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The Impact of Government Expenditure on Economic Growth in Libya During the Pried 1975-2019

(An Econometric Study using Adhoc and Almon models)

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أثر الإنفاق الحكومي على النمو الاقتصادي في ليبيا خلال الفترة (1975-2019)

ا ل

في هذه الدراسة تم تحليل العلاقة بين النمو الاقتصادي والإنفاق الحكومي للفترة 1994-2014 باستخدام نموذج ادهوك ، نموذج آلمون وهى أحد النماذج التأخر الموزعة. نظرًا لوجود ارتباط كبير جدًا بين الإنفاق الحكومي ، فقد تم فحص تأثيرات النمو الاقتصادي والإنفاق الحكومي باستخدام نماذج نموذج ادهوك ، نموذج آلمون في هذا التحليل للنماذج ، تم تحديد القيمة المتأخرة على أنها 2 وفقًا لمعايير بايزي باستخدام طول التأخير هذا. تم إجراء تحليل الانحدار من خلال إنشاء نموذج التأخر الموزع للإنفاق الحكومي والنمو الاقتصادي في الفترة المدروسة ، ووفقًا للنموذج ادهوك ، فإن الإنفاق الحكومي الحالي والتغيرات في القيم المتأخرة للسنة الأولى من الإنفاق الحكومي كان لها تأثير. تأثير إيجابي على النمو الاقتصادي في العام الحالي ، وتأثير سلبي في العام الثاني السابق. كما أظهرت نتائج نموذج آلمون أن الإنفاق الحكومي أثر سلباً وإيجابياً على النمو الاقتصادي في العامين الماضيين. تم العثور على علاقة إيجابية بين النمو الاقتصادي والإنفاق الحكومي في العام الحالي وعلاقة سلبية في الفترات السابقة t-1 و t-2. زيادة في النمو الاقتصادي بنسبة .74 في المائة استجابة لزيادة الإنفاق الحكومي في وحدة واحدة في العام الحالي ، وانخفاض بنسبة 52 في المائة في النمو الاقتصادي مقابل تغيير وحدة واحدة في الإنفاق الحكومي قبل عام واحد ، وانخفاض تغيير وحدة واحدة قبل عامين في الإنفاق الحكومي أدى إلى انخفاض بنسبة 2.06٪ في النمو الاقتصادي. ويستمر التأثير السلبي بالزيادة وإلى أن يصبح التأثير مساوياً للصفر بزيادة تأثير الإنفاق الحكومي في الفترات السابقة بعد سنتين .

الكلمات الدالة: النمو الاقتصادي، الإنفاق الحكومي، النماذج الديناميكية، نموذج ادهوك، نموذج آلمون.

The Impact of Government Expenditure on Economic Growth In (2019-1975) Libya During The Pried

(An Econometric Study using Adhoc and Almon models)

Abstract

In this study, the relationship between the economic growth, government expenditure for the period 1975-2019 was analyzed using the Adhoc and Almon model, one of the distributed models. Since there is a very high correlation between government expenditure and economic growth, the government expenditure -economic growth effects have been examined using Adhoc and Almon models. In the analysis of the models, the lagged value was determined as 2 according to the AIC criteria. Using this lag length, regression analysis was performed by creating a distributed lag model for the government expenditure and economic growth in the period examined. According to Adhoc model, current government expenditure and changes in the lagged values past 1 year of government expenditure had a positive effect on economic growth in the current year, and negative effect in the second year, Also according to the results of the Almon model that government expenditure affected negatively and positive on economic growth by the in the past 2 years. a positive relationship was found between the economic growth and government expenditure in the current year and a negative relationship in t-1 to t-2. Increase in economic growth by.74 percent response to increase in government expenditure in one unit current year,.52 percent decrease in economic growth against one unit change in government expenditure 1 year ago, and a decrease of in one unit change 2 year ago in the government expenditure resulted to a decrease of 2.06 percent in the economic growth. And The negative effect lasts increase and to zero by increase the effect of government expenditure in previous periods after 2 years.

Keywords: economic growth, government expenditure, Dynamic Models, Adhoc Model, Almon Model

1. Introduction

The Libyan economic experienced ups and downs in terms of its public spending inflows and its GDP in different administrations and policies that directly and indirectly affected on some macroeconomic variables.as GDP, which takes time. Thus, the Libyan government could take advantage of the opportunities derived from the effect in public spending during the Previous periods on growth GDP. However, the lag effects of public spending may be greater than the contributions of the current period, which may indicate that the opportunities generated have not been fully referenced in previous studies on the relationship between public spending and GDP growth in Previous periods and Current period in economics of Libyan. However, there are a number of studies that examined the relationship between public spending and economic growth One of the most important studies . study of Wagner (1958) about the 'demand following response' hypothesis, whereas Keynes (1936) advocated the 'supply leading response' hypothesis. Other two hypotheses are contemporaneous relationship, and neutrality or independence between government expenditure and economic growth, Landau, D. (1983) report a positive relationship between government expenditure of below 8 percent per annum and economic growth. Olabisi, A. S., & Oloni, E. F. (2012) claims that there is no string proof of any reliable relationship between growth and Government expenditure rate. Blackburn, K., & Pelloni, A. (2004) uncovers the adverse relationship between growth and government expenditure Sinha, D. (1998) claims that there is no string proof of any reliable relationship between growth and government expenditure rate, Arin, K. P., Braunfels, E., & Doppelhofer, G. (2015). Okoye, L. U., Omankhanlen, A. E., Okoh, J. I., Urhie, E., & Ahmed, A. (2019), and so on . No study has yet been carried out with the Almon and Ad hoc models on the relationship between public spending and economic growth, given the time lag between public spending and GDP. Therefore, we can consider The relationship between public spending and economic spending a lagging distributed model and will be analyzed with Those models. to assess and forecast the effects of changes in public spending on Libya's economic growth. . To find out is the influence in the change is temporary or permanent between GDP and public spending. for example, a sudden increase / decrease in public spending. If these public expenditures are not known to be permanent, they may not directly increase or decrease your GDP. However, if this increase or decrease in public spending turns out to be permanent, it could increase or decrease GDP in later periods, especially with not political stability in the country . Therefore, it is necessary to use those models in such kind of studies Gujarati, D. N., & Porter, D. C. (1999). So this study aims to highlight the concern that the government and decision-making bodies should base their decisions on econometric models and studies to better understand the long-term implications of the different policies they develop. Additionally, it can further improve the way we track improvements to a given policy and know when to expect its full implementation through dynamic model regression.

To achieve the objectives of the study, we will try to the answer some of the most important questions, does the growth of GDP in aggregate level do not responsiveness to the injections which come from Government expenditure? how Government expenditure effect directly and indirectly on the economic growth? does the economic growth of Libya at current time is favorably affected by current times government expenditure , and previous time government expenditure ? Is the Libya's Government expenditure has mixed impacts on economic growth or no?

The paper was organized as follows ; Section I provides general introduction ; Section II an analytical framework and a review of literature on government expenditure and

economic growth ; section III explains modeling, methodology, and data ; section IV presents the empirical results and discussion of study, and finally section V provides Conclusions and recommendation.

2. Literature Review

Dynamic models are simplified representations of some entity in the real world, in equations or computer code. Its objective is to imitate some essential characteristics of the study system, leaving aside the non-essential ones. Models are called dynamic because they describe how system properties change over time. , it describe the time trajectory of the variables in relation to their past values. Distributed lag models are widely used in econometric analysis Wooldridge, J. M. (2015). and in this study we closely examine such models and how lagged models are used in empirical econometrics on the Libyan economy.

A number of studies regarding the relationship between gdp and government expenditure are available in the economic literature. Some of the studies have shown that there is a significant role of Government expenditure to economic growth; whereas some studies have concluded that Government expenditure has the positive impact on the economic growth . also some of studies have the adverse impact on the economic growth, and some studies have shown that there is no any relationship between Government expenditure and economic growth. This section includes findings and conclusions of some of the key studies regarding the empirical study of Government expenditure and economic growth of different countries in the world.

The study of Fayad, M. K. (2000). aimed is to investigate the impact of government expenditure on the growth of the output of the non-oil sector GDPN in Libya.The Johanssen methodology was adopted for the co-integration of long-term behavior and error-correcting models for short-term behavior. The study aimed to investigate the impact of government spending on the growth of GDP for the non-oil sector. It is found that total public sector spending has a significant impact on GDP. A change of 1 percent would increase GDP by more than 0.65 percent.

The paper of Fouda, B. B. (2010). studies the intertemporal effects of various economic variables on the cameroonian growth. Using a Geometric Lag Model, he find out that 50% of the total effect of variables used is accomplished in less than half of a year. When we employ a Polynomial Distributed Lag, we nd out that even if investment has a positive impact on growth in the current year, but in the presence of government expenditures, this effect becomes negative after one year due probably to the eviction effect. In addition, he found out that the consumption causes economic growth after three years whereas economic growth causes the consumption after only one year.

In the study of Mazorodze, B. T. (2018), on Zimbabwe's economic update in 2017 applyed the ARDL, DOLS, FMOLS and CCR techniques for the period of 1979 – 2017,he found a significantly positive causal effect between both expenditure components on long term economic growth in Zimbabwe. Investment expenditure has a larger effect (0.1 – 0.8%) in comparison to consumption expenditure (0.02% – 0.03%).

Study of Chen, H., Singh, B., & Aru, W. S. (2020). examined the impact of government expenditure on economic growth in Vanuatu for the period 1981 to 2016. he found government expenditure negatively influences long-run economic growth when financed by tax revenues, but positively influences long-run economic growth when financed by other sources such as non-tax revenues and budget surplus/deficit. We further noted that

amongst expenditure compositions, expenditure on education, health, wages & salaries, agriculture, and interest payments individually has larger effects on the long-run economic growth.

The study of Barlas, A. W. (2020). evaluates the impact of expenditure compositions on economic growth in Afghanistan. The data was collected from the World Bank and Ministry of Finance using a period of 2004 to 2019. The gross domestic product was stated as dependent variable and public expenditure compositions were included as independent variables. The adjusted Keynesian function was applied to estimate the impact of government expenditure on economic growth, using, Autoregressive Distribution Lag (ARDL) model was applied. findings expose that there is a long-run relationship between government expenditure and economic growth. Furthermore, the previous and current expenditures on are positively correlated with economic growth in Afghanistan.

3. Methodology

3. 1 The data

In the study we will use time series techniques, because they are the techniques that are more appropriate to what the research aims to achieve in terms to answer of each question of the study questions the data used for this study is based on data by dollars covering the period from 1970 to 2019. The two economic variables included in this study are government expenditure and real Gross domestic product(GDP) a measure of growth economic. The data was obtained from the Central Bank of Libya and some statistics global sources , both series are converted to a record format, changing the register can reduce the problem of heterogeneity because it puts pressure on the scale on which variables are measured, reducing the decimal difference between two values to a two-level difference Gujarati, DN (2009). The time series in this study parse the variables as follows:

1- LNGDPt = Economic Growth.

2- LNEPNTUt = Government Expenditure

The prefix "LN" refers to the natural logarithm of the time series in question, and "D" refers to the relevant time difference. All economic estimates were made in this document using observations. Eviews wearing soft Stata, we will apply the econometric methodology, and distributed lag model using Adhoc and Alnon Models . in the present study, we will estimated all economic variables in this document using. Eviews -10 and Stata -16 software.

Granted that distributed lag models play a very useful role in economics, how can such models be estimated Specifically? so we should study ,the following.

3.2 General Distributed Lag Models

Distributed shift models occupy an important place in the economic literature. In regression models that use serial data, if the independent variable includes not only the current value but also the historical values, it is called a lagged distributed model Gujarati, (1999). Because economic life is dynamic, and not static, for example, the current consumption expenditure function not only depends on current income but also on the amount of savings from previous years Alt, F. L. (1942). These models can be expressed in two ways as infinite and finite lagged distributed models (Gujarati, 1999). The distributed model with infinite delay is expressed as follows.

Distributed-lag model is a dynamic model in which the effect of a regress x on y occurs over time rather than all at once. In the simple case of one explanatory variable and a linear relationship, suppose we have the following :

$Yt = \alpha + \beta_0 Xt + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \ldots + u_t$ …….(1)

Where we have not defined the duration of the delay, that is, how far back in the past we want to go. Such a model is called an infinite model

(lag), while a model of the type 1 is called a finite model (lag) of distributed lag because the length of lag k is specified. We will use finite model type 1 because it is easy to handle mathematically, so. How do we estimate the A distributed-lag model? We can take two approaches, they are Ad hoc model and Almon model.

3.2 Selection of optimum lag length

In order to create the Ad hoc and Almon models,the lagged value of the variables should be known . Which we will use it , so t he selection of optimum lag length of variables is inevitable before running the OLS regression. We will use There are various approaches for selecting appropriate lag length, from the most important of these criterions Schwartz (1978), Akaike Information, and Hannan and Quinn Information Criterion....and so on)

3. 3 Ad hoc model

The explanatory variable Xt in Ad hoc model assumed to be non-stochastic (or at least uncorrelated with the disturbance term ut) Xt-1, X_{t-2}, and so on, are non-stochastic, too. Therefore, in principle, the ordinary least squares (OLS) can be applied to:

$Y_t = \alpha + \beta_0 X^t + \beta 1 X_{t-1} + \beta 2 X_{t-2} + \ldots\ldots\ldots + \beta i X_{t-k} \ldots\ldots$ …….(2)

This is the approach taken by.Alt, F.F, (1942) and Grether, D. M., & Maddala, G. S. (1972) They suggest that to estimate Ad Hoc of Distributed Lag Models This sequential procedure stops when the regression coefficients of the lagged variables begin to be statistically insignificant and / or the coefficient of at least one of the variables changes sign from positive to negative or vice versa. Following this precept, we will first return Yt in Xt, then we will return Yt in Xt and X_{t-1}, then we will return Y_t in X_t, Xt-1 and Xt-2, and so on, as in equations:

(3) to (8) :

$Y = \alpha + \beta 0 Xt + \beta 1 Xt$ ……(3)

$Y = \alpha + \beta 0 Xt + \beta 1 Xt\text{-}1$ ……(4)

$Y = \alpha + \beta_0 Xt + ù1\ Xt\text{-}1 + ù2\ Xt\text{-}2$ ……(6)

$Y = \alpha + \beta_0 X_t + \beta_1 X_{t-1} + \beta 2\ X_{t-2} + \beta 3\ X_{t-3}$ ……..……...(7)

$Y = \alpha + \beta_0 X_t + \beta 1\ X_{t-1} + \beta 2\ X_{t-2} + \beta 3\ X_{t-3} + \ldots + \beta i$ x t-k ……(8)

This sequential procedure stops when the regression coefficients of the lagged variables begin to be statistically insignificant and / or the coefficient of at least one of the variables changes sign, which deviates from our expectation.

From advantages of the Adhoc Model, Significant t_ statistics for each coefficient, the sign of βi does not change, major R^2 and $R^{2\,/,}$ min. BIC and / or AIC values, there are disadvantages of the ad hoc model, the most important being that there is no a priori

guideline on what is the maximum duration of the delay. If many lags are included, there is less degree of freedom, and this makes the inference statistic somewhat unstable. we need data long enough to build the distributed delay model.

3.4 Almon model

Almon, Ad hc and Koyck models are the main models used in prediction of distributed lag models. When the Almon model is compared with the Koyck model, the parameters of the Koyck model show a decreasing trend and this situation can be quite limiting for the model. In the Almon model, βs may first increase and then decrease or first decrease and then increase. Based on a theorem known as the Weierstrass Theorem in mathematics De Branges, L. (1959). Almon developed that the values of in the model can be written as a function of the lag length, and can be approximated with a certain degree of polynomial Almon, S. (1965), as following :

$$Y_t = \alpha_0+\beta_0 X_t +\beta_1 X_{t-1} +\beta_2 X_{t-2} + \ldots\ldots+\beta_k X_{t-k} + \varepsilon_t \ldots\ldots(9)$$

finite delay distributed model expressed as

$$Y_t = \alpha_0 + \sum_{i=0}^{k} \beta_i X_{t-i} + \varepsilon_t \ldots\ldots(10)$$

Can be written as Amemiya, (1985). Multinomial lag model

$$\beta_i = a_0 + a_1^i + a_2^{i^2} + \cdots + a_m^{i^m} \ldots\ldots(11)$$

Is the polynomial formula.

Given that Almun's model is a quadratic polynomial, if equation (11) is recompense in equation (10).(

$$Y_t = \alpha_0 + a_0 \sum_{i=0}^{k} X_{t-i} + a_1 \sum_{i=0}^{k} iX_{t-i} + a_2 \sum_{i=0}^{k} i^2 X_{t-i} + \varepsilon_t \ldots\ldots(12)$$

Or

$$Y_t = \alpha_0 + \sum_{i=0}^{k} (a_0 + a_1^i + a_2^{i^2}) X_{t-i} + \varepsilon_t \ldots\ldots(13)$$

Obtained. Here

$$Z_{0t} = \sum_{i=0}^{k} X_{t-i} \quad ,Z_{1t} = \sum_{i=0}^{k} iX_{t-i} \ , \ Z_{2t} = \sum_{i=0}^{k} i^2 X_{t-i}$$

In shortcuts

$$Y_t = \alpha_0 + a_0 Z_{0t} + a_1 Z_{1t} + a_2 Z_{2t} + \varepsilon_t \ldots\ldots(14)$$

The equation is reached. Of the Almon model the length of the delay (k) to apply and the degree (m) of the polynomial must be determined (Gujarati, 2001). In short, when the polynomial degree is m = 2 and the lag number is k = 4, Z's are the same as in equations (15), (16) and (17).

$$Z_{0t} = \sum_{i=0}^{4} X_{t-i} = X_t +X_{t-1} +X_{t-2} +X_{t-3} +X_{t-4} \ldots\ldots (15).$$

$$Z_{1t} = \sum_{i=0}^{4} iX_{t-i} = X_{t-1} +2X_{t-2} +3X_{t-3} +4X_{t-4} \ldots\ldots(16)$$

$$Z_{2t} = \sum_{i=0}^{4} i^2 X_{t-i} = X_{t-1} +4X_{t-2} +9X_{t-3} +16X_{t-4} \ldots\ldots(17)$$

When the transformation is made from these models to the main model, the equation given in equation 15 is obtained. After the conversion to equation 15, in the second order

multi-term delay scheme, integers are given as much as the number of lags and when the model is estimated. we will coefficients a_0, a_1 and a_2 are found.

When the found a coefficients are placed in their places, "β" coefficients are reached. The values of the coefficients in terms of a are found as in Equation (18) - (23).

$\beta 0 = a0$ ……..……..…(18)

$\beta 1 = a0 + a1 + a2 + a3 + a4$ ……..……..(19)

$\beta 2 = a0 + 2a1 + 4a2 + 8a3 + 16a4$ ……..…….(20)

$\beta 3 = a0 + 3a1 + 9a2 + 27a3 + 81a4$……..……(21)

$\beta 4 = a0 + 4a1 + 16a2 + 64a3 + 256a4$……..……..….(22)

According to these values obtained, Almon Model can be written as in equation (23).

$Y_t = a_0 + \beta_0 X_t + \beta 1 X_{t-1} + \beta_2 X_{t-2} + \beta_3 X_{t-3} + \beta_4 X_{t-4} + e_t$……..……(23)

4- Empirical Results and Discussion

When government expenditure and economic growth is examined, it does not exhibit a continuous increase or decrease, producing a fluctuations being in both government expenditure and economic ascending and descending as in Figures 1 and 2 government expenditure and economic growth have increased continuously over time until 2019. It showed an increasing and decreasing situation from 1975 to 2019. The government expenditure and economic growth reached its highest value in 2019.all the variables are expressed in logarithm, to be used in the Dynamic Model approach which covers 45 observations.

Figure :1. Variation of Economic Growth , Government Expenditure and the Intervention Rate of The Libya : 1975-2019

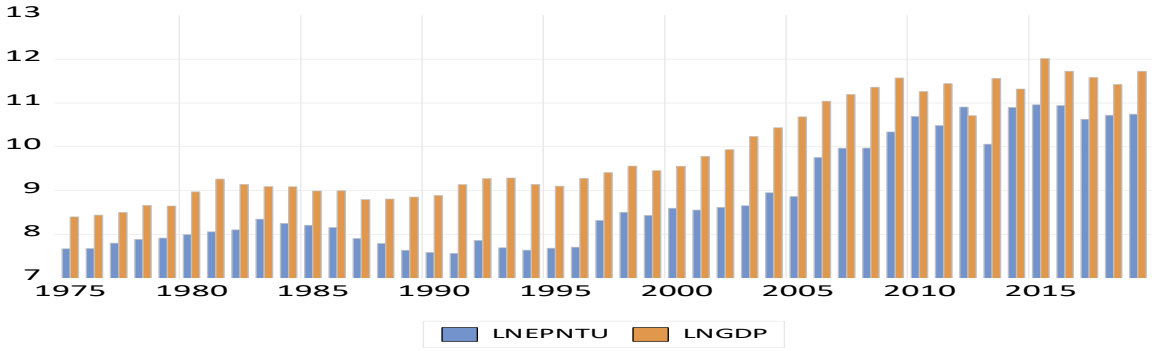
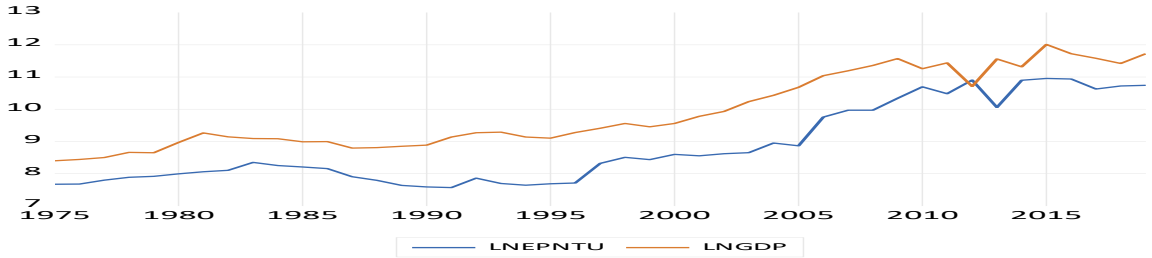


Figure :2 Variation of Economic Growth , Government Expenditure



In order to find the magnitude of relationship between economic growth and government expenditure, it is necessary to run the OLS regression, before that, we should selection of optimum lag length of these variables.

4.1 Selection of optimum lag length

The present study has used of some criterions to create the Ad hoc and Almon model, But before this step, one must determine the number of delay existing in this estimate. we used some criterions determined in table 1 , the results of the lag order selection criteria show that the number of delay chosen is equal to 2. Therefore, and at this moment, we are ready to create and estimate the Ad hoc and Almon models.

Table 1: Optimal Lag Lengths of the Ad hoc and Almon models.

Selection-order criteria
Sample: 1979 - 2019, but with gaps Number of obs = 31

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-52.8076				.117686	3.53597	3.56613	3.62849
1	11.3353	128.29	4	0.000	.002433	-.344213	-.25374	-.066667
2	20.6426	18.615*	4	0.001	.001735	-.686619	-.535831*	-.224043*
3	25.156	9.0268	4	0.060	.001696*	-.719742*	-.508639	-.072135
4	26.7871	3.2621	4	0.515	.002013	-.566908	-.295489	.26573

Endogenous: LNGDP LNEPNTU
Exogenous: _cons

4.2 Estimation of Ad Hoc Model

We applied approach Ad hoc sequentially, firstly regress LNGDPt on LNEPNTUt, then regress LNGDPt on LNEPNTUt and LNEPNTU $_{t-1}$, then regress GDPt on EPNTUt, $EPNTU_{t-1}$, and $EPNTU_{t-2}$, and so on. This sequential procedure stops when the regression coefficients of the lagged variables start becoming statistically insignificant and/or the coefficient of at least one of the variables changes signs from positive to negative or vice versa. Following this precept, we regressed LNGDPt on LNEPNTUt. Based on the our data for the period 1975–2019, Firstly : the results

regress of LNGDPt on LNEPNTUt the results were as follows:

Table 2: regression results of LNGDPt on LNEPNTUt

Source	SS	df	MS
Model	51.7513896	1	51.7513896
Residual	5.57384222	43	.129624238
Total	57.3252318	44	1.30284618

Number of obs = 45
F(1, 43) = 399.24
Prob > F = 0.0000
R-squared = 0.9028
Adj R-squared = 0.9005
Root MSE = .36003

LNGDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LNEPNTU	.9014271	.0451141	19.98	0.000	.8104458	.9924085
_cons	1.93798	.4022451	4.82	0.000	1.126775	2.749184

LNGDP = 1.93 + 0.90 *LNEPNTU ……..……(24)

(t) (4.82) (19.98) , R^2= 0.9028 , F = 0.000, $R^{/2}$= 0.9005

Firstly : results of regress LNGDPt on LNEPNTUt . From Table 2 we Can be obtain the equation number 24 Which indicate to economic growth LNGDPt as dependent variable and government expenditure LNEPNTUt as independent variables, the coefficient of LNEPNTUt is $\beta_0 = 0.90$, which is significant at 5% level and positive. The positive coefficient implies that current government expenditure causes the current

economic growth to increase.by 90 percent. When government expenditure increases in the current time, the valuem of R^2 is (about 90%) is more than reasonable and indicates a very good fit. All coefficients carry the correct sign, about 90 % of change in current economic growth of because of current government expenditure , and that all the sign cant variables have effect about 90 %.

After having the results of OLS regression current economic growth on current government expenditure, our next job is to examine the robustness of the estimated regression equation. The estimated regression equation (24) can be claimed to be robust if residuals of the equation are not serially correlated, the residuals are normally distributed and residuals are homoscedastic. Additionally, the estimated equation (24) is stable as it does not lack the property of linearity and misspecification of OLS regression. Table 3 presents the results from Breusch-Godfrey serial correlation LM test, Heteroscedasticity (White method) test, Jarque-Bera normality test and Ramsey's RESET test. The F-statistic and value of (Alfa) of Breusch-Godfrey Serial Correlation LM test imply that the null hypothesis of no serial correlation cannot be rejected. Hence, the residuals of estimated equation (24) are not serially correlated. Likewise, as reported by Jarque-Bera statistic and the corresponding probability value, the null hypothesis of normal distribution is not rejected. The residuals are also free from heteroscedasticity problem. Finally, as reported by t-statistic, F-statistic and Likelihood ratio of Ramsey's test, the estimated equation (24) is correctly specified bearing the property of linearity and hence it is stable equation

Table 3: Results of Diagnostic Tests

tests	Prob	vif
Breusch-Godfrey Serial Correlation LM	0.316	
Breusch-Pagan test of homoscedasticity	0.367	
Breusch-Godfrey LM test of Autocorrelati	0.369	
VIF test of multicollinearity		9.88
Ramsey RESET Test	0.062	
Normality Test	0.786	

Secondly : the results of regress LNGDPt on LNEPNTUt and LNEPNTU $_{t-1}$.

From Table 4 we can be obtain the equation number 25, which indicate to the coefficient is $\beta_1 = -0.59$, which is significant at 5% level and positive. However, the coefficient of $LNEPNTU_{t-1,}$ $\beta_1 = 0.32$, which is positive and not significant at less than 5 percent level. The increase in government expenditure in the previous period causes Current economic growth to increase by 32 percent. There is mixed impact of government expenditure on economic growth. When government expenditure increases in the current time, the rise in government expenditure will have positive impact on the current economic growth. On the other hand, when there was high government expenditure in the preceding time, during a year could Increase with government expenditure and there was positive impact on the economic growth in the current time. Though there is mixed impact of government expenditure on current economic growth, the increase in current economic growth due to high government expenditure has exceeded the increase in growth resulting the positive impact of government expenditure on economic growth more than positive impact of LNEPNTUt-1($\beta_1 > \beta_2$) in the previous period. The net increase in current economic growth by increasing government expenditure is found to be more than 3 percent. Changes in LNEPNTUt and lagged $LNEPNTU_{t-1}$ explains 90 % of the forces affecting

current economic growth with respect to our created variable. Thus, the effect is quite large according to our results. Although this might not be the real case since there are several other major variables affecting current economic growth about 10 % However what we can conclude is that the changes of Current government expenditure and previous has an effect on LNGDP in our models.

Table 4: regression results of LNGDPt on LNEPNTUt and LNEPNTU$_{t-1}$

Source	SS	df	MS	Number of obs =	40
Model	45.0506521	2	22.525326	F(2, 37) =	181.09
Residual	4.60241672	37	.124389641	Prob > F =	0.0000
				R-squared =	0.9073
				Adj R-squared =	0.9023
Total	49.6530688	39	1.27315561	Root MSE =	.35269

LNGDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LNEPNTU						
--.	.5949793	.1970809	3.02	0.005	.1956555	.9943032
L1.	.3233294	.1980557	1.63	0.111	-.0779696	.7246284
_cons	1.801634	.4292071	4.20	0.000	.9319776	2.67129

*LNGDPt = 1.80 + 0.59 *LNEPNTUt + 0.32*LNEPNTU$_{t-1}$……..*(25)

(t)= (4.20) (3.02) (1.63)

(Se)= (4.20) (3.02) (1.63)

R2= 0. 0.9037 , R^{-2}= 0. 9023 , F = 0.000 .

Thirdly : the results of regress LNGDPt on LNEPNTUt , LNEPNTU$_{t-1}$ and LNEPNTU $_{t-2}$

Table 5: regression results of GDPt on EPNTUt and EPNTU$_{t-1}$, EPNTUt $_{-2}$

Source	SS	df	MS	Number of obs =	37
Model	40.6913989	3	13.5637996	F(3, 33) =	115.92
Residual	3.8613145	33	.11700953	Prob > F =	0.0000
				R-squared =	0.9133
				Adj R-squared =	0.9055
Total	44.5527134	36	1.23757537	Root MSE =	.34207

LNGDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LNEPNTU						
--.	.7203819	.2034198	3.54	0.001	.3065212	1.134243
L1.	.593627	.2367896	2.51	0.017	.111875	1.075379
L2.	-.4099083	.2026148	-2.02	0.051	-.8221311	.0023146
_cons	1.897756	.4436004	4.28	0.000	.995244	2.800268

*LNGDP = 1.89 + 0.73*LNEPNTU + 0.59*LNEPNTU(-1) -.40*LNEPNTU(2) ……. (26)*

(t)= (1.15) (4.11) (3.73) (3.73)

(se)= (1.15) (4.11) (3.73) (3.73)

R^2= 0.9133 ,R^{-2}= 0.9055 , F = 0.000 , DW =1.26

The results in table 5 and equation number 26 also shows that the current effect of government expenditure to current economic growth is positive and signicant. After one year the previous effect of government expenditure on current economic growth have a positive effect and signicant. This result shows that government expenditures could have a positive impact on current economic growth. However, its interim effect after one year's remains positive and equals to %.59, but after two year, this effect changes the sign and becomes negative effect -40 percent. This result does not reflect the response function in Libyan economy.. It suggests that the government expenditures will have a negative and not signcant positive impact on current economic growth two years later (hysteresis effect) but this effect was lower level from the effect after one year. We also noticed from the table 3 that this negative effect after 2 years comes at a slower rate in the presence of GDP as dependent variable, and LNEPNTUt , LNEPNTU1-I , LNEPNTUt-2 as independent variables . They coefficients of is β1 = 0.0.73, β2= 0.59 which is significant at 5% level and positive. but coefficient β3 = -.40 is a negative coefficient and not significant implies that the previous government expenditures after two years causes the economic growth to fall. at a slower rate about 40 %.his latter result shows probably to the weakness of government expenditure effect of the previous periods (as lagged independent variable). after it was high in periods of less length, but when we take into account previous effect government expenditure to two years , this effect is shortened to 40 %. that government expenditure of different previous periods have a positive and negative impact on current economic growth, This latter result shows probably to the weakness of government expenditure effect of the previous periods (lagged independent variable). after it was high in periods of less length, but when we take into account previous effect government expenditure to two years , this effect is shorted to 40 %. The models of below equation number 27, 28, 29 show that government expenditure of different previous periods have a positive and negative impact on current economic growth, But this effect is decreases over time . With an R^2 equal to 0.91, it can be considered that all the explanatory variables and the describe the behavior of the GDP dependent variable very well.

*LNGDPt = 1.93 + 0.90 *LNEPNTU*……(27)

LNGDPt = 1.80 + 0.59 *LNEPNTU + 0.32*LNEPNTUt-1…….……....(28)

LNGDPt = 1.89 + 0.73*LNEPNTUt + 0.59*LNEPNTUt-1 - 0.40*LNEPNTUt-2 ……(29)

we chose the second regression in the three regressions, as the "best'' one because in the three equations the sign of $LNEPNTU_{t-1}$ was not stable and in the last equation the coefficient of $LNEPNTU_{t-2}$, changed to negative sign, which may be difficult to interpret economically. Although seemingly straightforward that over time the effects are changed to become decrease year after year. But ad hoc estimation suffers from many drawbacks, such as the following:

one of the most estimation problem

1. There is no a priori guide as to what is the maximum length of the lag.

2. More importantly, in economic time series data, successive values (lags) tend to be highly correlated; hence multicollinearity

4.3 Estimation of Almon Model

Current LNGDPt was explained by Ad hoc up to 2 years ago. This specification was fitted directly by Stata-16, also we brained the results by fitting this anther function (approach Almon) by Stata-16 . The polynomial approximation of the (α.....Bi,B_{t-i}) coefficients, to illustrate the results of Almon model technique. Table 6 gives results on current economic growth on current and the previous government expenditure for the Libya economic for the period 1975–2019. In order to apply the Almond model, first of all, the lagged values of the variables were determined as 2 according to the AIC and SCI criteria as in the table 1 above .

Table 6 : regression results of GDPt on EPNTUt, EPNTUt – 1, EPNTUt – EPNTUt - 2, EPNTUt - 3

Source	SS	df	MS	Number of obs =	34
				F(4, 29) =	104.65
Model	38.5231168	4	9.63077919	Prob > F =	0.0000
Residual	2.6687686	29	.092026504	R-squared =	0.9352
				Adj R-squared =	0.9263
Total	41.1918854	33	1.24823895	Root MSE =	.30336

LNGDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LNEPNTU						
--.	.842987	.1862422	4.53	0.000	.4620789	1.223895
L1.	.4315189	.2291944	1.88	0.070	-.0372362	.900274
L2.	-.3580591	.2226507	-1.61	0.119	-.8134308	.0973126
L3.	.0282573	.1828479	0.15	0.878	-.3457085	.4022232
_cons	1.571144	.4245918	3.70	0.001	.7027562	2.439532

we can summarize the results of Almon polynomial coefficients from running results in table 6 , as following.

LNGDP = 1.571144 + 0.842987 *LNEPNTU + 0.4315189*LNEPNTU(-1)-

se= (.42) (0.18) (0.22)

(t)= (3.70) (4.53) (-1.88)

.3580591*LNEPNTU(-2)+ o.0282573+*LNEPNTU(-3)……..(30)

(se)= (0.22) (0.18)

(t)= (-1.66) (0.16)

R2= 0. 0.93 , R^{-2}= 0. 92 , F = 0.000 ,

According to the results of the Almon model, a one-$ change in government expenditure in t, t-1,, t-3 periods causes a increase of 0.842987, 0.4315189, and o.0282573 in the current economic growth, respectively, while, One-$ increase in government expenditure in, t-2, period causes an decrease of - 3580591 $, in the current economic growth.

The parameters obtained by the Almon approximation are calculated by the regression equation number 30. The results found with the Almon model were found to be statistically significant. Based on these findings . Partial regression coefficient of β1,

was found to be statistically significant when the parameters belonging to the model were examined (P <0.05 and P-v <0.01). Briefly, the estimation of the parameters of the t-1, t-2 , t-3, periods was found to be not statistically significant. the correlation coefficient of the model is r = 0.96 and has a very high correlation value. Although the β1, β2 and β3 coefficients are statistically insignificant, In this model, F = 0.0000. and P-v <0.01 mean this model was generally significant .

According to Table 7 presents the results from Breusch-Godfrey serial correlation LM test, Heteroscedasticity (White method) test, Jarque-Bera normality test.That there is no serial correlation, Likewise The residuals have normal distribution.The residuals are also free from heteroscedasticity problem. Finally, as reported by Prob statistic, Ramsey's RESET test, we can conclude that the estimated equation (30) is correctly specified bearing the property of linearity and hence it is stable equation.

Table 7: Results of Diagnostic Tests

tests	Prob	vif
Breusch-Godfrey Serial Correlation LM	0.366	
Breusch-Pagan test of homoscedasticity	0.123	
Breusch-Godfrey LM test of Autocorrelati	0.369	
VIF test of multicollinearity		16.91
Ramsey RESET Test	0.088	
Normality Test	0.586	

Based on these findings, Changes in the lagged values of government expenditure for periods t, t-1, t-3 Although it has a positive effect, this effect is a gradually decreasing effect. When working with the Almon model the effect of current government spending becomes zero after the third year, The same explanations regarding Ad hoc model results apply here as well. "Z" values are obtained in the model. For Z values, Table 8 gives results on LNGDP, LNEPNTU and z0, z1, z2 for the Libya for the period 1975–2019., the degree of the model is accepted as t = 2 and according to the model results in Table 1.

Table : 8 Values data Z and economic growth, government spending.

	LNGDP	LNEPNTU	Z1	Z2	Z3
1.	9.26979	7.85941	0	0	0
2.	8.39842	7.66709	0	0	0
3.	8.43842	7.67321	0	0	0
4.	8.49842	7.79721	31.0225	46.1449	107.494
5.	8.65985	7.88503	31.2704	46.4991	108.133
6.	8.64611	7.91491	31.5883	47.0766	109.63
7.	8.96776	7.99112	31.8477	47.476	110.616
8.	9.26246	8.05668	32.0644	47.7836	111.255
9.	9.14217	8.10171	32.4976	48.1884	112.248
10.	9.08772	8.34811	32.7562	48.7216	113.265
11.	9.0831	8.24965	32.9057	49.251	114.557
12.	8.98886	8.20623	32.9589	49.7499	116.338
13.	8.99345	8.15493	32.5139	49.3164	115.227
14.	8.7914	7.90312	32.0537	48.8317	114.379
15.	8.80573	7.78941	31.4818	48.0604	112.796
16.	8.84897	7.63439	30.9128	46.9226	109.92
17.	8.88509	7.58589	30.5752	46.2229	108.228
18.	9.1361	7.56548	30.6452	45.6404	106.619
19.	9.28628	7.69166	30.7024	45.7481	106.394
20.	9.1364	7.63743	30.754	46.1069	107.219
21.	9.10064	7.68423	30.8727	46.599	109.139
22.	9.27606	7.70684	30.7202	46.0341	107.459
23.	9.40763	8.31789	31.3464	45.9876	107.181
24.	9.5574	8.50315	32.2121	46.7843	108.303
25.	9.45258	8.43203	32.9599	48.2594	111.136
26.	9.55664	8.59637	33.8494	50.392	117.306
27.	9.77955	8.55312	34.0847	50.9699	118.853
28.	9.93068	8.61749	34.199	51.042	118.827
29.	10.2344	8.65043	34.4174	51.5129	120.197
30.	10.4318	8.94837	34.7694	51.5448	120.098
31.	10.6805	8.8622	35.0785	52.1017	121.108
32.	11.0414	9.75441	36.2154	52.7102	122.51
33.	11.1945	9.96848	37.5335	54.3239	125.738
34.	11.3601	9.97007	38.5552	56.0639	128.746
35.	11.2598	10.6946	40.0309	59.1702	137.634
36.	11.4405	10.4823	40.9711	60.1835	139.935
37.	10.7091	10.9059	41.4849	61.2807	141.777
38.	11.5601	10.059	42.4207	62.8853	146.302
39.	11.318	10.8984	42.1418	63.9542	149.086
40.	12.0111	10.9556	42.3456	63.3177	148.023
41.	11.7235	10.938	42.819	63.7343	149.288
42.	11.5827	10.6275	42.851	62.9295	145.081
43.	11.4212	10.7205	43.4195	65.5444	152.846
44.	11.7243	10.7423	43.2416	65.3702	152.98
45.	11.5717	10.338	43.0283	64.7894	151.672

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After we obtained the "Z" values, we can illustrate the Almon technique we estimate it the results were as the in the table 9.

Table : 9 The results of estimate Almon technique

Source	SS	df	MS		
				Number of obs	= 45
				F(3, 41)	= 16.51
Model	31.3590398	3	10.4530133	Prob > F	= 0.0000
Residual	25.9661921	41	.633321758	R-squared	= 0.5470
				Adj R-squared	= 0.5139
Total	57.3252318	44	1.30284618	Root MSE	= .79582

LNGDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Z0t	.5240481	1.220868	0.43	0.670	-1.941546	2.989642
Z1t	.7640141	.3619271	2.11	0.041	.0330875	1.494941
Z2t	-.5463821	.4086173	-1.34	0.189	-1.371601	.2788373
_cons	7.292239	.4149517	17.57	0.000	6.454227	8.130251

After the "Z" values were estimated as in the table 9, we can obtain a equation follows to illustrate the Almon technique as :

*LNGDP = 7.29 + 0.52 *Z_{0t} + 0.76* Z_{1t} -.54* Z_{2t} .....(31)*

Se= (.41) (1.22) (.36) (. 41)

(t) = (17.67) (-1.34) (2.11) (-1. 34)

R2= 0. 0.9037 , R^{-2}= 0. 9023 , F = 0.000 , DW =0.82

By analyzing of this Equation, after the "Z" values were estimated, the values were obtained as follows

$\hat{\beta}_0 = \hat{a}_0 = 7.2$

$\hat{\beta}_1 = (\hat{a}_0 + \hat{a}_1 + \hat{a}_2) = 0.74$

$\hat{\beta}_2 = (\hat{a}_0 + 2\hat{a}_1 + 4\hat{a}_2) = - 0.12$

$\hat{\beta}_3 = (\hat{a}_0 + 3\hat{a}_1 + 9\hat{a}_2) = -2.06$

After obtaining the values, the Almon model was obtained as follows

LNGDP = 7.29 + 0.74 *Z_{0t} - 0.12* Z_{1t} - 2.06* Z_{2t} .....(32)

Se= (.41) (1.22) (.36) (. 41)

(t) = (17.67) (-1.34) (2.11) (-1. 34)

According to the results of the Almon model equation 32 the government expenditure affected negatively and positive on economic growth by the in the past 2 years. a positive relationship was found between the economic growth and government expenditure in the current year and a negative relationship in t-1 to t-2. Increase in economic growth by.74 percent response to increase in government expenditure in one unit current year, .52 percent decrease in economic growth against one unit change in government expenditure 1 year ago, and a decrease of in one unit change 2 year ago in the government expenditure resulted to a decrease of 2.06 percent in the economic growth. And Thenegative effect lasts increase and to zero by increase the effect of government spending in previous periods after 2 years.

5. Conclusions and recommendation

The estimated values were shown and compared. First, the Almon and Ad hoc scheme achieves significance for a greater number of coefficients, which may be a consequence of the smaller effect of multicollinearity here than in the OLS case. Second, the signs attached to each coefficient are identical in both cases but they are markedly different in values and consequently will have different policy implications on the economic, as in the equation (26)(32), the changes in the lagged values of government expenditure for periods, although it has a positive effect, this effect was negative effect a gradually increasing. When working with the Almon model; The same explanations regarding Ah doc model results, we can conclude the following most important results

1-The increasing level of the Government expenditure increases economic growth at current time. Whereas the of the decreasing that Government expenditure Lowers economic growth at current time but on the long run. the government expenditure of preceding has negative effect on the economic growth of current time.

2. The of Libyan has not benefited from opportunities generated by in government spending. the lagged effects of government spending on economic growth were Less by

the current period contributions which could suggest that the government spending opportunities generated are not fully exploited.

3. The relationship between government spending and ecnomic growth, suggest that the government spending coefficient is highly significant in some periods. However; the lagged government spending variable (representing all lagged government spending via the to Almon geometrically declining weight assumption) was not significant at any period of the two previous years which may suggest lack effects for previous periods government spending on current period economic growth. At the end we recommend that the government and decision-making bodies base their decisions on econometric models and studies such as this study to better understand the long-term implications of the various public spending policies on the economic growth. Additionally, you can further improve the way we track improvements to a given public spending policy and know when to expect its full implementation through dynamic model regression.

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