

Economic Growth, External Debt and Budget Deficit in Jordan: ARDL Approach

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Abstract

The current study aims to investigate the impact of economic growth and external debt on budget deficit in Jordan for the period (1993-2017), the study used unit root test, autoregressive distributive lag (ARDL) approach, Bound test, to examine the study hypotheses. ARDL bound test and ARDL cointegration proven that there is a long run relationship exists between economic growth, external debt and budget deficit in Jordan. The ARDL long run coefficients show that economic growth has a negative significant impact on budget deficit while external debt has a positive significant impact. In the short run the empirical results show that the budget deficit lags (1,2) have a positive and significant impact on current budget deficit while external debt lags (2, 3) have negative significant impact on budget deficit in Jordan.

Keywords: Budget Deficit, External Debt, Economic Growth, Ardl, Jordan.

Introduction

The budget deficit is one of the most controversial topics in the world. The classical theory emphasized the idea of balancing the state budget because the balance of the public budget reflects the good use of public funds, and the classics do not allow deficit or surplus due to the principles they believe in, which is the role of guardian state. The Keynesian theory called for the intervention of the state in economic activity and expansion of its expenditure beyond its revenues to deal with the recession and economic decline, rejecting the principle of balancing the public budget and adapting it in line with the prevailing economic situation.

Budget deficit leads to inability of the government to play its economic, social and political role towards society, as well as increasing the volume of internal and external indebtedness, high rates of unemployment and inflation. The budget deficit effectively reduces national savings and private investment Fisher (1993) as the state uses internal borrowing, which negatively affects the financing of private investment projects. The deficit in the public budget gives a signal to citizens that the government has lost control over the management of funds. It was found that the country that suffers from a deficit in its budgets has lower growth rates compared with countries that have surplus budgets and that the continuous rise in the budget deficit will also lead to the problem of bankruptcy of the state As a result (Ball and Mankiw,

1995) investors will have less confidence to invest in the country and this will reduce the country's economic growth. Jordan, like other developing countries, suffers from a persistent deficit in the public budget due to the increasing intervention of the government in economic, social activities as well as the increase in the population, the high rates of inflation and high unemployment rates, the waste of public expenditure, the low efficiency of public projects, the high costs of public investment, low public expenditure rationalization, expansive fiscal policy trends in economic downturns, low public revenues under tax and customs exemptions, tax evasion and low efficiency of the tax system. In the light of that the government used different policies to reduce growing the budget deficit.

The importance of the study comes from the importance of the subject of budget deficit, which concerns governments and economic and financial policy makers. Where governments are constantly seeking to reduce and eliminate budget deficit. The importance of the study is also derived from the study's attempt to reach conclusions and recommendations that would benefit the researcher and the political and economic decision maker to control or reduce budget deficit. On the basis of the above problem the current study aims to examine the economic determinants of budget deficit in Jordan through the period 1993-2017. The study consists of five sections: Section one introduction, section two literature review, section three data and methodology, section four empirical results and section five conclusions.

Literature Review

A number of studies have addressed the relationship between economic growth, external public debt and budget deficit in many countries. These studies have used different techniques to test this relationship. These studies include the following:

Saima and Kamal Uddin (2017) explored the relationship between budget deficit and public debt in Bangladesh over the period 1995 to 2015. They employed Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests for testing the stationarity of the series, Johansen Cointegration techniques to visualise the long run relationship between the two variables and Vector Error Correction Model (VECM) to evaluate the short run properties of the cointegrated series. Cointegration test shows the presence of long run equilibrium relationships between the two variables. The Vector Error Correction Model (VECM) provides evidence that there is a unidirectional causality running from public debt to budget deficit but not the way round. Nayab (2015) examined the impact of budget deficit on economic growth in Pakistan through the period 1976-2007. He used Granger Causality test, Cointegration test, VAR and VECM to determine the relationship between budget deficit and economic growth, he found that there is a positive impact of budget deficit on economic growth.

Abu Shihab (2014) examined the causal relationship between economic growth and fiscal policy in Jordan during the period 2000-2012. She used the Granger causality test to determine the direction of the relationship between the two variables. She found that there is only a causal relationship going from the economic growth to budget deficit. Based on the outcome of causality tests.

Alam and MD. Taib (2013), investigated the relationship of external public debt with budget deficit, current account deficit, and exchange rate depreciation in debt trap and non debt trap countries. They adopted an empirical approach under the ecology of dichotomy which is our main contribution. REM and FEM both were used with the support of requisite diagnostic tests plus additional efforts of Granger Causality test and Equality tests were used to ensure

robustness in results. their findings reveal that external public debt is positively related to budget deficit.

Murwirapachance, Mared and Chong (2013) examined the macroeconomic determinants of budget deficit in South Africa for the period 1980- 2010. They used Vector Error correction model (VECM) to determine the impact of unemployment, economic growth, foreign debt and government investment. They found that all determinants have a positive impact on budget deficit except foreign debt has a negative impact.

Anayochukwu (2012) investigated the causal relationship between inflation and fiscal deficits in Nigeria, through the the period 1970-2009. He used is the autoregressive distributed lag (ARDL) model and the Granger-causality test. The result of the Granger-causality test shows that the fiscal deficit causes inflation. The results from the ARDL test confirm a significant negative relationship between growth in fiscal deficit (% of GDP) and inflation. He recommended that policies targeted at inflationary control in Nigeria could best be achieved if they are aimed at fiscal deficits reduction. In addition, the government should support growth in the real sectors of the economy.

Abd Rahman (2012) investigated the relationship between budget deficit and economic growth in Malaysia's, by using quarterly data from 2000 to 2011, Four variables were used, real GDP, government's debt, productive expenditures and non-productive expenditures. He used ARDL approach to analyze the long-run relationship between variables since it can cater for small sample size. He found that there is no long-run relationship between budget deficit and economic growth of Malaysia. while, productive expenditure has positive long-run relationship with the economic growth.

Fatima, Ahmad and Rehman (2012) investigated the effect of budget deficit on economic growth of Pakistan for the period 1978-2009. multiple linear regression is conducted to ascertain the impact of budget deficit on the economic growth of Pakistan, They found that there is a negative impact of budget deficit on the economic growth. They suggested for the government to avoid certain levels of the budget deficit to achieve desired level of growth.

Srivayal and Venkata (2004) examined the relationship between budget deficit and macroeconomic variables represented by exchange rate, GDP, consumer price index and money supply in India through the period 1970-2002. They used Granger Causality test, Cointegration test, and VECM . They found a long relationship between study variables and there is a bidirectional causality between budget deficit and exchange rates and they found that GDP Granger causes budget deficit where as budget deficit does not.

The previous studies used different techniques to examine the relationship between budget deficit and economic growth and foreign public debt and other macroeconomic variables. The present study is an extend to the previous studies, to examine the impact of economic growth (LNGDP) and external debt (LNEXDEB) on budget deficit in Jordan. the current study contributed in the literature through introducing a proof on the determinants of budget deficit from Jordan as a developing country. The study used ARDL long run and cointegration approach and stability test, to examine the relationship between budget deficit and its determinants.

Data and Methodology The Data

The current study used annually time series data for the period (1993-2017) and collected from the Central Bank of Jordan database for the study variables Budget deficit (BD), economic growth (GDP) and external debt (PFD).

Methodology

The empirical previous studies used different statistical techniques such as cointegration test, granger causality test, multiple linear regression, vector error correction model (VECM) and autoregressive distributive lag ARDL approach to examine the relationship between budget deficit and other macroeconomic variables.

Cointegration is concerned with the analysis of long run relations between integrated variables and re-establishing the relationship between the considered variables into an Error Correction Model (ECM). Cointegration approaches of Granger (1981) and, Engle and Granger (1987) Johansen (1988, 1991) and Johansen and Juselius (1990) can be used only if the variables have same integration degree such as I(0) or I(1) or I(2). Autoregressive Distributed Lag (ARDL) approach was established by Pesaran and Pesaran (1997), and Pesaran and Shin (1995, 1998), later on it was further organized by Pesaran, Shin and Smith (2001) can be applied if all the time series are stationary at level I(0) or if all the time series are stationary at level I(1) and if they are a combination of I(0) and I(1) but it can't be used if one of the time series is stationary at I(2). (Pesaran and Shin, 1999, and Pesaran et al. 2001). The result gives the short-run dynamics and long run relationship of the considered variables. (Ahmad , Ahmad , Mushtaq and Nadeem, 2016; Nkoro and Kelvin Uko, 2016).

The study used ARDL approach in order to examine the relationship between economic growth, external debt and budget deficit, in Jordan for the period 1993-2017. The current study methodology based on the methodology of Rahman (2012) and Anayochukwu (2012) that employed Autoregressive Distributive Lag (ARDL) approach.

Research question ,the current study aims to answer the following question: How do economic growth and external debt affect the budget deficit of Jordan?

The Model Specification

The model includes budget deficit (BD), economic growth measured by gross domestic product (GDP) and external debt (EXDEB) which can be written in a semi-natural logarithm form because budget deficit has negative values:

$$BD = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln EXDEB_t + U_t \quad (1)$$

where BD is budget deficit the dependent variable, the independent variables are, LNGDP is natural logarithm of gross domestic product, LNXDEB is natural logarithm of external debt, U is the error term, β_0 is the constant, β_1 , β_2 , are parameters (elasticity's), t is the time.

The ARDL model takes the following :

The study unrestricted Autoregressive Distributed Lag (ARDL) is formulated as follows:

$$\Delta BD_t = \beta_0 + \sum_{i=0}^n \beta_1 \Delta \ln GDP_{t-i} + \sum_{i=0}^n \beta_2 \Delta \ln EXDEB_{t-i} + \beta_3 BD_{t-1} + \beta_4 \ln GDP_t - 1 + \beta_5 \ln EXDEB_{t-1} + U_t$$

. Where Δ denotes the first difference, BD, budget deficit, β_0 is the constant, LNGD , Natural logarithm of GDP , LNXDEN, natural logarithm of external debt, U is the error term,

t is the time, the expressions with the summation sign (β_1, β_2, \dots) represents short run dynamics of the model. The expressions ($\beta_3, \beta_4, \beta_5$) represents the long run relationship.

Study Variables

Dependent Variable

Budget Deficit: Budget deficit as a percentage of GDP . It means that government expenditures exceed its revenues (public saving is negative) .

Independent Variables:

Economic growth : an increase in the level of production over time. measured by Gross Domestic Product of Jordan.

External Debt: the stock of the government borrowed money externally in order to finance budget deficit.

Study Hypotheses

The study examines the following alternative hypotheses:

H1: There is a significant relationship between economic growth and budget deficit in Jordan.

H2: There is a significant relationship between public foreign debt and budget deficit in Jordan.

Empirical Results Unit Root Test/ stationary

Autoregressive Distributed Lag (ARDL) can be applied if all the time series are stationary at level

$I(0)$ or if all the time series are stationary at level $I(1)$ and if they are a combination of $I(0)$ and $I(1)$ but it can't be used if one of the time series is stationary at $I(2)$. so to verify that we use The Augmented Dickey Fuller test (ADF) to test the stability for the time series of the study variables budget deficit (BD), economic growth (GDP) and external debt (PFD). From Table (1) the results of Augmented Dickey Fuller (ADF) unit root test, when we test for unit root test at level and (non trend, trend and intercept) that external debt (LEXDEBT) is stationary at level while budget deficit and economic growth are stationary at first difference. in the light of the unit root test results which shows all time series are stationary at $I(0)$ and $I(1)$. we can apply ARDL to examine the relationship between variables.

Table 1

Augmented Dickey Fuller (ADF) Unit Root Test

Variable	Calculated ADF Statistics	5% ADF Critical Value	Probability	Order of Integration	Stationary/ Not Stationary
BD	-0.23508	-1.9572	0.52	I(0)	Not stationary
LNGDP	-0.871868	-1.9572	0.8906	I(1)	Not stationary
LNEXDEBT	-3.63445	-1.95641	0.0009	I(0)	Stationary
BD	-4.17967	-1.967974	0.0002	I(1)	Stationary
LNGDP	-8.9925	-1.9572	0.0000	I(0)	Stationary

Results and Discussion

To use the ARDL approach, first it is necessary to test the existence of a long-run relationship between the study variables and to verify it we compare the F-statistics of the unrestricted ARDL results with the upper critical value of bound (Pesaran) test. Second if the long run relationship between the study variables is proven, the coefficients of the long-run relationship are estimated. The coefficients of this relationship are estimated by ARDL method. after that the restricted or error correction model (cointegration) estimated (Anayochukwu, 2012).

ARDL Bound Test

The hypothesis of the bound test is:

Ho: No long run relationship exist between variables.

H1: There is a long run relationship exist between variables.

To examine the existence of long-run relationship between the study variables. to verify that we compare the F-statistics of the unrestricted ARDL (as shown in table 2) with the critical value of upper bound test. from table (2) the F-Statistics value (9.285323) is greater than the upper bound (Pesaran) value (3.1) at 5% we can reject the null hypothesis that states no long run relationship exist between variables and accept the alternative hypothesis that states there is a long run relationship exist between variables. so this result proven that the variables have a long run relationship.

Table 2

ARDL Bounds Test results

Null Hypothesis: No long-run relationships exist		
TestStatistic Value	K	
F-statistic	9.285323	2
Critical Value Bounds		
Significance	I0 Bound	I1Bound
10%	2.63	3.35
5%	3.1	3.87
2.50%	3.55	4.38
1%	4.13	5

ARDL Long Run Coefficients Results

Once the ARDL bound test proven that the time series have long-run relationship, the coefficients of the long-run relationship are estimated by using maximum lag of 4. The Akiak Information Criteria (AIC) had selected a model of ARDL (0,0,0) specification. The estimated longrun coefficients are as follows:

Table 3

ARDL Long Run Coefficients

Variable	Coefficient	Std.Error	tStatistic	Prob.
LNGDP	-0.00819	0.003824	-2.14277	0.0501
LNEXDEB	0.045573	0.01539	2.961307	0.0129
C	-0.3905	0.132297	-2.95172	0.0132

from table (3) It is observed that in the long run, economic growth has a negative significant impact on budget deficit of Jordan at 5 percent level with coefficient value of (-0.00819) this means a 1 percent increase in economic growth will decrease budget deficit by (-0.00189) percent this is due to that economic growth leads to an increase in tax revenues and a decrease in government spending on social programs and this leading to a decrease in the budget deficit. In cases of economic contraction, this leads to lower tax revenues while increasing government spending on social programs, as well as increased government intervention in the economy to stimulate the economy and take off which leads an increase in budget deficit(Saima and Kamal Uddin , 2017 and Fatima, Ahmad and Rehman 2012), The results differ with the results of Abd Rahman,(2012) who found no relationship while Murwirapachance, Mared and Chong (2013) found a positive relationship. This result is

consistent with the view of the Keynesian economics which sees a positive relationship between budget deficit and economic growth (Briotti, 2005).

This difference can be attributed to different factors such as the time dimension, the types of countries, the method of analysis and the degree of budget deficit (Rehman, 2012).

External debt has a positive significant impact on budget deficit at 5 percent level since the coefficient is (0.045573) and its probability is (0.0129). This means 1 percent increase in external debt will decrease budget deficit by (0.045573) percent holding other variables constant. This result is consistent with the result of Murwirapachance, Mared and Chong (2013) and differs with results of Alam and MD. Taib (2013).

ARDL Short Run and Cointegration (Error correction) Results:

The estimates of the error correction model based on the associated long-run estimates. The maximum lag length is automatically selected by the method based on Akaike Information Criterion (AIC). According to AIC information criteria we found ARDL(3,0,4) as the best equation.

The coefficient of the Cointegration equation (CointEq1) which is called the error correction term ECM(-1) or the speed of adjustment toward equilibrium. From Table (4) we can see that the sign of the coefficient of the cointegration equation (CointEq1) is negative and significant, since its probability is (0.0000) which is less than 5% percent. Therefore, there is a long run causality running from economic growth (LNGDP) and external debt (LNEXDEB) to budget deficit (BD). The estimated coefficient of the cointegration equation CointEq(-1) is (-1.60437) (prob value = 0.000) indicates that the speed of adjustment from short-run disequilibrium toward long-run equilibrium level, particularly 1.60437 percent of short-run errors will be corrected in the long run.

From table (4) in the short run budget deficit (lag 1 and 2) have a positive and significant impact on budget deficit. While GDP has not a significant impact on budget deficit this is due to the fact that economic growth in Jordan did not grow at rates sufficient to affect the budget deficit. But public external debt (lags 2, 3) have a negative and significant impact on budget deficit. This is due to the increase in the cumulative deficit sends signals to the government to use a contractionary fiscal policy, which leads to reduce the budget deficit.

Table (4)

ARDL Co integrating and short run results

Dependent Variable: BD

Selected Model:

ARDL(3, 0, 4) Cointegrating Form

Variable	Coefficient	Std.Error	tStatistic	Prob.
D(BD(-1))	0.55263	0.174976	3.158327	0.0091
D(BD(-2))	0.312461	0.135972	2.29797	0.0422
D(LNGDP)	-0.00731	0.028363	-0.25782	0.8013
D(LNEXDEB)	-0.03833	0.023146	-1.6559	0.126
D(LNEXDEB(-1))	-0.03892	0.02513	-1.5489	0.1497
D(LNEXDEB(-2))	-0.07854	0.022936	-3.42411	0.0057
D(LNEXDEB(-3))	0.0411	-0.055461	0.023983	2.312521
CointEq(-1)	0	-1.60437	0.244043	-6.57414
Cointeq = BD - (-0.0082*LNGDP + 0.0456*LNEXDEB 0.3905)				

Unrestricted Autoregressive Distributed Lag (ARDL) Estimation Results.

The maximum lag length is automatically selected by the method based on Akaike Information Criterion (AIC). According to AIC information criterions we found ARDL(3,0,4) as the best model. from table (5) external debt (lag three) the only variable that is significant in explaining the relationship of the budget deficit at five percent confidence level. R-square value is (0.74) and adjusted R square value is (0.52) shows that (0.52) changes in budget deficit is I expressed jointly by the independent variables and this indicates that the model is fit. The F-Statistic value is (3.492024) and its probability (0.027399) indicates that the explanatory variables are jointly significant and are capable of explaining changes budget deficit of Jordan through the period 1993-2017.

Table 5

unrestricted ARDL results Dependent Variable: BD

Maximum dependent lags: 4 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (4 lags, automatic): LNGDP LNEXDEB

Selected Model: ARDL(3, 0, 4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
BD(-1)	-0.191084	0.05289	-0.27677	0.7871
		<u>0.173472</u>		
		<u>0.157847</u>	-1.95543	
BD(-2)	-0.006941	0.23857	-1.35997	0.1964
		<u>0.028362</u>		
		<u>0.038724</u>		
BD(-3)	-0.036798	0.30866	-1.08603	0.0764
		<u>0.039434</u>		
		<u>0.034688</u>	-1.60652	
		0.23368		
LNGDP	-0.01311			0.0855
LNEXDEB	-0.03857			0.2011
LNEXDEB(-1)	0.073387			0.0846
LNEXDEB(-2)	-0.03996			0.3007
LNEXDEB(-3)	0.133798			0.006
LNEXDEB(-4)	-0.05573			0.1365
			<u>-1.37526</u>	
			<u>-1.88919</u>	
C	-0.62485			0.0216
			<u>1.895148</u>	
			<u>3.392923</u>	
			-2.67395	
			<u>ndentvar</u>	-
R-squared	0.740739	<u>Meandep</u>		0.0785
		S.D. dependent var		6
Adjusted squared	0.528616			0.0198
				15

Akaike infocriterion		-
S.E. of regression	0.013605	5.45106
Sumsquared resid	0.002036	4.95367
<u>HannanQuinn</u> criter.		5.34311
F-statistic	3.492024	
Prob(F-statistic)	0.027399	

Residual Diagnostics for unrestricted ARDL

From the following diagnostic tests in tables (6,7,8) , Breusch-Godfrey Serial Correlation LM Test, Heteroskedasticity Test: Breusch-Pagan-Godfrey and Jarque-Bera that the model passes three tests normality, autocorrelation and heteroskedasticity, since their probabilities values are more than 5%.

Table 6

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.010404	Prob. F(1,5)	0.9227
Obs*Rquared	0.039453	Prob. Chi Square(1)	0.8426

Table 7

Heteroskedasticity Test: Breusch-PaganGodfrey

F-statistic	0.185957	Prob. F(12,6)	0.9934
Obs*Rquared	5.150736	Prob. Chi-Square(12)	0.9528
Scaled explained SS	0.88628	Prob. Chi-Square(12)	1

Table 8

Normality Test

JarqueBera	5.711594
Probability	0.057510

CUSUM Stability Test for the Unrestricted ARDL

This study used the CUSUM stability test (Cumulative Sum of recursive residuals) which was developed by Brown et al. (1975). If the plot of CUSUM statistic stays within 5% significance level, then the estimated model is said to be stable (Dritsakis, 2011). Figure (1) shows the results of the (CUSUM) Cumulative Sum of Recursive Residuals for Unrestricted ARDL. From Figure (1) the plot of CUSUM statistics stays within 5% significant level this means that the budget deficit (BD) estimated model is stable.

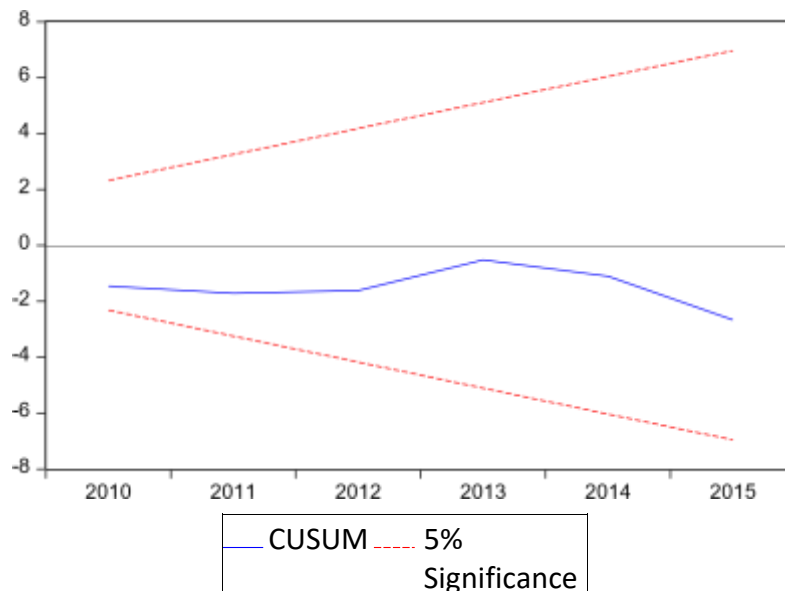


Figure (1) CUSUM Cumulative Sum of Recursive Residuals for Unrestricted ARDL

Conclusions

This study examined the impact of economic growth and external debt on budget deficit in Jordan. By using annually time series data for the period (1993-2017) The study used unit root test, Autoregressive Distributive Lag (ARDL) Approach and ARDL Bound test, cointegration to examine the study hypotheses. In addition, Cumulative Sum (CUSUM) of recursive residuals is used to confirm the stability of the estimated model. The study find the following.

1- ARDL

bound test proven that there is a long run relationship between economic growth, external debt and budget deficit.

2- The error correction (cointegration) of ARDL shows that there is a long run relationship between economic growth, external debt and budget deficit which means there is a causality running from economic growth and external debt to budget deficit.

3- The ARDL long run coefficients show that economic growth has negative significant impact on budget deficit this is due to that the economic growth increases tax revenues and decrease government spending on social programs then decreasing budget deficit.

4. The ARDL long run coefficients show that external debt has a positive significant impact on budget deficit this attributes to that foreign borrowing is usually preferred when the state needs large investments to meet the needs of economic growth as well as the need for foreign

currency to settle the balance of payments deficit or to strengthen foreign exchange reserves. External debt increases during periods of recession as a result of increased need for state intervention in the economy to contribute effectively revitalizing the national economy, Which increases the budget deficit. If public debt is not stabilized at less than 60% of gross domestic product, the level of public debt considered to be a dangerous , it will also increase external debt and increase debt services. This would eliminate the benefits of the initial economic growth of debt-financed deficit. This may be greater than the initial benefits and this may drag the economy into recession again but with more danger serious effects, leading to lower public revenues and thus increase the deficit in the public budget(Osinubi and Olaleru , 2006).

5- The ARDL short run coefficients show that economic growth has not a significant impact on budget deficit this is due to the fact that economic growth in Jordan did not grow at sufficient rates to affect the budget deficit in Jordan in the short term. While the results of statistical analysis showed that the (lags 2, 3) of external debt had a negative impact on the budget deficit and this may be due to the fact that the accumulation of the former public debt may give signals to the government to reduce the deficit in the public budget. policy implications, the study concluded that economic growth has a negative effect on the budget deficit. Therefore, in order to reduce the deficit in the public budget, the study recommends the policy makers to adopt economic programs and financial policies that ensure the Jordanian economy achieve sufficient growth rates in which the state can increase its revenues and thus reducing the budget deficit. The study also found that the external debt has a positive impact on the budget deficit. Therefore, the government should work continuously to adopt budgets that depend mainly on government revenues as much as possible and reduce dependence on external debt to finance its budget deficit, especially if these loans are of high interest In the near future, the state does not have the ability to repay this debt, and this debt is used to generate income-generating investment to reduce the deficit in the public budget and harsh conditions, the state does not have the capacity to repay this debt in the near future, and the state should use this debt in income-generating investment projects to reduce the deficit in the public budget.

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