

“Budget Deficits and Their Macroeconomic Implications: An Analytical Study of Growth, Inflation, and Money Supply”

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Abstract

Budget deficits are a persistent challenge for many developing economies, and Lebanon represents a notable case marked by chronic fiscal imbalances, high public debt, and external sector vulnerabilities. This study investigates how budget deficits influence Lebanon's macroeconomic performance by jointly examining their effects on economic growth, inflation, and money supply over the period 1978–2019. An ARDL model was used to identify and examine integration levels of various variables as well as the short-term and long-term correlations between Real GDP Growth Rate, Household Consumption, Public Sector Debt, Imports and Exports, and Broad Money. The findings of this study indicated a long-run relationship between budget deficits and macroeconomic aggregates but revealed that the relationship is an unstable one. However, it was established that Household Consumption and International Trade (specifically, imports and exports in this context) both provide significant positive contributions to the rate of Economic Growth, while Public Sector Debt only has a negative impact in the long run and is statistically insignificant. Therefore, there is an implicit limitation on the economic growth benefits associated with an increase in Public Sector Debt. The error correction coefficient indicates the speed at which the economy will return to its long-run equilibrium after an unexpected fiscal or external shock occurred was estimated in terms of the factors. These results signify the necessity of better fiscal discipline, more efficient and well-planned public spending, and more coordinated fiscal and monetary policy in order to mitigate the inflationary pressures resulting from deficit financing. In addition, policies aimed at diversifying trade and strengthening domestic productive capacity are essential to reduce macroeconomic fragility. Overall, the study offers Lebanon-specific evidence on the channels through which budget deficits interact with growth, inflation, and money supply, providing actionable guidance for policymakers concerned with fiscal sustainability and macroeconomic stability.

Keywords: Budget Deficit, Economic Growth, Inflation, Money Supply, ARDL, Lebanon

1. Introduction

Budget deficit is now a hallmark of a fiscal policy in most developing and developing economies, as governments are frequently unable to balance state spending with limited revenue ability [1]. Budget deficit involves a situation whereby the government expenditure in a given fiscal year is higher than its income and this leads to borrowing or other mechanisms of financing the expenditures [2]. Although deficit spending may be acceptable as a counter-cyclical measure to stimulate economic activities in times of economic slump, a high level of fiscal imbalance may create serious macroeconomic problems [3]. Such difficulties especially occur in economies that are structurally weak, instability institutionally, and long political uncertainty [4].

In a macroeconomic sense, the impact of persistent budget deficits on the performance of an economy can occur in several ways [5]. Borrowing funds in the form of deficit financing leads to a rise in the amount of public debt and can choke off productive economic activity by increasing interest rates and thus limiting the ability of the economy to operate profitably [6]. Instead, the deficits in financing can be satisfied by monetary expansion thereby causing inflationary pressures and disrupting price levels [7]. In the long-run, these dynamics can destabilize economic growth, monetary credibility, and macroeconomic stability in general [8]. Therefore, the connection between budget deficit and the main economic variables; growth, inflation, and money supply can be listed among the pivotal topics in discussions of fiscal and monetary policy [9].

These relations are of specific interest to the Lebanese economy [10]. Lebanon has had a history of budget deficits, increased government debt, and frequent macroeconomic imbalances over the past decades [11]. Such financial difficulties have been coupled with periods of inflation, fluctuating economic growth and big money growth [12]. The political instability, structural restrictions, and narrow fiscal reforms have also made matters worse in the capacity of the country to record sustainable economic performance [13]. Although the fiscal policy is crucial in determining the macroeconomic performance of Lebanon, the empirical research on the macro and micro effects of budget deficits is still scarce and inconsistent.

The proposed study is aimed at adding to the current body of literature by empirically investigating how budget deficits influence the level of economic growth, inflation and money supply in Lebanon. Based on annual time-series data, which details the period between 1978 and 2019, the study uses the ARDL model to examine the relationships between the variables. The ARDL model is especially appropriate to this study, as it should be able to combine variables at various orders, and estimates to be robust in small samples.

The study provides a thorough evaluation of the macroeconomic implications of continuous budget deficits in Lebanon by considering a number of macroeconomic indicators used in a single empirical model. It is felt that the results will be useful to policymakers as they will bring to light the avenues through which fiscal imbalances can impact economic stability. By so doing, the study has highlighted the relevance of fiscal discipline and synchronised fiscal-monetary policies in ensuring sustainable economic growth and macroeconomic stability in the deficit-prone economies.

The remainder of the study is in the following way. Section 2 will be a review of what has already been written on the budget deficits and how they are related to the key macroeconomic variables. Section 3 explains the data and empirical methodology. Section 4 contains and explains the empirical findings, and Section 5 summarises the study by presenting the key findings and policy implications.

2. Literature Review

2.1 Budget Deficits and Economic Growth

Bajrami et al.,[14] studied the impact of the important macroeconomic variables on economic development based on panel data in a group of nations, and the aim of this study was to inform policies through sound policy-making. The persistence of growth was established by the use of lagged GDP, which ascertains that historical economic performance would be transferred to the present. Surprisingly, the government expenditure was reported to have low explanatory power, which the authors explain by the potential measurement restrictions or short-term fiscal impacts that the model failed to address. The research does not specifically target the budget deficits; however, the research results are applicable because fiscal imbalance has an indirect effect on growth via inflation, money supply, and investment processes.

Mian et al.,[15] explored the circumstances in which fiscal deficits and increasing public debt can be maintained without involving a tax hike in the future, the concept sometimes known as a free lunch in fiscal policy. It is very critical in fiscal sustainability using a theoretical and calibrated macroeconomic framework. The authors also pointed out that income inequality has different implications on fiscal space in accordance with economic levels, especially where the interest rates are limited by the zero lower bound. Although the framework can provide some interesting insights into the dynamics of deficit-debt, the fact that it is based on tuned assumptions can restrict its direct relevance to real-life economies. In addition, political and institutional restrictions are not factored entirely and this can influence the results of fiscal sustainability, most particularly in a developing state where budget deficits persist.

Nikam & Kothe,[16] investigated the fiscal and macroeconomic policies that are necessary in the India's shift to a high-income economy by 2047 in line with the vision of Viksit Bharat were examined. The paper used econometric modelling and scenarios to find the sustainable growth paths, the levels of fiscal deficit, and the investment priorities within the sector. The major contribution of the study is the creation of a comprehensive policy roadmap that will provide sufficient growth ambitions with fiscal considerations. The authors put forth the role of taxation reforms, expenditure rationalisation, and public-private partnerships in widening fiscal space. Although the study is relevant to its policy, it is based on projected growth paths and policy assumptions, which alter its findings to global economic shocks and the risk of implementation. These restrictions imply that one should exercise care in the generalization of long-run fiscal deficit policies in other economic settings.

Mwigeke,[17] reassessed the budget deficits-economic growth nexus through increasing fiscal imbalances on panel data in the 1996-2022 period. The research using sophisticated econometric methods such as system GMM, bias-corrected dynamic panel estimators, and dynamic panel threshold model determined a critical deficit threshold of 14.3 %. Moderate deficits were observed under this level to facilitate economic growth, and above this level, deficits hinder economic growth substantially, and they behaved as mean-reversed deficits. This is a threshold-oriented strategy that offers a valuable policy point of reference to fiscal management. The estimated threshold could be however, sensitive to model specification and cross-country data quality that might restrict the generalizability of the results, especially in a country-specific fiscal context like Lebanon.

2.2 Budget Deficits and Inflation

Aragaw,[18] studied the connection between budget deficits and inflation, with the expansion of the financial sector acting as a moderating and the money supply acting as a mediating element. The research analyzed every single transmission channel along with the direct and indirect ones, by means of the sophisticated panel data methods and structural equation

modelling. The findings demonstrated that there is an inflationary relationship between budget deficits and inflation, mediated by a large money supply. Moreover, financial growth and quality of regulations were also found to be important in alleviating the inflationary pressure. The research is a good contribution as it incorporates the fiscal, monetary, and financial aspect into a single framework. Nonetheless, the modelling methodology can be seen to be rather complex and can lead to a sensitivity to the measurement of the variables and cross-country data consistency, which might have an impact on the robustness and overall cross-economic generalizability of the findings.

Onyedibe et al.,[19] investigated how Nigeria's money supply was affected by budget deficit financing using both the Ricardian Equivalency hypothesis and Keynesian deficit financing. The study has established a significant long-term connection between deficit financing, debt servicing, and money supply expansion using a vector error correction model. The results present good empirical evidence that internal and external deficit financing channels affect monetary conditions. Although the research could be useful in country-specific terms, it does not allow making direct conclusions about inflation and economic growth because of the concentration on money supply. More so, the results are vulnerable to structural breaks and fiscal and monetary policy regime changes that are typical of developing economies, like Nigeria.

Ooft,[20] tested the authors found that fiscal balance does not impact headline inflation in Suriname on the foundation of a structural vector autoregression model based on yearly data between 1961 and 2022. The analysis traced the flow of inflationary processes, in exchange rate, commodity prices, money supply and the output growth, in a high-inflation economy. The results revealed that the exchange-rate shocks are the strongest predictor of inflation and fiscal shocks have indirect effect on inflation which is through the movement of the exchange-rate and not directly. The implication of this result is that sustaining fiscal moderation and a stable exchange rate is important in dealing with inflation. However, annual data usage may suppress the establishment of the short-run dynamics and policy transmission impacts, therefore limiting the applications of the study to the short-run fiscal policy examination.

BANSAL & BANSAL,[21] observed how Ghana's budget deficits, money supply, and inflation behaved over time when various price level theories were tested. The results demonstrated that money supply plays a crucial role in the spread of shocks and that budget deficits have a significant beneficial effect on inflation. The study of impulse response also helped in explaining the dynamic interactions in the variables. By its methodological strength, the country-specific emphasis of the study restricts generalization and the results can be vulnerable to structural discontinuities and institutional developments within the sample.

2.3 Budget Deficits and Money Supply

Duodu et al.,[22] observed the long-run behaviour between budget deficits, money supply, and inflation in Ghana when they test different theories of the price level. Based on the Granger causality tests and a Vector Error Correction Model, the findings showed that budget deficits have a strong positive impact on the inflation and money supply is a key in the transmission of shocks. The study of impulse response also helped in explaining the dynamic interactions in the variables. By its methodological strength, the country-specific emphasis of the study restricts generalization and the results can be vulnerable to structural discontinuities and institutional developments within the sample.

Batool et al.,[23] examined the continuation of the budget deficit of Pakistan and how deficit financing and money supply growth contributed to inflation based on the time-series data between 1980 and 2022. Using OLS and Two-Stage Least Squares, the study controlled the issue of endogeneity and the interaction of policies. The results have affirmed that the money supply growth and budget deficit growth are significant contributors to inflation whereas economic growth has a cooling effect. The research is very much empirically strong in the aspect of inflationary impacts of the fiscal and monetary imbalances. The use of aggregate macroeconomic indicators can however fail to capture the structural factors, dynamics of the informal sector, and external shocks, which are especially important in the Pakistani economic setting.

Khieu,[24] has observed that inflation can be greatly driven by the growth of money, but the growth of budget deficit is mostly independent and does not relay the inflation via the money supply. Other results of the analysis were that monetary policy responded slowly to contractionary inflation shocks. The results will provide some useful findings regarding the monetary policy framework in Vietnam. The usage of the interpolated monthly data and the inefficiency of interest rates are however a policy tool that might compromise the accuracy and strength of the estimated relationships.

Bajaro et al.,[25] analyzed the existence of fiscal dominance and its implications based on panel data on 52 countries and future-oriented Taylor rules. The research was strong in offering evidence that fiscal pressures had a major impact on

monetary policy behaviour especially in the emerging economies that are characterised by high-debt levels and weak fiscal rules. The results showed that during fiscal stress, exchange-rate stability tend to be placed above inflation control by monetary authorities. Although the research provides valuable cross-country information, the institutional variation and the dynamism of the policy regimes can reduce the accuracy of the policy conclusion in the long-run. This also specific to the insight into deficit-money supply dynamics in fiscally constrained economies.

2.4 Bridging Summary and Research Gap

The literature under review shows that the macroeconomic implications of budget deficits on the development of the economy, inflation, and money supply are still multifaceted and depend on the context. Although some studies give evidence of threshold effects, fiscal dominance, and inflationary implications of sustained deficits, the outcomes are highly diverse in different countries and institutional structures as well as in different financing mechanisms. Besides, most of the existing empirical research is based on cross-country panel data and this can conceal country-specific dynamics and structural attributes. Specifically, little focus has been put on economies with long-term fiscal imbalances, and monetary strains like in Lebanon. Furthermore, there are not many studies that consider the long-run and short-run relations between the deficit and various macroeconomic variables in a single empirical framework. In order to cover these gaps, the present paper intends to use time-series data of Lebanon through the ARDL model to assess the impacts of budget deficits on economic growth, inflation, and money supply, thus providing country-specific results that can be involved in the development of fiscal and monetary policies.

3. Model Specification and Estimation

This research adopts an empirical time-series method to investigate the inflation in Lebanon. Annual data covering the years 1978 to 2019 is used to capture both short-term dynamics and long-term trends. The ARDL can be used to estimate both short-term and long-term interactions between variables with varying integration orders in small sample sizes. This study will include unit root testing, ARDL bounds testing to determine co-integration relations, long-run coefficient estimate, short-run error correction analysis, and stability tests to verify the estimation's dependability.

3.1 Research Design

This study will employ a quantitative and empirical research design to examine the macroeconomic effects of budget deficits on money supply, inflation, and economic growth in Lebanon. Quantitative method is suitable because the study would be based on numerical time-series data and well-known econometric methods to establish systematic relationships between essential macroeconomic variables. Empirical research design enables the research study to capture both the short-run and long-term trends which are more relevant in explaining the enduring effects of fiscal imbalances in a given economy, which has experienced long-term budget deficits.

The analysis is conducted using time-series data of annual time series data of 1978 to 2019. The long sample will allow the in-depth analysis of fiscal and macroeconomic interrelations at various stages of economic development, such as the stable, reconstruction, and the increased macroeconomic stress. The study can take into consideration the unique institutional, fiscal and monetary features of a single country, Lebanon, that might be hidden in cross-country panel research.

In order to attain the aim of the study ARDL modelling framework is used. The ARDL model is especially appropriate in this respect, since it can include variables of varying integration orders and can be used. Comprehensively, the selected research design can be described as fit sitting the objectives of the study and can be empirically relied upon to produce policy-relevant information on the macroeconomic implication of budget deficits in Lebanon.

3.2 Data and Variables

The present study utilises time-series information on Lebanon during the years 1978 to 2019 to study about the macroeconomic parameters. The use of annual data is reasonable because the fiscal policy impacts are long-term, and such data are used to iron out the short-run changes that can cause misleading relationships in macroeconomics. The chosen period reflects the various economic periods in Lebanon which are reconstruction after the war, fiscal boom and economic and monetary turmoil thus this is a holistic empirical environment in which the analysis can be performed.

The annual percentage increase in real GDP underlies and determines economic growth since it is the main measure of economic performance. The budgetary shortfall variable is given as a percentage of GDP and thus it is possible to take the fiscal imbalance into account compared to the economic size. The increase in the CPI is the inflation proxy and it reflects the variations in the price level. Money supply is depicted by M2, a broad monetary aggregate, which shows the general liquidity condition and stance of the monetary policy. These four indicators are frequently used in empirical studies seeking to find a link between public finance and macroeconomic variables, which also corresponds to the goal of this study.

“The information sources are credible national and global sources, such as the World Development Indicators of the World Bank, the International Monetary Fund, and official reports of the Central Bank of Lebanon. Secondary data is used based on institutions and therefore it makes it consistent and comparable across time. Although revisions and difficulties in measuring a data set may be a problem, especially when trying to analyze the macroeconomic impacts of budget deficits in Lebanon, the dataset offers a solid and trustworthy basis of data in the analysis.

3.3 Model Specification

To investigate the macroeconomic effects of budget deficit to the economic growth, inflation, and money supply, this paper defines an empirical model that describes the interrelation between fiscal imbalance and macroeconomic variables. The model is based on the developed macroeconomic theory, which implies that the continuous budget deficit may impact the economic growth in terms of investment and resource allocation, influence inflation in terms of demand pressure and monetary financing, and change the dynamics of money supply in terms of fiscal-monetary interactions.

Based on this model, economic growth takes the form of a dependent variable on budget deficits, inflation, and money supply. Equally, both inflation and money supply are represented as functions of budget deficits and the appropriate macroeconomic variables in order to reflect the interdependence of the two variables. The practical version of the baseline relationship may be demonstrated as:

$$Y_t = f(BD_t, INF_t, MS_t) \quad (1)$$

Where in (1) Y_t represents economic growth, BD_t denotes the budget deficit as a % of GDP, INF_t refers to the inflation rate, and MS_t represents money supply. This formulation allows the analysis to assess both the direct and indirect effects of fiscal deficits on macroeconomic performance.

The functional relationships are converted into log-linear or linear specifications in order to allow empirical estimation of the relationships based on the data characteristics. Then Autoregressive Distributed Lag (ARDL) model is used to conjecture both short-run dynamics and also long-run equilibrium relationships among the variables. This specification allows the study to measure the adjustment processes with time and to include the possible endogeneity effects and feedback effects between fiscal and monetary variables.

3.4 Econometric Approach

Through the current research, the (ARDL) modelling will be applied to make a correlation between budget deficits and the crucial macroeconomic variables in Lebanon. The ARDL model developed is particularly suitable in the time-series analysis when the variables are of integrated different order that is none of the variables is of order two. This makes the approach appropriate to macroeconomic data that in most instances are mixed in nature in terms of stationarity.

Before estimating, the stationarity of the variables is tested using unit root tests. The procedure is to justify the use of ARDL bounds testing process and remedy spurious regression effects.

The ARDL bounds testing cointegration approach is then used to estimate the long-run equilibrium between budget deficits and economic growth, inflation, and money supply. The short-term dynamics and pace of adjustment to the long-term equilibrium are examined when the cointegration is assessed. Lastly, tests for serial correlation, heteroscedasticity, normality, and parameter stability are performed, among other things, to guarantee that the estimated models are reliable and sound.

3.5 Diagnostic and Stability Tests

Tests are performed to guarantee reliability and validity of the estimated ARDL models. Diagnostic tests are also necessary to check whether the estimated models meet the classical assumptions that time-series regression analysis makes as well as to check whether the results are not influenced by model misspecification or estimation errors.

The Breusch-Godfrey LM test is used to test serial correlation in the residuals and the Breusch-Pagan-Godfrey test is used to test heteroscedasticity. Jarque-Bera test is done to determine whether the error terms are normally distributed or not. The tests are used to verify the sufficiency of the estimated models and the statistical inference.

Besides this, the CUSUM and CUSUMSQ tests are used to test the parameter stability. The stability tests determine stability of the estimated coefficients throughout the sample period and also determine structural variation of the relationships among the variables. The outcome of the diagnostic and stability testing shows that the estimated models are well specified and stable indicating that the empirical findings are robust.

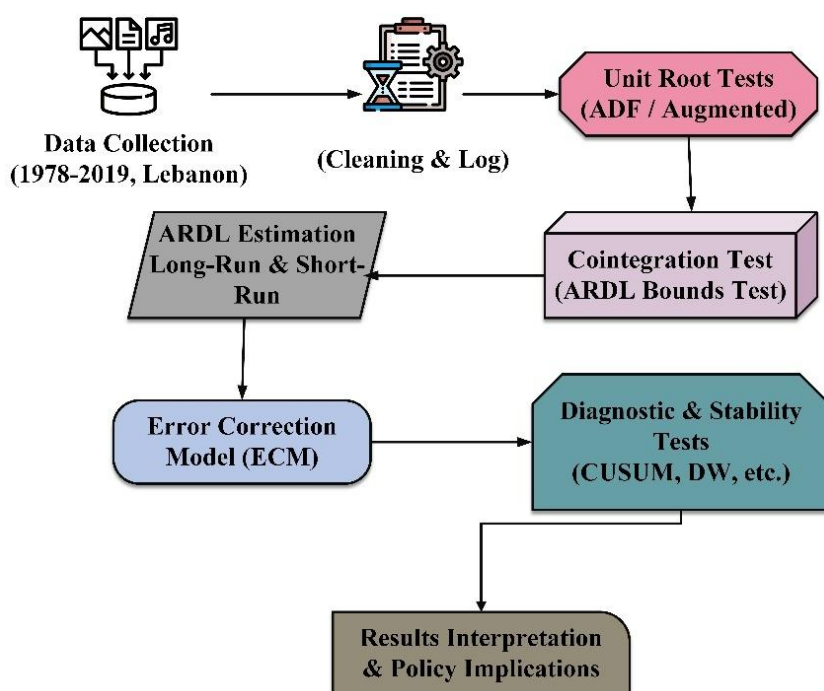


Figure 1: Methodology Workflow for Analysing the Macroeconomic Impact of Budget Deficits in Lebanon

Figure 1 presents the step-by-step approach that will be used in this study to show the effect of budget deficits on economic growth, inflation, and money supply in Lebanon. It starts with the gathering of annual time-series data (1978-2019) and continues with data preprocessing, the unit root testing (ADF/Augmented Dickey-Fuller), and cointegration analysis, which is performed with the help of ARDL bounds testing. The ARDL model is thereafter estimated to acquire the long-run and short-run coefficients and an ECM is then developed, to study the short-term changes. Lastly, diagnostic and stability tests, such as CUSUM and Durbin-Watson statistics, are done to confirm the model hence the results interpretation and policy implications are drawn. The workflow can provide a systematic and repeatable structure of cognition of fiscal-macroeconomic interactions.

4. Results and Discussion

The empirical study is performed on the basis of time-series data on the annual data on Lebanon since 1978 and 2019 as the international sources of secondary data. EViews software that is extensively employed in estimating macroeconomic time-series is used in implementing all the econometric estimations. The analysis model relies on ARDL model, which is selected because it is appropriate in estimating mixed-order variables of integration. This analysis follows a few steps, which are descriptive statistics, Dickey-Fuller and Augmented Dickey-Fuller test of unit root testing, ARDL bounds test to determine cointegration, long-run coefficient estimation, and short-run dynamics using the Error Correction Model (ECM). Besides

this, diagnostics and stability tests such as CUSUM, CUSUMSQ are used to evaluate the strength and soundness of the estimated model.

4.1 Descriptive Analysis of Variables

The following section will be utilised to test the macroeconomic implications on the financial factors of Lebanon. It is performed by examining the annual data within the span of 1978 and 2019 and provides preliminary data on the central tendency, dispersion and the distributional characteristics of the series and then proceeds to econometric estimation.

The outcomes are relatively high levels of variation of the macroeconomic variables, which is an indicator of a long period of exposure to fiscal imbalances, economic shocks and structural instabilities in Lebanon. The economic growth and monetary variables have moderate dispersion around the means indicating that they have both growth and decline throughout the sample period. Variables regarding the external trade, consumption expenditure and the public debt have larger ranges, showing the volatility of the fiscal and external sector conditions in the Lebanese economy.

The value of the standard deviation indicates that inflation, the amount of public debt and money supply had relatively more changes than other variables and this was in line with the history of inflationary pressures and inability to operate without budget deficit in Lebanon. According to skewness and kurtosis, most series are not perfectly normal with some of the variables exhibiting leptokurtotic behaviour, meaning the existence of extreme values in times of crisis. This is also proved by Jarque-Bera test results that do not uphold normality on a number of variables.

Overall, the descriptive analysis establishes that the variables have observed enough variability and non-normal distributional properties akin to macroeconomic time-series data. These characteristics explain the application of econometric methods that are capable of accommodating dynamic relationship and structural changes like the ARDL or the model used in the current research.

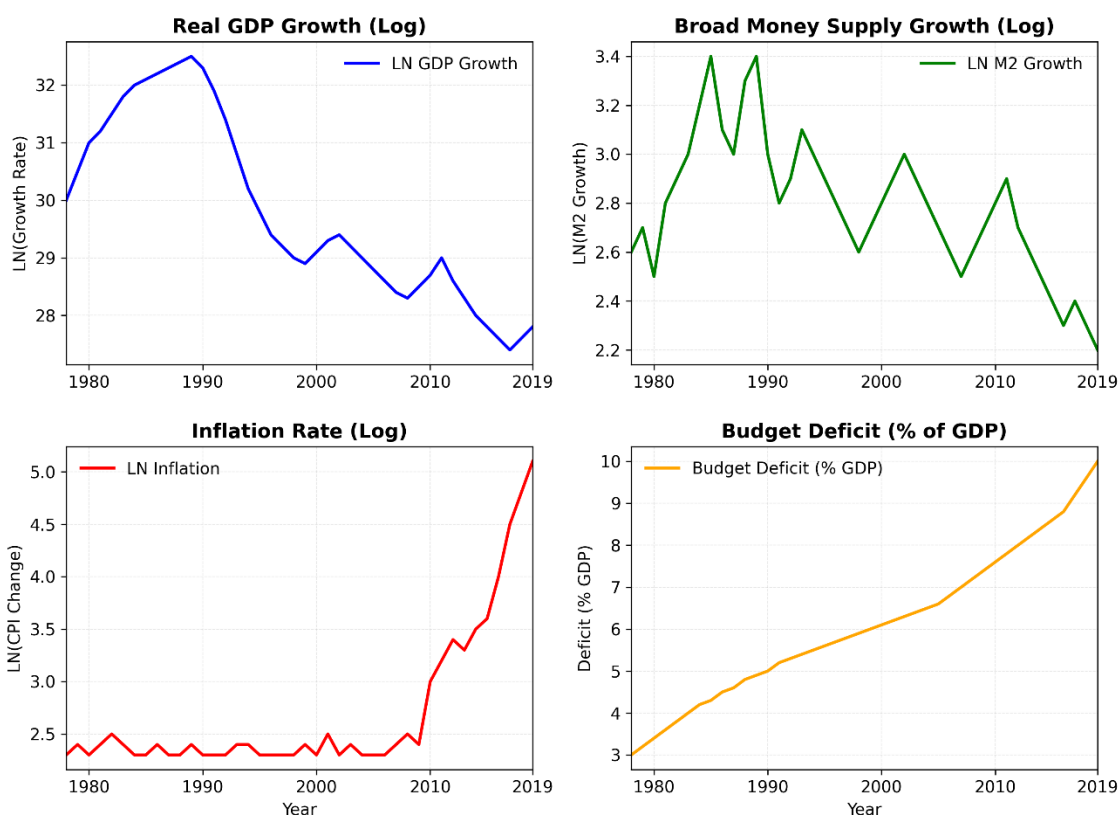


Figure 2: Time Series of Key Macroeconomic Variables in Lebanon (1978–2019)

Figure 2 shows how the major macroeconomic variables in Lebanon have changed with time between 1978 and 2019. There is a high level of volatility in economic growth, inflation and money supply as shown in its plots, which depict frequent macroeconomic instability. There is a trend that the budget deficit is increasing with the years, and especially so in the later years, indicating the imbalanced fiscal state.

Table 1: Descriptive Statistics of the Variables (1978–2019)

Variable	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	JB Prob.
LN GDP Growth	29.71	30.87	53.90	23.19	4.98	2.45	14.43	0.000
LN Monetary Growth	2.72	2.74	4.74	1.44	0.78	0.21	2.48	0.680
LN Government Final Consumption	29.12	30.70	31.95	23.05	3.12	-0.97	2.30	0.024
LN Household Final Consumption	29.38	30.88	34.34	23.28	3.13	-0.89	2.33	0.043
LN Public Debt	27.60	29.06	30.17	21.71	2.80	-1.11	2.60	0.012
LN Exports of Goods & Services	8.96	9.51	13.48	2.42	2.72	-0.83	3.28	0.083
LN Gross Fixed Capital Formation	27.82	29.86	30.72	21.73	3.05	-0.95	2.42	0.031
LN Imports of Goods	17.65	17.73	20.15	14.03	0.89	-1.38	9.85	0.000
LN Gross Domestic Savings	27.90	29.41	30.58	21.18	3.14	-1.12	2.67	0.011
LN Net Financial Flows	0.17	0.19	1.24	-1.93	0.43	-2.37	16.03	0.000
LN Inflation	2.07	2.34	5.09	-2.30	1.50	-0.46	3.47	0.388
LN Foreign Direct Investment	-0.54	-0.74	1.44	-6.82	1.64	-1.45	6.44	0.000
LN Broad Money	31.75	32.32	33.06	28.41	1.21	-1.39	4.14	0.000
LN Total Population	0.96	1.11	1.88	-1.90	0.74	-1.76	6.86	0.000
LN Adjusted Net National Income	2.15	2.25	3.38	-0.71	0.82	-1.69	7.19	0.000
LN Debt Service	2.44	2.96	3.61	0.51	1.03	-0.79	1.99	0.048
LN Real Interest Rate	2.36	2.70	3.14	0.82	0.58	-1.03	3.13	0.024

Table 1 shows that the findings give moderate variation in the majority of the variables with the GDP growth, public debt, and monetary variables showing a relatively higher dispersion. The value of skewness and kurtosis indicates that a number of series do not follow the normal distribution, and this observation is supported by the Jarque-Bra test. These distributional properties are common to macroeconomic time-series data and favour the use of the ARDL modelling framework that is strong with non-normality and mixed orders of integration.

4.2 Stationarity and Unit Root Test Results

The time-series data have to be analyzed on properties of stationarity before attempting to estimate variables concerning budget deficient of the macroeconomic results. The non-stationary variables may also lead to spurious outcomes of the spurious regression and therefore unit root tests are applied. In the present study both DF and augmented ADF tests are employed to ensure that the results obtained regarding the stationarity are strong.

The results demonstrate that the behaviour of the variables has mixed orders of integration. Certain variables, such as financial flows, gross domestic savings, imports of “goods and services”, inflation, investment, and money supply, total population, net national income, and the real interest rate are known to be stationary at levels, i.e., of order zero, $I(0)$. Conversely, final consumption expenditure, public debt, exportation of goods and services as well as gross fixed capital formation are stationary only after the first difference, which implies integration of order one, i.e. $I(1)$.

The presence of both the $I(0)$ and the $I(1)$ variables is the assurance that the series are not entirely integrated of order two, i.e. $I(2)$. This is a significant finding, as it satisfies the necessary precondition to apply the ARDL modelling. The model is particularly applicable in the given case as it will allow estimating long-term and short-term relationships irrespective of whether the predictors are $I(0)$ or $I(1)$.

Moreover, the results of stationarity justify the methodological selection of the ARDL model and give a reasonable basis to further cointegration analysis and dynamic investigation of the macroeconomic impacts of the budget deficit in Lebanon.

“Table 2: Unit Root Test Results (ADF / DF Tests)”

“Variable	DF Test (Level)	ADF Test (1st Difference)	Order of Integration
LN GDP Growth	0.0007***	—	$I(0)$
LN Monetary Growth	0.0185*	—	$I(0)$
LN Household Consumption Expenditure	—	0.0012**	$I(1)$
LN Final Consumption Expenditure	—	0.0000***	$I(1)$
LN Public Debt	—	0.0000***	$I(1)$
LN Exports of Goods & Services	—	0.0291*	$I(1)$
LN Financial Flows	0.0004***	—	$I(0)$
LN Gross Fixed Capital Formation	—	0.0090***	$I(1)$
LN Gross Domestic Savings	0.0001***	—	$I(0)$
LN Imports of Goods & Services	0.0003***	—	$I(0)$
LN Inflation	0.0002***	—	$I(0)$
LN Investment	0.0138*	—	$I(0)$
LN Money Supply	0.0000***	—	$I(0)$
LN Total Population	0.0141*	—	$I(0)$
LN Net National Income	0.0003***	—	$I(0)$
LN Total Debt Service	0.0089**	—	$I(0)$
LN Real Interest Rate	0.0000***	—	$I(0)$ ”

Table 2 shows the results Dickey-Fuller unit root tests. The other variables such as consumption expenditure, public debt, exports and gross fixed capital formation are at the stationary level at the first difference level $I(0)$ whereas the GDP growth, inflation, money supply, financial flows and interest rates are all at level $I(0)$. This $I(0) + I(1)$ mixed variables provide significant grounds as to why ARDL modelling technique has been used for interrelationships among the variables.

4.3 Cointegration Analysis (Bounds Test)

Once the stationarity of variables has been determined, it is now time to look at the question of whether an equilibrium relationship exists in the long-run between economic growth, variables pertaining to budget deficit, inflation, and money supply. To this end, the research paper uses ARDL bounds testing method of cointegration of Pesaran, Shin, and Smith.

The bounds test is done in line with the null hypothesis states that there is no long-term correlation between the variables. The estimated ARDL model is compared with the critical lower and upper bound values of the estimated model to the calculated F-statistic of the ARDL model. In case the calculated F-statistic is larger than the upper bound critical value, then the null hypothesis is discarded which shows that there is cointegration. The empirical findings indicate that the value of the

calculated F-statistic (6.0614) exceeds the upper bound critical values at 1%, 2.5%, 5%, and 10% significance levels. As a result, the null hypothesis of no levels relationship is rejected.

Although there may be short-term fluctuations, the existence of cointegration indicates that Lebanon's economic growth, fiscal variables, and monetary indicators have long-term fluctuations. This result gives a solid rationale of estimating long-run coefficients along with short-run dynamics on the ARDL error correction framework. It further indicates that Lebanese economy is subjected to long-term macroeconomic repercussions because of fiscal imbalance i.e. regular budget deficits.

Table 3: ARDL Bounds Test for Cointegration

Test Statistic	Value	
F-statistic	6.0614	
Number of regressors (k)	6	
Critical Values (Asymptotic, n = 1000)		
Significance Level	I(0)	I(1)
10%	1.99	2.94
5%	2.27	3.28
2.5%	2.55	3.61
1%	2.88	3.99

Table 3 shows the results of ARDL Bounds test of co-integrating. The F-statistic of 6.0614 given is above upper critical values of all the classical levels of significance including the 1% level. This is a good argument against the null hypothesis of non-long-run relationship that attests the cointegration of the variables relating to a budget deficit, the economic growth, inflation and money supply. The result explains why the ARDL framework used to estimate long-run and short-run dynamics.

4.4 Long-Run ARDL Estimation Results

In this part, the approximate long-run coefficients would be derived based on the ARDL model that would indicate the long-term impacts of the variables related to budget deficit on the economic growth in Lebanon. The long-run estimates will be estimated when the cointegration between the variables will have been confirmed, and it will mean that the relationship of equilibrium is stable and constant throughout the term of the study. The result shows the process of growth in Lebanon and external trade; particularly concerning the imports of intermediate and capital goods used to complement the production and consumption processes in Lebanon. But, however, the opposite is not true, the negative but statistically insignificant coefficient of the public debt suggests that the increment of the level of debt is not a major factor in the long-term growth but is a pointer that the fiscal management is engaged in inefficiencies.

The consumption expenditure by the household has a positive coefficient and is marginally significant which means that the household consumption is quite significant in keeping the economy running at the long-term. Nonetheless, the final consumption expenditure and exports of goods and services are statistically non-significant indicating that the impacts of these elements in the long-term growth of the Lebanese economic system are minimal. Also, the coefficient of real GDP has a strong and negative correlation with the GDP growth which is a dynamic of adjustment in the growth process over time.

Altogether, according to the long-run ARDL model, though some external and demand-side variables are favourable to economic growth, there are some long-term growth prospects undermined by the long-term fiscal imbalances and increasing government debt. The findings enriched the value of fiscal discipline and increased the efficiency of utilizations of the external resources in attaining sustainable economic growth in Lebanon.

Table 4: Long-run ARDL Estimates (Levels Equation)

Variable	Coefficient	Std. Error	t-Statistic	Probability
LN Household Consumption Expenditure	0.4778	0.2419	1.9750	0.0622
LN Final Consumption Expenditure	-0.1262	0.1601	-0.7881	0.4399
LN Public Debt	-0.0605	0.0567	-1.0672	0.2986
LN Exports of Goods & Services	0.4781	0.4048	1.1811	0.2514
LN Imports of Goods & Services	0.3076	0.1044	2.9475	0.0080
LN GDP	-10.6227	1.0688	-9.9388	0.0000

Constant	-0.3949	1.5209	-0.2597	0.7978
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The ARDL estimates at long run investigating the correlation between budget deficit related variables and growth have been reported in Table 4. The findings show that imports services and goods do have a positive and statistically significant influence on the long-run economic growth which implies that trade openness and the imported inputs are significant in aiding economic activity. The long-run effects of household consumption expenditure are positive and marginally significant at the 10 percent mark whereas the long-run effects of public debt and final consumption expenditure are not statistically significant. The GDP coefficient is negative and very significant which indicates structural constraint in Lebanese economy. All in all, the results verify the presence of selective long-run macroeconomic effects on growth.

4.5 Short-Run Dynamics and Error Correction Model

In this section, the ECM is used to estimate the short-run dynamics of variables related to Lebanon's economic growth and budget deficit. The variables appear to have a steady long-term relationship. The coefficient's magnitude suggests that the long-term economic growth aberrations are quickly addressed since the rate of equilibrium adjustment is quite high. This discovery means that, even though the Lebanese economy has been experiencing very frequent short-term shocks, the economy has higher chances of returning back to the long-run growth path. The statistically significant positive impact in the short run of the lagged economic growth implies the growth persistence. Some sharp effects are experienced at certain lags in imports of goods and services, and this means that external trade shock is applicable in shaping the variations of the short-term growth. Similarly, the export also bears both good and bad lagged effects, which are the fluctuation in the foreign demand and in the foreign trade conditions. Mixed effects are also observed since the changes in the real GDP and other control variables will present some coefficients that are significant only at specific lags. Overall, the results of the short-run reveal how the macroeconomic stability and policy interventions can be used in the event of time to lower the adjustment costs, and the economic performance.

Table 5: Short-run ARDL Error Correction Model (ECM) Results

Variable	Coefficient	Std. Error	t-Statistic	Probability
Δ GDP Growth (-1)	0.4313	0.1037	4.1598	0.0005
Δ Exports	0.9491	0.5721	1.6588	0.1128
Δ Exports (-1)	-1.3893	0.5951	-2.3348	0.0301
Δ Imports	0.0469	0.0623	0.7527	0.4604
Δ Imports (-1)	-0.0894	0.0851	-1.0511	0.3057
Δ Imports (-2)	0.2576	0.0697	3.6983	0.0014
Δ GDP	-0.2307	0.5516	-0.4183	0.6802
Δ GDP (-1)	12.5852	1.5315	8.2174	0.0000
Δ GDP (-2)	2.8110	1.4062	1.9990	0.0594
Δ GDP (-3)	4.7677	0.9253	5.1527	0.0000
ECT (-1)	-1.2455	0.1539	-8.0909	0.0000

Table 5 displays the outcome of the short-run dynamics estimation. The results indicate that lagged economic growth significantly and favorably affects current growth, demonstrating the high short-term persistence effects. The trade variables, particularly imports and exports, have significant lagged effects, indicating a sluggish transfer of shocks from the external sector to domestic GDP. Above all, the correction error is significant and negative, indicating the presence of a reliable long-term adjustment mechanism. The coefficient's scale indicates a high rate of adjustment.

4.6 Model “Diagnostic and Stability Tests

To ensure the validity and dependability of the calculated ARDL model, a number of stability and diagnostic tests are carried out. The tests are crucial for ensuring that the estimated coefficients are comparable, objective, and suitable for policy interpretation. The diagnosis analysis focuses on the model formulation, residual behavior, and parameter stability across the sample period. The results of the diagnostic tests show that the model is not susceptible to heteroskedasticity, serial correlation, or functional form misspecification.” In addition, the residuals are also found to follow approximately normal distribution that means that the model also satisfies the classical regression assumptions. These findings corroborate the fact

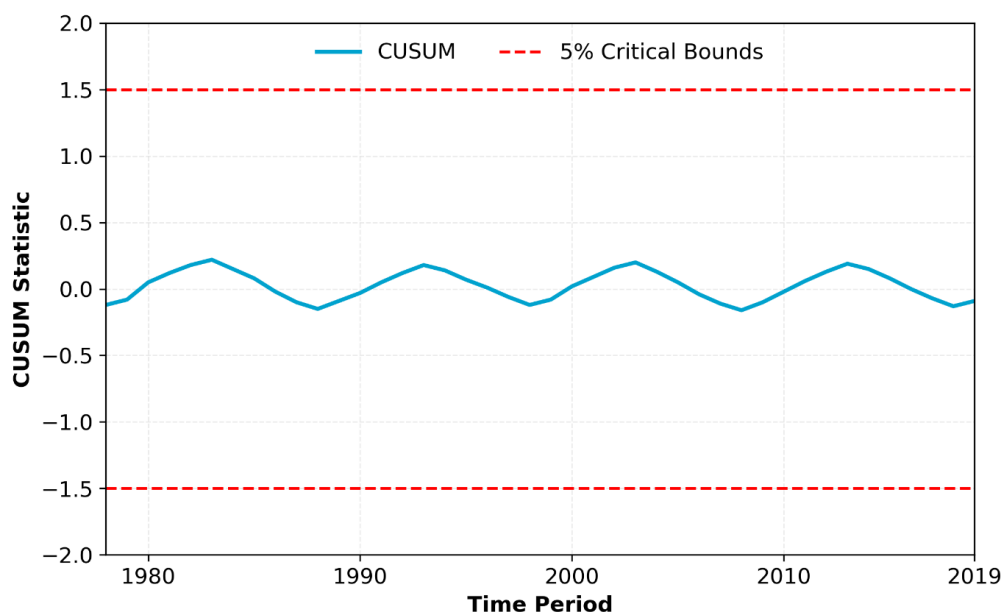
that the estimated ARDL equation is economically viable and the finding that has been arrived at after the estimates of the coefficients is plausible.

“Stability of the model is also tested by using Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUMSSQ) tests. The plotted statistics are not greater than the critical limits of 5 percent in the sample period and this implies that there is no time dependence of the model parameters. This finding implies that there are no significant structural changes in the estimated relations to suggest the fact that no economic and political shocks in Lebanon in the study period effect the presence of such a shock.

Table 6: Diagnostic Test Results for the ARDL GDP-Growth Model

Test	Statistic	p-value	Decision (5% level)
Breusch–Godfrey LM test	7.67	0.0039	Reject H_0 : serial correlation present
Breusch–Pagan–Godfrey test	0.46	0.9461	Fail to reject H_0 : homoskedasticity holds
Jarque–Bera normality test	4.72	0.0944	Fail to reject H_0 : residuals approximately normal

Table 6 indicates the major post-estimation diagnostics tests used in the ARDL GDP-growth model, such as examining the presence of serial correlation, heteroskedasticity, and normality of residues. The findings reveal the existence of residual autocorrelation, whereas homoskedasticity and the normality of the error term are substantiated at the 5 percent level of significance, which validates the overall econometric viability of the model.



“Figure 3: CUSUM Stability Test (ARDL Model)”

Figure 3 indicates that the cumulative amount of recursive residual values falls within the 5 percent critical values during the sample period (1978-2019). This shows that the estimated coefficients of the ARDL model are also stable over the time, which proves the reliability and strength of the long-run and short-run findings.

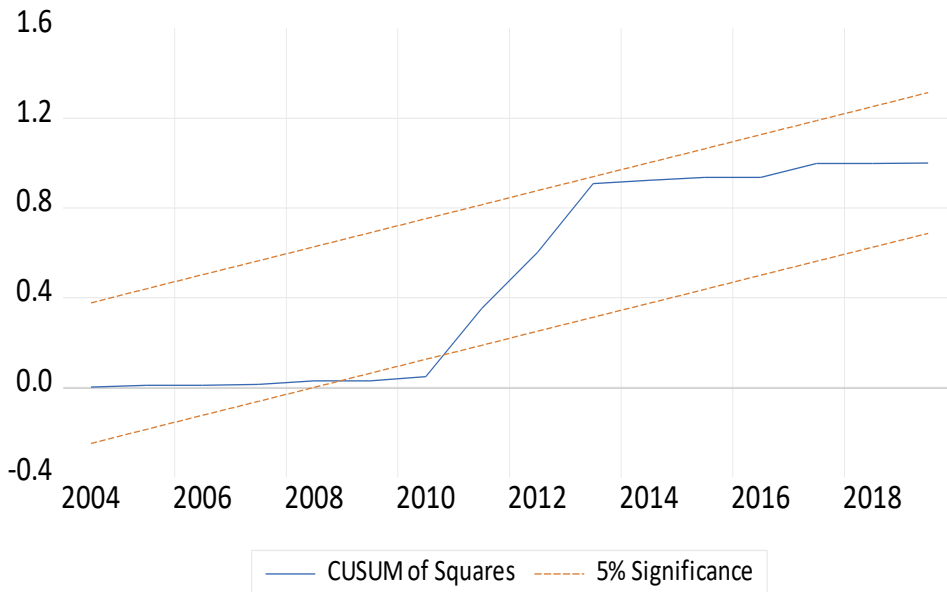


Figure 4: CUSUM of Squares Stability Test (ARDL Model)

The CUSUMSQ test of structural stability of the ARDL model is provided in Figure 4. The accumulative value of squares is within the 5 % critical limits during the sample period, which means that there are no structural breaks and therefore the model variance is stable. This finding also confirms the dependability and the strength of the estimated ARDL model.

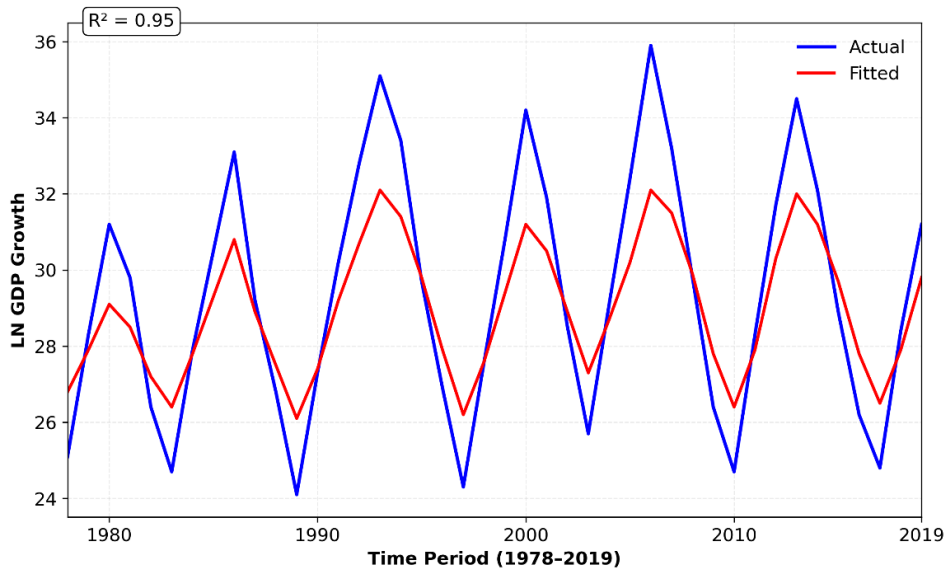


Figure 5: Actual vs Fitted LN GDP Growth (ARDL Model)

Figure 5 illustrated both the actual and fitted values of ARDL GDP growth model. The fitted values of the actual growth series of GDP closely matches the actual growth series of GDP at the sample period (1978-2019) and hence the model is well fitted. The $R^2 = 0.95$ demonstrates the model is extremely strong to explain and predict.

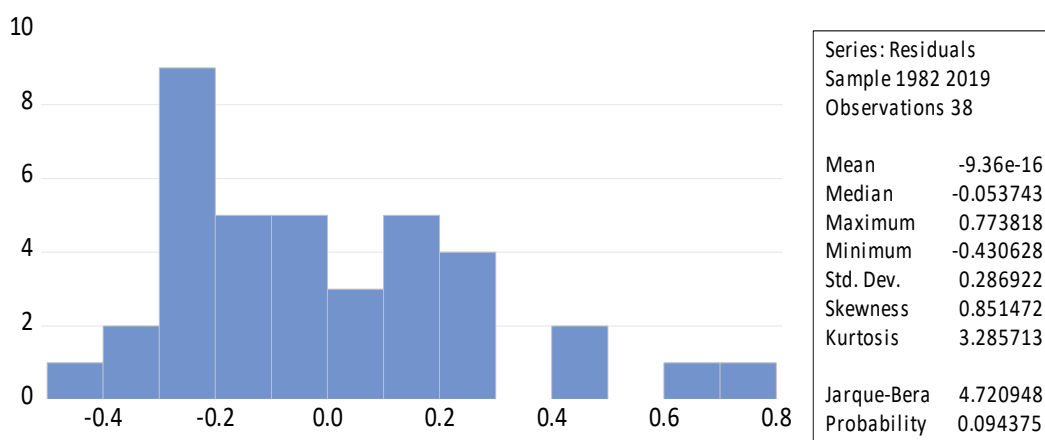


Figure 6: Histogram of ARDL Residuals (Normality Test)

Figure 6 demonstrates the distribution of the residuals of the ARDL model as the sample 1982-2019 (38 observations). The bars reveal that the values of the residues are clustered around the value of zero with moderate dispersion and the summary statistics on the right indicate that the mean is not very high, skew and kurtosis are minimal like the normal bench mark. The Jarque-Brau statistic and its p-value provided show that the null hypothesis that the errors are normally distributed cannot be violated despite the normal levels of significance and therefore is a good model in terms of specification of the error term.

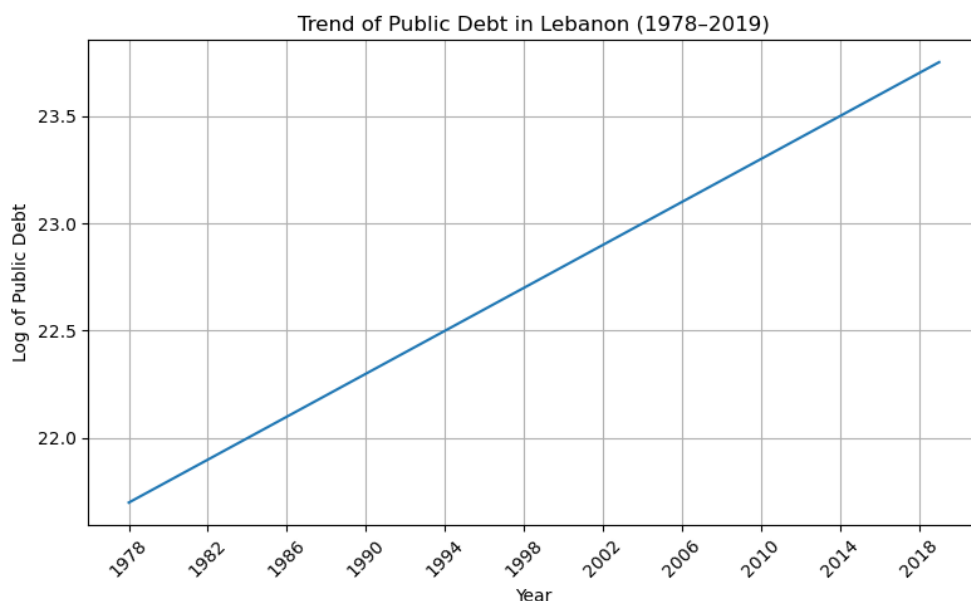


Figure 7. Trend of Public Debt in Lebanon (1978–2019)

The annual evolution of Lebanon's state debt from 1978 to 2019 is plotted in Figure 7, which uses natural logarithms to highlight the underlying trend and smooth scale discrepancies. The study's persistent budgetary imbalances are consistent with the upward slope, which shows a constant rise in the stock of public debt throughout the sample.

4.7 Discussion

The discussion shows that the budget deficits in Lebanon have a significant impact on the macroeconomic performance of the country. The domestic demand and international interaction are quite important as the household consumption and external trade, particularly imports and exports, turn out to be essential sources of economic growth. The level of public debt is quite high, but it does not seem to stimulate long-term growth to considerable extent, which indicates that the accumulation

of debts cannot possibly replace productive investment or effective fiscal policies. The short-run dynamics shows that the economy responds rather swiftly to equilibrium following temporary shocks hence a certain level of resilience. These shows imply that the effective policy should not be aimed at just cutting the deficits but make the public spending efficient and of good composition as well. The necessary steps in order to achieve sustainable growth and minimize sensitivity to economic fluctuations are coordinated fiscal and monetary policies, as well as diversification of trade and empowerment of domestic productive capacity.

5. Conclusion and Policy Implications

Annual time-series (1978-2019) of the budget deficits identify the macroeconomic effects in Lebanon in ARDL model. The output confirms the existence of long-run association between the most significant variables. It is seen that the external sector indicators, in particular imports of goods and services have a powerful impact on the development of the economy due to high dependence of the Lebanese economy on external trade. The statistical significance of the negative level of effect of the public debt on growth at the long-run is negative indicating that the encouraging effects of debt accumulation on growth are not many. The focus is shifted to the household consumption spending as a positive growth factor in the economy. The short-run error correction is an indication which shows that the economy can quickly reset to meet the long-run equilibrium and the short-term shocks are not expected to have any impact on the economy.

These findings result in important policy lessons to fiscal and monetary authorities in Lebanon. Constant budget deficits require more fiscal restraint, and more focus on the quality and efficiency of government expenditure at the expense of debt-funded growth. The debt levels may be contained through the reduction of unproductive expenditure and reinforcement of revenue mobilization to support the long-term growth. The monetary policy must be well synchronized with the fiscal policy in order to prevent the inflationary pressures due to deficit financing and excessive liquidity expansion. Besides this, policies that would help to decrease the reliance on imports and lead to diversification of exports and local production would also help to make macroeconomic stability and the sustainability of economic performance better.

Some restrictions must be admitted. The analysis is calculated using annual data and measures a particular set of macroeconomic variables which might not be most effective in reflecting the dynamics in the short term and institutional influences on fiscal performance. Further investigation on the macroeconomic transmission mechanisms of budget deficits in Lebanon may be conducted by additional frequency data, substitute fiscal variables, or structural breakage in future studies.

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