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The Impact of Macroeconomic Policies on Economic Growth in Sudan

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Abstract

The study aimed to identify the impact of macroeconomic policies on economic growth in Sudan during the period from 2000 to 2022. The paper hypothesized that macroeconomic policies (fiscal policy, monetary policy, and foreign trade policy) have a direct impact on economic growth rates, focusing on the most important macroeconomic indicators as independent variables, and gross domestic product (GDP) as an indicator of economic growth as the dependent variable. The paper adopted a descriptive-analytical approach and an econometric model, using secondary data from reports from the Central Bank of Sudan, the Ministry of Finance and Economic Planning, and the Central Bureau of Statistics .The most important findings of the paper were a positive relationship between money supply, government spending, public revenues, the exchange rate, and economic growth. The results showed that an increase in money supply leads to an increase in GDP through an increase in government spending, while an increase in government spending leads to an increase in GDP. Public revenues also play a pivotal role in financing public spending, which enhances economic growth. Furthermore, the depreciation of the Sudanese pound's exchange rate leads to an increase in the GDP growth rate by increasing the volume of exports, which contributes to reducing the trade deficit and improving the balance of payments. The paper's most important recommendations include directing government spending toward priority sectors such as education, health, and infrastructure, while reducing reliance on current spending and increasing capital spending to support development projects that generate sustainable economic returns. It also aims to integrate fiscal, monetary, and foreign trade policies to ensure macroeconomic stability and enhance the effectiveness of macroeconomic policies in achieving economic growth and sustainable development.

Keywords: Microeconomics Policies, Economic growth, Fiscal policy, Monetary policy, Foreign trade Policy, Sudan.

أثر السياسات الاقتصادية الكلية على النمو الاقتصادي في السودان

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ملخص

هدفت الدراسة إلى تحديد أثر السياسات الاقتصادية الكلية على النمو الاقتصادي في السودان خلال الفترة من عام ٢٠٠٠ إلى عام ٢٠٢٢. وافترضت أن السياسات الاقتصادية الكلية لها تأثير مباشر على معدلات النمو الاقتصادي واعتمدت الدراسة على المنهج الوصفي التحليلي ونموذج القياس الاقتصادي. وكانت أهم النتائج التي توصلت إليها الورقة وجود علاقة إيجابية بين المعروض النقدي والإنفاق الحكومي والإيرادات العامة وسعر الصرف والنمو الاقتصادي. ومن أهم توصيات الورقة توجيه الإنفاق الحكومي نحو القطاعات ذات الأولوية كالتعليم والصحة والبنية التحتية، مع تقليل الاعتماد على الإنفاق الجاري وزيادة الإنفاق الرأسمالي لدعم مشاريع التنمية التي تُولّد عوائد اقتصادية مستدامة.

الكلمات الدالة: سياسات الاقتصاد الجزئي، النمو الاقتصادي، السياسة المالية، السياسة النقدية، سياسة التجارة الخارجية، السودان

1. INTRODUCTION

The multiple economic and political crises that the world has witnessed, most notably the Great Depression of, marked a turning point that prompted a reconsideration of the extent of state intervention in economic activity, especially after market mechanisms failed to achieutomatic economic equilibrium. Keynesian analysis is one of the most important contributions that recognized the importance of state intervention in the economy, granting it broad scope for participation in economic life through economic policies that seek to increase the rate of economic growth, as the ultimate goal of any country. This is accompanied by improving the standard of living, creating job opportunities, reducing poverty, and achieving sustainable development. Accordingly, governments pay great attention to macroeconomic policies that can contribute to achieving the goal of economic stability and influencing economic growth. Economic growth is one of the most important indicators of economic performance in most countries. Therefore, we find that most countries seek to achieve high economic growth rates by restructuring the economy and reorienting macroeconomic policies with the aim of achieving economic stability.

Sudan is one of the countries where economic growth rates have continued to fluctuate between high and low levels due to the implementation of inappropriate economic policies, which have led to an imbalance between aggregate demand and supply. These economic policies have played a major role in this instability in recent years. This was the result of several factors, including the global financial crisis of 2008 and the decline in remittances and foreign inflows resulting from oil exports, which affected the balance of payments, exchange rate, and general budget deficit. These effects were reflected in the GDP, inflation rates, and exchange rate. Recent years have witnessed a steady increase in the money supply growth rate in Sudan due to several factors, most notably the widening budget deficit, increased government spending, and a decrease in public revenues. Public spending grew at rates higher than public revenues, leading to a budget deficit of more than 11% of GDP in 2019; the fiscal deficit reached 13% of GDP in 2020, while the 2020 budget reflected a deficit of $1.6 billion. The fiscal deficit was further exacerbated by the low tax rate compared to GDP. Public revenues (excluding grants) amounted to only 5.4% of GDP in 2020. Financing the budget deficit through printing money led to an inflation rate of 60% in 2018, which continued to rise, reaching 230% in October 2020. The trade balance also recorded a large deficit due to weak export growth of 1.8% compared to the significant growth in imports of 7% on average.

The Sudanese economy also recorded negative growth due to the economic contraction in 2018 and the economic crisis caused by the COVID-19 pandemic, declining by 8.2% in 2020. Per capita GDP declined by approximately 62% over the past five years, from US$1,910 in 2015 to US$0.730 in 2020. What are the most important macroeconomic policies affecting economic growth in Sudan? And to what extent do these economic policies affect economic growth in Sudan during the period 2000-2022? Based on these questions, the research hypotheses were formulated as follows:

Paper Hypotheses:

1 /There is a relationship between money supply and economic growth.

2 /There is a relationship between government expenditure and economic growth.

3 /There is a relationship between public revenues and economic growth.

/4There is a relationship between exchange rate and economic growth.

Paper Objectives: To identify the impact of macroeconomic policies on economic growth in Sudan during the period (2000-2022). This is achieved through the following:

- Determining the impact of money supply on economic growth in Sudan.

- Analyzing the impact of public revenues on economic growth in Sudan.
- Evaluating the impact of government expenditure on economic growth in Sudan.
- Demonstrating the impact of the exchange rate on economic growth in Sudan .

Paper important:

The paper addresses the impact of macroeconomic policies on economic growth in Sudan, examining data, information, and indicators provided during the study period ((2000-2022 The study's findings also contribute to supporting and assisting relevant authorities in making the decisions and recommendations reached by the study.

Paper Methodology:

The paper relied on the descriptive, analytical, and inductive statistical approach, the econometrics model, and the ordinary least squares (OLS) method to estimate the relationship between the study variables. The study relied on time series data from various secondary sources, as well as specialized publications and periodicals from the World Bank, the Central Bank of Sudan, and the Federal Ministry of Finance, covering the period from 2000 to 2022.

Previous Studies:

Mohamed Osman Ahmed AlBashir (2019): This study examined the impact of fiscal policy on economic growth in Sudan during the period 2000-2018. The study's problem was the fluctuations in economic growth rates in Sudan despite the implementation of diverse fiscal policies and multiple financial reforms implemented by the government. The study aimed to analyze the relationship between fiscal policy tools and economic growth, evaluate the effectiveness of fiscal policy in achieving economic stability, examine the impact of public spending on growth rates, and analyze the role of tax policy in mobilizing financial resources. The study adopted a descriptive analytical approach using a multiple regression model to analyze the data. It also used advanced statistical analysis tools to test the relationships between variables. The study found a positive relationship between government spending and economic growth, and a negative impact of the general budget deficit on growth rates. The results also demonstrated the weak efficiency of the tax system in mobilizing financial resources. The study recommended the need to rationalize public spending, diversify sources of public revenue, reform the tax system, and enhance investment spending in productive sectors.

Moataz Adam Abdel Rahim (2018) study entitled "Evaluation of Macroeconomic Policies on the Gross Domestic Product (GDP) Growth Rate during the Period 1997-2016", unpublished doctoral dissertation, Sudan University of Science and Technology. The study aimed to determine the impact of macroeconomic policies on economic growth rates in Sudan during the period 2000-2022, by identifying the most important macroeconomic policies that affect economic growth rates. The paper assumed that macroeconomic policies (fiscal policy, monetary policy, and foreign trade policy) have a direct impact on economic growth rates. One of the most important findings of the study is the lack of a significant impact on the money supply on the GDP in the short term, while the impact is significant and there is a direct relationship in the long term between the money supply and the GDP growth rate. One of the most important recommendations of the study is to direct fiscal policy in the area of public spending to contribute to raising GDP growth rates.

Saeed Ahmed Suleiman (2017) study entitled "The Impact of Macroeconomic Policies on Economic Reform in Sudan during the Period 2004-2014," unpublished doctoral dissertation, University of Nilein. The study aimed to understand the contribution of macroeconomic policies to economic reform. The study's problem was the failure to activate economic policy tools to guide economic reform and the authorities' inability to use government expenditures to support economic sectors. The study assumed a relationship between economic policies and economic reform programs in Sudan. The study followed a historical approach based on previous studies, a descriptive analytical approach, and an econometric model. The study reached

the following key results: A one-unit increase in public revenues leads to a 1.4% increase in GDP. This demonstrates the effective role public revenues play in economic reform. The study recommended the need to develop an effective economic policy that achieves comprehensive economic reform across all economic sectors and coordinates fiscal and monetary policies.

Amal Abbas Mohamed Ali's study (2015):This study assessed the impact of fiscal policy on investment and economic growth in Sudan during the period 1980-2010. The study's problem was the weak investment rates despite the financial incentives provided and the declining private sector contribution to economic activity. The study aimed to analyze the relationship between tax incentives and investment, evaluate the role of public spending in stimulating economic growth, and examine the impact of fiscal policies on foreign direct investment flows. The importance of the study lies in providing an in-depth analysis of the effectiveness of fiscal incentives in attracting investment and stimulating economic growth. The study used the descriptive, analytical, and quantitative approach, employing econometric models to analyze the relationships between the study variables. The study found a positive relationship between tax exemptions and investment volume, and that infrastructure spending has a positive impact on economic growth. The results also demonstrated a weak investment environment and complex administrative procedures. The study recommended developing the tax system, increasing infrastructure spending, simplifying investment procedures, and improving the business climate.

Daif Ahmed (2014) study entitled "The Impact of Fiscal Policy on Sustainable Economic Growth in Algeria during the Period 1989-2012" (Unpublished PhD Thesis, University of Algiers). The study aimed to analyze the development of macroeconomic indicators in Algeria and then evaluate these indicators within Kaldor's magic square. The study concluded that fiscal policy in Algeria is closely linked to oil prices. His econometric study of the impact of fiscal policy, including its two components—tax policy and government spending policy—on economic growth concluded that there is a direct relationship between government spending and GDP, as well as an inverse relationship between tax policy and GDP.

Dalia Mohamed Ismail (2014) study entitled "The Impact of Fiscal Policy on Sudan's Gross National Product during the Period 1980-2012" (Unpublished PhD Thesis, University of Sudan for Science and Technology). The study aimed to know the impact of fiscal policy on the gross national product. The problem of the study was represented by the decline in incomes and that Sudan suffers from a lack of savings, which negatively affects the gross national product. The study reached the most important results, which is that the state's spending on development projects, is reflected positively on the national product. The study recommended directing public spending towards productive projects, and not exceeding public expenditures from revenue growth except in emergency cases.

Literature Review:

The Concept of Macroeconomic Policy:

- Macroeconomic policy refers to everything related to decision making regarding the choice between the various means available to society to achieve specific economic and social goals and the search for the best paths to these goals.(Ahmed Zaki, 1985, p. 83.)

- Macroeconomic policy is defined as the set of measures adopted by the state to facilitate the achievement of desired economic goals and ensure their implementation.(Toporwski, Jan, 2004,P 174) If these goals represent priorities sought, economic policy is one of the tools whose use and implementation leads to the achievement of these goals according to the approved priorities under the best conditions, i.e., within the framework of optimal independence of available or expected resources.

- Economic policy, in its simplest form, is a method for improving economic performance, or an attempt to make the economy function better.

- The scope of macroeconomic policy is to control the macroeconomic variables that influence overall economic performance, and to control the factors that determine each of these macroeconomic variables.

- What is macroeconomic policy:?

- The state plays an important and fundamental role in managing the macroeconomy in a manner that ensures stability, external balance, full employment, and fair income distribution. This is in addition to traditional state functions such as security, defense, and the judiciary. Therefore, there is an urgent need in our time for macroeconomic policies that accommodate new economic transformations and challenges.

Types of Macroeconomic Policy:

There are different types of policies, for example: reform policy, qualitative policy, quantitative policy, fiscal policy, monetary policy, domestic policy (which affects incomes, such as subsidies and tax increases), foreign trade policy, and supply-side policy.

Objectives of Macroeconomic Policy:

The objectives of macroeconomic policy depend on maximizing the social welfare function, and there is considerable disagreement on this issue. In short, there is a party that determines this function (the individual maximizes the utility function, the firm maximizes the profit function, and society maximizes the social welfare function).

The objectives of macroeconomic policy, which most contemporary countries seek to achieve, can be summarized in two main goals: directing available economic resources toward their best uses and achieving economic stability. These goals can be briefly discussed as follows:

- Directing economic resources toward their best uses

- Achieving financial and monetary balance or economic stability

- Comprehensive use of human and natural resources

- Maximizing per capita income

- Equitable distribution of income and wealth

- Achieving economic growth

While each society may have specific goals, societies often share these goals.

Fiscal policy is one of the most important economic policy tools used by the state to influence economic activity and achieve its development and social goals. Definitions of fiscal policy vary according to the perspectives of economic researchers and thinkers.

Fiscal Policy:

Fiscal policy is defined as "the set of programs planned and implemented by the state related to public revenues and public expenditures to achieve specific economic and social goals" (Mohammad Abd al-Aziz Ajamiya, 2003, p. 125) . This definition focuses on the executive aspect of fiscal policy through its main tools, namely public revenues and expenditures.

It is also defined as "the government's use of public spending programs and public revenues to influence macroeconomic variables with the aim of addressing economic problems and achieving desired goals" (Hamid Abd al-Majid Daraz, 2008, p. 87). This definition indicates the effective role of fiscal policy in achieving economic stability.

Monetary policy:

Monetary policy can be defined as the set of texts, laws and procedures taken by the monetary authority to influence the money supply by expansion or contraction in order to achieve economic goals.

Monetary policy is defined as the intervention of monetary authorities to influence the money supply and direct credit using specific monetary means, with the goal of achieving certain economic objectives.(Sami Khalil, 1982, p. 812.)

There are two methods for implementing monetary policy: contractionary monetary policy, which aims to reduce inflation by raising interest rates and selling securities through open market buying and selling. Expansionary monetary policy, which is used to reduce unemployment and economic recession by lowering interest rates and purchasing securities to increase liquidity.

Foreign trade policy:

"A planned government program that identifies a set of tools or methods that can influence foreign trade over a specific period, ensuring the achievement of specific economic, social, or political objectives that are difficult or impossible to achieve through the free market mechanism."(Abdul Basit Wafa, 2000, p. 12).

It is clear from the definition that foreign trade policy is part of a whole, namely economic policy.

While economic policy is generally the link between economic doctrines and economic systems, foreign trade policy is also the link between foreign trade doctrines and the systems actually applied in the field of international economic relations.(Salwa Ali Suleiman, 1973, pp. 65, 8).

To regulate its foreign trade, the state resorts to a set of tools or methods that it deems most appropriate to achieve the desired goals. These tools are not of a single nature; they may be monetary (such as exchange rates and interest rates), financial (such as subsidies and customs duties), commercial (such as state trade and the quota system), or administrative (such as health and technical requirements).

Economic growth:

Economic growth is one of the most important indicators measuring the macroeconomic performance of any country. Definitions of this concept vary depending on the economic schools and thinkers. Economic growth is defined as the continuous increase in average real per capita income over a long period of time (Ajamiya, Muhammad Abd al-Aziz, 2018, p. 45). It can also be defined as the expansion of a country's real gross domestic product (GDP), leading to an improvement in individuals' standard of living (Al-Eisawi, Ibrahim, 2019, p. 78). The concept of economic growth differs from economic development, as economic growth focuses on quantitative aspects of the economy, such as increased production and income, while economic development encompasses structural changes in the economy and qualitative improvements in individuals' standard of living, income distribution, and social justice (Abdul Hamid, Abdul Muttalib, 2017, p. 123). Many economists have indicated that economic growth is a necessary but insufficient condition for achieving comprehensive economic development (Ramzi Ali Ibrahim, 2020, p. 92).

Growth is a quantitative concept that refers to the continuous increase in the production of economic goods in a country (Mustafa & Abdel Rahman, 2014, p. 16). It is the effort exerted to increase real income cumulatively through the more efficient and comprehensive use of available human and natural resources, with the aim of raising national income at a rate greater than the rate of population growth (Al-Quraishi, 2010,

p. 36).

Analysis of the impact of macroeconomic policies on economic growth rates in Sudan.

The stability of macroeconomic policies is essential for building local and international confidence in the business environment. These macroeconomic policies reflect the interaction of aggregate demand and supply, and the poor performance of these indicators leads to structural imbalances in any country's economy. Sudan, like other developing countries, suffers from structural problems in the economy. Therefore, there is a need to address these structural problems so that the Sudanese state can establish productive economic relations, attract investments, support the growth of companies, and improve foreign trade. These imbalances are linked to the following macroeconomic indicators:

Money Supply:

Recent years have witnessed a steady increase in the growth rate of the money supply in Sudan due to several factors, most notably the widening budget deficit, increased government spending, and a decrease in public revenues. The fiscal deficit in 2019 reached 11% of GDP, while the 2020 budget reflected a deficit of $1.6 billion. Government spending represents 19% of GDP. The fiscal deficit was further exacerbated by the low tax rate compared to GDP. Public revenues (excluding grants) amounted to only 5.4% of GDP in 2020. Financing the budget deficit through printing money led to a rise in inflation, reaching 60% in 2018 and continuing to rise, reaching 230% in October 2020. Public spending grew at rates higher than public revenues, resulting in a general budget deficit of more than 13% of GDP in 2020.

Government expenditure:

Current government spending, budget deficits, and deficit financing have witnessed a steady increase in recent years. Statistics indicate that current spending rose from 24 billion to 38.8 billion Egyptian pounds between 2010 and 2014, a 25% increase, at a time when the policy called for spending cuts. This increase in current spending was not matched by a similar increase in non-oil public revenues after oil resources were withdrawn from the budget, leading to a widening resource gap and budget deficit. The Ministry of Finance was forced to resort to borrowing from the Central Bank to cover the deficit. This led to increased inflationary pressures, with the fiscal deficit in 2019 reaching 11% of GDP, while the 2020 budget reflected a deficit of $1.6 billion. Government spending represents 19% of GDP. Inflation: Government spending has played a significant role in the high rates of inflation in Sudan, especially since this spending is not matched by real production, as it is financed by printing money. To facilitate the analysis of developments in inflation rates during this period, it was divided into three periods:

During the period from 2000 to 2004, inflation rates began to decline successively until they reached a single digit. Inflation rates continued to decline, aided by the start of oil production and exports. Inflation rates continued to decline, reaching 8% by the end of 2000. They then stabilized in 2004 due to savings in foreign exchange reserves, with inflation rates ranging between 5% and 8% during the period. The highest inflation rate was 8% in 2000 and the lowest was 5% in 2001.During the period from 2005 to 2015, inflation rates remained stable at a single digit and did not rise again, even after the signing of the peace agreement and the accompanying expansion in government spending. As a result of the global crisis, the secession of the South, and the subsequent cessation of foreign investment flows, the inflation rate rose to 14% in 2008. The inflation rate continued to rise slightly, but jumped to 35.1% in 2012 and reached a low of 7.2% in 2006. Inflation rates continued to rise, reaching their highest level in 2013, reaching 37.1%, and their lowest level in 2015, reaching 16.9%. During the period from 2015 to 2022, Sudan converted its fiscal deficit into cash, and printing money led to rising inflation rates. The inflation rate exceeded 60% in 2018 and reached 230% in October 2020.

Public revenues:

Public revenues are what the state obtains from its assets and include taxes, government fees, property fees, returns from government companies, and donations and grants received by government institutions and

public bodies. Sudan's tax system has played a key role in financing the general budget, particularly after the country lost most of its oil revenues following the secession of South Sudan in 2011. Taxes constituted the primary source of public revenue, prompting the government to adopt a number of fiscal reforms aimed at expanding the tax base and improving tax collection efficiency. Despite these efforts, the tax system faced significant challenges that affected its ability to generate sufficient revenue to finance public spending. Public revenues have undergone significant structural transformations over the past two decades, particularly after the secession of South Sudan in 2011, which resulted in Sudan losing approximately 75% of its oil revenues. Oil revenues declined from approximately 60% of total public revenues to less than 20%. This shift represented a significant shock to the general budget, as oil had been the primary source of funding for government spending, prompting the Sudanese government to seek alternatives to compensate for this significant revenue shortfall. With the decline in oil revenues, reliance on tax and customs revenues has increased as the primary sources of funding for the general budget. However, this transformation faced significant challenges, including weak tax administration, widespread tax evasion, and an expanding informal sector, which limited the state's ability to achieve significant increases in tax revenue.

Exchange Rate:

The Sudanese economy has witnessed a number of policies related to devaluing the exchange rate, which aimed to achieve a primary goal: improving the performance of the Sudanese economy and raising its efficiency by influencing its overall indicators linked to the exchange rate. The deterioration of the national currency's exchange rate increases the impact of the external sector on rising domestic prices, and indirectly contributes to increasing inflationary pressures. The effect of the exchange rate on inflation rates in Sudan is greater and more important than the effect of monetary changes (i.e., the effect of money supply growth). The current instability of the exchange rate and the widening gap between the official rate and the parallel rate, which... It reached more than 25%, creating a climate that negatively affected foreign exchange sources, and this led to an acceleration of the parallel exchange rate compared to the official rate until its value reached 250 Sudanese pounds for every US dollar in 2020 AD.

GDP growth Analysis:

Recent years have witnessed a marked decline in GDP growth rates since 2011 (the year of secession). GDP growth fell from 5.2% in 2010 to 1.9% in 2011, and then to 1.7% in 2012. This is due to several reasons, the most important of which are the secession of the South, the loss of oil resources, and the emergence and growth of imbalances in the economy. The structural imbalances that limit production have played an additional role in the continued decline in economic growth rates, which has led to an increase in imports to fill the gap in local consumption and increase the effects of imported inflation on local prices. In addition to the decline in economic growth rates, the structural imbalances related to production result in a continuous rise in production costs, which has led to This, in turn, led to increased inflationary pressures and a contraction in the Sudanese economy, as a result of negative GDP growth in 2018, which declined by 8.2%. In 2020, due to the outbreak of the COVID-19 pandemic, per capita GDP fell by 62%. Over the past five years, per capita GDP declined from $1.910 in 2015 to $0.730 in 2020.

Economic Growth Rates in Sudan:

The Sudanese economy experienced significant fluctuations in growth rates during the period 2000-2022, recording an average annual growth rate of 5.2% during the period 2000-2010, driven primarily by oil revenues and investments in the petroleum sector (Mohamed Osman Ahmed, 2018, p.45). This period was characterized by an influx of foreign direct investment, particularly in the oil, mining, and agricultural sectors. With the secession of South Sudan in 2011, the economy experienced a sharp decline in growth rates, falling to 1.4% in 2012 (Abdul Wahab Sayed Ahmed Osman, 2016, p.78). Economic growth was affected by several major factors, including declining foreign investment, a decline in oil exports, and the depreciation of the local currency. Government policies related to subsidies and public spending also affected growth rates, as austerity policies led to a slowdown in economic activity in non-oil sectors (Ibrahim Ahmed Al-Badawi, 2020, p.123).

The Sudanese economy recorded an average annual growth rate of 3.5% during the period 2013-2020.

Data and Research Methods

Expressing economic phenomena in mathematical form and determining the direction of the relationship between study variables is based on what economic theory provides. Here, GDP, as an indicator of economic growth is a dependent variable, and its value is determined based on the values assumed by other variables, known as independent variables.

Formation of Economic Relations:

The formulation of a model of impact of macroeconomic policies on economic growth in Sudan, in which econometrics models were used to test assumptions related to economic relations in a quantitative manner, and the data that were dealt with in these models are the money supply, government expenditure, and public revenues the in addition to exchange rate in the period (2000 -2022). According to the following formula:

GDP = f(MS , GEX ,REV, EXC)

Whereas:

MS: money supply (in the broad sense of M1 and M2, and includes all means of payment for the public).

GEX: Government expenditure (the amounts spent by the government or any public legal person with the intent to achieve public benefit).

REV: Public revenues (amounts collected by the government or any public legal entity for the purpose of achieving a public benefit).)

OEX: the exchange rate (it is the price of the Sudanese pound against the US dollar, meaning that one unit of the dollar is equal to a number of Sudanese pounds).

Determine the mathematical form of model:

The mathematical form of the model means the number of equations contained in the model (it may be a linear or non-linear model), and the mathematical form shows that inflation is a function of the money supply, government expenditure, Public revenues, exchange rate .

$GDP = \beta 0 + \beta 1\ MS + \beta 2\ GEX + \beta 3\ REV + \beta 4\ EXC + Ut$

Data analysis and processing:

Economic relations usually include explanatory variables that are linked to dependent variables through unknown parameters that are estimated by standard analysis in the presence of random errors resulting from errors in the measurement of these variables. Therefore, the accuracy of the estimates depends mainly on the size and nature of the errors, so the accuracy of the model must be improved. Standard through the primary analysis of the data especially if the data is related to time series. (Tariq AlRasheed et al.2014, p , 45.

Series stability test:

A time series is a set of observations whose data are unstable and related to each other, and this instability leads to unreliable predictions. There are many tests that can be applied to time series data, the most important of which are:

1-Testing unit roots: When testing unit roots, it is necessary to determine whether the variables under study are stationary at their level or when calculating the initial difference. There are several tests that can be used

through program packages ready to test the stationarity of the series, the most important of which are:

1-1Philips-perron Test:

The Philips-person test to measure the accuracy of the data and the capabilities of the model to test the stillness and stability of the series or unit root, which is based on including a number of differences with time gaps until the problem of autocorrelation disappears. If the regression coefficient of the standard formula is equal to one, then the model leads to the existence of the unit root problem, which suffers from the instability of the series. (Tariq AL Rasheed et al, 2014, p, 45).

Table No. (1)

Results of the Philips-perron test for stability of study variables

The stability level of the series the critical value is at 5% significance level.

Calculated value (Philips-perron test value) variables

The first difference	-3.004861	0.9998	GDP
The first difference	-3.004861	1.0000	MS
The first difference	-3.004861	1.000	GEX
The first difference	-3.004861	0.0103	REV
The first difference	-3.004861	1.000	EXC

Source: the researcher using (Eviews).

It is known that if the value of the Philipss-perron test (calculated value) is greater than (critical value) at 5% significance level for a variable data series, this indicates the stability of the series. According to Table (1), after conducting the test, it was found that all variables stabilized in the first difference.

2-1-Cointegration test:

Counteraction means the possibility of a long-term balance between time series that are unstable in their levels. If the time series data are integrated of one rank, the estimated regression is real and no false.

The Johansen test is used to determine the possibility of there being more than one vector of counteraction, because the model contains more than one independent variable.

Table No. (2)

Results of Johansen counteraction test

Hypothesized Trace 0.05

No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob. **
None *	0.965409	133.1207	69.81889	0.0000
At most 1	0.822707	62.47348	47.85613	0.0012

At most 2	0.556457	26.14450	29.79707	0.1245
At most 3	0.242150	9.072314	15.49471	0.7015
At most 4	0.143366	3.249635	3.841466	0.0714

Source: the researcher using (Eviews).

Through the results of the counteraction test, it became clear that there is a one-way cointegration. This indicates the stability of the time series and the balance of the model in the long term, and that the instability of the data at its levels does not lead to a false estimate.

Estimation model: using the ordinary least squares method (Eviews program).

Table No (3) Results of estimating the linear model of the GDP function.

Dependent Variable: GDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	227.1244	57.05307	3.980932	0.0009
MS	0.000395	3.64E-05	10.85309	0.0000
GEX	-0.005579	0.000489	-11.40759	0.0000
REV	0.001383	0.001308	1.057329	0.3043
EXC	4.022251	1.787174	2.250621	0.0371

R-squared	0.990718	Mean dependent var	1004.447
Adjusted R-squared	0.988656	S.D. dependent var	1779.868
S.E. of regression	189.5715	Akaike info criterion	13.51707
Sum squared resid	646872.2	Schwarz criterion	13.76392
Log likelihood	-150.4463	Hannan-Quinn criter.	13.57915
F-statistic	480.3334	Durbin-Watson stat	1.515415
Prob(F-statistic)	0.000000		

Source: the researcher using (Eviews).

Estimation Command:

LS GDP C MS GEX REV EXC

Estimation Equation:

GDP = C(1) + C(2)*MS + C(3)*GEX + C(4)*REV + C(5)*EXC

Substituted Coefficients:

GDP = 227.124392687 + 0.000395360655214*MS - 0.00557863506333*GEX + 0.00138282672783*REV + 4.0222510824*EXC

Estimation results of the model:

1- According to the economic criterion:

From standard analysis table No. (3), and looking at the (coefficient) column, the sign of the (intercept) was positive (227.1244), which is consistent with economic theory and represents the intrinsic force of the impact of GDP or economic growth. The sign of the money supply coefficient (MS) was positive (0.000395), which is consistent with economic theory, which assumes a positive direct relationship between money supply and GDP. The sign of the government spending coefficient was negative (-0.005579). This contradicts economic theory, which assumes a direct relationship between government spending and GDP. The sign of the public revenue coefficient was positive (0.001383), which is consistent with economic theory, which assumes a positive direct relationship between public revenue and GDP. The sign of the exchange rate coefficient was positive (4.022251), which is consistent with economic theory, which assumes a positive direct relationship between exchange rate and GDP.

2-According to the statistical standard:

Significance of Estimated Parameters: This is done through standard analysis table No. (3). Looking at the (Prob) column, the probability value for money supply (MS) is (0.0000), which is less than the significance level of (0.05). This is consistent with the economic theory that states: There is a direct relationship between money supply and GDP, and that an increase in money supply contributes to an increase in GDP.

The probability value for government expenditure (GEX) was (0.0000), which is less than the significance level of (0.05). This is consistent with the economic theory that assumes a direct relationship between government spending and GDP. This means that government spending plays a major role in increasing the intensity of GDP, especially since government spending is matched by real production, which leads to an increase in GDP, leading to an increase in the rate of economic growth.

The probability value of public revenues (PRV) reached (0.3043), which is greater than the significance level (0.05). It is insignificant due to the weak contribution of public revenues of GEX in recent years. However, it is consistent with the economic theory that assumes a positive direct relationship between public revenues and GDP, as a continuous increase in public revenues leads to an increase in government expenditure (GEX), which in turn leads to an increase in economic growth through GDP.

The probability value of the exchange rate (OEX) reached (0.0371), which is less than the significance level (0.05). It is consistent with the economic theory that assumes a positive direct relationship between the exchange rate and GDP, as a continuous increase in the exchange rate leads to an increase in GDP.

Goodness of fit of the equation: This is done using the R-squared test or the adjusted coefficient of determination. If its value is high, this indicates the goodness of fit of the model. It is clear from Table (3) that the coefficient of determination is (0.99). This means that 99% of the effects that what occurs in GDP are due to the independent variables, and the remainder, 1%, is the effect of random variables, which indicates the good fit of the estimated equation.

Significance of the model: Using the (F) test, if its probability value is less than the significance level (0.05), the regression model is significant, but if the probability value is greater than the significance level, the regression model is not significant. Table No. (3), the probability value Prob(F-statistic) is (0.000000). It is less than the level of significance (0.05), so the model as a whole is significant.

3- Evaluation according to the standard:

The standard criterion is represented in measurement problems, including the problem of autocorrelation. After conducting the analysis, it was found that the value of Durbin-Watson (1.51), and this value is close to the standard value (2), and this means that there is no problem of autocorrelation.

4-The problem of difference in variance: For regression analysis, the random error term is constant, meaning that the average difference between adjacent observations does not increase or decrease significantly over time, and the data is not characterized by the presence of a problem of difference in variance.

To discover the problem of difference in variance, the Heteroscedasticity Test was used: ARCH. It was found from Table No. (4) that the value of (0.203672)(Obs*R-squared) = and the probability value is equal to (0.6518) Prob, and this value is greater than the level of significance (0.05), which means that, there is no problem with contrast difference.

Table No. (4) ARCH test for variance

Heteroskedasticity Test: ARCH

F-statistic	0.186887	Prob. F(1,20)	0.6701
Obs*R-squared	0.203672	Prob. Chi-Square(1)	0.6518

Source: the researcher using (Eviews).

5. Normal Distribution Test:

The normal distribution test is performed to determine the presence of normal distribution assumptions in the regression model. The normal distribution of variables can be detected by examining the probability value using the skewness test. The results obtained in this study show that the probability value is 0.001216, which is less than 0.05, or at $\alpha = 5\%$. Thus, the data in this study are declared to be normally distributed.

5-Model's ability to predict:

To determine the model's ability to predict, the Thiel's equality test was used. In this model, we find that the value of the Thiel's coefficient is equal to (0.05), and whenever the value of the Thiel's coefficient is less than the correct one, the model has the ability to predict future values, as in Figure No. (4). Below.

Results:

- There is a positive relationship between money supply and economic growth: The results showed that an increase in money supply leads to an increase in GDP through increased government expenditure. This reflects the positive impact of expansionary monetary policy on economic activity, as government expenditure contributes to stimulating aggregate demand and supporting productive sectors.

- A positive relationship exists between government expenditure and economic growth: The results show that increased government expenditure leads to increased GDP. This reflects the positive impact of expansionary fiscal policy on economic activity, as government expenditure contributes to stimulating aggregate demand and supporting productive sectors.

- A positive relationship exists between public revenues and economic growth: It was found that

increased public revenues lead to increased GDP. This indicates that public revenues play a pivotal role in financing public spending, which, when managed efficiently, promotes economic growth.

- There is a positive, direct relationship between the exchange rate and economic growth, as a depreciation of the Sudanese pound's exchange rate leads to an increase in the GDP growth rate through increased export volume, which contributes to reducing the trade deficit and improving the balance of payments.

- Recommendations :

- It is recommended that government spending be directed toward priority sectors such as education, health, and infrastructure, while reducing reliance on current spending and increasing capital expenditure to support development projects that generate sustainable economic returns.

- Fiscal policies should be implemented to reduce fluctuations in government revenues and spending by diversifying revenue sources away from reliance on natural resources, adopting policies to limit inflation, and stabilizing the currency.

- It is recommended that the fiscal deficit and money supply be controlled by reducing borrowing from the Central Bank, directing public debt toward productive projects rather than covering current expenditures, and seeking to reschedule external debt and benefit from international debt relief initiatives.

- It is essential to integrate fiscal, monetary, and foreign trade policies to ensure macroeconomic stability and enhance the effectiveness of macroeconomic policies in achieving economic growth and sustainable development.

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Appendix (1)

Tables (1): gross domestic product, Money supply ،government expenditure, Public Revenues ،exchange rate, (2000-2022)

EXC	**P. Rev**	GEX	MS	GDP	years
2.57	3522	35220	346677	33.662	2000
2.62	3902	41860	432213	40.658	2001
2.66	1880	51790	563266	42.835	2002
2.61	2668	73900	742356	55.733	2003
2.58	4307	110380	969779	68.721	2004
2.44	11403	138430	140313	83.298	2005
2.17	5581	17096	178717	96.611	2006
2.02	6530	20806	197146	106.527	2007
2.09	8073	22440	229331	124.609	2008
2.30	135659	20025	161063	135.57	2009
2.31	23075.4	24162	199083	162.203	2010
2.67	23075.4	28573	418531	182.689	2011
3.57	23393,1	26272	586630	243.412	2012
4.76	31612.2	36178	664457	294.63	2013
5.74	46026.8	50632	777390	447.827	2014
6.03	54499.8	54476	938426	505.9374	2015
6.18	57865.0	69099	1210001	605.514	2016
6.68	77054.0	91368	2035675	815.8554	2017
24.33	12494.6	162792	4309866	1317	2018
62.00	16483.6	211057	6897976	1950.1	2019
250.00	26459.3	462797	13022296	3974	2020
375.00	15248.08	1597616	32969588	5958	2021
571.00	17357.86	2474525	43568595	5856.893	2022

Source: Central Bank of Sudan: Annual Reports, various issues (2000-2022)

Appendix (2) Estimating GDP function as an indicator of economic growth

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Dependent Variable: GDP				
Method: Least Squares				
Date: 05/03/25 Time: 16:55				
Sample: 2000 2022				
Included observations: 23				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	227.1244	57.05307	3.980932	0.0009
MS	0.000395	3.64E-05	10.85309	0.0000
GEX	-0.005579	0.000489	-11.40759	0.0000
REV	0.001383	0.001308	1.057329	0.3043
EXC	4.022251	1.787174	2.250621	0.0371
R-squared	0.990718	Mean dependent var		1004.447
Adjusted R-squared	0.988656	S.D. dependent var		1779.868
S.E. of regression	189.5715	Akaike info criterion		13.51707
Sum squared resid	646872.2	Schwarz criterion		13.76392
Log likelihood	-150.4463	Hannan-Quinn criter.		13.57915
F-statistic	480.3334	Durbin-Watson stat		1.515415
Prob(F-statistic)	0.000000			