Besides, Barro added that the accumulation of public capital would get a good education and medical care, which will result in the improvement of human resources, followed by the advancement in technology, which also goes through infrastructure to improve the flow of goods and services.

Additionally, Romer's (1986) model aims to clarify how and why developed economies throughout the universe experience continuous growth. According to this model, the emergence of sectors that advance technology and the encouragement of research propel advanced technologies in emerging nations.

In the Romer concept, the total output variable is:

$$Y = K^{\alpha}(AL_y)^{1-\alpha} \quad [10]$$

Where A shows the technology and; Ly : the labor force.

The education of human resources or the population helps a country to be more competitive and innovative. The government and the business people could improve growth through investment and steadying the economic growth rate optimally.

1.1.5 The Types of Economic growth

Economic growth is a crucial macroeconomic objective because it might increase the population's living standard and contribute to new job creation. The two types of economic growth are:

1. Intensive growth, which is the type that encourages innovation via technology and modernization, such as the economy of South Korea, France, the USA.
2. The extensive growth typified by all augmentation in quantity use of one or more factors of production, such as the economic system of China, India, Thailand.

However, the benefit of economic development is essential for the population, firms, hospitals, or all economic sectors because it helps to increase firms' profit and spend more on research and development. So, all these changes will lead to technological breakthroughs, improvement in medicine, and sustain the country's budget. It also gives the best confidence to firms and encourages them to take significant risks for innovation.

1.2 INFLATION

Inflation is a problem that has received so much interest in academic studies nowadays, and it has also been an issue in economic debates. However, many scholars still need to pay more attention to measuring how the public perceives inflation as affecting economic growth. According to Mishkin (2004), the public perception of the policy's legitimacy is a crucial element of a successful anti-inflation strategy or management.

Moreover, inflation is one of the macroeconomic indicators that became an important issue in economic or monetary studies. Inflation is raising the average cost of goods and services globally (Parkin, 1993). Meanwhile, another side, inflation is defined by Reza, Pramodio and Fitiani (2021) as an excess demand for goods and services. Inflation can be the general increase in all prices in a country during a period. However, inflation is also called consumer price value and in general, it estimated the percentage of fluctuation in the consumer price index (CPI) during a period. The CPI represents the prices paid by the average urban consumer for each product in the World, and its calculation is with the Product Price Index or the GDP deflator.

Most nations in the world attempt to keep their inflation rate between two and three percent annually and they are the lowest rate that can be acceptable for households or companies.

Deflation is the general drop in the level of product and service pricing throughout a year, it can incredibly occur, but it is not a negative sign of inflation simultaneously. Thus, a policy connected to inflation includes policies to stabilize the price level (Mankiw, 2000). Thus, a policy connected to inflation includes policies to stabilize the price level (Mankiw, 2000).

There are many causes of inflation, but recently due to the pandemic, we can cite seven main reasons for Inflation (Matthews II, 2022):

a - Demand-Pull Inflation

Demand-Pull inflation happens when the price of some goods and services exceeds the economy's ability to purchase those demands. Ex: When many people try to buy the Huawei Mate (2500 EUR).

b - Cost-Push inflation

Cost-Push inflation arises when the general price of goods and services increases because of an augmentation of workers' salaries and materials such as construction, transportation, health, etc.

c- Rising Wages

It happens when there is a general rise in workers' salaries because rising salaries allow consumers to pay a considerable amount for wanted goods or services without impacting their purchasing power.

d- Devaluation

It is when the exchange rate of currency goes down. So, the money will lose value, making a country's export less costly and encouraging foreigners to invest or buy from them.

e- Increased Money Supply

It happens when the federal or Central bank raises the money supply in a country's economy. So, the money supply will be faster than the production rate.

f- Policies and Regulations

Refer to specific policies that can cause either a cost-push or demand-pull inflation. Let us imagine if the government issues tax subsidies for particular products. This regulation can raise the demand for those products. The prices might also rise if the demand outstrips the supply.

g- Consumer Expectations

Consumer expectations cause inflation when there is already a high inflation which causes workers to ask for salary increase to fulfill their loss of purchasing power. This means that when the workers win the increase of salary, the trader raise the price accordingly to the wage cost, causing inflation.

Whatever, the inflation rate should adjust by 2% every year to have the best because if the money is in a bank, the interest will not follow the raising of the inflation rate. For example, if someone kept an amount of 1000 USD in a bank in 2017 for an interest of 4% per year and at the time the 1000 USD was equal to 561.020 CFA if we add the 4% profit for four years 561.020 CFA; it will be 656.315 CFA. If he had the money without putting it in the bank for these four years, now he should have the 1000 USD, which equals 641.500 CFA, so there is a loss of 14.815 CFA. If he invested the 561.020 CFA in economic activity for four years, the person might make enough profit.

1.3 POPULATION GROWTH

The population is the first resource of a nation and economic development (Boserup, 1965; Julian, 1981. Population growth is the annual change in a country's total population rate.

However, the World population growth experienced unlimited growth from 1315-1317 after the Great Famine and the end of the Black Death in 1350, when the world population was nearly 370 million. The UN Department of Economic and Social Affairs announcement in 2018 stipulated that the human population grew from 1 billion in 1800 to 7.5 billion in 2018, which will be 11 billion in 2100 while in 2022, the world population was around 7.96 billion (World Meters, 2022). However, the Population growth rate varies according to the country's reality due to variables like birth rate, death rate, abortion

rate, net immigration rate, and net migration rate. Generally, other social factors can influence fertility and birth rate: religion, education level, social security for the elderly, access to abortion, contraception, immigration, child labor, the cost of raising children, and government programs to assist with childcare. In contrast, net migration can influence education, government behavior, technology, and the population's mentality.

Even though the demographic growth is a country's first development resource, some authors have disagreed with the statement above because they think the poor management of human resources is the origin of hunger in the past century, but not a lack of them. Despite this, many scholars disagree that population growth can be a factor in the development, such as Malthus (1798), who contended that population growth causes hunger and poverty. Other scholars also added that rapid population growth is one of the primary causes of ecological catastrophes and contributes to low incomes and low levels of lifestyle. Still, to control the population's rapid growth, the government and society should encourage women's empowerment. They should teach them the different types of family planning to avoid pregnancies they do not want, and the government should hire women who have studied reproduction health services.

A sustainable economy with political and social implications should follow population growth. Because if the population multiplies, the government should do a food campaign so that there will be enough food for all the people, the parents must give birth to children that they can take care of, and there should be enough jobs for the youth to make them not be criminals.

Although, population growth has many advantages than disadvantages with the implication of these two actors: Government and society, because the more people a country has, the more work they do, and the more money or value it earns. Population growth leads to more significant human capital to exploit, which will contribute to higher economic development, improve the society's demographic structure, and show the efficiency of higher population density. Finally, we should retain that population growth helps to achieve economic development and social progress.

Hence, researchers have conducted numerous analyses of the relationship between economic growth and inflation. Tobin (1965) demonstrated that there is a favorable correlation existing between inflation and economic development, whereas Stockman (1981) concluded an unfavorable relationship between GDP and Inflation, but Sidrauski (1967) demonstrated that inflation and economic growth do not have any relationship.

Based on empirical analysis, Mallik & Chowdhury (2001) presents a long-term positive relationship between economic development and inflation, whereas Barro (2013) gets a substantial and unfavorable relationship between them, and Kigume (2011) discovered that there is no relationship between Inflation and GDP growth. However, the relationship between inflation and the GDP growth of a nation depends on its economic conditions and empirical study.

Nevertheless, studying the nexus between population growth and economic development is also one of the most macroeconomic topics analyzed by scholars (economists, demographers, and financial). As economists used to say, "the population is the first natural resource of a country," which means that obviously, we cannot talk about the development of a state without knowing its demographic issues and the well-being of its population. The population growth of a country encouraged labor force augmentation, which increased economic development. Therefore, a large population offered ample opportunity to the domestic market and encouraged innovation, competition, and technological advancement (Savas, 2008). Furthermore, Becker et al. (1999) mentioned that a rapid increase in population growth could negatively and positively impact general production. However, Barlow (1994) illustrated that a slow rise in population growth would not cause rapid growth of the economy, whereby Eli et al. (2015) analysis showed a positive impact of population growth on economic development. Also, Jhingan (2005) assumed that population growth helped capital growth through the increase of knowledge, the capacity of the population, and their skills because physical capital stock depended on human capital formation. According to Todaro and Smith (2006), population growth can harm economic development due to poverty, inequality of income, lack of education, health, food problems, etc.

Despite this, examining the relationship between inflation, population growth, and economic growth is not a popular subject because it is not a topic used by many authors. The analysis of other authors on the relationship between Inflation and GDP growth and the relationship between population growth showed that both variables could have a positive or negative effect on the economic growth of a nation. Inflation is a global increase in the price of goods and services during a given period. Population growth is the augmentation in the percentage of the national population, so they are all variables that can impact a nation's economic health.



CHAPTER 2:

2. AN EXAMINATION ABOUT THE REPUBLIC OF IVORY COAST'S ECONOMY

This part gives a brief presentation of the country, a summary of its economic growth, population growth, and inflation. The comparative statistical analysis of the Ivory Coast with its neighbors and the World is also included.

2.1 BRIEF SUMMARY OF THE IVORY COAST

Ivory Coast, also known as Cote d'Ivoire and officially known as the republic of Ivory Coast, is one of the West African countries with Abidjan as the economic capital and Yamoussoukro as the administrative capital. Its neighboring countries are Mali and Burkina Faso on the North, Ghana on the East, Guinea, Liberia on the West, and the Atlantic Ocean on the South. It occupies 322,463 km² with a population of 28.4 million in 2021 (IMF,2021) with tropical weather (6 months of sunning, six months of abundant rain). The country has forests in the southern and western parts, separated by three principal rivers, Sassandra, Bandama, and Komoe (see Figure 1). The state also has fourteen districts, including the two capitals. The districts are thirty-one regions separated into hundred and eight departments. The most crowded cities are Abidjan (4.7 million population), Bouake (680,694), Daloa (591,633), and San-Pedro (631,156), according to the world atlas. Apart from Abidjan (the economic capital) along the Atlantic Ocean, the other touristic places are St Paul's Cathedral, the Banco National Parks, Natural History Museum, etc. France constructed the country; even its presidential palace is the property of France, to which the government continues to pay the rent bills every year until now.

The official language of the Ivory Coast is French, and it has more than sixty-six ethnic or tribes, divided into four ethnic groups Akan in the East, the South-East and the center of the country, Krou in the South-West, Mande in the North-East, and the West, Gour in the North. Their languages are Baoule (the largest single ethnic), Bete, Dioula, and Senufo, respectively. Moreover, the Akan group represents 28.8% of the population, the Mande group 21.4%, the Gouro 16.1%, the Krou group 8.5%, and the foreign

community represents 25.2%. The Mande group comprises migrants from west African countries, which are Guinea, Senegal, Mali, Burkina-Faso (the largest number of migrants in the Ivory Coast), Benin, Ghana, Nigeria, Liberia, and Mauritania. Apart from the migrants, the major foreign communities in the country are French, Lebanese, Vietnamese, the US, Spanish, and Canadians. The Lebanese community is the biggest foreign community in the Ivory Coast, with more than 300.000 citizens because their exact number is unknown (Minority Right, 2018).

The religions in Ivory Coast are very diverse, with the majority of Muslim and traditional beliefs in the North of the state and the majority of Christians in the South, who are adherent and combine their thoughts to live in perfect peace and security.

According to the Minority Rights Group international, the Muslim community represents 42.9% of the population, composed of 72.7% migrants from neighboring countries. 17.2% of Catholics also consisting of 17.7% of west African migrants, Evangelicals 11.8%, Methodists 1.7%, other branches of Christians 3.2%, traditional believers 4.1 and people with any religion represent 19.1% of the total population.

Moreover, like all African countries, political issues have always been the principal factor in the underdevelopment of the Ivory Coast. The country was known as a model of stability in the region from its independence. Still, in 2002 it noticed a civil war during Laurent Gbagbo's (4th president) time, which was caused by the rising ethnic tension from Bedie's presidency (the second president), whose government was separating the population from their origins to know who is Ivorian or who is not. So, they encouraged some people to attack people whom they think are foreigners, their business, and there was a fissure between the Muslim and Christians in the country by separating the nation into two. The overturn of the military president Robert Guei (the third president) to the election of Laurent Gbagbo (4th president) as the first representative of the nation in 1999 was one of the causes of Ivory Coast's first civil war from September 2002 to Mars 2007 (BBC News, 2019).



Figure 1: Map of The Ivory Coast

The nation also experienced its second civil war from 2010-2011, which led to the election of Alassane Dramane Ouattara, the current president of the republic, who is on his third mandate that he won on March 2021 (World Bank, 2021). Ivory Coast suspected al-Qaida jihadists attacked their border with Burkina Faso during the night of March 28-29, 2021 (Worldview, 2021).

2.2 THE ECONOMIC GROWTH OF THE IVORY COAST

Emerging from decades of conflict and wars, Ivory Coast Ivory is one of the west African countries that had been independent for more than 62 years from France with the most emergent economy among all the countries that France has colonized. It is also poised to improve its political stability and enjoy continued economic growth. At the same time, the economic indicators of the Ivory Coast have been on a new reliance since 2020, according to BBC News, which showed that the Ivory Coast is the first largest trader of Cacao beans in the World. Ivory Coast is well known for its Cacao Production,

which made agriculture the main profitable economic sector of the nation (Wood, 2003). The country also produces other agricultural products (bananas, coffee, palm oil, etc.).

Agriculture in Ivory Coast is very lucrative. On June 4th, 2021, the world bank approved finance to help the development of the agri-food sector and create thousands of jobs for Ivorians. The international Development Association financed over 25 million USD in the development of Ivorian's agri-food sector, whose objective is to help the progress and competitiveness of the agri-food sector and remove any obstacles that can slow down the growth of this sector. This project will create a private partnership in agriculture, especially in Cassava production, horticulture, and aquaculture. In Africa, scientists have predicted that in 2030, one family will have to feed at least two citizens because of the extensive urbanization of the continent (World Bank, 2021).

According to the World Bank, agriculture represents 16% of the total GDP and 60% of total export; approximately. It also employs 2/3 of the total population. In addition, to cocoa beans and cashew nuts, the Ivory Coast also exports bananas, coffee, rubber, cotton, and palm oil. Although the country is the fifth rice exporter globally, it imports wheat, cornmeal, and dairy products. Now young people are using new technology to cope with or manage climate change, which they call Smart agriculture. Nevertheless, there are only a minority of chocolate companies in the nation.

However, the inflation rate in the country raised because of Covid-19; it was 0.61 in 2018, -1.1 in 2019, and rose to 2.4% in 2020 (World Bank Indicator, 2021), affecting the household basket since the price of goods and services is up. Hence, the population of the Ivory Coast is young, like all the populations of African countries, and the medium age is 18.9 years (World population review). Its total population was 26.4 million in 2020, while it was 25 million in 2018 and 25.7 million in 2019, and the population's growth rate was 2.5% in 2020, 2.5% in 2018, and 2.5% in 2019 (World Bank Indicator, 2021), which is a moderate rate that can easily control. However, the economic development of the Ivory Coast is boosting comparatively to its neighboring countries.

The economic atmosphere of the country has been very promoting in this last decade. Ivory Coast is the third country after Nigeria and Ghana to have enabled

economic growth in West Africa. Only Covid-19 decreased its GDP to 1.9 in 2020, while the growth rate was 6.9 in 2018 and 6.2 in 2019 (World Bank Indicator); as we can see, all the two variables noticed an increase except the GDP growth in 2020. However, in 2021, the GDP growth became 6%, inflation rose to 4.09, and population growth increased to 2.92% (Statista, 2021). So, in 2021 all the variables noticed a change. The GDP and population growth rate increase is good for the country's economic health, but inflation is to be analyzed because it affects the household basket.

The unemployment percentage was 7.10% in 2011; it started decreasing in 2013 to 4.3% and decreased to 3.7 in 2014; in 2016, it was 2.6%, and in 2021 it is at 3.5%, which is encouraging. The country's public debt represented 22.53% of the real GDP in 2011 and will gradually increase to 50.09% in 2021. Nonetheless, the GDP per capita was 1740 USD in 2011, which increased to 2150 USD in 2014 and decreased to 1970 USD in 2015; from 2016, it was 2000 USD. The total population was growing slowly by 2% every year until 2020, but for 2021 the population growth rate is 2.93% (Statista, 2021).

However, presenting an overview of the economic progress of a country is a fundamental process to analyze the evolution of macroeconomic indicators of that country, see Figure 2 below, which presents four macroeconomic indicators: the GDP growth rate, the domestic savings rate, the investment rate, and the inflation rate of the nation. It shows that public policymakers made a great effort to keep the inflation rate below 4% from 2012 to 2020 to avoid diminishing consumers' purchasing power and disrupting the nation's development. So, because of Covid-19, the state's inflation rate became 4.09% in 2021, see Figure 3. Similarly, economic growth progressed better after the war of 2010 to 2011, but in 2020 it decreased to 1.96%. It reached its highest of 10.71% in 2012 in the 12 years 2010-2021 see Figure 2, due to structural adjustments through the Emerging Ivory Coast Plan.

Also, the saving rate of the Ivory Coast is consistently above 20% from 2010-2021, and the highest domestic saving rate of this period was in 2014, with 26.40% of the annual saving rate. While we all know that savings are essential for investment in an economy, and Ivorians have understood that. Also, these high rates show that the state is

among the emergent countries and the income level of employees is medium. As a result, the Ivory Coast's investments, which are the primary reason for any nation's economic growth, are derived from foreign aid and foreign direct investment, rising to 23.37% in 2021 from 21.68% in 2010. And the highest investment rate in the Ivory Coast during the study period was recorded in 2015 at 23.48%. It is close to the rate of 2021.

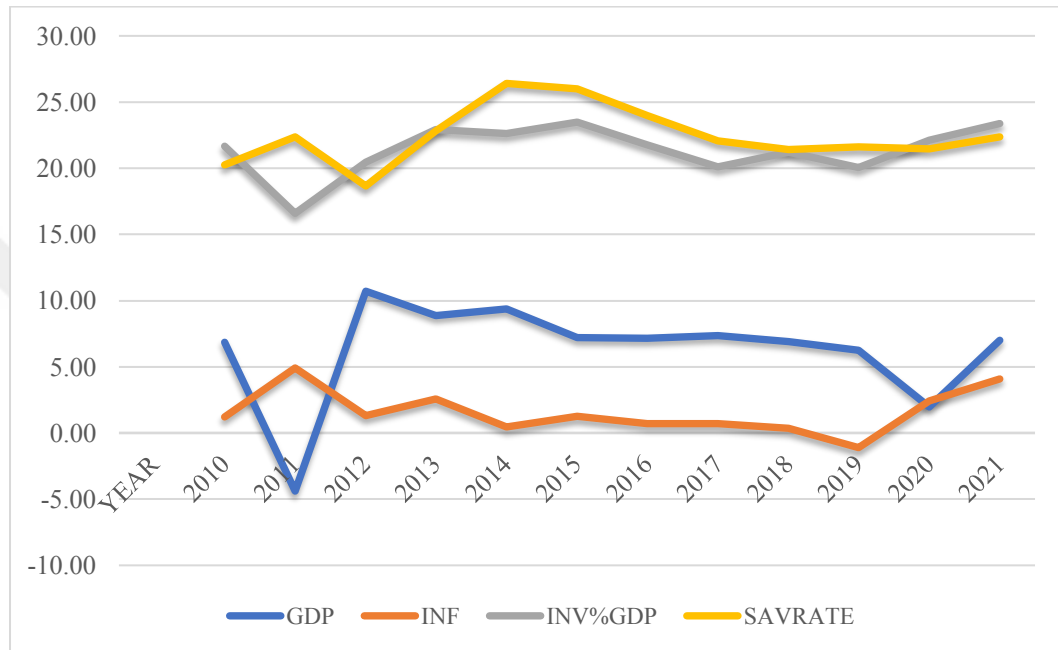


Figure 2: Evolution of Macroeconomic Indicators of Ivory Coast (2010-2021)

Source: CEIC DATA, World Bank Data

Moreover, Table 1 presents some other macroeconomic or economic indicators of the Ivory Coast in the ten last years, which are: the gross domestic product (GDP), the rate of inflation, the interest rate, the population growth rate, the public debt, the unemployment rate, the nominal GDP, the GDP per capita ratio and the overall population size. As illustrated in Table 1, the GDP growth was a negative number (-4.39%) in 2011, suddenly it increased to 10.71% in 2012 and decreased to 8.89% in 2013; since then, it continued to decline up to 1.95% in 2020 because of Covid 19.

Table 1: Economic Indicators of The Ivory Coast

Years	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
GDP growth %	-4.39	10.71	8.89	8.79	8.84	7.18	7.36	6.89	6.23	1.95	7.2
Inflation rate%	4.91	1.30	2.58	0.44	1.25	0.72	0.68	0.35	-1.10	2.42	4.09
Population growth%	2.39	2.44	2.48	2.50	2.52	2.54	2.55	2.55	2.55	2.54	2.92
Unemployment rate%	7.8	6.20	4.30	3.70	3.10	2.60	3.27	3.30	3.32	3.49	3.50
Interest rate%	4.30	4.30	4.00	3.50	3.50	3.50	4.50	4.50	4.50	4.50	4.00
Public Debt % of GDP	22.5	24.1	26.3	28.2	30.5	31.7	33.5	36.0	38.7	47.7	50.0
Nominal GDP (Billions of USD)	36.6	36.3	42.7	48.8	45.8	47.9	51.5	58.0	58.5	61.3	65.0
GDP per Capita (thousands of USD)	1.74	1.84	1.93	2.15	1.97	2.1	2.11	2.31	2.27	2.32	2.29
Population (Million)	21.2	21.54	22.8	22.6	23.2	23.8	24.4	25.6	25.7	26.3	28.3

Source: World Bank Data, IMF 2021, Central Bank of West Africa, Trading Economics, Statista, Macrotrend.

In these ten years, the population increase rate is in the interval of 2 to 3%. The inflation rate, which was from (-1 to 2) since 2014, increased to 2.42% in 2020 due to Corona and became 4.09% in 2021.

The government of the Ivory Coast is doing its best to reduce its unemployment rate. Since 2014, unemployment has been between 2 to 4%, which was more than 7% in 2011. The interest rate in the state as in all the CFA franc countries has an interest of 4% in general. But sometimes it decreases to 3.5%, and sometimes it increases to 4.5%.

The nation's public debt represents $\frac{1}{2}$ of the real GDP, a percentage of 22% of GDP in 2011 and 30% in 2015, it is now 47.74% of GDP in 2020 (28.958 USD million), and the public debt per capita is 1098 USD. The government usually earns international debt easily because it meets all the characteristics, but it is still struggling to manage income inequality and public finance.

The nominal GDP does not stop augmenting every year. It was 36.69 billion USD in 2011; it became 42.76 billion USD in 2013, 50.01 billion USD in 2018, 61.34 billion

USD in 2020, and 65.02 billion USD in 2021. The most considerable augmentation in the nominal GDP in the last ten years was in 2019, with 6.43 billion USD.

However, the GDP per capita, which is an indication of the living standards of a country in one year, was 1740 USD in 2011; it increased to 2150 USD in 2014 and decreased to 1970 USD in 2015; since then, it was 2000 USD and more. The total population also grows yearly, with a minimum of 1 million increased people to the previous population number.

Nonetheless, Ivory Coast is ranked 114th in competitiveness (trading economics, 2022) among 140 countries; it is ranked 85th on the World Happiness Index and 53rd in the population of 196 nations. Regarding the Human Development Index, Ivory Coast is also ranked 162nd among 189 countries published in 2019, at 122nd level in the Doing Business Ranking (country economics, 2020). It is ranked 128th in safety and security, 98th in personal freedom, 101st in good governance, 89th in economic quality, 130th in living conditions, and 137th in education (Legatum prosperity index, 2021). According to Geoba.se, the life expectancy in Ivory Coast in 2021 is 60.19 years old on average: 61.45 years for women and 58.97 years for men.

According to Reuters (2021), on June 15th, 2021, the Multilateral and bilateral lenders bound to assist the 2021 and 2025 Development Plan for the Ivory Coast or its five years development plan with a total of 26.1 billion USD, said the Prime Minister of the state Patrick Achi. The rise of funds for this Development Plan 2021 to 2025 was as follows: The World Bank will support the program with an amount of 8.7 billion USD, the European Union 6 billion Euros, and billion USD from the African Development Bank, France promised quite 4 billion Euros, the Islamic Development Bank 2 billion USD, and therefore West Africa Development Bank will support with 1 billion Euros. The Prime minister added that the meeting was a "success" because he had beyond what he expected. He also said, "Despite what we asked for, promises totaling 15 billion USD, we had collected 26.1 billion USD.," and the country would be waiting for the support to be honored.

Although it is ranked 171st among 188 countries on the Human Development Index, food insecurity, malnutrition, and gender inequalities, severely affect poor people as they deal with the issues of cultivable land because of climate change. Moreover, 48.4% of Ivorians are female, and 4% of the total population lives below the poverty scale. However, the state is ranked 155th on the Gender Inequality Index (World food program, 2022). As we all know, if there is food insecurity, we are exposed to insufficient food production.

The country's strategic plan is now to allow the government to support women, and farmers, then to adjust food consumption by diversifying the policies so that there will be a sustainable promotion for market access. All these strategies will give a foundation for a more robust economy that will reduce imports of goods, offers better life environment options for vulnerable populations, and boost durable and sustainable national food systems.

Another new challenge is that the Ivory Coast wants to maintain a high development rate in the coming years. Which will increase national wealth, absorb the growing population, create jobs, and attain tangible results in human development, so both the government and the Ivorians have to work hard to realize this new challenge.

Furthermore, the primary sector of the Ivory Coast's economy continues to be driven mainly by producing its two top export products, cocoa, and coffee, which rank in the first and fifteenth levels in global production. The country had a booming secondary sector in recent years and a predominantly tertiary sector.

The Republic of Ivory Coast has the highest growth rate having low inflation in the West African Monetary Union (WA EMU). The nation's median annual expansion rate was 7% from 2015 to 2017. After a slowdown in 2018, the Ivorian economy's growth peaked at 6.2% in 2019. The contributions to the secondary sector's development dropped from 2.2% in 2019 to 1.1% in 2020. The tertiary sector decreased from 4.1% in 2019 to 2.8% in 2020. The contribution of the primary sector would be negative in 2020 (UEMOA, 2020). Even though agriculture accounted for 21.39% of the gross domestic

product of the Ivory Coast in 2020, the industry sector occupied about 20.86%, and the industry services occupied 42.13% in 2020, see Figure 3 (Statista, 2020).

From Figure 3, we can explain that the service sector percentage of GDP decreased gradually during this period of 10 years. The industrial sector percentage of GDP noticed an increase from 2010-2014; it fell in 2015 and 2016, increased from 2017-2019, and decreased in 2020. But the agriculture sector's percentage of GDP noticed a decrease from 2010-2015 and an increase from 2016-2020.

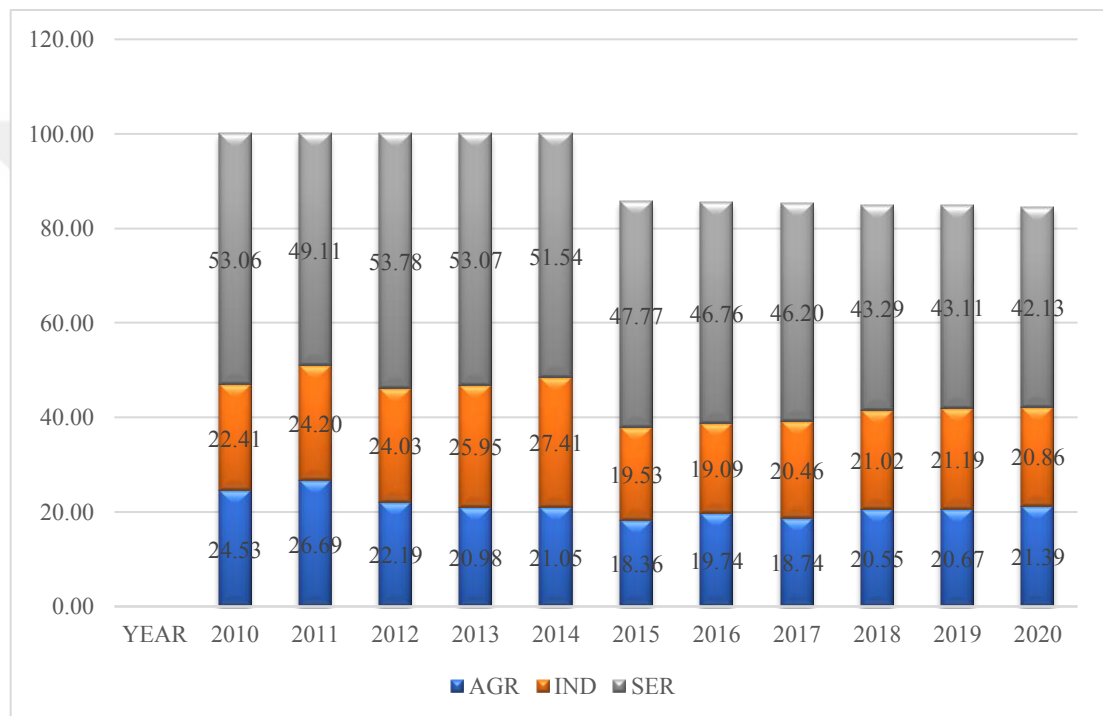


Figure 3: The Sector of Agriculture, Industry, and Service in The GDP of The Ivory Coast

Source: Statista.com

In the graph, we can observe that all the sectors noticed an outstanding decrease because of the presidential election that took place in 2015.

2.3 THE INFLATION OF THE IVORY COAST

In the Ivory Coast, the inflation rate calculates the rise or fall in the prices of products and services that all buyers can pay. The crucial categories are food and non-alcoholic goods (25% of the total percentage); Restaurants and Hotels (13%);

Transportation (12%); electricity, housing, water, gas, petrol, and other fuels (13%) followed by housing, clothing, and footwear (10%), communication (7%), and other goods and services (5%). The index also includes Health and Furnishings (4%), household equipment, and routine maintenance of the house (4%). Then, Education, Recreation, Culture, Alcoholic beverages, and tobacco represents the remaining (7%) (Trading economics, 2022).

The Inflation in Ivory Coast from 1972 to 2020 has a minimum percentage of -1.10% in 2019 and a maximum percentage of 27.42% in 1977. The average percentage was 6.55%. The inflation rate fell in 2019 to -1.10% by losing 0.75%, a loss it did not observe during the civil war of 1999. Moreover, it increased to 3.5% in 2020 by winning 2.4%, as shown in Figure 4.

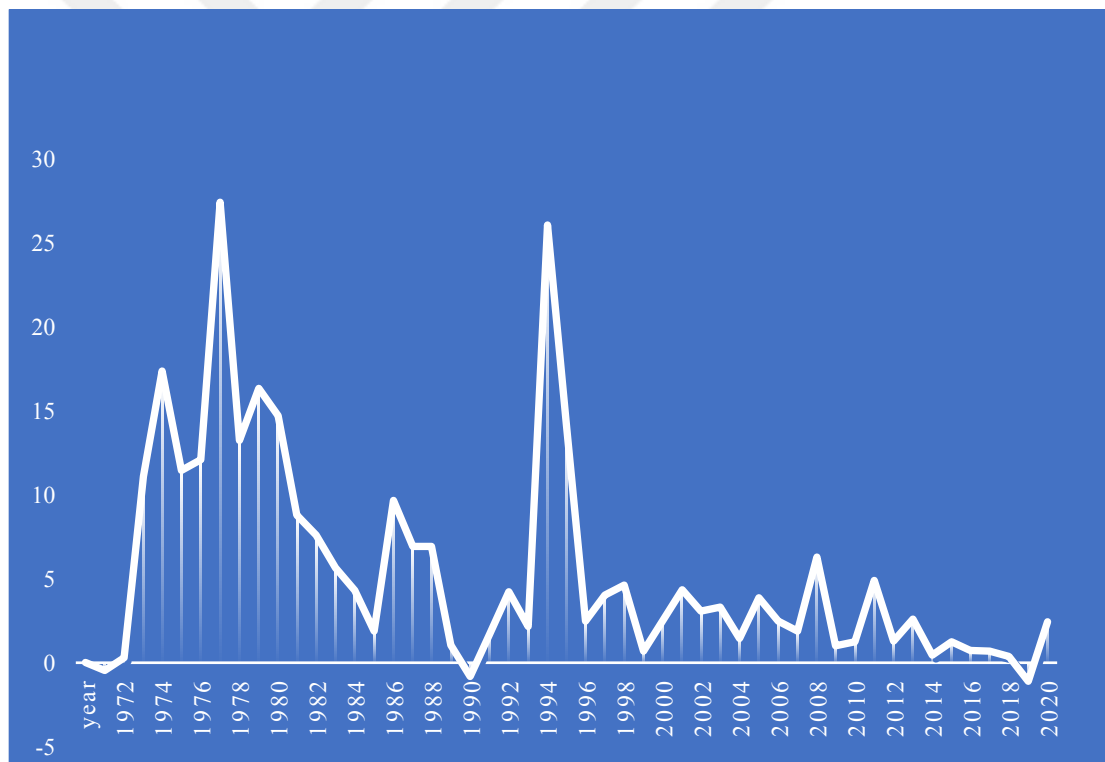


Figure 4: Inflation of The Ivory Coast From 1970-2020

Source: World Bank data

2.4 THE POPULATION AND POPULATION GROWTH OF THE IVORY COAST

The population of the Ivory Coast was 16 million at the end of the XIX century; it increased to 20 million in 2009, and in 2020, the total population of the state was 26.3 million, which saw that the population is gradually increasing (World Bank data). The country's population occupied 0.34% of the World's total population, which is 7.9 billion people, and it is ranked 53rd in the list of classification of World countries by population with a density of 83 people per Km² (World Meter, 2021). The population is as follows: 51.3% lived in town and 48.7% in the backcountry. The median age is 18.9 years, and the life expectancy is 58.75 years old.

The Ivorian government wants to increase the number of its population because the country needs a lot of labor force for economic development. For that, it sets the following goals:

1. Expand the areas with high out-migration.
2. Reduce maternal and infant mortality.
3. Encourage family planning, which improves the well-being of every family, even though Ivory Coast had 15 million residents in 2000.

The population density has tripled between 1950 and 2021, and the present population policy seeks to: 1) lower child mortality, 2) boost fertility, and 3) limit immigration and emigration.

In addition, the Ivory Coast has an infant death rate of 122/1000 per year, and most of the rural population lacks access to healthcare. In reality, the fertility rate is 6.7%. Sterilization and abortion for contraceptive purposes became prohibited in the state, and there is restricted access to contraceptive medication. The nation's rapid economic growth among its neighboring countries made immigration high, and one-third (1/3) of the total population is foreign-born.

However, low levels of emigration existed, but internal mobility accounted for about half of the population. In addition to transforming the Savannah and the woodland

zone into rural areas, the government is also trying to change some rural districts into medium-sized towns.

Table 2: The Population of The Ivory Coast

Year	TPOP In Million	TPOP Growth	Median Age	Fertility Rate	Density	Urban Population In Million	Country's Share of World Population	Ivory Coast Global Rank
1990	11.92	3.75%	17.5	6.85	37	4.82	0.22%	58
1995	14.19	3.55%	17.8	6.41	45	5.99	0.25%	59
2000	16.45	2.99%	18	6.05	52	7.20	0.27%	55
2005	18.35	2.21%	17.8	5.68	58	8.29	0.28%	57
2010	20.53	2.27%	17.9	5.25	65	9.65	0.30%	56
2015	23.22	2.50%	18.3	4.95	73	11.42	0.31%	56
2016	23.82	2.57%	18.4	4.89	75	11.81	0.32%	55
2017	24.43	2.58%	18.4	4.89	77	12.22	0.32%	55
2018	25.06	2.59%	18.4	4.89	79	12.64	0.33%	54
2019	25.71	2.58%	18.4	4.89	81	13.08	0.33%	53
2020	26.37	2.57%	18.9	4.68	83	13.53	0.34%	53

Source: World Meter

In 2022, the population of the Ivory Coast will increase by 655,550 people, reaching 27,970,139 people at the end of 2022. The natural population growth will be positive and will be 642,712 people. During the year, approximately 1,022,658 children can be born, and 379,946 people can die. If external migration stays at the same level as 2021, the population will increase by 12,838 inhabitants because of migration. Moreover, the total number of people who came into the country for a long time (immigrants) would be more than the number of people leaving the country (emigrants).

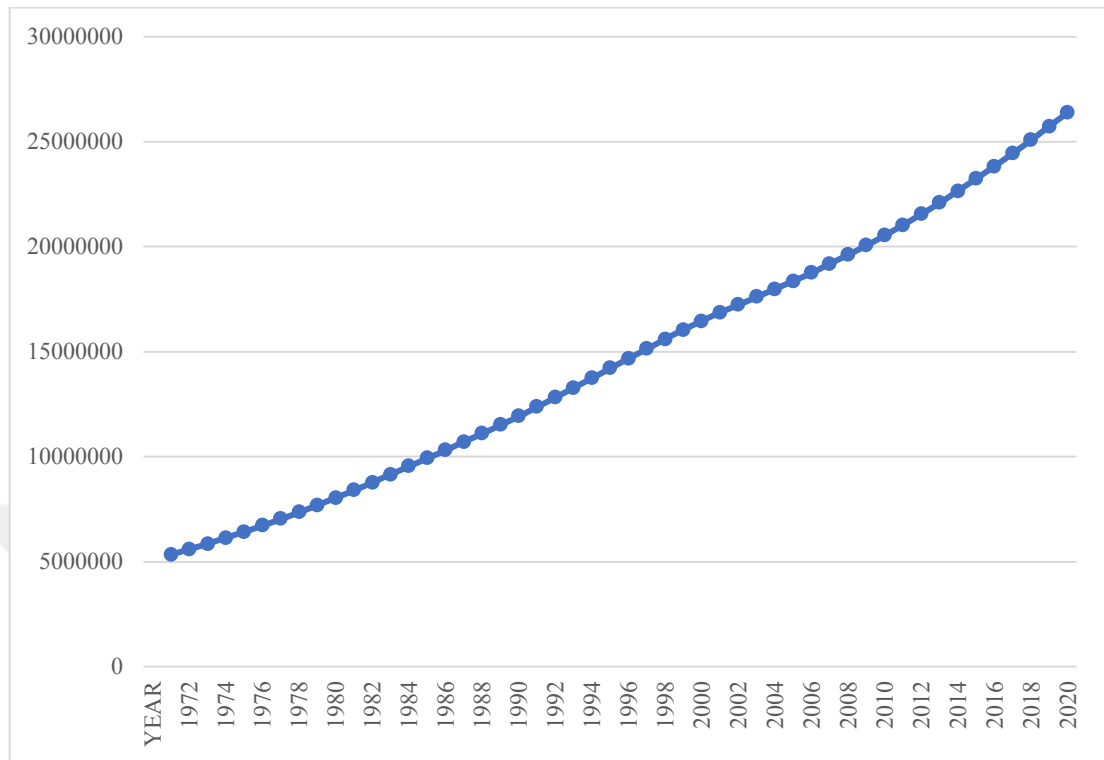


Figure 5: The Population of The Ivory Coast from 1970 – 2020

Source: World Bank Data

Population growth is the outcome of mortality, birth, and migration rates. An example of the year 2019 is in the Figure 5: The population of the Ivory Coast reached about 647,000 inhabitants. In 2019, the death rate was 9.9 per 1000 people (~ 247,000 deaths), and the birth rate was 35.5 per 1000 (~ 889,000 births). Consequently, around 5,000 inhabitants joined from other countries by migration. During the previous ten years, the number of average deaths yearly was 252,820 in the Ivory Coast, and the annual birth number was 838,625 (World Bank data, 2022).

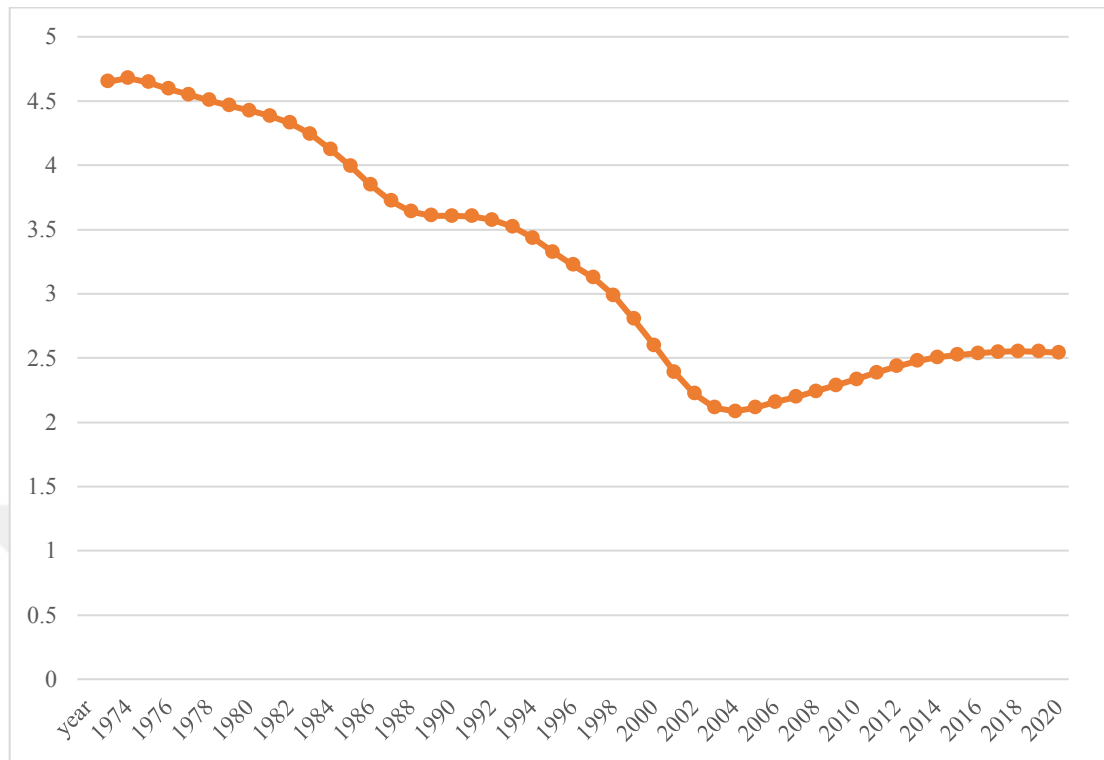


Figure 6: The Population Growth of The Ivory Coast From 1974-2020

Source: World Bank Data

From Figure 6, it is often certified that from 1974 to 2020, the population growth of the Ivory Coast noticed two breaks: the first in 1988 and the second in 2004. Additionally, the nation's population growth has generally decreased during this period, as shown in the graph. It fell from 1974-2004 (4.67%- 2.08%), then increased from 2005-2020 (2.15%- 2.54%).

2.5 COMPARATIVE EXAMINATION OF IVORY COAST

As mentioned in the introduction, the republic of Ivory Coast is a west African country. It had its independence in 1960 from France, which colonized the country for more than 67 years. The state shares a border with three francophone countries (Guinee, Mali, and Burkina Faso), also colonized by France, which had their independence on October 2nd, 1958, November 24th, 1958, and December 11th, 1958. It shares a border with also two anglophone countries (Liberia & Ghana) that had their independence on January 7th, 1822, and March 6th, 1957, respectively. Liberia was not a colonized nation;

it was a country where American slaves were left, so in 1822, it became a republic. And Ghana was colonized by England.

Nevertheless, the republic of Ivory Coast uses the same currency as Mali and Burkina Faso, the West African CFA franc or franc of the African Financial Community. Eight countries (Burkina Faso, Benin, Ivory Coast, Mali, Guinea-Bissau, Senegal, Togo, and Niger) used the CFA franc in West Africa by creating the Economic and Monetary Union in West Africa (WA EMU). The Central Bank of West Africa (BCEAO in French) governs the union. And the CFA franc is also used by CEMAC, an Economic and Monetary Community of Central African States (Cameroon, Congo, Equatorial Guinea, Gabon, and Chad), and the Bank of Central African States serves as its central bank (BEAC)(BCEAO,2020).

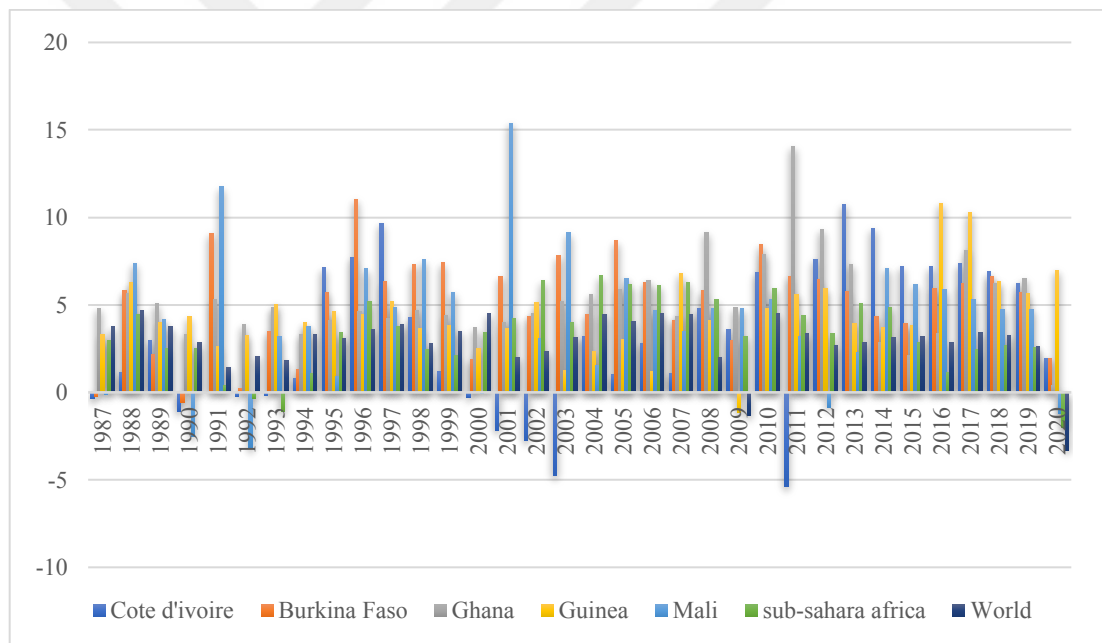


Figure 7: Annual GDP Growth of Ivory Coast with Neighbor Countries & The World

Source: World Bank Data

Moreover, the nation's economic situation is on reasonable reliance compared to its border countries. The GDP growth of the Ivory Coast is 6% in 2021 while, the GDP growth of Burkina Faso, Ghana, Guinea, Liberia, and Mali in 2021 are respectively 6.67%, 6.6%, 7.1%, 3.5% and, 6.3%. Only Liberia has a growth rate of less than 6%. In

the zone, the average growth rate of GDP is 3.50 %, and globally, the average rate of GDP expansion will be 5.90 % in 2021. As we can certify from Figure 7, the average growth rate of Sub-Sahara countries was negative in 2020 with a value of -2,01%, which was a very low rate of the GDP growth of the region during this period of study from 1987 to 2020. And its highest rate was in 2004 with 6.65%. The median GDP growth rate of the World was also negative in 2020, with a rate of -3.29%, which was the lowest growth realized in the World during these thirty-three years, and the highest rate obtained by the average world GDP growth was 4.66% in 1988.

From 1987 to 2020 the lowest growth rate in Ivory Coast was -5.37% which took place in 2011, and its highest growth rate was 7.72%, it took place in 1996. Comparatively to its neighbor countries, the lowest and highest growth rates of Burkina Faso, Ghana, Guinea, and Mali were -0.6% in 1990 for Burkina Faso, and its highest growth rate was 11.01% in 1996; the same year that Ivory coast realized its highest growth. Ghana had its lowest growth rate in 2020 at 0.41%, and the highest was 14.04% in 2011. Guinea also noticed its lowest growth rate in 2009, with -1.12%, and its highest rate of 10.8% in 2016. Finally, the lowest growth rate of Mali was -3.21% in 1992, and its highest growth rate was 15.37% in 2001. See Figure 7.

The inflation rate of the Ivory Coast was 3%, Burkina Faso 2.1%, and Mali 4.5% in 2021. Because of being among the West Africa Economic and Monetary Union (WAEMU), the three countries have an inflation rate of a unit number. Comparatively, Ghana and Guinea have an inflation rate of two digits (12%), which explains that they have different inflation management than the other countries because they are not a member of the same organization. They manage their monetary policy by themselves. Additionally, the average inflation rate in sub-Saharan Africa was 10.74%, higher than the inflation targets in Ivory Coast in 2021, while the long-term average was 4.35%.

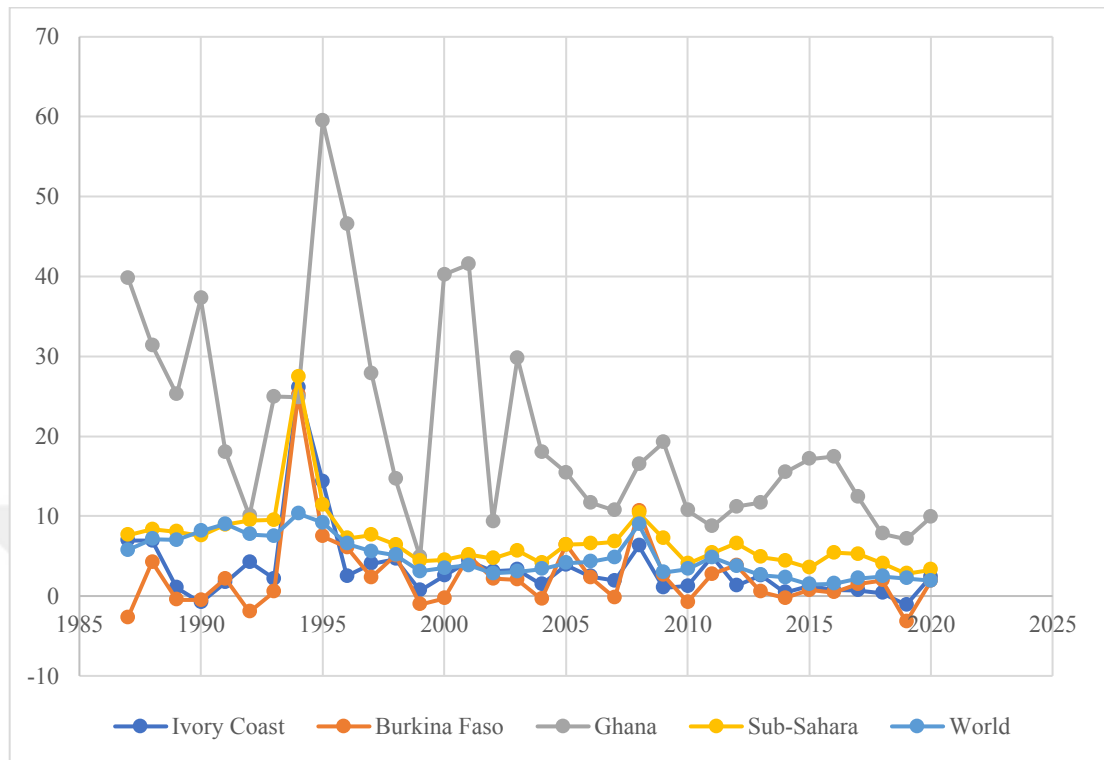


Figure 8: Annual Inflation Rate of the Ivory Coast, Neighbor Countries & The World from 1987-2020

Source: World Bank Data

Furthermore, Figure 8 shows that the inflation rate of the Ivory Coast was not constant; it was volatile. The highest rate was 14.29% in 1995, and the lowest was -1.1% in 2019. The average inflation in the World gradually decreases with time; its highest rate was 3.7% in 1987, with the lowest rate of 2.1% in 2004. The average inflation rate of Sub-Saharan countries does not have a negative sign during these 33 years. The lowest inflation rate in the Sub-Saharan region from 1987 to 2020 was 2.77% in 2019, and the highest was 27.4% in 1994. Comparatively to the Ivory Coast, the lowest inflation rate in Burkina Faso was -3.23% in 2019, and its highest rate was 25.17% in 1994. Also, Ghana's lowest inflation rate was 4.86% in 1999, and the highest inflation rate registered in Ghana went up to 59.46% in 1995.

When it comes to population growth, Ivory Coast's population growth is bigger than all the country's percentage of population growth, even bigger than the average population growth of the region and the World in 2021, see Figure 9.

We can certify in the graph below that the average population growth in the World seems to decrease from 1987 to 2020, and the average population growth of the Sub-Saharan countries is constant; because from 1987 to 2020, the population growth does not go beyond 2%. Among all the countries, Liberia noticed massive changes in its population growth percentage during these 33 years, as studied in Figure 9. Because we can certify from the graph that between 1987 to 1993, the population growth rate of Liberia was negative. Still, suddenly, there was a great increase from 1994 to 1998. It decreased again from 1999 to 2003, increased from 2004 to 2009, decreased from 2009-2014, and remained constant from 2015 to now. While, Liberia, Mali and Burkina Faso knew an increase in their population growth during these years. Still, Guinea and Ivory Coast noticed a decrease in their population growth percentage up to 2010, which then increased slightly until 2020.

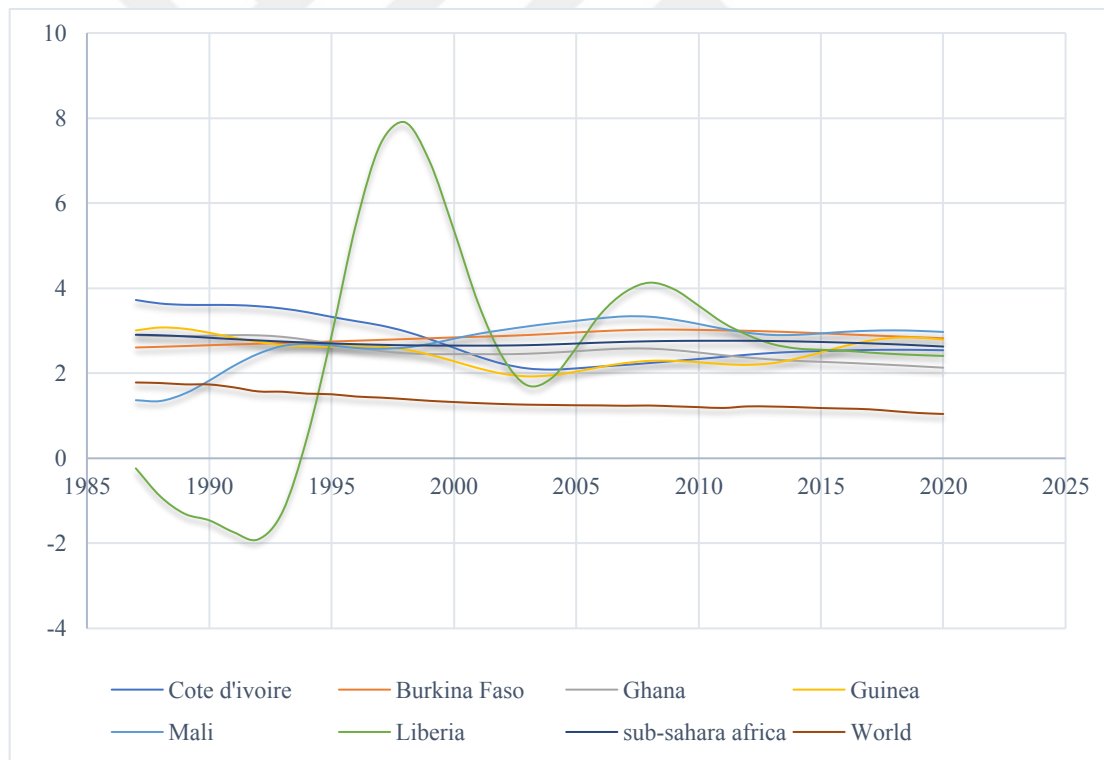


Figure 9: Annual Population Growth of Ivory Coast, Neighbor Countries & The World

Source: World Bank Data

Among these, Ivory Coast was in the 120th position on the Legatum Prosperity Index. At the same time, Burkina Faso was in the 134th position; Ghana is in the 99th position, Guinea was in the 140th position, Liberia was in the 139th position, and Mali was in the 151st position. So, it is Ghana that had enough prosperity among the six countries in 2021.

Security and Safety indicators measure how a nation's social security has been affected by conflict, war, and criminal activity. Moreover, the Safety and Security position of the Ivory Coast was 128th, Ghana 82nd, Burkina Faso 142nd, Guinea 122nd, Liberia 110th, and Mali 158th. We conclude that Mali is the most destabilized country among the neighboring countries of the Ivory Coast, and Ghana is the less country destabilized by war, crime, etc.

Table 3: Comparative Presentation of The Ivory Coast's Economic Indicators in 2021

Countries	Ivory Coast	Burkina Faso	Ghana	Guinea	Liberia	Mali	Sub-Sahara	World
GDP growth %	6	6,67	6,6	7,1	3,5	6,3	3,7	5,9
Inflation rate	3,5	2,1	12,6	12,5	5,8	4,5	10,74	4,35
Population growth	6,81	2,84	2,12	2,78	2,42	2,99	2,62	1,03
Unemployment rate	3,5	5,2	4,6	4,3	2,7	7,4	6,7	6,3
Interest rate	4	4	17	11,5	20	4	9,45	6,96
Balance of trade (Millions of USD)	464,7	-94,33	295,9	2.863	-57,4	-526,6	10.567	-1.600.000
Public Debt % of GDP	50,09	48,18	37,1	43,4	56,61	50,98	213	983
Nominal GDP (Billions of USD)	65,02	15,96	70	16	2,7	19,56	329,53	22.990,0
GDP per Capita (thousands of USD)	2,29	0,74	2,27	1,18	0,4	0,94	4,45	12,15
Population (Million)	28,3	21,43	30,8	13,5	5,18	20,85	1.370	7.900,00

Sources: World Bank, the Global economy, BBC, CEICDATA, IMF, Statista, Trading Economics, The Balance, Africa Development Bank, Macrotrends,

The tremendous GDP growth rate belongs to Guinea, with economic growth of 7.1%, and the lowest economic growth was from Liberia, with a growth rate of 3.5% in 2021. The unemployment rate in the region was 6.7% regarding the workforce that the region has because of its young population. However, the unemployment rate of the Ivory Coast was 3.5%, the smallest percentage of unemployment was from Liberia 2.7%, and the country with the most considerable unemployment rate was Mali 7.4%. Moreover, the standard inflation rate in Sub-Saharan countries was more than the double of global inflation average. Also, Ghana was the country that registered higher inflation (12.6%), and Burkina Faso was the lowest (2.1%) among the six countries in 2021 from Table 3 above.

Liberia is the country in which banking system owns the biggest rate among the six countries, with an interest rate of 20% on every loan. And the nations of WAEMU have the lowest interest rate of 4%. Moreover, it is known that Africa is generally the biggest importer, and the Sub-Saharan region is not an exception. The region had more than 10.56 thousand million USD as a trade deficit in 2021. While Ivory Coast, Ghana, and Guinea recorded a trade surplus of 464.7 million USD, 295.9 million USD, and 2.86 thousand million USD (the highest trade surplus between the six countries), respectively. Mali had the highest trade deficit of 526.6 million USD in 2021. Although Liberia is the indebted country among them, it has more than 56.6% of its gross domestic product GDP in debt. Also, the country that has less debt is Ghana, with only 37.1% of its GDP. The region's debt represents 213% of the GDP, and the debt in the World is 983% of the World's total GDP. Even though Ghana is the most populated state among them, with a population of 30.8 million, Ivory Coast is the one that has the highest GDP per capita of 2.29 thousand USD per year. Hence, Ivorian citizens have more income than the citizen of their neighboring countries. And the less populated state is Liberia which has a population of 5.18 million; it is also the nation with the lowest GDP per capita, 0.4 thousand USD.

Furthermore, economic quality is a pillar to measure the equipment of an economy to generate wealth and employ the entire workforce of a country. The Economic quality

of the Ivory Coast was in the 89th position, Burkina Faso was in the 116th, Ghana was in the 137th, Guinea was in the 157th, Liberia was in the 145th, and Mali in the 127th position. It shows that Ivory Coast was the best country to generate wealth and work for its economy quickly, and Guinea was the worst country to create wealth and work for its economy among these six countries in 2021.

In the Education pillar, we see how a country's pre-primary education, including primary, secondary, and postsecondary education, performed along with the skills of the adult population. However, the education level of the Ivory Coast was 137th, Ghana was 116th, Burkina Faso 154th, Guinea 160th, Liberia 162nd, of Mali 161st. Among the countries, Ghana was the best country that had a good education system, and Liberia was the one that had a small level of education in 2021.

The health pillar measures the extent to which individuals are healthy and their access to healthcare, which includes the health system, mortality rate, and health outcomes, including illnesses and risk factors. The level of Ivory Coast was 149th, Ghana was 117th, Burkina Faso was 132nd, Guinea was 156th, Liberia was 159th, and the level of Mali was 146th. Here also, Ghana was the country that had the best health care system among the six countries (Legatum, 2021).

CHAPTER 3:

3. LITERATURE REVIEW

This chapter is about the empirical literature summary. We will discuss the empirical results from previous studies related to the research topic. There are no many studies or papers that analyzed the impact of population growth and inflation on the economic development of a state but, many studies conducted the relationship between inflation and GDP growth and the relation between population growth and GDP separately, using panel data or time series data in one or several countries. Nevertheless, we will cite the authors that studied the impact of inflation on GDP growth in the first part and the authors that examined the relationship between population growth and GDP growth in the second part. However, this fragment of the paper allows us to have a perspective on this topic and to compare the results we will obtain in the methodology part.

3.1 THE STUDIES ON THE RELATIONSHIP BETWEEN INFLATION AND GDP GROWTH

Ozyilmaz (2022) stipulated the relationship between inflation and GDP growth in EU nations, indicating that a bidirectional causal relation existed between the consumer price index (CPI) and GDP deflator variables. The study included the data of 1996-2019 in twenty-seven EU countries by utilizing Dumitrescu and Hurlin causality model.

Adaramola, & Dada (2020) investigated the effect of inflation on the GDP growth of Nigeria from 1980 to 2018 by using the ARDL model and the causality test on real GDP, interest rate, inflation rate, exchange rate, money supply, government consumption expenditure, and the degree of economy's openness. The findings illustrated that while interest rate and money supply had a positive and significant effect on GDP, inflation and the exchange rate also had a negative and significant effect on the GDP. However, the causality outcome gave a unidirectional impact from the interest rate, government expenditure, and exchange rate to GDP growth, and inflation and the degree of the economy's openness gave any causal effect on the GDP growth of Nigeria.

Konaon (2017) studied the relationship between inflation and economic growth in the Ivory Coast from 1985 to 2010, using the ARDL bounds test procedure to analyze the long-term and short-term relationship that connects inflation and economic development. In the long run, there was a positive and significant relationship between inflation and GDP growth. While in the short term, there was a negative and insignificant relationship between them.

Obradovic et al. (2017) analyzed the linkage of inflation and economic development in Serbia, operating ARDL bound testing model from 2007: Q1 to 2014: Q3. Meanwhile, the results showed a long-term cointegration relationship between the variables and a short-run causality effect from inflation to GDP growth.

Behera, and Mishra (2016) studied inflation and financial growth nexus in Brazil, Russia, India, China, and South Africa (BRICS countries) using the ARDL approach from 1980 to 2012. Therefore, the findings revealed a long-run connection between inflation and GDP growth in China and South Africa. And there was a unidirectional causality between GDP and inflation in India, and a bidirectional causality between them in China.

Barro (2013) analyzed data from over a hundred countries from 1960 to 1990 to determine the correlation between inflation and economic growth using Panel data analysis. The result shows a significant relationship between the variables.

Osuala, Osuala, and Onyeike (2013) studied the influence of inflation on the economic development of Nigeria from 1970 to 2011. They obtained a positive and significant relationship between the variables. And the Granger causality test does not show any influence from one variable to another.

Niyimbanira (2013) also checked the econometric evidence of the interaction between inflation and development in South Africa by employing the ARDL, the Johansen cointegration, and the Granger causality techniques from 1990 to 2010. The analyses revealed a long-run association between inflation and GDP growth. The Granger causality test presented a unidirectional causality relationship from inflation to development.

Kasidi, and Mwakanemela (2013) conducted the effect of inflation on the development of Tanzania from 1990 to 2011, using functional correlation and cointegration approaches. The results showed a negative effect of inflation on GDP growth and that it did not exist any cointegration and long-run relation between the variables.

Koulakiotis and Papasyriopoulos (2012) checked the causality relation between inflation and GDP in European countries. They used panel data analyses on 14 European countries during their investigation. They found that inflation led to GDP growth at the 5% significance point, and GDP growth caused inflation at the 10% significance point. The causality test also showed a bidirectional relationship between the variables at the 10% significance level.

Hossain, Ghosh, and Islam (2012) found out the long-run association between inflation and GDP growth of Bangladesh from 1978 to 2010 by using Augmented Dickey-Fuller ADF and Phillip-Perron tests for stationary, cointegration test, and causality test. The cointegration result showed no cointegration connection between inflation and economic growth. In contrast, the causality result was tested at two different lags and showed the same results. For lags 2 and 4, the result was a one-way causality effect from inflation to economic development. So, they concluded that inflation had a causal impact on the development of Bangladesh from 1978 to 2010.

Ayyoub, Chaudhry, & Farooq (2011) found a negative and significant relationship between inflation and GDP growth for Pakistan using the ordinary least squares (OLS) method from 1972 to 2010.

Sattarov (2011) also explored the link between inflation and economic expansion in Finland from 1980 to 2010 utilizing the error correction model. Moreover, the result indicated a positive long-run relationship between inflation and GDP growth.

Hasanov (2011) checked the threshold effect on inflation in Azerbaijan by investigating the connection between its inflation and development. Hasanov examined the impact of the threshold inflation on GDP that raised from 2000 to 2009 and had a

non-linear link between the variables, with a threshold level of 13% inflation rate on the economic upturn.

Ahmed (2010) also empirically studied Bangladesh's inflation and GDP growth relationship from 1988 to 2008 using the ARDL bound test model. The findings indicated that there wasn't any statistical relationship between the two variables in the long run and indicated a negative and significant relationship between them in the short run. The Toda Yamamoto causality test showed a unidirectional causality relationship between inflation and GDP growth.

3.2 THE STUDIES ON THE RELATIONSHIP BETWEEN POPULATION GROWTH AND GDP GROWTH

Omotayo and Olusegun (2020) analyzed the effect of population growth on GDP growth in Nigeria from 1994 to 2019, with a time series data of gross domestic product or GDP, the fertility rate, the mortality rate, and the immigration rate of the country. They used the cointegration and error correction model to conduct an empirical study on variables. So, they obtained results that the mortality rate had a negative and significant impact on GDP, and they concluded that reproduction had the greatest positive impact. While they got that immigration has a positive and significant effect on GDP in Nigeria.

Abebaw (2019) did an empirical inquiry into the relationship between population growth and economic development in Ethiopia from 1981 to 2018 using the ARDL model and the Toda-Yamamoto causality test. Although, the findings shows that population growth and economic development have a long-run relationship according to the bound test. Nevertheless, the ARDL model's result showed a negative impact of population growth on economic growth in both the short-run and long run. In comparison, economic growth positively affected population growth in both the short and long run. Furthermore, the Toda-Yamamoto causality test attested to a unidirectional effect going from population to GDP growth.

Chang et al. (2017) examined the connection between population growth and the standard of living in twenty countries from 1870 to 2013 using the bootstrap panel causality test. However, the findings revealed a unidirectional Granger causality effect

from the population to the living standard in four countries (Finland, Portugal, Sweden, and France). There is a unidirectional result from the standard of living to their population growth in Canada, Japan, Germany, Norway, and Switzerland. They found a bidirectional Granger causality effect of the variables for Italy and Australia. There is not a Granger causality effect in the USA, Brazil, Belgium, Sri Lanka, the UK, New Zealand, Spain, Denmark, Netherlands, and Uruguay.

Akinbode, Okeowo, and Azeez (2017) examined the dynamic effect of population on the economic growth of Nigeria, using time series data from 1970 to 2014 obtained from the central bank of Nigeria statistical data analyzed with ADF, Johansen-cointegration test, VECM, and Toda-Yamamoto causality test. The Johansen-cointegration test revealed a long-term link between the variables. Likewise, the VECM results stated that economic growth is in long-run equilibrium when its annual rate is 6%. Finally, the causality test revealed a unidirectional causality going from population growth to GDP growth.

Sibe, Chiatchoua, and Megne (2016) conducted a panel data investigation of the thirty most populated countries in the world to show the long-run relationship between population growth and the per capita income. The error correction model determines the long-run impact of population growth on economic growth (per capita income). And the granger causality test determines the type of causality direction that relates the dependent variable to the independent variable. However, the findings demonstrated a long-run equilibrium relationship between the variables and bidirectional causality between them from the granger causality test. They concluded that population and economic development have a positive relationship.

Ali, Ali, and Amin (2013) investigated how Pakistan's population growth affected the country's economic expansion from 1975 to 2008 by applying the ARDL model to determine the relationship between the variables. And the results showed a substantial positive correlation between population growth and economic expansion. After, they added third and fourth variables, unemployment and the expenditure made on health and education, to check directly or indirectly the effect of population growth on the country's

economic growth. The results indicated that population growth contributed unfavorably to unemployment but favorably to economic growth. Furthermore, population growth has a positive and insignificant effect on expenditure on health and education (HRD). They concluded that population growth led to economic development but created unemployment, leading to educational and health problems.

Thuku, Gachanja, and Almadi (2013) obtained a positive correlation between population and economic growth in Kenya. They used a Vector Auto Regressive (VAR) estimation procedure to analyze the study on time series data from 1963 to 2009. Therefore, they concluded that the population growth in Kenya impacts its economic development.

Mulok et al. (2011) tested the relationship between population growth and economic growth with Malaysian data from 1960 to 2009. The results demonstrated no causal or long-term relationship between GDP growth and population growth.

Garza-Rodriguez et al. (2011) studied the relationship between Mexico's population and economic growth from 1960 to 2014 using the Gregory-Hansen cointegration test. The results attested that GDP growth had a negative effect on population growth throughout the short term. Still, the long-term population positively impacted GDP growth, and the causality result showed a bidirectional causality relationship between the two variables.

Muhammad (2009) revealed that Pakistan's population growth correlated negatively with its economic growth for the period of 1981 and 2005. Multivariate analysis results show that Pakistan's population increased by up to 430% from 1950 to 2001.

Wong & Furuoka (2005) examined the relationship between population and economic development in Asian countries by using Johansen, Gregory, and Hansen cointegration test, which revealed a no existence long-run relationship between the two variables in Asian countries in 2005. However, they also used a Granger causality test that showed a bidirectional causality relationship between population and economic growth for Japan, Korea, and Thailand. It showed a unidirectional causality relationship

from population to economic growth for China, Singapore, and the Philippines. A unidirectional causality effect from economic development to population in Hong Kong and Malaysia. And finally, Taiwan and Indonesia had no evidence of causality between population growth and economic growth.

Furuoka (2005) examined the relationship between population growth and economic development in Malaysia and found that there is a long-run equilibrium relationship between population growth and economic development. Moreover, in the short run, population growth impacted GDP per capita and vice versa.

Thornton (2001) analyzed the correlation between population growth and economic growth in his paper during the 20th century using the granger causality tests, and error correction model to determine the long-run relationship between population growth and GDP growth. The results of the study show that there is no long-run relationship between the variables, and no causality effect existed between them.

Dawson & Tiffin (1998) investigated the long-run relationship between population growth and the living standard in India from 1950 to 1993, using the Johansen cointegration tests. The results indicated that there is no long-run relationship between the variables.

There are many empirical studies about studying the relationship between inflation and economic growth, both in a single and a group of countries. And there are also many studies on the relationship between population growth and economic growth. There were several types of data, ranging from panel data to time series data from these previous studies, with different types of methodologies as well. Nonetheless, each study depends on different independent variables taken into account and the results obtained from the econometric analysis.

However, from the first point of this empirical literature many studies had a long-run positive relationship between inflation and economic growth as results, such as Konaon (2017), Odradovic et al (2017), Niyimbanira (2013) and, Sattarov (2011) studies. While studies like Konaon (2017), and Ahmed (2010) had a short-run negative cointegration between them. Adramola & Dada (2020), Barro (2013), Kasidi &

Mwakanemela (2013), and Ayyoub, Chaudhry & Farooq (2011) papers had a negative and insignificant cointegration relationship between inflation and GDP growth. But study like Osuala, Osuala and Onyeika (2013) had a positive and significant relationship between the variables in both long-run and short-run. While Hossain, Ghosh & Islam (2012) studies did not find any cointegration relationship between them. Moreover, Adramola & Dada (2020), Osuala, Osuala and Onyeika (2013) did not find any causal relationship between the two variables. While Ozyilmaz (2022), Koulakiotis & Papasyriopoulos (2012) found a bidirectional relationship between them, and papers like Niyimbanira (2013), Hossain, Ghosh & Islam (2012) and, Ahmed (2010) had a unidirectional relationship going from inflation to GDP growth.

Comparatively to the second point of this chapter, Omotayo & Olusegun (2020); Ali, Ali & Amin (2013); Thuku, Gachanja, and Almadi (2013); and Furuoka (2005) studies had a positive relationship between population growth and economic development. While Muhammad (2009) had a negative relationship between them. And, Akinbode, Okeowo, & Azeez (2017); Sibe, Chiatchoua & Megne (2016); then Garza-Rodriguez et al. (2011) had a long-run positive relationship between them. But Mulok et al. (2011); Thornton (2001); and Dawson & Tiffin (1998) found no statistical relationship between the two variables. Although, Abebaw (2019) attested a unidirectional effect going from population growth to GDP growth. While Sibe, Chiatchoua & Megne (2016); and Garza-Rodriguez et al. (2011) found a bidirectional effect between them.

Generally, the results of the empirical literature examination are mixed and depend on the countries and the study's period.

CHAPTER 4:

4. DATA AND METHODOLOGY

This chapter briefly explains related statistical concepts of time series data analysis. The results of unit root, bound test, ARDL, FMOLS and DOLS tests are given in this chapter.

4.1 DATA

This study used annual data on economic growth, inflation rate, and population growth rate from 1961 to 2021 for Ivory Coast. The data are retrieved from the World Bank Development Indicators. Additionally, the model takes into account the growth rates of the gross domestic product (GDP), the rate of population growth (POP), and the inflation rates (INF). However, inflation and population increase can have either positive, negative, or neutral effects on the nation's economic growth.

As already mentioned in the introduction, the analysis aim is to understand between inflation and population growth, which variable impact the economic development of the Ivory Coast the most.

The GDP growth is used as the dependent variable; therefore, the inflation rate and the natural logarithm value of the population growth rate are selected as the independent variables, see Table 4.

Table 4: Definition of Variables

Variables	Symbol	Definition	Source
Economic growth	GDP	Ratio of GDP Growth	World bank data
Inflation growth	INF	Ratio of Inflation Rate	World bank data
Population growth	POP	Natural Logarithm of Population Growth	World bank data

4.2 MODEL SPECIFICATION

The gross domestic product or the physical capital is a function of real GDP. The real GDP analyzed as a function of inflation and population growth because human capital may be part of population growth in this study,

Therefore, the mathematical expression of the relationship between GDP growth and the independent variables is:

$$GDP = f(INF, POP) \quad [1]$$

The growth function of the model is below:

$$GDP = \beta_0 + \beta_1 INF + \beta_2 POP + \varepsilon_i \quad [2]$$

The error term means to be different from zero because it gathers all empirical model factors outside the equation that could affect the nation's real GDP growth. β_i are the partial elasticities of the real GDP concerning the independent variables mentioned above.

4.3 ANNUAL CHANGE IN VARIABLES FOR IVORY COAST

If the structure of the data is examined, there may found broken lines in time series. In Figure 10 below, that represents the annual change of the GDP variable of the Ivory Coast, there was an extensive decrease in 1978, 1979, 1980, and, from 2011 to 2013.

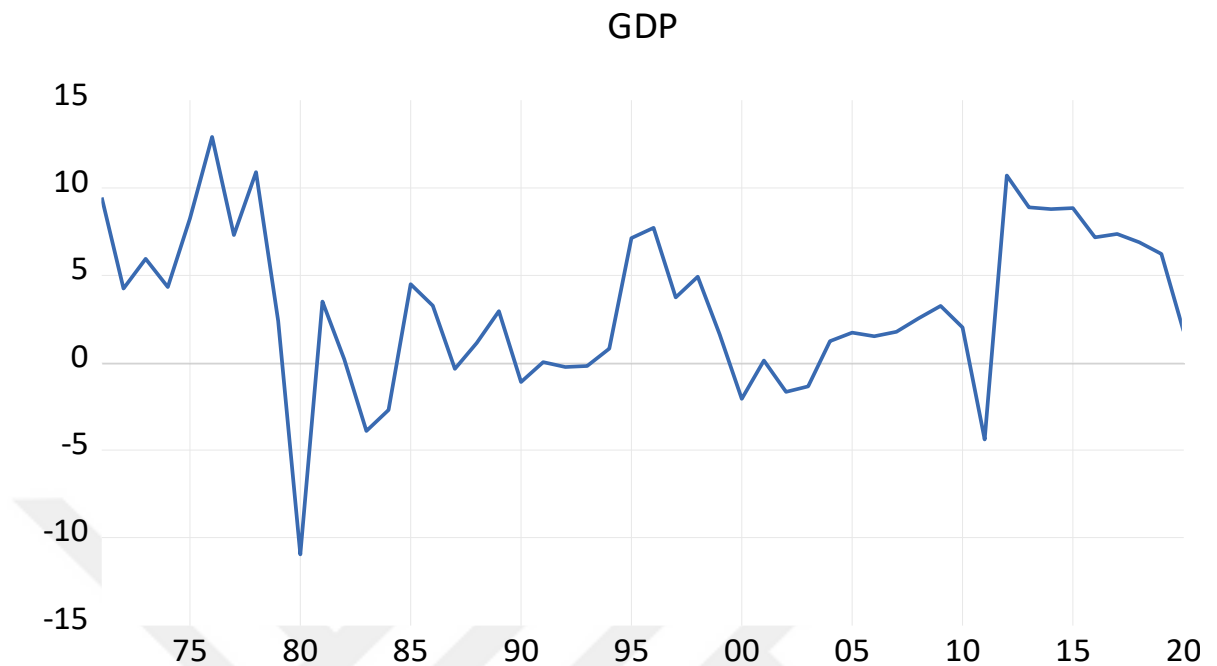


Figure 10: Ivory Coast's Annual GDP Change

The inflation graph of Ivory Coast is given in Figure 11 below, it also had volatile change in 1978, going to 1979 and 1980, decreasing then, the second big broken line realized in 2011-2013 caused an increase and linear graph.

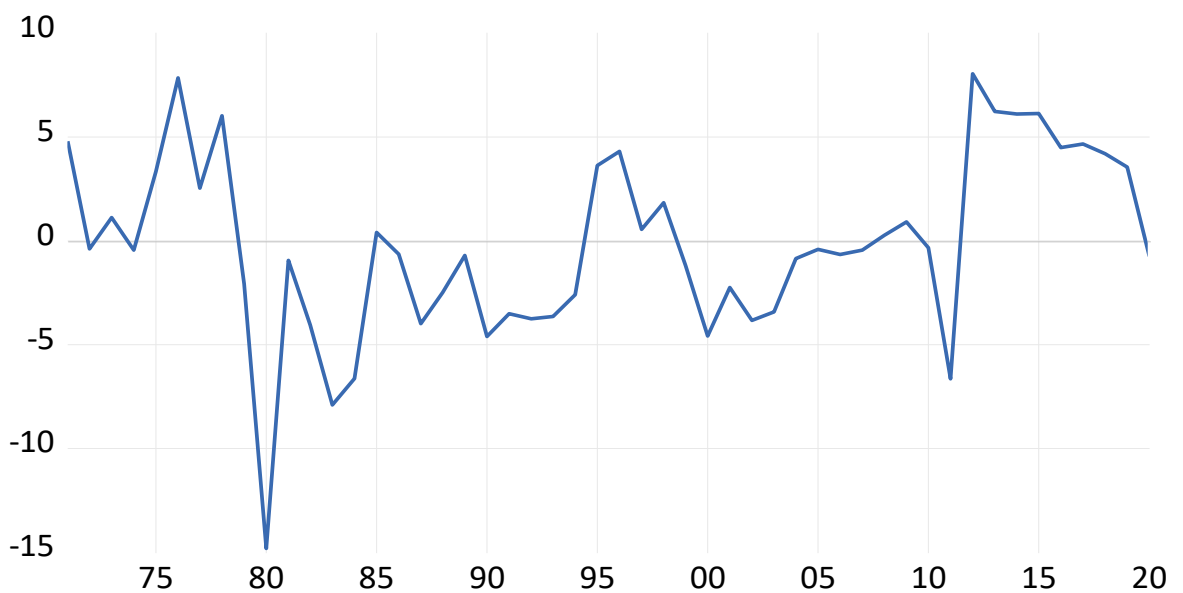


Figure 11: Ivory Coast's Annual Inflation Change

The population growth graph of Ivory Coast has a decreasing trend until the 2005 then it starts to increase in the following year in Figure 12.

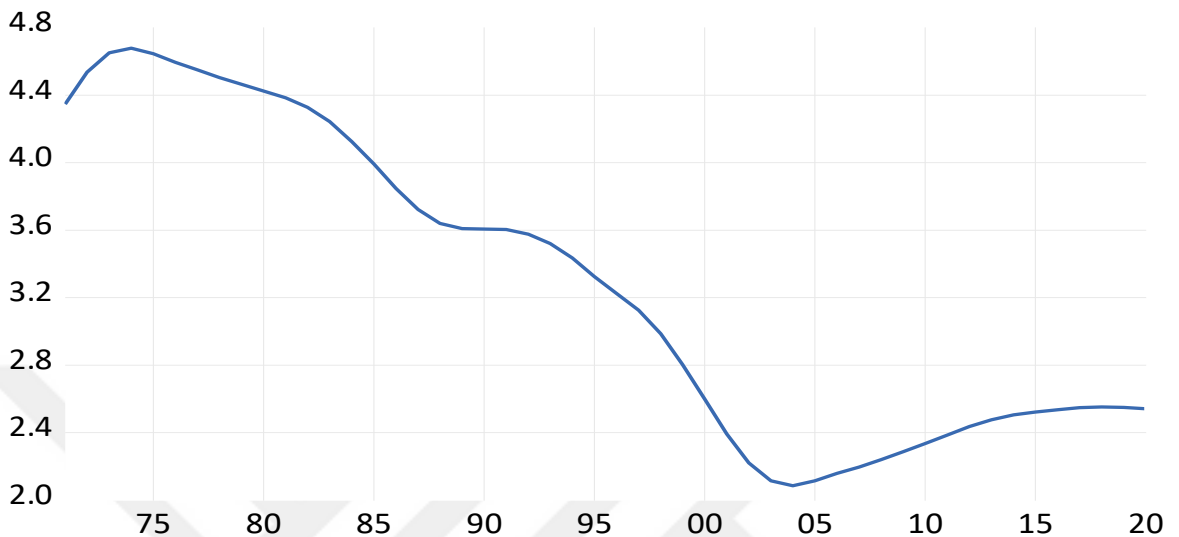


Figure 12: Ivory Coast's Population Growth Change

4.4 UNIT ROOT TEST

The unit root test determines variables' statistical properties or stationarity in time series data analysis. The time series data are occasionally stationary in level. The first step is to check whether each variable is stationary; if not, in that case, we have to find the order of integration of each variable. Because estimating non-stationary series may lead to spurious regression; in other words, it is when there is no relationship, but the result shows a high and significant relationship between variables. Moreover, if the variables in the regression model are not stationary, the standard assumptions would not be valid, and the usual t-test critical values (1% or 5%) would not follow t test distribution.

When applying the ARDL model, the variables should be stationary at level $I(0)$, or stationary at the first difference $I(1)$, therefore the second requirement of performing a unit root test is to determine if the variables are not stationary in second difference $I(2)$. So, testing the time series variables is vital before any regression analysis.

However, the unit root test determines if the independent and dependent variables are stable. The utilized tests for stability are the Phillips Perron (PP), Ng-Perron, and the

Augmented Dickey-Fuller (ADF) tests. However, Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests to check a reliable outcome of the stability test and also the Ng-Perron tests. All the variables should be integrated or remain unchanged in level or first difference, and none should be integrated or stationary at the second difference when we apply the ARDL model.

The procedure for testing the ADF unit root is as follows:

$$\Delta Y_t = \alpha + \delta t + \gamma Y_{t-1} + \sum_{i=1}^p \lambda_i \Delta Y_{t-i} + \varepsilon_t \quad [3]$$

Where Y_t is the variables in consideration in this model at time t (which can be GDP, INF or POP), t represents the time; Δ denotes the first difference of the variable; γ is the coefficient of the first lag on Y_t (Y_{t-1}); ε_t is the error term; p is the optimal lag length of any variable. Thus, the ADF test's null hypothesis is that there is no unit root stationarity.

The hypotheses are:

H_0 : if $\gamma = 1$, there is a unit root, and the P-value should be bigger than 0.05; it is not stationary

H_1 : if $\gamma = 0$, there is no unit root, and P-value should be less or equal to 0.05; it is stationary

Moreover, the ADF unit root test is similar to the PP unit root test.

Table 5: The Results of Unit Root Test

ADF Test Results			
Variables	Constant, Linear Trend ADF Statistic	Variables	Constant, Linear Trend ADF Statistic
GDP	-2.440	ΔGDP	-5.522*
INF	-4.314*	ΔPOP	-4.192*
POP	-2.512	ADF critical values of ΔGDP and ΔPOP series 1%=-3.555 5%=-2.915 10%=-2.594	
ADF critical values of GDP and POP Series 1%=-4.124 5%=-3.489 10%=-3.173			
ADF critical values of INF series 1%=-3.546 5%=-2.911 10%=-2.593			

PP Test Results			
Variables Names	Constant, Linear Trend ADF Statistic	Variables	Constant, Linear Trend ADF Statistic
GDP	-1.965	Δ GDP	-5.561*
INF	-4.494*	Δ POP	-4.677*
POP	-0.272	PP critical values of Δ GDP and Δ POP series 1%=-3.548 5%=-2.912 10%=-2.594	
PP critical values of GDP and POP Series 1%=-4.121 5%=-3.487 10%=-3.172 ADF critical values of INF series 1%=-3.546 5%=-2.911 10%=-2.593			

Ng-Perron Test Results				
Variables	MZ _a	MZ _t	MSB	MPT
GDP	-7.039	-1.823	0.259	13.017
INF	-18.281*	-2.992*	0.163*	1.451*
POP	0.318	0.218	0.687	104.731
Δ GDP	-26.187*	-3.618*	0.138*	0.936*
Δ POP	-60.211*	-5.457*	0.090*	0.475*
Ng-Perron critical values of GDP and POP series at 1% significance level for MZ _a , MZ _t , MSB and MPT are respectively: -23.80, -3.42, 0.14, and 4.030 Ng-Perron critical values of Δ GDP, Δ POP and INF series at 1% significance level for MZ _a , MZ _t , MSB and MPT are respectively: -13.800, -2.580, 0.174, and 1.780 * shows 1% significance level				

From Table 5, we can see that the ADF unit root test results show that the dependent variable GDP is not stationary in level with the constant, linear trend at a 5% significance level. However, it is stationary in the first difference with a constant at a 1% significance level.

The first independent variable, INF, is stationary in level with constant at a 1% significance level. While the last independent variable, POP, is not stationary in a level with a constant, linear trend, but it is stationary in the first difference with a constant like GDP at a 1% significance level.

Furthermore, the result of the Philip Perron test from Table 5 indicates that GDP is stationary in the first difference with a constant at a 1% significance level; INF is stationary in level with a constant at a 1% significance level, and POP is stationary in first difference with a constant at 5% significance level.

However, the Ng-Perron test proclaims that GDP and POP are stationary in the first difference with a constant at a 1% significance level. Moreover, INF is stationary in level with constant at a 1% significance level.

Although, the summary of the unit root tests in Table 5 gives evidence that the sample ADF, PP, and, Ng-Perron tests statistics for GDP and POP are all stationary in first difference and statistically significant at the critical value of 1%. Therefore, we reject the null hypothesis of unit root, suggesting that the variables are I (1) stationary. The INF variable results from these four tests ensure that INF is I (0); we can reject the null hypothesis and embrace the alternative hypothesis.

4.5 THE ARDL BOUNDS TEST

The bounds test approach is the following test after establishing that the variables are stationary. According to Johansen (1988) and Engle and Granger (1987), a cointegration test should have the same fundamental integral and many long-run data. However, the ARDL bounds test approach by Pesaran and Shin (1999) solved all these problems. However, Pesaran et al. (1999), cited by Narayan (2004), suggested that annual time series data only utilize a maximum of two lag durations. The bounds test analyzes the long-run equilibrium relationship between the dependent and independent variables. In this paper, after the unit root test, one variable is in order I (0), and the two variables are in order I (1), so we can conduct ARDL bound test. Fortunately, any variable is I (2); otherwise, we will be upset not to do the bounds test analysis.

Hypothesizes are below:

Hypothesizes are below:

H_0 : there is no long-run cointegration

H_1 : there is long-run cointegration

The general (p, q) model is specified below:

$$Y_t = y_{oj} + \sum_{i=0}^p \delta_j Y_{t-i} + \sum_{i=0}^q \beta' X_{t-i} + \varepsilon_{jt} \quad [4]$$

Where is the variable allowed to be I (0) or I (1), and are coefficients; y is the constant, $j=1 \dots k$; p and q are optimal lag orders, and is the vector of error terms.

The examination of the coefficients' joint significance is from the Wald test (bounds test) using the F-test. The Wald test constrains the estimated long-run coefficients of real GDP growth, real inflation rate, and the natural logarithm of population growth rate. The newly calculated F- statistic contrasts the lower and upper bound critical values offered by Pesaran et al. (2001). If the F-statistic is greater than the upper and lower bound critical values, the null hypothesis of no cointegration will be rejected. Otherwise, it will be accepted if the F- statistic's lower and upper bound critical values are lower than its value.

Table 6: The Bounds Test Result (Dependent variable Δ GDP)

K	F-statistic	Critical Values for (1% Significance Level)	
		Lower Bound	Upper Bound
2	7.785	4.13	5

Note: K represent the number of independent variables

The F-statistic value is 7.785 in Table 6 which is bigger than the lower bound of 1% significance level I (0) and also greater than the upper bound of 1% significance level I (1). So, we draw the conclusion that there is a cointegration relationship between the dependent and independent variables.

The ARDL model is in this research is the following: ARDL (2,4,4)

Table 7: The ARDL Model Prediction Results

Variables	Coefficient	Std. Error	t-Statistic
GDP (-1)	1.1018	0.1193	9.2285*
GDP (-2)	-0.345	0.1175	-2.9353*
LPOP	0.5159	0.1424	3.6214*

INF	0.0005	0.0029	0.1889
INF (-1)	0.0091	0.0029	3.1274*
C	-2.8032	0.9528	-2.9418*
Diagnostic Results			
X^2_{HT}	0.390[1,55]		
X^2_{BG}	0.318[2,50]		
X^2_{RAMSEY}	0.943[1,51]		

Note: *1%, **5%, ***10% indicates the significance levels. X^2_{BG} , X^2_{HT} , and X^2_{RAMSEY} show test values of heteroscedasticity, serial correlation, and linearity test respectively. Values in parentheses indicate probability values.

The model accepted for the ARDL (2,4,4) in Table 7. From the examination of the diagnostic control results of the ARDL model, no autocorrelation problems, no changing variances problems, and the structural form of the model is strict.

4.6 THE ARDL DIAGNOSTIC TESTS

The ARDL diagnostic test checks the model's authenticity before running the ARDL test. These tests help us determine if the model has no autocorrelation. There are no non-linearity problems, multicollinearity, or variance issues, and to know if the error terms have a normal distribution.

The normality test is necessary for time series data study because it is the first step to analyzing data. It helps to determine the normal distribution of the error terms. For that, we should have two hypotheses:

H_0 : Error terms have a normal distribution

H_1 : Error terms don't have a normal distribution

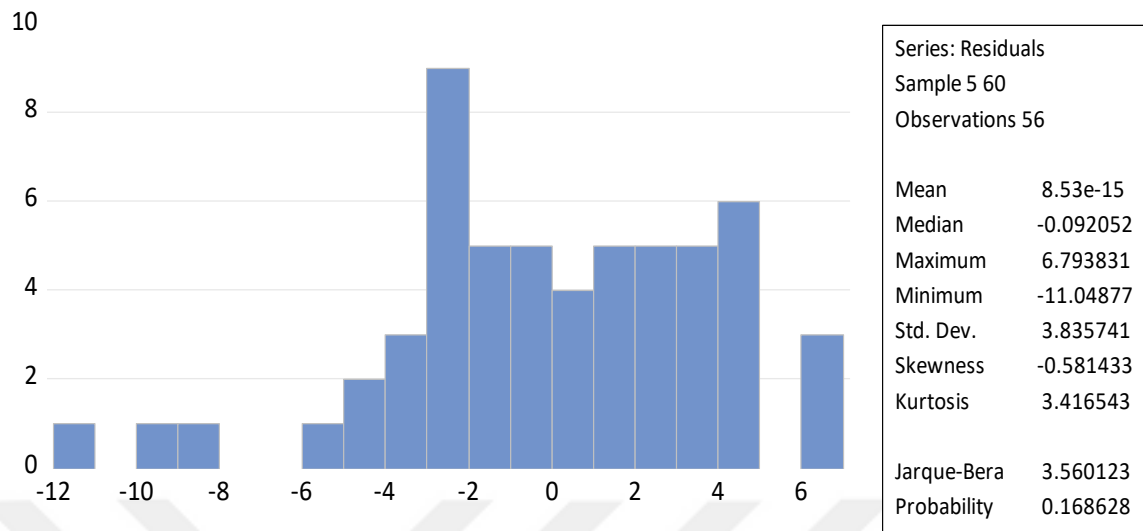


Figure 13: Normality Test Results

To know the normal distribution of the error terms, we have to check the value of the probability of Figure 13. The significance level is accepted as 5 % in this research. As the probability value is greater than 5%, we accept that the error terms are normally distributed.

The multicollinearity test revealed the degree of correlation between the independent and dependent variables using the Variance Inflation Factor (VIF).

If $VIF=1$, there is no correlation between the independent variables and others;

If VIF is more than 5 or 10, there is a high correlation or multicollinearity between the independent variables and others.

Table 8: Multicollinearity Results

Variable	Variance Inflation Factors		
	Coeff. Variance	Uncentered VIF	Centered VIF
C	10.76	32.03	NA
INF	0.015	3.287	1.802
POP	508.7	2102	93.89

To explain the result, we refer to the values of centered VIF. Nevertheless, we can see in Table 8 that the Centered VIF value of INF is approximatively equal to 2, and the

Centered VIF value of POP is 93.89. So, there is no multicollinearity or correlation between inflation and economic growth. However, there is a high correlation or multicollinearity between population growth and GDP growth.

Running the heteroscedasticity test helps us validate the regression result; we should know if the error terms have fixed variance. For that, we must check if the probability Chi-square value is higher than the 1% critical value. At that time, the error terms have fixed variance, but if the probability Chi-square is lower than the 1% critical value, we must conclude that the error terms do not have fixed variance. The test has two (2) hypotheses below:

H_0 : Error terms have fixed variance

H_1 : Error terms don't have fixed variance

The Breusch-Godfrey test is an autocorrelation test that determines the error in a regression model. It also checked if the consecutive number of the error terms is independent occasionally. The error terms value should be serially correlated, which means that to analyze, we should compare the probability of the Chi-Square value to the significant value of 1%. And its hypotheses are below:

H_0 : There is no serial correlation

H_1 : There is a serial correlation

The Ramsey RESET test is important to know if the regression model is linear or non-linear. Whether it existed any non-linear combination between the variables also has two hypotheses:

H_0 : $t = 0$, the model has no omitted variables

H_1 : $t \neq 0$, the model has omitted variables.

Table 9: The Diagnostic Tests Results of ARDL Model

	TEST	H_0	Obs R-squared	Prob.Ch ²
--	------	-------	---------------	----------------------

Serial Correlation	BG LM Test	No autocorrelation	0.729	0.694
Heteroscedasticity	ARCH Test	Homoscedastic	0.401	0.526
Linearity	Ramsey RESET Test	Linear relationship	0.943	0.335

Comparing the probability of the Chi-Square value in Table 9 for the Heteroscedasticity test with the statistical significance level (1%), we concluded that the Prob Chi-Square is greater than 1%, we accept, so the error terms have fixed variance. And we reject H_1 .

As we can see in Table 9 for the Breusch-Godfrey test results, the probability of the Chi-Square value is greater than 0.01 or 1% critical significance level. Therefore, we should accept the null hypothesis that there is no serial correlation and reject the alternative hypothesis of the existence of serial correlation.

The linearity or Ramsey test results from Table 9 show that the probability Chi-squares values are bigger than the 1% critical significance level, which means that we accepted the null hypothesis of a model free from specification errors. So, the model is linear.

4.7 ARDL LONG-RUN AND SHORT-RUN RELATIONSHIP

As there is a long-run cointegration, to analyze the short-run, we have to conduct the error correction model (ECM), which is specified below:

$$\Delta GDP_t = a_o + \sum_{i=1}^p a_{1j} \Delta GDP_{t-i} + \sum_{i=1}^{q1} a_{2j} \Delta POP_{t-1} + \sum_{i=1}^{q2} a_{3j} \Delta INF_{t-1} + \lambda ECT_{t-1} + e_t \quad [5]$$

The t-statistic on the independent variable presents the causal effect of the short run.

If the ECT (-1) is negative and significant at a 1 or 5% significance level, we believe there is a short-term relationship. If the coefficient of the independent variable is positive, there is a positive relationship in the short run. Otherwise, if they are negative, it also shows a negative relationship in the short run.

Table 10: The ARDL Long Run and Short Run Results

ARDL (2,0,1) Estimated Long Run Coefficient			
Variables	Coefficient	Std. Error	t-Statistic
LPOP	2.121	0.112472	18.860*
INF	0.040	0.012477	3.207*
C	-11.524	1.863039	-6.185*
ARDL (2,0,1) Estimated Error Correction Coefficient			
ECT (-1)	-0.243244	0.062630	-3.883*

Note: Indicates significance at *1%, **5%, ***10%.

Meanwhile, the Table 10 above, the coefficients of the independent variables are all positive. This means that the variables might have a favorable cointegration association, and the probability value of the constant (C) is also significant because it is lower than the 1% critical level. So, we conclude that we have obtained a positive relationship between the variables in the long term, which are the same results obtained by Konaon (2017); Niyimbanira (2013); Obradovic et al. (2017); and Sattarov (2011) in the case of the relationship between inflation and GDP growth. Similarly, from the studies of the relationship between population growth and GDP growth, the results are similar to Abebaw (2019); Akinbode, Okeowo, and Azeez (2017); Sibe, Chiatchoua, and Megne (2016); Garza-Rodriguez et al. (2011) and Furuoka (2005)'s papers that indicated a positive connection between population growth and economic development in the long term.

The results of the Error Correction term value is negative in Table 10 and its probability value is less than 1% critical value, which means it is significant. We deduced that there is a short-run cointegration relationship. As the coefficients of the independent variables are positive, the dependent and independent variables have a short-term, positive connection.

The ARDL model indicated a positive and significant relationship between inflation, population, and GDP in both the long and short run. This is similar to the result Osuala, Osuala, and Onyeike (2013) obtained in inflation and GDP. Also similar to Ali, Ali, and Amin (2013); and Thuku, Gachanja, and Almadi (2013) studies in the case of population growth and GDP.

4.8 THE DYNAMIC ORDINARY LEAST SQUARES (DOLS) REGRESSION MODEL

The Dynamic Least Squares Regression model is an alternative test to confirm the ARDL test. Alternatively, to check the cointegration relation between the variables. Solving the finite sample bias of ordinary least squares (OLS) caused by endogeneity issues. It helps to estimate the long-run variances.

Table 11: DOLS Results

DOLS Estimated Coefficient			
Variables	Coefficient	Std. Error	t-Statistic
POP	2.487	0.142	17.481*
INF	0.017	0.012	1.456
C	-18.359	2.602	-7.054*
R-squared	0.955739	Mean dependent var	22.98225
Adjusted R-squared	0.954159	S.D. dependent var	1.282208
S.E. of regression	0.274529	Sum squared resid	4.220494
Long-run variance	0.180922		

Note: Indicates significance at *1%, **5%, ***10%.

From Table 11, the probability value of POP is significant because it is less than 1% significance level, and its coefficient sign is positive, which means that there is a positive and significant cointegration between GDP and POP. Nevertheless, the contrary show off for the INF series because its probability value is insignificant, so there is no cointegration relationship between GDP and INF, which made us examine the FMOLS regression test.

4.9 FULLY MODIFIED ORDINARY LEAST SQUARES (FMOLS)

REGRESSION MODEL

It is also an alternative ARDL model created by Philips and Hansen to develop new methods of cointegration coefficient estimation. It deals with serial correlation and non-parametric issues.

Table 12: FMOLS Results

FMOLS Estimated Coefficient			
Variables	Coefficient	Std. Error	t-Statistic
POP	2.335	0.097	23.839*
INF	0.031	0.009	3.343*
C	-15.156	1.604	-9.446*
R-squared	0.955739	Mean dependent var	22.98225
Adjusted R-squared	0.954159	S.D. dependent var	1.282208
S.E. of regression	0.274529	Sum squared resid	4.220494
Long-run variance	0.180922		

Note: Indicates significance at *1%, **5%, ***10%.

Table 12 shows that all the probability values of the independent variables are significant because they are all less than 1% critical level. Moreover, the coefficient of both POP and INF are positive, which means a positive and significant cointegration relationship exists between GDP, LPOP, and INF series.

Table 13: The Results of Alternative Models

Variables	ARDL	DOLS	FMOLS
LPOP	2.121*	2.487*	2.335*
INF	0.040*	0.017	0.031*
C	-11.524*	-18.359*	-15.156*

Note: Indicates significance at *1%, **5%, ***10%.

From Table 13, we can see that the ARDL and FMOLS models are similar, and they attest that there is a favorable and significant relationship between the variables.

Still, the DOLS model shows a non-cointegration connection between inflation and the dependent variable (GDP). So, we concluded that our ARDL results were correct.



5. CONCLUSION

The main objective of this thesis is to determine which factor between inflation and population growth influence the Ivory Coast's economic development most, for the period between 1961 to 2021. The normality test showed that the error terms are normally distributed, and the multicollinearity test showed no correlation between inflation and GDP growth. There is a high correlation between population growth and GDP growth. In contrast, the serial correlation test showed that the probability value is bigger than 5%, meaning there is no correlation between the variables. No evidence of a heteroscedasticity problem and the variables have a linear relationship between them.

Even though to find out the relationship between variables in the long and short run, we used the Autoregressive Distributed Lag model (ARDL). But, before employing the ARDL model, the three variables are controlled for their time series properties (stationarity properties) using ADF, PP, and Ng-Perron tests, also called unit root tests. The results show that economic growth or gross domestic product (GDP) and population growth (POP) are all integrated in the order I (1), but inflation (INF) is integrated in the order I (0). so, we can conduct the ARDL model since the series are at different levels (levels 0 and 1). There is a big probability of a short-run relationship and also long-run relationship between the dependent and independent variables.

Since the study used an ARDL model methodological approach, also known as the Bound test method, the result revealed that the bound test value or F-statistic value is larger than the upper and lower bound critical value of I (0) and I (1). So, there is a long-run equilibrium cointegration relationship between the dependent variable GDP and the independent variables INF and POP.

In the long-run relationship, we found that inflation (INF) and population growth positively and significantly impact GDP growth in the Ivory Coast. But population growth affects the GDP growth of the Ivory Coast most because if the population growth (POP) increases by 1, it causes the economic growth (GDP) to increase to 21.21%. If inflation (INF) increases by 1, it only causes GDP to grow at 0.4% in the long term.

Going from the results found in this study and those from some authors mentioned in the introduction and the empirical literature parts. For the papers concerning the relationship between GDP growth and inflation, we note a similarity on the one hand and an absence of similitude on the other hand. This paper found that inflation had a positive and significant effect on GDP growth in the short and long run, similar to Tobin (1965), and Osuala, Osuala & Onyeika (2013) papers that demonstrated a positive relationship between the two variables in both long and short run. But, Konaon (2017) and Sattarov (2011) found only a long-run positive relationship between the variables in their studies. Stockman (1981) and Barro (2013) concluded a negative relationship between GDP and inflation, while, Sidrauski (1967) showed that there is no relationship between inflation and economic growth.

Nonetheless, about the results obtained from this paper about the relationship between population growth and economic development, we constated that population growth had a positive and significant relationship with GDP growth in the short run and long run. Just like the study of Eli et al. (2015), Ali, Ali, and Amin (2013), Omotayo and Olusegun (2020), and Furuoka (2005) that all concluded that population growth has a positive impact on GDP growth in their different studies.

The empirical analyses showed that inflation and population growth positively impacted the Ivory Coast's economic development during our study period. So, the government of the Ivory coast should maintain its inflation policies management. They should bring together all efforts so that the inflation rate in the nation will not be greater than 3.5% which is the optimal rate for inflation in a country (Ragot, 2004). Though, it is not because inflation positively impacts economic growth that they must encourage or be tolerant of hyperinflation (an uncontrollable rise of the price of goods and services during a period). That can be a big issue that prevents the money supply policies.

As for population growth, the government should encourage births because most of the world's developed countries have a large population. As it is said, human resources are the first resources of the economic growth of a state. However, encouraging birth must be accompanied by good health care services and modern hospitals, followed by food

self-sufficiency. We can only work or talk about economic development if people have full stomachs. Promoting food self-sufficiency would make most of the population do agriculture, for which the government should provide all the necessary materials for a good planting process and harvest. A high birth rate should also follow the minimum living conditions.

However, the government should make people stop rural exodus or rural flight by ensuring that all the cities in the country have a minimum of all the things or achievements that can impress people in the capital or urban area.

The government should support the reconciliation due to the two wars noticed by the country. Moreover, more than three thousand were killed during the wars, and drive between six hundred thousand to six hundred and forty thousand people left their homes by being refugees in the neighboring countries, in other west African countries, or moving into the capital.

The Ivorian government should create an outstanding organization to care for the children who lost their parents during these wars because most children live in the street. They thieve, kill and terrorize the population.

Finally, a population can only work with employment. So, the government should support job creation, encourage youth entrepreneurship and public-private partnership, construct factories to transform natural resources to finish products that can employ more than a thousand people, invest in the public sector.

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