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EFFECT OF UNEMPLOYMENT, INFLATION AND FOREIGN DIRECT INVESTMENT ON ECONOMIC GROWTH IN SUB-SAHARAN AFRICA

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ABSTRACT

This research explores the influence of unemployment, inflation, and FDI on GDP growth from 1991 - 2021. Sub-Saharan Africa faces unique economic challenges, and understanding the dynamics of these key variables is crucial for informed policymaking. By assessing the interactions among unemployment, inflation, and FDI, this research seeks to provide valuable insights into how these factors influence economic growth in the region. Such insights can guide governments, international organizations, and investors in formulating effective strategies and policies to promote sustainable and inclusive economic development in the region, ultimately improving the quality of life for its citizens. The ARDL model is utilized to estimate the model's short-run and long-run phases. The Granger causality test, the Error Correction Model (ECM) approach, and the cointegration test are all applied during the investigation. The variables considered are GDP growth, FDI, unemployment, and inflation. According to the results of the stationarity test, GDP growth and inflation (INF) were stationary at the level, whereas unemployment and FDI were stationary at the first difference. The cointegration test results demonstrate that the variables under consideration had a long-run association. The ECM outcomes also found that, while unemployment and inflation have negative effects on GDP growth, FDI has a positive effect. Finally, the Granger causation analyses showed that none of the variable Granger causes the other. The finding suggests that the government should implement policies that manage unemployment and inflation while also encouraging FDI inflows to improve GDP growth.

Keywords: *Economic Growth, Unemployment, Inflation, Foreign Direct Investment, Autoregressive Distributed Lag Model*
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Introduction

In Sub-Saharan Africa, the influence of unemployment, inflation, and FDI on GDP progress is a key issue. High unemployment rates impede social and economic progress in the area, making it a major problem, as shown by the data from WDI, which shows a rise from 5.52% in 2013 to 6.80% in 2021. On the other side, inflation has an impact on people's and enterprises' purchasing power, which may result in instability and decreased investment. FDI also meaningfully contributes to GDP growth by supplying resources, technology, and job opportunities S.Gaikwad (2013) and Kamaly (2014). For Sub-Saharan African policymakers and other stakeholders, it is crucial to comprehend how these components interact.

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In the region, unemployment is a key roadblock to economic development. Low productivity, poverty, and social unrest are all consequences of high unemployment rates Irge (2020) and Levinsohn (2008). The World Bank estimates that Sub-Saharan Africa's average unemployment rate was 6.1% in 2020, with youth unemployment being particularly high. Studies have revealed a conflict between the region's unemployment rate and GDP expansion. For instance, a study by (Ojima, 2019) used the OLS method on yearly data from 1980 to 2017 to examine the link between unemployment and GDP progress in Nigeria. Results reveal a detrimental association between GDP growth and unemployment, and Nigeria, among the biggest economies in Sub-Saharan Africa, was linked to high unemployment rates. According to a report by the ILO (Ryder & Director-General, 2020), the region had the highest unemployment rate globally, with youth unemployment being particularly severe.

In Sub-Saharan Africa, inflation can also stifle economic growth. Inflationary pressures degrade individuals' and enterprises' purchasing power, limiting their ability to invest and spend. It causes uncertainty, which reduces both local and external investment. The IMF on tackling rising inflation in Sub-Saharan Africa has stated that inflation has a detrimental impact on GDP expansion in numerous Sub-Saharan African nations Kovacs et al., (2022). In Zimbabwe, hyperinflation exacerbated a severe financial crisis around the late 2000s, the official inflation rate for June 2019 was 97.9% resulting in a steep decrease in GDP.

According to (Kovacs et al. 2022), inflation has increased dramatically over the previous two years, primarily due to external causes including rising food and energy prices as well as supply chain disruptions. As of July 2022, the median inflation rate was little over 9% compared to the pre-pandemic period's average of slightly over 5% (2009–19). Despite being at its highest point in 10 years, inflation in the area is still below the peak of 12% (median) experienced during the global financial crisis.

According to (Kovacs et al. 2022), a challenging economic climate currently exists in the region (SSA) as a result of the pandemic recovery, rising food and energy costs, and significant governmental debt. The area needs to boost growth while addressing excessive inflation rates that are endangering earnings and food security. Due to the roughly twofold increase in inflation since the pandemic, social and political unrest is a concern. Contrary to affluent countries, most countries lack the resources to promote growth. Since the pandemic, external factors such as fluctuating currency rates, natural disasters, supply chain disruptions, and global commodity prices have influenced inflation.

In Sub-Saharan Africa, FDI is essential in fostering economic progress. FDI boosts economic activity and generates job possibilities by bringing in technology, capital, and management knowledge. According to the United Nations Conference on Trade and Development (UNCTAD), FDI inflows to Sub-Saharan Africa will reach $32 billion by 2020. Joshua et al., (2021) stated that FDI is viewed as a possible accelerator for GDP growth in Sub-Saharan Africa (SSA). According to the United Nations Conference on Trade and Development's (UNCTAD) 2021 World Investment Report, foreign direct investment (FDI) into Sub-Saharan Africa decreased by 12% in 2020, primarily because of the COVID-19 epidemic and its accompanying uncertainty. The report highlights the significance of FDI in boosting sustainable growth and economic diversification in the region.

Finally, the impact of unemployment, inflation, and FDI on GDP progress in Sub-Saharan Africa is an important field of research. Unemployment and inflation can stymie economic development and social progress, whereas FDI can bring much-needed capital and expertise. Policymakers and stakeholders must comprehensively understand the dynamics and interconnectedness between unemployment, inflation, foreign direct investment, and GDP development in the area to develop effective strategies that foster economic expansion and development. They should prioritize policies addressing unemployment and inflation while creating a platform encouraging FDI. Sub-Saharan African nations can boost their GDP growth forecasts and the well-being of their people by doing so. The supposition is supported

by suggestive evidence that is created using observed data as well as findings from previous studies.

The study's main focus is to examine the influence of FDI, inflation, and unemployment on Sub-Saharan Africa's GDP growth from 1991 to 2021. This study aims to answer the following research questions:

1. How does unemployment, inflation, and FDI impact the economic growth of Sub-Saharan African, and are there short-term or long-term relationships among the study variables?
2. To what extent do unemployment, inflation, and FDI influence the economic growth of Sub-Saharan African economies, considering both short-term and long-term effects?
3. Is there a significant causal relationship between unemployment, inflation, FDI, and economic growth in Sub-Saharan Africa, and does this causality run in one direction, both directions or not?

The paper is divided into the following sections: a review of the relevant literature is found in the second section. Section three provides a description of the methodology, data source, model, and estimating strategy used in the article. The fourth section contains result analysis and discussion, and section five contains the conclusion and policy recommendations.

Theoretical Literature

Theory of Unemployment

Unemployment is a key concern in economics, and various theories attempt to explain its causes and consequences. One prominent theory is the "classical" or "neoclassical" theory, which emphasizes the role of labor market factors. According to this theory, unemployment arises from the imbalance between labor supply and demand due to wage rigidities or mismatched skills (Mankiw, 2009, P.169). Another influential theory is the Keynesian theory, which focuses on aggregate demand as the primary driver of unemployment. Keynes argues that insufficient demand leads to cyclical unemployment during economic downturns. These theories provide different perspectives on the underlying mechanisms of unemployment and have shaped policy debates and interventions.

Keynes states that achieving full employment is not common within classical economic theory. He argues that macroeconomic equilibrium can be attained below full employment, as the level of productivity and employment in equilibrium may not necessarily match to maximum employment revenue. In the event that total demand is insufficient to cover all commodities, output will be reduced to balance total demand.

According to the theory of Okun's law, which varies depending on the specific country and time period being analysed, a direct association exists between real GDP growth and cyclical unemployment. The law suggests that a 1% rise in cyclical unemployment aligns to a negative growth of 2% in real GDP. Conversely, a one-percentage-point decline in joblessness leads to a 2% rise in annual percent of real GDP growth. According to (Fuhrmann, 2016), to achieve 2% reduction of unemployment percentage while maintaining a potential GDP expansion rate of 2% per year, actual GDP should expand by 4% per year, as stated by Okun's law. To stabilize being without a job, GDP growth typically needs to be two times the pace of employment potential growth. To effectively minimize unemployment, the economy must grow at the rate as mentioned above.

Inflation Theory

The classical theory claims that, inflation primarily stems from changes in the currency supply. The money quantity theory suggests that a rise in the currency supply is the sole factor that can elevate overall price levels. However, in modern income theory, demand-pull

inflation is understood as a situation where the total money demand surpasses the degree of output at full employment (Mankiw, 2009, P.391). In this perspective, prices for goods, services, and economic resources respond to pressures resulting from supply and demand, they easily rise when there is robust overall demand. Economists like Golden Weiser, Hawtrey, and Friedman firmly support the idea that price rises are primarily a monetary phenomenon brought about by an extreme currency supply. Significant investment spending on a large scale, either in the public or private sector, creates surplus demand in the economy that exceeds total output (Sekwati & Dagume, 2023).

The classical theory's emphasis on labor market flexibility and the role of market forces in determining employment levels has influenced subsequent economic thought and policy debates. However, it has been subject to criticism and has been augmented by other theories that consider factors such as aggregate demand, technological change, and institutional arrangements.

Eclectic Theory of International Production

In the host economy, spillover effects from foreign direct investment (FDI) have had a positive and notable impact. Through the combination of labor and physical capital, FDI has also raised total production in the recipient nation. As a result, FDI has an impact on the recipient country's economic development indirectly by guaranteeing the development of human capital and updating technology, as well as directly by assuring the maintenance of the capital stock (Hossain et al., 2022).

The eclectic paradigm, formulated by John Dunning in 1980, provides an explanation for the theory of foreign direct investment (FDI). This hypothesis holds that ownership advantages, location advantages, and internalization benefits are the three primary factors that affect FDI. In addition, according to the OLI paradigm, "government policy can determine FDI location in host countries, considering human nature as a motivation of MNCs for FDI" (Vasyechko 2012, P. 130). On the basis of three advantages ownership (O), location (L), and internalization (I) it handles positive issues and prescribes a conceptual framework for understanding foreign value operations of firms. As page 95 by Dunning & Lundan (2008) states, "the eclectic paradigm seeks to offer a general framework for determining the extent and patterns of both foreign owned productions undertaken by country's own companies, and that of domestic production owned and controlled by foreign investors." Multinational Enterprises (MNEs) have certain advantages known as ownership advantages, such as managerial know-how, brand recognition, and technological prowess (Dunning 2008, P.142).

The "ownership (O) advantage" is said to explain the "why" or motivation behind MNCs' actions, in accordance with eclectic theory. According to Dunning's (2008) theory, a firm's ownership advantages are measured by how much of a competitive advantage they have over rival companies. When compared to regional rivals without these advantages, a company can benefit from its innovative capabilities, access to financial resources, organizational and marketing systems, and marketing systems that can be purchased (Bajrami et al., 2019).

The "location (L) advantage" of eclectic theory, which explains the "where" or location of the enterprises and which are particular to the country, is another significant benefit. As previously mentioned in the location theory and hypothesis section, some examples of such specifics include the labor force (availability and quality), natural resources, and society structure (political structure and legal systems). It is profitable for a corporation to use its assets abroad when it has a location advantage, such as input distribution, which results in supply from its home country base (Bajrami et al., 2019).

The "how" or the method in which MNCs conduct their business is finally explained by the internalization (I) advantage. The level of ownership and control is known as internalization. No ownership or control is at one extreme of the scale. The market or at arm's length are used to conduct transactions. Full control is at the other extreme of the spectrum.

By owning or managing the other firm, the company "internalizes" the market transactions and prevents them from taking place at arm's length (Dunning 2008, p. 327–330). According to internalization theory and hypothesis, businesses with ownership-specific advantages are more likely than rivals to internalize their use.

According to Lucas (1988) and Romer (1986), the progress of FDI receiving country's economy is subjected to international money flows, specifically foreign direct investment (FDI), which introduces training, skills and technology to the domestic labor force. According to proponents of endogenous growth theory, economic development occurs gradually and is driven by technological advancements. Multinational corporations (MNCs) are regarded as crucial institutions that facilitate the exchange and dissemination of knowledge across borders, both intentionally and unintentionally. They play a substantial role in the growth of developing markets, as foreign venture is essential for their economic advancement. Consequently, policies are formulated to attract and promote such investments. Cicea et al. (2022) state a strong proof supporting the association between FDI and GDP growth, highlighting a robust correlation between the two variables.

Kamaly (2014) supports the idea that African countries experience significant economic development through the introduction of new technologies and skills brought about by capital inflows. Kamaly further highlights the significance of FDI for GDP growth but stresses that it is not the sole determinant of progress. These findings are in line with contemporary and neoclassical viewpoints on the theory of endogenous growth. A similar viewpoint can be found in the 2017 edition of the United Nations Conference on Trade and Development (UNCTAD), which claims that FDI inflows significantly contribute to the growth and development of the global GDP and are expected to do so in the future.

Empirical Literature

Using quarterly data, Sekwati & Dagume (2023) evaluate how inflation and unemployment affected South African's GDP growth between 1994 and 2018. They found that the study's factors were stationary at first difference rather than at level. The test for Johansen co- integration revealed a long-run link between the factors, indicating that continuous price increase and joblessness have a detrimental effect on GDP growth. The outcome did not find any issues with the White Heteroskedasticity, Jarque-Bera, or Serial correlation LM tests. The authors suggest South Africa's federal government implement reasonable pricing policies for price stability and establish a framework linking the Higher Education Department and Training with companies to develop tertiary skills and create employment opportunities, thereby promoting stable prices and GDP growth.

Mohseni & Jouzaryan (2016) studied how Iran's economic growth between 1996 and 2012 was affected by unemployment and inflation. The ARDL model was employed in their investigation to look at the link between the factors over both the short and long-terms. The model evaluation results showed how continuous rise in prices and being without a job have a substantial and negative effect on economic growth over time, demonstrating that these factors slow down economic growth. They advise the government to make careful preparations and strategies to reduce and control unemployment and inflation. Similarly, Pakistan's economic growth was studied by Shahid (2014) in relation to unemployment and inflation. From 1980 through 2010, the World Data Bank provided the time series data. According to the unit root ADF and phillip-Perron, economic growth is stationary on level and first difference, in contrast to unemployment and inflation, which are stationary on first difference. The ARDL result demonstrates a long-term relationship between the variables. Further evidence that there is no issue with heteroskedasticity, model misspecification, or serial correlation comes from the results of the tests for White heteroskedasticity, Ramsey reset, and Breusch-Godfrey serial correlation.

Jeke & Wanjuu (2021) investigated the influence of inflation and unemployment on growth of output in South Africa. Using ARDL model, the authors evaluated the short-run

and long-run impacts of continuous price increases, joblessness, and other controllable variables on the nation's real GDP from 1994 to 2019. The research outcomes showed that inflation has an inverse impact on real GDP, while the presence of human and physical capital positively affects real GDP. The study highlighted that the most effective approach to combat unemployment is to raise the quantity and advance the standard of physical capital, thereby enhancing labor productivity, along with investing in human capital. The findings further suggested that an increase in real GDP results in more investment, leading to an expansion in employment opportunities.

Makaringe & Khobai (2018) conducted a study using quarterly data spanning the period 1994Q1 to 2016Q4 to examine trends and the impacts of being without a job on South Africa's GDP growth. According to the results of the (ARDL) bounds test, there was a long-run association between unemployment and GDP growth. The empirical results revealed a detrimental long-run and short-run link between being without a job and GDP growth. The link between unemployment and GDP growth in Nigeria from 1980 to 2013 was examined by Michael et al. (2016). Utilizing cointegration tests, VECM techniques, and the Granger causality test, they examined variables such as real GDP (RGDP), the unemployment rate (UNEMP), and private consumption expenditure (PCE). The research findings demonstrate a sustained connection between these variables in the long-run, with unemployment having a substantial inverse effect on RGDP. They suggest that the government should develop more job possibilities in order to absorb the unemployed labor force and modernize the agriculture sector in order to make it more appealing to citizens. This would considerably cut Nigeria's unemployment rate.

Shiferaw (2023) employed various models to study the dynamic link on economic growth, inflation, and unemployment in Ethiopia. The cross-wavelet transform (XWT) analysis shows a link between joblessness, continuous rise in prices, and economic growth, which exhibited variations in correlation in the long-run. The study further utilized the generalized autoregressive multivariate Student's t score, which indicated except for women and young people, there exist a dynamic link on joblessness and GDP growth. Furthermore, the model revealed a strong link between unemployment and a continuous rise in prices. According to the ARDL method, GDP was negatively influenced by unemployment while positively impacted by inflation. The study reveals that unemployment significantly impacts GDP and inflation, recommending government policies to reduce unemployment, particularly among young people. Idris (2021) also examined the effects of unemployment and inflation on Nigeria's GDP growth using yearly data spanning the years 1986 to 2020. The model coefficient was assessed using the OLS method. The results show that inflation positively affects Nigeria's GDP growth, demonstrating a positive influence. On the other hand, unemployment has a significant and negative impact on GDP expansion.

Karahan & Çolak (2020) looked into the link between inflation and Turkish GDP growth using a quarterly data set from 2003 to 2017. They used the Nonlinear Autoregressive Distributed Lag (NARDL) model for their investigation. The study's findings showed that inflation and economic growth had contradictory relationships in Turkey. Similarly, Ngoc (2020) utilized the NARDL technique to explore the asymmetric impact of inflation and money supply on GDP growth in Vietnam from 1990 to 2017. The analysis supported the long-term asymmetry of price rises and its detrimental effects on GDP growth.

Bashir (2022) focused on examining inflation's influence on Nigerian economic growth using the ARDL model and data from 1990 to 2020. The outcomes of the ARDL model indicates that money supply, price rises, and interest rates all significantly impede GDP growth. Conversely, government spending on consumption was found to have a significant favorable impact on economic expansion. The study suggests that the government and monetary authorities should take proactive measures to address inflation and interest rate fluctuations, ensuring appropriate rates that promote economic growth and mitigate adverse effects on the economy.

Iloabuchi's (2019) study utilizes annual data from 1999 to 2017 sourced from WDI and Central Bank of Nigeria's database. An assessment was conducted to explore the effect of being without a job on Nigeria's GDP expansion. The study employs various statistical techniques such as pair-wise Granger Causality, Ordinary Least Squares (OLS), Phillip-Perron and ADF unit root tests. The study reveals a Unidirectional relationship between economic growth and unemployment, suggesting population growth alongside economic expansion. To address this, the government should support natality rates, quality education, and human capital development. Similarly, Jibir et al. (2015) studied the influence of unemployment on Nigeria's GDP growth using annual data from 1982 to 2014. They obtained secondary data from the Central Bank Statistical Bulletin. The study used an exploratory research approach and procedures like Pair-wise Granger causality testing, OLS, and the Phillips-Perron stationarity test. The findings revealed a detrimental association between unemployment and real GDP, indicating a rise in unemployment were linked to lower Nigerian economic development. However, granger causality test did not identify any causation between Nigerian joblessness and GDP growth. The report recommends Nigerian policies to create job opportunities for unemployed youth, including skill acquisition centers and school system reforms, aiming to turn them into employment producers.

Gyang et al. (2018) used the OLS Method to analyze the link between inflation, unemployment, and GDP growth in Nigeria from 1986 to 2015. The Granger Causality Test and Johansen Co-integration Tests were employed to ascertain the long-term link and causal direction between the variables. The stationary characteristics of the variables were evaluated using the ADF test. The results indicate that neither unemployment nor inflation had a statistically significant influence on explaining GDP growth during the specified time frame. Based on their results, the study suggests focusing on stimulating economic activity in Nigeria's real sector and implementing expansionary fiscal policies to enhance employment opportunities for both educated and uneducated individuals.

Zivanomoyo & Mukoka (2015) investigated how unemployment affected Zimbabwe's economic development between 1982 and 2013. OLS was used for the regression, they tested long-term relationships using cointegration tests, and established short-term dynamics using the ECM. Based on the research outcomes, a clear inverse association between being without a job and economic expansion was found, demonstrating that unemployment has a detrimental effect on GDP growth. Kukaj (2018) looks at how unemployment and GDP growth are related in seven Western Balkan nations. The study treats unemployment, FDI, and remittances as independent variables while GDP growth is utilized as the response factor. A major issue in the area is the high unemployment rate, which is a sign of economic stagnation and a failure to use the available production capacity, which lowers the living level. Utilizing secondary data from national and international statistics organizations as well as STATA 12 program for data analysis. In Western Balkan countries, the empirical findings indicate an inverse effect between GDP development and unemployment, with a rise in unemployment lowering GDP growth by 0.5%.

Raza et al. (2021) studied the correlation between FDI and GDP growth in OECD nations. The researchers utilized fixed effect models and GMM estimators on a dataset covering the period from 1996 to 2013. The findings demonstrated a substantial and positive link between FDI and economic growth, with interaction terms having a comparable effect. The Granger causality test found that FDI and regulatory effectiveness have a two-way causal association. Furthermore, there was a one-way causal relationship for corruption management, political stability, voice and accountability, and administration performance. It concludes that countries with higher institutional quality had higher economic growth and FDI inflows. To improve regulatory quality, policymakers should develop effective policies that strengthen institutional quality metrics and make dramatic reforms to anti-corruption legislation.

Gaikwad (2013) analyses the impact of the flow of FDI resulting from the application of liberalization policies on Indian economic growth. The researcher employed a Cobb-Douglas

production function and the ARDL model to evaluate the data spanning from 1990 to 2008. The finding shows a long-run correlation between labor force expansion, real capital, and FDI, as the three elements that substantially determine GDP. Although foreign direct investment boosts GDP, the findings imply that its impact is relatively minor compared to the significant influence of labor and capital on GDP. Similarly, Hossain et al., (2022) examined how trade openness and FDI affected GDP growth in 30 Asian economies that were experiencing crises. In addition to generalized method of moments (GMM) estimations, they also used fixed-effects models, and panel-corrected standard errors (PCSE). The study also evaluates the estimates and the test's long-run causality consequences. According to the findings, trade openness and FDI both have a long-run positive influence on GDP growth in Asian economies.

Also, Wehncke et al. (2022) look at the long-term and causative relationship between official development assistance (ODA), foreign direct investment (FDI), and economic growth in 20 African nations between 2000 and 2018. They employed ARDL and the ECM as the main valuation methods. The research findings revealed a favorable and long-term cointegration association between growth in the economy and official development assistance. Additionally, they identified a cointegration relationship between government development support and FDI. The study suggested that GDP growth serves as a stimulus for official development aid, while FDI contributes to fostering growth. According to the study, African nations should link their formal development support policies with their national developmental objectives to draw FDI and other development aid.

Research Methodology

Research Design

The study utilizes annual time series data spanning from 1991 to 2021 as a result of the data availability. The data sources for the study were derived from World Bank database (WDI). The factors derived include Gross Domestic Product (GDP) measured as annual percentage growth, total unemployment rate measured as a percentage of the labor force, the yearly percentage of CPI for the measure of inflation, and the net inflows of FDI as a percentage of GDP. Eviews-10 is the most convenient analysis tool the author understood compared to STATA and SPSS, hence it will be used for data analysis. Graphs, charts, and tables will all be used to present the data.

Model Specification

This study uses an approach similar to that used by Irge (2020) to examine how unemployment and inflation affect Ethiopian economic expansion. However, by utilizing GDP as the response factor and unemployment, inflation, and FDI as explanatory factors, this study makes modifications to Irge's model. The ARDL model was used to explore how GDP growth, unemployment, inflation, and FDI are related to one another. The GDP growth will be regressed against the explanatory factors (UNEMP, INF, FDI). It is worth noting that there is no need to transform the variables into logarithmic form since they are already expressed in percentage.

$$GDP = f(UNEMP, INF, FDI) \tag{1}$$

ARDL Econometric Model

$$GDP_t = \beta_0 + \beta_1 GDP_{t-1} + \beta_2 UNEMP_t + \beta_3 INF_t + \beta_4 FDI_t + \varepsilon_t \tag{2}$$

Where:

GDP_t : GDP growth (annual %)

GDP_{t-1} : The lagged value of GDP growth (annual %), capturing the persistence or autocorrelation of GDP

$UNEMP_t$	: Signifies unemployment, total (% of total labor force) modeled ILO estimate
INF_t	: inflation measurement, consumer prices (annual %)
FDI_t	: Foreign direct investment, net inflows (% of GDP)
β_0	: Intercept term, which captures the constant effect on GDP,β_1, β_2, β_3, and β_4 are the parameters to be evaluated
ε_t	: Stochastics term, which captures the unexplained variation or random shocksin the model

The anticipated signs from the regression equation to be estimated are as follows:

$$\beta_2 < 0, \beta_3 < 0 \; and \; \beta_4 > 0$$

The following steps are part of the study's methodology:

This work examined the order of variable integration, the characteristics of variable stability, and model parameters using two-unit root test methods: Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP). The two unit-roots were chosen based on comparability and consistency, with PP being more dependable due to its robustness in serial correlation and heteroscedasticity Irge (2020).

According to Irge (2020), a crucial step in performing ARDL estimate is choosing the proper lag length. The final prediction error (FPE), Schwarz information criterion (SC), Hannan-Quinn information criterion (HQ), Akaike information criterion (AIC), sequential modified LR test statistic at a 5% significance level, and others are frequently used to calculate the length of the lag. Each requirement, though, includes a unique penalty. The Schwarz information criterion (SC) and the Akaike information criterion (AIC) serve as the last two selection criteria in this study.

Stability Diagnostics Test

As outlined by Pesaran & Shin (1998), stability tests for parameters involve the utilization of cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ). These diagnostic tests are employed to evaluate the stability of estimated coefficients in an ARDL model over time. Their purpose is to determine whether the relationships captured by the model remain consistent and do not exhibit significant variations across different time periods. To evaluate the stability of these coefficients, a graphic representation of the recursive coefficients is used.

Granger Causality Test

A statistical method called the Granger causality test, which was proposed by Engle & Granger (1989), is employed to look at the causal connection between variables in an ARDL model. This test investigates whether the past values of one variable can provide valuable information in forecasting the future values of another variable. It assesses whether a particular variable's lagged values significantly impact predicting the value of another variable.

Results and Discussion

To ensure that none of the variables have an order of integration of 2, stationary tests were performed as part of the ARDL procedure. The outcomes of the ADF and PP stationary tests are obtainable in Table 1 and Table 2, respectively. Based on the outcomes of these tests, it is determined that GDP and INF have an order of integration of zero, denoted as I(0), indicating they are stationary variables at level. On the other hand, UNEMP and FDI have an order of integration of one, denoted as I(1), suggesting they are stationary at first difference. This study is supported by Shahid (2014); Makaringe & Khobai (2018) and Mohseni & Jouzaryan (2016). Therefore, the lag selection criteria can be carried out.

Table 1: ADF Test Results

Variable	Level			1st Difference		
	C	C & T	None	C	C & T	None
GDP	-3.086540*	-3.011693	-0.811050	-5.128830*	-5.629443*	-5.206893*
UNEMP	0.112809	0.866376	0.771123	-3.645482*	-4.403758*	-3.650793*
INF	-3.340669*	-4.170106*	-1.797204	-5.607669*	-5.491706*	-5.685851*
FDI	-2.750706	-3.173224	0.207141	-7.349361*	-7.167988*	-7.325886*

Note: * Denotes P < 5% Significance Level

Table 2: Phillips-Perron (PP) Unit Root tests

Variable	Level			First Difference		
	C	C & T	None	C	C & T	None
GDP	-2.972326*	-2.879870	-0.873273	-7.021356*	-13.72993*	-7.180442*
UNEMP	-0.329023	2.104962	0.654153	-3.613604*	-4.334473*	-3.622054*
INF	-3.307217*	-4.170106*	-1.533497	-14.80410*	-14.46117*	-12.88048*
FDI	-2.529769	-3.059440	0.465118	-7.541651*	-7.701073*	-7.426742*

Note: * Denotes P < 5% Significance Level

Table 3: Pairwise Granger Causality Tests (Lags: 1)

Null Hypothesis	Obs	F-Statistic	Prob.
UNEMP does not Granger Cause GDP	30	0.07524	0.7859
GDP does not Granger Cause UNEMP		2.56486	0.1209
INF does not Granger Cause GDP	30	0.28758	0.5962
GDP does not Granger Cause INF		1.71551	0.2013
FDI does not Granger Cause GDP	30	2.86942	0.1018
GDP does not Granger Cause FDI		0.23308	0.6331
INF does not Granger Cause UNEMP	30	0.97410	0.3324
UNEMP does not Granger Cause INF		0.54300	0.4675
FDI does not Granger Cause UNEMP	30	0.05199	0.8213
UNEMP does not Granger Cause FDI		0.43001	0.5175
FDI does not Granger Cause INF	30	2.89436	0.1004
INF does not Granger Cause FDI		2.89188	0.1005

Granger causality test that was proposed by Eagle & Granger (1989) as stated in the methodology was used. This technique can be used to determine whether time series data has a causal influence. The null hypothesis was not rejected at 5% significance level because the p-values were all above 0.05. Hence all of the p-values for economic growth (GDP), unemployment (UNEMP), inflation (INF), and foreign direct investment (FDI) are more than 0.05, there is no indication of Granger causation between these variables.

When p-values are above the selected significance level (usually 0.05), meaning the null hypothesis can't be discarded. In this situation, the null hypothesis would be the past values of one factor don't provide any more predictive information about the future values of the other variable beyond what can be anticipated using the lagged values of that variable alone. Therefore, based on the findings, it can be said that there is no Granger causation between GDP, UNEMP, INF, and FDI. Jibir et al. (2015) did not identify any causation between Nigerian joblessness and GDP growth which is consistent with this study. However, Raza et

al. (2021) Granger causality test found that FDI and regulatory effectiveness have a two-way causal association. Also, Iloabuchi's (2019) findings reveal a Unidirectional link between economic growth and unemployment.

Subsequently, the criteria for lag selection are applied, as far as none of the factors are integrated of order 2.

Table 4: VAR Lag Order Selection Criteria with (Max = 1)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-170.1351	NA	2.964881	12.43822	12.62854	12.49640
1	-136.3769	55.46002*	0.846834*	11.16978*	12.12135*	11.46068*
2	-127.0046	12.71944	1.471331	11.64319	13.35602	12.16682
3	-112.0146	16.06077	1.957408	11.71533	14.18942	12.47168

Table 4 presents the outcomes of the criteria for lag selection for ARDL model. Selection of length of lags for the dependent and independent variables can vary. Prior to applying the ARDL model, it is essential to determine the suitable lag length for both the response and explanatory factors. Two commonly used methods for lag selection in time series data are the AIC and SC. The AIC approach was utilized for the ARDL model to select the lag length. AIC results above, shows that lag one was selected for the ARDL model estimation. The lag selection criteria are in line with Irge (2020) that utilized AIC approach but the selected lag was two.

Table 5: ARDL Regression Result
The Chosen Model For The ARDL Analysis Is ARDL (1, 1, 0, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)	0.163811	0.231606	0.707284	0.4862
UNEMP	-5.327059	2.273786	-2.342814	0.0278
UNEMP(-1)	3.738773	2.495225	1.498371	0.1471
INF	-0.0688397	0.082101	-0.833082	0.4130
FDI	0.765643	0.415794	1.841398	0.0780
C	11.31397	10.97298	1.031075	0.3128

R-squared	0.495362	Mean dependent Var	3.525470
Adjusted R-squared	0.390229	S.D. dependent Var	2.149972
S.E of regression	1.678867	Akaike info criterion	4.050971
Sum Squared resid.	67.64624	Schwarz criterion	4.331211
Log likelihood	-54.76457	Hannan-Quinn criterion	4.140622
F-Statistic	4.711767	Durbin-watson stat	2.005555
Prob(F-statistic)	0.003868		

From the results in Table 5 above, it was observed that the variables UNEMP and INF exhibit an inverse association with GDP growth during the analysed time period. Conversely, FDI shows a favorable association with economic growth. The statistical significance of these relationships is as follows: Unemployment is significant at a 5% level, while FDI is significant at a 10% level. However, the inflation variable (INF) does not exhibit statistical significance.

This means a 1% rise in the UNEMP leads to 5.33% drop in GDP growth, assuming that all other variables remain constant. In contrast, a 1% change in FDI is associated with a 0.77% increase in GDP growth, while holding other variables constant. For the inflation variable (INF), a 1% change is linked to a 0.07% reduction in GDP growth, with other variables

remaining unchanged. The anticipated signs of the parameters in section three are supported by the estimated parameters from table 5 above.

Additionally, the coefficient of determination (R^2) of 0.495362 shows that the explanatory variables of UNEMP, INF, and FDI can account for roughly 49.5% of the gross domestic product (GDP) variation. This highlights how the model may be utilized for policy analysis and how well it captures the data.

Table 6: F-bounds Test (Null Hypothesis: No Levels Relationship)

Test Statistic	Value	Signif	I(0)	I(1)
			Asymtotic: n = 1000	
F-statistic	4.935701	10%	2.72	3.77
K	3	5%	3.23	4.35
		2.5%	3.69	4.89
		1%	4.29	5.61

The F-bounds test is employed to assess whether a long-run association exists between response and explanatory factors for ARDL model. The outcomes of the F-bounds test, as obtained in Table 6, shows the estimated F-statistic value is 4.935701, exceeding both the lower bound of 3.23 for integrated order 0 (I(0)) and the upper bound of 4.35 for integrated order 1 (I(1)) at a significance level of 5%. This indicates that the response variable and the explanatory factors have a long-term relationship. The study's results are consistent with previous studies performed by Mohseni & Jouzaryan (2016), Sekwati & Dagume (2023), and Makaringe & Khobai (2018) and Shahid (2014) which also demonstrate a negative long-term relationship between unemployment, inflation, and GDP growth. In contrast, FDI shows a favourable long-run influence on GDP, which is in line with the outcomes of Wehncke et al. (2022) and Raza et al (2021).

Table 7: Long-Run Results

Variable	Coefficient	Std. Error	t-statistic	Prob.
UNEMP	-1.899435	1.737118	-1.093441	0.2851
INF	-0.081796	0.093020	-0.879342	0.3879
FDI	0.915634	0.522618	1.752014	0.0925
EC = GDP – (-1.8994*UNEMP – 0.0818*INF + 0.9156*FDI)				

The findings in Table 7 illustrate the long-term association in Sub-Saharan Africa between the explanatory factors (UNEMP, INF, and FDI) and the response factor (GDP). Although there is no statistically substantial correlation between unemployment (UNEMP) and GDP growth, it is noticed that there is a negative correlation. In the long-run, a 1% rise in unemployment is related to a 1.899% decline in GDP while all other variables remain constant. In a similar vein, it is discovered that INF has a long-term negative influence on GDP growth in Sub-Saharan Africa, but this impact is similarly not statistically significant. A 1% rise in is related to a 0.082% decline in GDP, assuming other factors stay the same. However, it's crucial to remember that, when all other factors are held constant, a 1% rise in FDI will eventually leads to 0.916% rise in GDP growth. In contrast, Gross domestic product (GDP) and FDI are positively correlated and statistically significant. If all other factors remain unchanged, a 1% rise in FDI is linked to a 0.917% increase in GDP growth. The results of this study are in line with earlier research such as Sekwati & Dagume (2023), Mohseni & Jouzaryan (2016), and Wehncke et al. (2022). In contrast, the study contradicts the results of Shiferaw (2023) and Idris (2021) in which unemployment was found to have a negative association with GDP growth while inflation have a positive relationship.

Table 8: Short-Run Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.31397	10.97298	1.031075	0.3128
GDP(-1)*	-0.836189	0.231606	-3.610387	0.0014
UNEMP(-1)	-1.588286	1.735205	-0.915330	0.3691
INF**	-0.068397	0.082101	-0.833082	0.4130
FDI**	0.765643	0.415794	1.841398	0.0780
D(UNEMP)	-5.327059	2.273786	-2.342814	0.0278
cointEq(-1)*	-0.836189	0.172813	-4.838687	0.0001

The estimation of the ECM provided in Table 8, the coefficient of the error correction term is negative and statistically significant at the 1% level. This shows that the factors have a lasting association. The lag error correction term's coefficient, which is specifically -0.836189, shows that 83.6% of the disequilibrium brought on by the shock from the prior year is offset by the present one, bringing the variables back to long-run equilibrium.

The coefficients of the change in the explanatory factors in the results of the ECM show their consequences in terms of short-term effects. In the short-run, joblessness has a major detrimental influence on GDP. A 1% rise in unemployment causes a 5.327% decrease in GDP while keeping all other factors constant. Similarly, although it is not statistically substantial, INF has a short-term negative association with GDP. On the other hand, at a 10% level, FDI has a favorable and statistically significant link with GDP. A 1% rise in FDI leads to a 0.766% increase in GDP assuming other factors remain constant. Similarly, this finding also agreed with the findings of Sekwati & Dagume (2023), Mohseni & Jouzaryan (2016), and Wehncke et al. (2022). On the other hand, the study contradicts the results of Shiferaw (2023) and Idris (2021) in which unemployment was found to have a negative relationship with GDP growth while inflation have a positive relationship.

Residual Diagnostic Tests

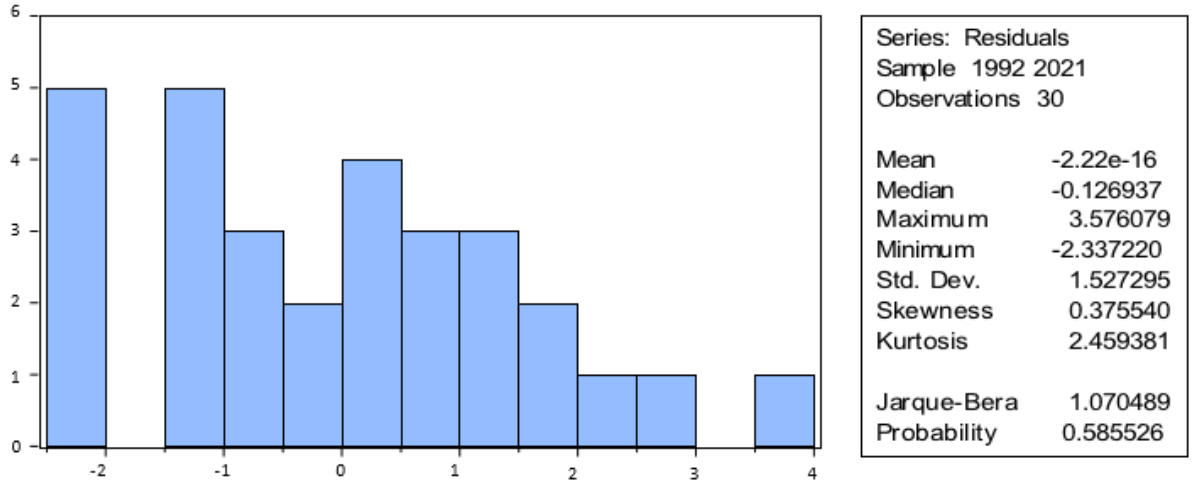

Figure 1: Normality Test

Table 9: Results of Breusch-Godfrey Serial Correlation LM Test

Null hypothesis: No serial correlation at up to 1 lag			
F-statistic	0`.221812	Prob. F(1, 23)	0.6421
Obs*R-squared	0.286556	Prob. Chi-Square (1)	0.5924

Table 10: Results of Breusch-Pagan-Godfrey Heteroskedasticity Test

Null hypothesis: Homoskedasticity			
F-statistic	1.468950	Prob. F(5, 24)	0.2367
Obs*R-squared	7.029646	Prob. Chi-Square (5)	0.2184
Scaled explained SS	3.282858	Prob. Chi-Square (5)	0.6565

The outcomes of the hypothesis tests display that this model does not have any indication of serial correlation or heteroscedasticity. Assuming that the null hypotheses of no serial correlation and no heteroscedasticity cannot be rejected, the probability values for both tests are above the 5% level of significance. The null hypothesis is not rejected at the 5% significance level, and the Jarque-Bera test demonstrates that residuals have a normal distribution since the P-value is (0.585526) which is above 5%. This finding agreed with the results of Sekwati & Dagume (2023), Shahid (2014) and Zivanomoyo & Mukoka (2015) in which the outcomes did not find any issues with the White Heteroskedasticity, Jarque-Bera, and Serial correlation LM tests.

Stability Diagnostic Tests

Table 11: Presents the Results of the Ramsey RESET test

	Value	df	Probability
t-statistic	1.720446	23	0.0988
F-statistic	2.959934	(1, 23)	0.0988
Likelihood ratio	3.631804	1	0.0567

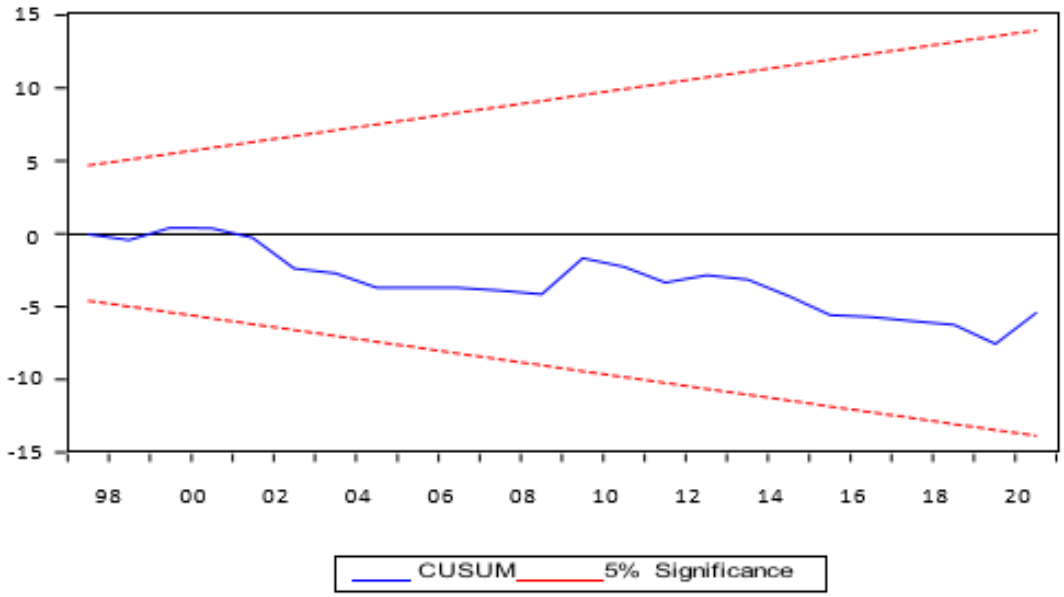

Figure 2: CUSUM Test

To assess the stability of the ARDL model, the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests were performed. In these tests, the stability of the model's structure is examined by plotting the cumulative sum of the recursive residuals. Because the test lines at the 5% level of significance are inside the critical limits, the stability test results demonstrate that all of the models stated are stable. The stability null hypothesis cannot be refuted in light of this. The Ramsey's RESET test's finding that the model is adequately defined is further supported by the F-statistic, whose p-value (0.0988) is above 5% level

of significance. assuming that the model is appropriately stated based on this. The study's results are consistent with previous studies conducted by Irge (2020); Jeke & Wanjuu (2021); Mohseni & Jouzaryan (2016); and Makaringe & Khobai (2018) all demonstrated the stability of the models.

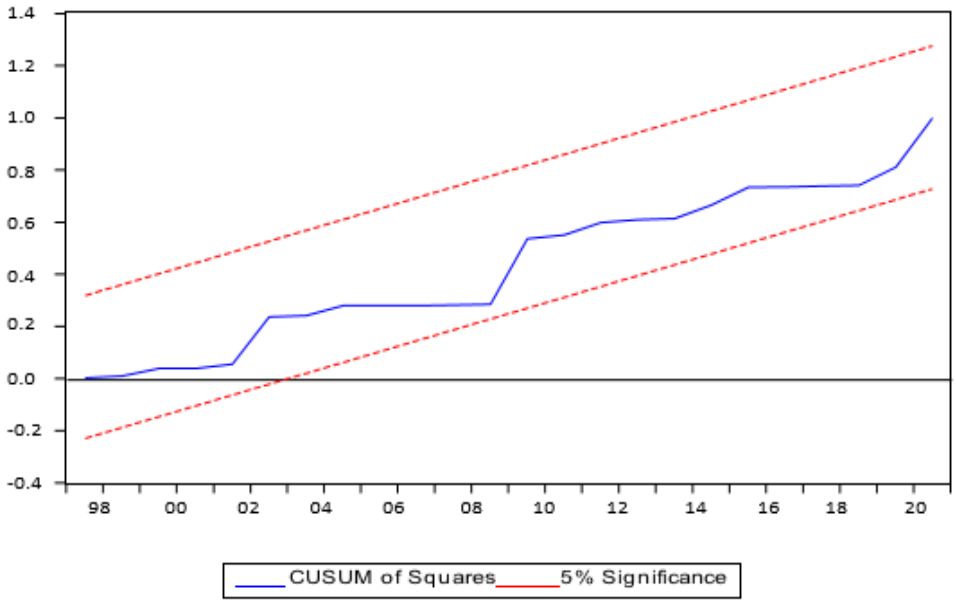

Figure 3: CUSUM of Square Test

Conclusion

This study investigates the link between Sub-Saharan African GDP growth and three key factors: unemployment, inflation, and FDI. The bounds test confirms there exist of long-run relations between these factors and GDP growth in Sub-Saharan Africa. Long-run estimations from the ARDL test reveal a detrimental association between unemployment, inflation, and GDP growth. However, the analysis does not find statistically significant Granger causality between unemployment, inflation, FDI, and GDP growth. This implies that changes in one variable do not consistently predict changes in the others. Consequently, these variables can be considered as independent of each other, without any observed causal influence in either direction within the specific context of this study.

Regarding the effects of UNEMP, INF, and FDI on GDP growth, the findings of this study have vital policy implications for Sub-Saharan Africa. Long-run and short-run negative correlations between joblessness and inflation on economic expansion highlight the necessity for policymakers to prioritize these issues while implementing their plans for solving them.

Efforts should focus on implementing effective job creation policies and promoting skills development to reduce unemployment rates. Additionally, measures to control inflation, such as prudent monetary policies and targeted fiscal interventions, are crucial to maintaining price stability and stimulating economic growth.

Regarding FDI, which exhibits a favorable long-term and short-term trend in GDP growth, policymakers should encourage a favourable investment climate. This can be achieved by implementing business-friendly regulations, providing tax incentives, improving infrastructure, and strengthening institutions to attract foreign investors. Promoting technology transfer and knowledge spillovers from FDI can further enhance productivity and promote sustainable GDP growth in the region.

Research gap is that other research may delve into the heterogeneity across countries within Sub-Saharan Africa, considering the diverse economic structures, resource

endowments, and policy environments. Analysing country-specific factors and conducting comparative studies would enable a more nuanced considerate of the relationships between unemployment, inflation, FDI, and GDP growth, contributing to tailored policy recommendations for individual countries in the region.

Declarations

The author's declared that this article was written as part of the research requirement for the author to be conferred a master's degree in Economics at Airlangga University.

Conflict of interests

The author has disclosed that there are no conflicts of interest pertaining to the research, findings, or conclusions presented in this article regarding the impact of unemployment, inflation, and FDI on GDP growth in Sub-Saharan Africa.

Availability of Data and Materials

The data and resources employed in this article, which examines the influence of unemployment, inflation, and FDI on GDP growth in Sub-Saharan Africa, were gathered from WDI. This ensures that the data is easily accessible and dependable for researchers to verify and authenticate the findings of the study.

Author's Contribution

This article makes a distinct contribution by examining the combined influence of unemployment, inflation, and FDI on GDP growth in Sub-Saharan Africa. By including FDI as a variable, it offers a comprehensive analysis that expands the understanding of factors influencing GDP growth in the region.

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Appendix

Year	GDP	UNEMP	INF	FDI
1991	0.508587403	6.147244001	8.934306569	0.541391475
1992	-0.111686852	6.179281666	9.486542506	0.536967026
1993	-0.704851825	6.144465082	9.52484537	0.806072947
1994	1.078589675	6.092085173	27.44798071	1.113246197
1995	3.345448013	6.026550338	11.42593996	0.974452927
1996	5.115724075	6.032802149	7.191646604	0.879705826
1997	4.351480155	6.068859695	7.647174333	1.78544655
1998	2.493639125	6.062266587	6.435732876	1.50003973
1999	2.163062096	6.105130795	4.356433745	2.13886969
2000	3.506941415	6.070346696	4.500788563	1.647392664
2001	4.27129489	5.983969785	5.147468002	3.866365181
2002	6.309886716	5.905859221	4.705791237	2.500635264
2003	4.100169281	5.852673534	5.679417711	2.520517918
2004	6.558452581	5.705954279	4.136632131	1.855212258
2005	6.005079473	5.59549975	6.427552781	2.420138617
2006	6.061527487	5.53491013	6.537843953	1.707833095
2007	6.136041451	5.474596653	6.78669789	2.617123621
2008	5.130176617	5.451311604	10.37852448	3.080598583
2009	2.99178197	5.508183737	7.215314136	3.018200649
2010	5.955931724	5.909842185	4.03314139	2.272444979
2011	4.199175913	5.759908063	5.366210929	2.580406254
2012	2.676040661	5.692640373	6.581831051	2.668404027
2013	5.069575112	5.520004017	4.885163876	2.242323063
2014	4.890637424	5.614791158	4.402253092	2.335766791
2015	2.827255249	5.805728915	3.550759674	2.628288905
2016	1.400439537	5.8505969	5.432710958	1.949882977
2017	2.488682149	5.914792776	5.196981853	1.631568293
2018	2.762042591	5.915200679	4.092978193	1.638384477
2019	2.55901056	6.066772092	2.77698537	1.531160595
2020	-2.068856312	6.627844285	3.313322895	1.390507018
2021	4.201410451	6.798442936	4.435518177	3.85493467