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Macroeconomic Determinants of the National Debt in Djibouti: An ARDL Approach

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Abstract: The fundamental aim of this paper is to inspect the way macroeconomic factors such as GDP, Inflation, and government spending affect the national debt of Djibouti. What is more, the paper analyzes the fluctuation of the Djiboutian debt over 20 years. Consequently, the paper employed an autoregressive distributed lag model to evaluate the long-run cointegration between the national debt and the potential variables. The paper mainly focuses on Djibouti from the period 2000 to 2020. After applying the model, the data revealed that in the long run if the GDP and the government spending rise by 1% the national debt simultaneously increase. However, that was not the case for inflation since it had the opposite effect. According to the model, an increase of 1% in inflation cause the national debt to go down. The paper summarizes that all the macroeconomics investigated in this study have a significant and noteworthy impact on the national debt of Djibouti. To start with, growth in the domestic product makes it easier to pay the amount of the debt. Additionally, Djibouti is a country that is heavily relied on external debt. Thus, whenever the government is spending or injecting cash into the public sector it always borrows to meet its obligation. Finally, the Djiboutian currency is tied with the dollar as a result the inflation is quite unremarkable and insignificant.

Keywords: National Debt, Government Spending, GDP, Inflation Rate

1. Introduction

The East African Community has achieved excellent accomplishments since the nineteen and is currently appraised across Africa to act as an illustration of fruitful local coordination. A large portion of these victories are established in the community's solid past originates before any local legislative association on the planet by the nineteen-sixties, and in the political aim that has stirred specialized endeavors around territorial joining programs since the marking of the 1999 Treaty. Few of these accomplishments includes organization building and financial advancement because of the tradition's association and the normal market, and a typical voice in the continent [2].

Public Debt is essentially an obligation owed to holders of Government and institutions like the Treasury Bills and Treasury Bonds. Nations generally get by securities and government bonds. What is more, countries often take debt for two reasons. For instance, when the expected gains are less than the planned amount for the expenditure and payback maturing loans. "Logical" amounts of taking a debt by a developed nation are probably going to improve its financial development and economy, both through capital allocation and efficiency development. Nations in the beginning phases of improvement have little supplies of capital and are probably going to have venture open doors with paces of return higher than the advanced countries. In conditions, they utilize the acquired assets for useful ventures and they don't experience the ill effects of macroeconomic precariousness, arrangements that twist economic initiatives, or sizable diverse shocks. That is why development ought to grow and permit ideal obligation reimbursements [23].

Adequate utilization of debt could prompt improved economic development and consequently, better ways of life. To make obligation powerful, there is a need for expansive

changes in the executives of the public area. Generally speaking, assets from debt have not been utilized as actually, for instance, projects funded by worldwide credits have, because of the absence of satisfactory or practical preparation, not succeeded to create appropriate assets to support the debt acquired. In this manner socio-economic expansion is compromised since the public authority spends tremendous aggregates on advance reimbursements, consequently diminishing the cash it spends on schooling, wellbeing, and other social conveniences, which mostly focus on poor people, who consist mostly of the populace [17].

Djibouti is famous for taking huge amounts of debts to stabilize and balance its economy. Thus, the aim of this paper is to analyze how macroeconomic factors influence the national debt of Djibouti. It also evaluates the economic growth of Djibouti during the past 20 years. Accordingly, the data consist of various factors such as GDP, inflation rate, and government spending. Additionally, the information was gathered from multiple sources such as world banks, Statista, and economy country from the period 2000 to 2020.

The paper will be composed of the following. Section 1 will involve reviewing past literature on the topic, then in section 2, we will explore the methodology and econometric model that are employed in this study. After identifying the methodology that will be utilized. In section 3 we will apply the model and interpret the results. Finally, in Section 4 we will conclude the study.

2. Background Information

2.1. The Unexplored Link Between Debt and GDP

It is evaluated if either the debt in public or private assumes a significant part in the typical working of a market economy. For instance, when it comes to the private sector credit is fundamental to work with venture and development over the long haul. Simultaneously in the public sector, the obligation can have fruitful impacts as far as efficient utilization and supporting useful venture[1].

Initially, a large amount of obligation leads the economy more powerless against macroeconomic shocks. By limiting the space for counter-repetitive financial strategy and overflow impacts when it comes to the private sector, a public obligation shade can extend unpredictability, control financial recuperation, or hurt the economy. Additionally, in the short-haul, forceful solidification should be executed in downturns. High government getting prerequisites can make a country more inclined to liquidity shocks and defaults. Seen sovereign weakness, reflected in higher uncertainties and costs of acquisition, can gush out over to other areas or locales, particularly in an underdeveloped country [4].

In numerous hypothetical models. Rational degrees of the current debt are supposed to maintain a beneficial outcome

on economic growth. In customary neoclassical perspective, permitting the capital to mobilize. On the other hand, the capacity of a country to provide loans and get loans increments momentary development. There is the presence of incitement for capital-scant nations to acquire and contribute. Eaton for instance, suggested a model that displays an expansion at the expense of the foreign capital that brings down the acquisition of outer obligation engendering to decrease the long-term growth [7].

The most sensible presumption states that nations will most likely be unable to acquire debt unreservedly as a result of the moral hazard of obligation or the rejection of risks. In the event that the acquiring nation can conceal its activities from the money lender, it might decide to consume or reinvest oversee a portion of the acquired assets. An enormous mass of debt stocks might be bound to produce assumptions that debt administration will be supported with especially distortionary kinds of tax collection. For example, the expansion charge, or cuts in useful public speculation [19].

2.2. Does Government Spending Increase the Quantity of the Debt

The idea that when a nation increases its spending can invigorate economic development is a very dubious issue among specialists and researchers all over the world. The quantity of liabilities that a nation has including domestic obligations and foreign obligations are many times depicted as government obligations. Numerous nations, explicitly developed nations, have encountered growing levels of Debt to-GDP proportion since the worldwide monetary emergencies in 2008/2009 [29].

Cottarelli, Schaechter and Labonte contend that diminished spending plan deficiencies may in the short period bring higher level of unemployment, while relentless amassing of public obligation past levels considered feasible will cause hardships in changing monetary factors, particularly through their consequences for total national output (Gross domestic product) [5, 18].

The application of any expansion in a nation's spending will make state-run administrations spending plan shortfalls and retreat to acquiring debt for them to keep up with steady tax rates over the long run. A time of social unsettling calls for an expansion in government spending, which current incomes can't meet. Accordingly, public spending is dislodged from the past level, bringing about tax rates too high to support the rising need of the nation. Which as a result prompts the public obligation until it exceeds the country's growth [10].

In accordance, the Wealth of Nations contends that the collection of a high level of obligation is advised to be harmful to any country. Regardless of whether all of it is owed to homegrown financial backers, and ought to consequently be stayed away from. This is upheld by Mill contending that, in any case, that public obligation probably won't be harmful to a nation whenever funded from foreign reserve funds. This implies that there is no swarming out

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impact when nation borrowings retain homegrown reserve funds that would either be put uselessly or put resources into other nations [20].

2.3. The Controversial Relationship Between the Inflation Rate and Debt

Accomplishing reasonable economic development and improvement is a main pressing issue for all nations [28]. Numerous world economies are described by low capital development and a deficiency of assets to meet expanding public uses [1]. With persistent expansions in open consumption and extending monetary shortages, a greater part is compelled to seek after domestic and foreign debt to stop monetary deficiencies and asset advancement [13]. Moreover, nations can raise finances through tax assessment, production, or internal obligation, with money least favored due to the apprehension about fueling inflation.

Outer debt involves the outside money-related obligation commitments, including ensuring responsibilities by the government to non-occupants in different monetary standards, ordinarily in US dollars. Adapted to outer commitment, external currency debt includes; public and openly ensured debt, short and long-haul (longer than one year) debt, for example, bilateral and multilateral debt as well as business advances and credits. It additionally involves transient obligation (short of one year) from institutional moneylenders, private non-insured obligation, IMF obligation, and obligation commitment to foreign exchange currency.

As per Nelasco, outer debt acquisition has become essential in the advanced world since it supplements homegrown investment funds and permits nations to do useful operations [22]. Ezeabasili and Gana emphasize that external debt acquisition is alluring and can give the

supporting importance to speed up economic development if they are diverted to expand the useful limit of the economy and advance financial development and. The countries need to intensely acquire debt from other nations to make up the deficit in the balance resulting from heavy imports [9, 11].

3. Data and Methodology

After defining the existing literature and exposing the main variable, we describe the Debt function below.

$$Debt = f(GDP, GovS, Inf) \tag{1}$$

Hence, the paper investigates the fact whether the variable mentioned in the above equation contributes to debt fluctuation in Djibouti. In this equation, the debt stands for the national debt that Djibouti owes to lenders, GDP represents the total domestic product growth over the years, GovS implies the amount of money spent in the public sector, and the Inf represents the inflation rate. The function above can be rewritten in a clear econometric form as below.

$$Debt_t = \beta_0 + \beta_1 GDP_t + \beta_2 GovS_t + \beta_3 Inf_t + \varepsilon_t \tag{2}$$

In this equation, β_0 is the constant while ε_t is considered the error term of the equation. The parameters of β_1 until β_3 is the coefficient that are used to estimate the fluctuation of the debt. In this study, yearly data between 2000 to 2020 were used. Additionally, all of the data were extracted from economy country.com except the inflation since it is obtained from Statista. In addition, the data used in this study are based on the macro-economic factors of Djibouti. The equation utilized in order to estimate the ARDL Bounds testing is provided below.

$$\Delta Debt_t = \propto_0 + \sum_{i=t}^{p} \propto_1 \Delta Debt_{t-} + \sum_{i=t}^{p} \propto_2 \Delta GDP_{t-1} + \sum_{i=t}^{p} \propto_3 \Delta GovS_{t-1} + \sum_{i=t}^{p} \propto_4 \Delta Inf_{t-1} + \lambda_1 Debt_{t-1} + \lambda_2 GDP_{t-1} + \lambda_3 GovS_{t-1} + \lambda_4 Inf_{t-1} + \varepsilon \tag{3}$$

According to the equation the $\propto$ parameters stand for the short-term relationship. On the other hand, the symbol λ stands for the long run relationships. Consequently, this approach tests the null hypothesis of no cointegration ($\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0$) or the alternatve hypothesis of cointegration ($\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq 0$) based on the F-test. In addition, this F-test is acquired based on the bounds test in

relevance with the lower and the upper bound value that is mainly stated by Pesaran, Hashem, Yongcheol, & Richard [26]. Moreover, this approach helps to offer relevant facts whether the factors are cointegrated. Also, if in the long period the variables are cointegrated the coefficient of each one of them is estimated throughout an error correction model. The equation is identified below.

$$\Delta Debt_t = \gamma_0 + \sum_{i=t}^{p} \delta_i \Delta Debt_{t-1} + \sum_{i=t}^{p} \phi_i \Delta GDP_{t-1} + \sum_{i=t}^{p} \phi_i \Delta GovS_{t-1} + \sum_{i=t}^{p} \phi_i \Delta Inf_{t-1} + \mu ECT_{t-1} + \upsilon_t \tag{4}$$

In this model the ECM signifies the error correction term and the μ is the parameter that represent the speed of adjustment. An adversely estimated noteworthy μ infers an adjustment on the deviations from the balance.

A brief observation of Djiboutian macroeconomics

We can perceive from 2000 until 2020 the Djiboutian GDP surpassed the debt by 3500 million dollars while the debt remained constant at 1000 million dollars over the years. It was only in 2007 that the debt exceeded the gross domestic product because of the subprime crisis (Figure 1):
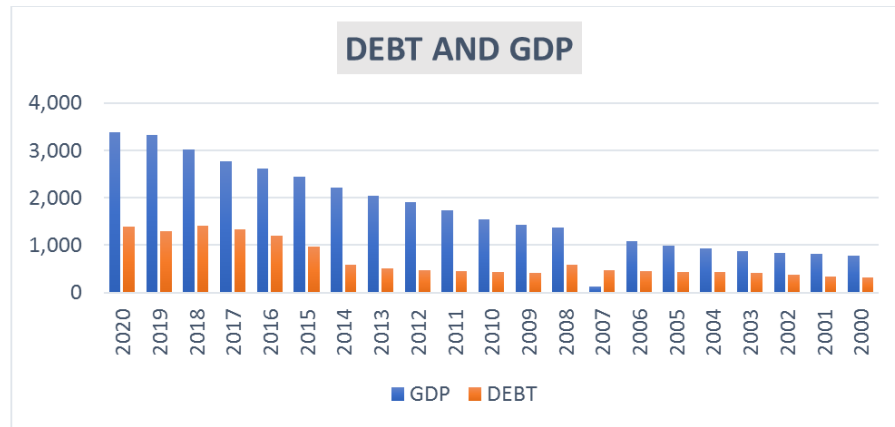
*Figure 1. A comparison between the debt and GDP during the past 20 years.*

This graph is exhibiting the situation in Djibouti. We can detect the amount of debt borrowed is higher than the government spending. This confirms our statements that since Djibouti is an underdeveloped country it needs more cash to maintain the economy stable and managing the public sectors (Figure 2):
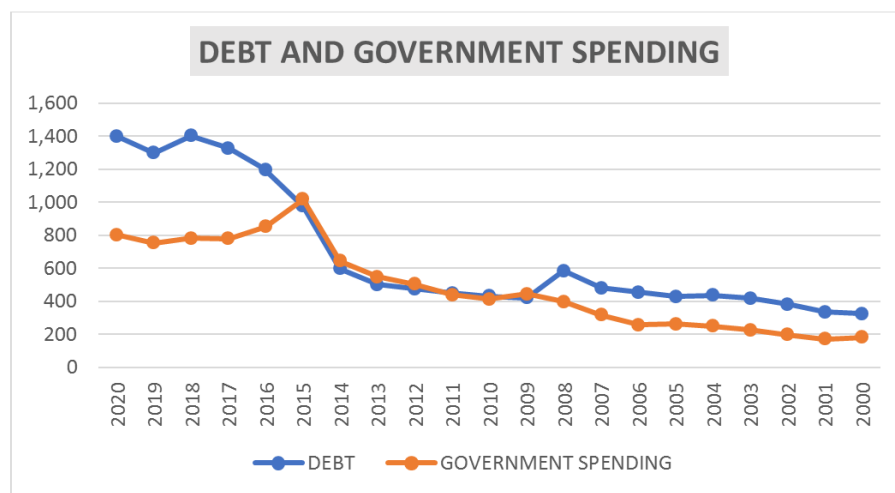
Figure 2. An observation between the government expenditure and the debt acquired.

The inflation curve expresses how the Djiboutian inflation rate varied between 0 to 3 over the years. There were only a few occasions where the inflation rate went up, which was between 2008 and 2013 because of the global crisis. However, starting from 2015 it regained a stable rate (Figure 3).
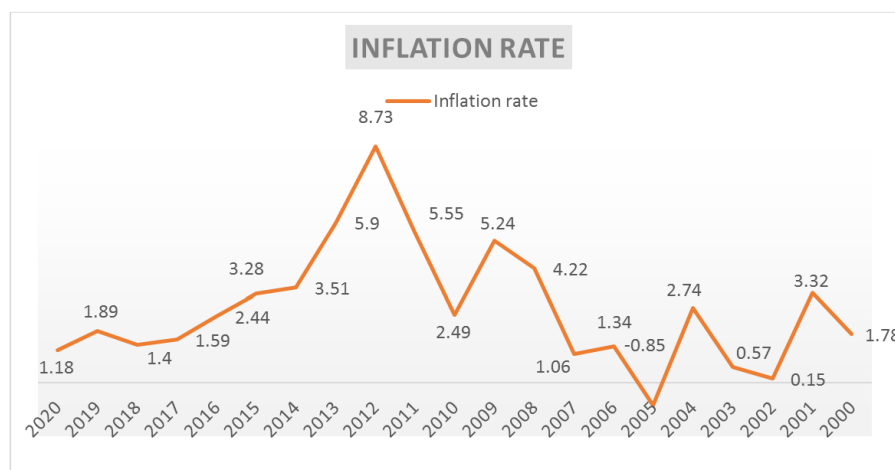
Figure 3. The fluctuation of the Djiboutian inflation rate.

4. Findings and Discussion

4.1. Descriptive Statistics

Table 1 displays the descriptive statistics; all the values are raw. However, a more distant analysis will be carried on. We can observe that during the past 20 years, the amount of debt has varied from 323 million dollars to 1401 million dollars. This validates that Djibouti continued to borrow more during the past years. Besides, based on the data the inflation rate increased significantly during two periods which are 2008 and 2012, recording 4.22% and 8.73 respectively. In general, the GDP grew at a healthy pace over the last 20 years. Denoting from 119 million dollars to 3384 million dollars. Lastly, the amount spent on expenditure was only 181 million dollars during 2000. However, it reached its peak in 2015 at 1,017 million dollars. The paper utilizes an autoregressive distributed lag (ARDL) model to determine simultaneously the short period and the long period parameters. However, the principal goal is to observe the evidence revealing the long period of cointegration between the national debt and its prospective determinants.

It is presented in the econometric Literature the existence of various cointegration methods to test the long-run coefficients. For instance, there is Engle, & Granger, Johansen in his 1988 article, Johansen in his other 1995 press and Johansen, & Juselius. [8, 14-16]. Nonetheless, the ARDL bounds approach that is established by Pesaran, & Shin as well Pesaran, & smith contains some noteworthy benefits in relevance to the previous models [24, 25]. Secondly, the author Banerjee expresses that OLS estimation is prejudiced because they don't consider the short-period dynamic. Thus, the ARDL bound test can offer a more solid coefficient compared to small samples [3].

Table 1. Descriptive statistics.

Variable	Notation	Source	Mean	Std. Dev.	Max	Min
Debt	Dbt		681.2381	392.5914	1401	323
GDP	Gdp	Country economy.com	1725.524	931.9958	3384	119
Government Spending	GovS		486.7619	258.5024	1017	170
Inflation rate	Inf	Statista	2.74	2.23	8.73	-.85

4.2. Testing If the Study Has a Unit Root

The initial stage when conducting the time series is about the investigation if the variables are stationary or not. According to Granger, & Newbold, if the data exhibit nonstationary series it might engender a false regression dilemma [12]. Therefore, to assess the stationarity of the factors augmented by Dickey, fuller, Phillips and Perron unit roots tests were employed in this analysis [6, 27].

Table 2 displays the unit-roots test for the level and first differences concerning the variables. It additionally estimates via intercept and trend intercept. The general theory of ADF and PP tests states that the null hypothesis suggests that variables contain unit roots (nonstationary) whereas, the alternative hypothesis purposes stationarity. In accordance with our data, both the ADF and the PP test demonstrated that some of the variables such as Debt, GDP, and GovS are stationary at a level whereas the inflation is not. Even, after applying the first differences some variables were revealed to be nonstationary. As a consequence, ARDL is the most suitable and appropriate when it comes to the stationarity of the variables since it is a powerful test to analyze in the long run.

Table 2. Unit root test results.

Panel A: Augmented Dickey-Fuller (ADF) Unit Root Test.					
Variable	**Intercept**		**Trend and intercept**		*Order of Integration*
	Level	First difference	Level	First difference	
Debt	1.102 **	-1.803	-1.557	-2.374	1
GDP	2.396 **	-2.957 **	-2.064	-4.744 **	1
GovS	0.839 **	-3.063 **	-2.553	-3.451	1
Inf	-1.165	-4.600 **	-1.695	-4.576 **	1

** means the series are stationary at 5%.

Panel B: Phillips-Perron Unit Root Test.					
Variable	**Intercept**		**Trend and intercept**		*Order of Integration*
	Level	First difference	Level	First difference	
Debt	1.797 **	-2.452 **	-1.280	-3.039	1
GDP	2.099 **	-5.768 **	-2.941	-7.587 **	1
GovS	0.879 **	-4.215 **	-2.604	-4.445 **	1
Inf	-1.288	-5.538 **	-2.131	-5.249 **	1

** means the series are stationary at 5%.

4.3. ARDL Bounds Test

After analyzing the stationarity of our variable, in this step, we will inspect the results concerning the ARDL test exhibited in Table 3. As indicated in the table the optimal model mentioned by the Schwarz information criteria is ARDL (2,2,0,2). Therefore, the F-statistics value as well as the t-statistics values, present a value greater than the upper critical values at 5% which is determined by Pesaran et al 2001. As a result, we reject the null hypothesis of non-cointegration and retain the alternative hypothesis. Because the ARDL bounds test revealed that the variables are cointegrated in the long run. Thus, we will proceed now with the cointegration form and the estimation of the long-run coefficients.

***Table 3.** The results of the Autoregressive Distributed Lag (ARDL) Bounds Test.*

Model: F (DEBT, GDP, GovS, Inf)								
Optimal Lag Length: ARDL (2,2,0,2)								
F-statistic: 13.017								
t-statistic: -3.341								
Critical value								
	10%		**5%**		**25%**		**1%**	
	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]
F	2.720	3.770	3.230	4.350	3.690	4.890	4.290	5.610
T	-2.570	-3.460	-2.860	-3.780	-3.130	-4.050	-3.430	-4.370

4.4. The Estimation Results of the Model

In table 4 we have the results concerning the long run and short run of the model. Before starting the interpretation, we checked the diagnostic test of the model. Based on Durbin-Watson the model revealed no serial correlation of 2.449 additionally, the model has no conditional heteroscedasticity of 0.3918. Lastly, the cusum demonstrated that the model is stable. Now according to our table mainly in the short run cointegration, the model displays a negative and significant error correction term of -0.532 [21]. Secondly, the most essential results of this paper are in the long run estimation. As claimed by the table the amount of the debt payable increases by 0,216 as the GDP grows by 1%. Because the increase in the domestic product implies Djibouti will be able to pay back its debt over the years. Rationally, a higher GDP will engender economic development, more resource availability, and profits and investment activities.

Moreover, we have the GovS as a critical determinant of the debt. The results illustrate that the amount of the Djiboutian debt increase by 1.057 whenever the government spending ruses by 1%. This finding specifies that whenever the Djiboutian government needs to spend money on expenditures such as health care, education, and social projects the amount of money borrowed goes up. Thirdly, we observe that the national debt shrinks by 81.50% when inflation goes up by 1%. During the period of debt, inflation is considered an efficient instrument for borrowers (Djibouti) to decrease the value of the Debt.

Finally, all the determinants manifested a significant p-value of 0.042 for the GDP, 0.038 for the GovS, and 0.000 for the Inf which is significant at 5% and at 1% respectively. The evidence generated by the model supports the previous and relevant literature that the national debt of each country is affected and cointegrated with numerous macroeconomic factors such as (GDP, expenditure, trade balance, interest rate, and inflation). Hence, the national debt can be regulated if adequate policies are applied in relevance to the country's capacity.

***Table 4.** The long run estimation results.*

Dependent Variable: Debt.				
Long-Run Estimations				
Regressors	**Coef.**	**Std.Err.**	**T**	**P>t**
GDP	0.216	0.091	2.36	0.042 **
GovS	1.057	0.433	2.44	0.038 **
Inf	-81.50	13.33	-6.11	0.000 *
_cons	45.510	41.885	1.09	0.305

** and * denotes statistical significance at 5% and 1% respectively.

***Table 5.** The short run estimation results.*

Short-Run Estimations (Cointegration form)				
Regressors	**Coef**	**Std. Err**	**t**	**P>t**
DEBT				
L1	0.721	0.151	4.75	0.001 *
L2	-0.253	0.140	-1.80	0.105

Short-Run Estimations (Cointegration form)				
Regressors	Coef	Std. Err	t	P>t
GDP				
--.	0.032	0.059	0.55	0.598
L1	-0.056	0.043	-1.32	0.221
L2	0.139	0.042	3.32	0.009 *
GovS	0.563	0.124	4.54	0.001 *
Inf				
--.	-17.81	7.142	-2.49	0.034 **
L1	-12.39	7.413	-1.67	0.129
L2	-13.20	10.03	-1.32	0.221
EC (-1)	-0.532	0.15942	-3.34	0.009 *
_cons	45.510	41.885	1.09	0.305

***, ** and * implies statistical significance at 10%, 5% and 1% chronologically.
Number of obs = 19
F (9, 9) = 137.14
Prob > F = 0.0001
R-squared = 0.99
Adj R-squared = 0.98.

4.5. The Validity of the Model

In relevance with table 5, the results presents that there is no any serial correlation and heteroskedasticity which implies the authenticity and validity of the findings.

Table 6. The diagnostic tests.

Durbin-watson	No Serial correlation	2.449
Heteroskedasticity	No conditional heteroscedasticity	0.3918
Cusum	Stable	

5. Conclusion and Implication

The paper rigorously assessed various macroeconomic determinants that affect the Djiboutian debt. Since most African countries seek solutions to decrease their national debt. Therefore, they observe the fluctuation of their macroeconomic factors to determine whether they will be able to pay off their obligation. Within this sense, the paper evaluated the influence of the gross domestic product, government spending, and inflation on the national debt of Djibouti from the time frame 2000 to 2020. The results illustrated the presence of a relationship that exists between the variables and the Djiboutian debt in the long run. Consequently, an error correction model was utilized so the findings will be more accurate. The findings displayed that an increase in GDP and government expenditure increases the amount of the Djiboutian debt. Whereas, a rise in the inflation rate diminishes the percentage of the debt. The suggestion behind these outcomes is that spending money on the Djiboutian public sector expands the amount of money borrowed from external sources. Since Djibouti is an underdeveloped country, it needs more cash to maintain the economy and invest in the public sector such as education, health, and social protection. Furthermore, during the last year, the Djiboutian GDP grew exceptionally due to maritime activities and the presence of military bases. Which enabled the country to ease it is debt obligation a little. The results also signify the Djiboutian inflation rate is not resulting in an increase in debt. In view of the fact that the Djiboutian currency DJF is tied with the US dollar which restricts any fluctuation and makes it stable. The paper contributes to the wide literature and mainly to African countries, especially Djibouti. By providing concrete evidence and strategies to manage their national debt in proportion to their macroeconomic factors. Additionally, policymakers, economists, and governments can utilize the findings while making decisions and promoting economic activities.

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