Research Article

Measuring the financial and monetary impact of public expenditure and money supply on inflation in Iraq

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Abstract: The paper seeks to clarify and measure the relationship between public Expenditure and money supply in the broad sense(M2) as explanatory variables on inflation expressed in the overall price level (as a dependent variable) in the Iraqi economy during the period 2005-2019. We relied on the Autoregressive Distributed Lag(ARDL) model to measure the relationship between study variables, using annual data for descriptive analysis and monthly quarterly data for standard analysis. The time series were subject to static tests through the ADF (Augmented Dickey-Fuller) test and the PP (Phillips - Perron) test. We also applied the Integration Analyses for Common and Model Stability Tests (Breusch-Godfrey serial correlation LM test) to test the model for absence of serial correlation; the Wald test for the significance of the estimated variables; and the CUSUM and CUSUM Squares test for the stability of the model as well as the estimation of the model's short- and long-term parameters. It turns out that there is a positive relationship between public expenditure, the general level of prices, the supply of money and the general level of prices. These variables have a role to play in raising the overall level of prices because of higher aggregate demand for aggregate supply and thus deepening the inflationary gap within the Iraqi economy.

Keywords: Public Expenditure, Money Supply, Inflation, Iraqi Economy, ARDL.

1.Introduction

The State's general economic policy is based on a number of fiscal and monetary measures aimed at achieving and promoting economic stability. One of the most important of these measures is the instruments of fiscal and monetary policy to address economic problems. Indeed, one of the main problems affecting the Iraqi economy is the problem of inflation.

In order to address inflation in the Iraqi economy, it is necessary to diagnose the main reason that deepens the inflationary gap within the economy. The Iraqi economy suffers from a major structural imbalance and a gap in the output, particularly the inability of aggregate supply to meet the growing aggregate demand.

Research problematic: The problematic of the study is that increasing public expenditure or increasing the volume of money supply increases aggregate demand. With an economic imbalance, especially in the production structure, aggregate supply does not meet the growing aggregate demand, hence deepening the inflationary gap.

Research Objective: The aim of the present study is to measure the financial and monetary impact by investigating the nature of the relationship of the impact of both public expenditure and the supply of money on the general price level for the period 2005-2019, which represents its annual growth rate over inflation using monthly quarterly data.

Research hypothesis: The study assumes that there is a direct correlation between public expenditure and the supply of money at the general price level, and that the problem of inflation in the Iraqi economy is a monetary problem resulting from the increase in liquidity within the economy. This leads to an increase in aggregate demand, since the increase in public expenditure is actually the result of an increase in the money supply as well.

Research methodology: Using the autoregression model of the slow distributed lags (autoregressive distributed lag), the long-and short-term relationship of the estimated model is determined and the relative importance of both variables in the model is determined and is more likely to affect inflation, By analyzing the monthly time series generated by the Central Bank of Iraq (Central Bank of Iraq, 2005-2019).

2.Literature review

One of the most important studies to verify and explain the monetary and financial implications of inflation was presented by (Oyeleke & Orisadare, 2018). Their study dealt with the relative importance of public debt and

the growth of money supply over the1980-2015 period using annual data, and after examining the behavior of the time series, the model was tested using the automatic regression of unrestricted carriers (VAR) technique. The results of the study showed that, in the short and long terms, public debt represented a large proportion of the variation in inflation rather than growth in the money supply. Hence, inflation in Nigeria becomes a financial phenomenon.

A study on the impact of fiscal and monetary policies on inflation in the Iraqi economy (Al Doski, Al Awali, & Hussain, 2011), from 2003 to mid-2010, indicates the effectiveness of fiscal and monetary policies on influencing inflation, as fiscal policy affects inflation hikes (general price level) while monetary policy reduces inflation during the study period, using quarterly data (three months) as well as the Standard Small Squares Method (OLS) to estimate the estimated model's parameters and produce results. The most important result is that monetary policy is heavily constrained on fiscal policy by the exchange rate at which public expenditure is formed since oil revenue (95-97%) is in the value of the dollar.

Another study conducted by (Derbi, 2016) presented his study on the impact of fiscal depth and exchange rate on inflation in the Iraqi economy from 1970 to 2014. Fiscal depth was measured by M2/GDP. The exchange rate of the Iraqi dinar against the United States dollar on the inflation rate was measured using the two-step Engle-Granger method .The Johanson and Joselius method was used to test the common integration of variables and to determine the short-term and long-term causal relationship between variables using the error correction vector model (VECM). The results show a common integration between fiscal depth and exchange rate to short-term and long-term inflation. Therefore, it is important to control the money supply and to come up with measures to absorb its increase over both the short- and long-term inflation. An important study is on this subject, (Choi and Oh 2000), (Castillo 2014), (Eze and Ibrahim 2015), (Diermeier and Goecke 2016), (Patrizio 2016), (Ofori, Danquah and Zhang 2017), (Angelina and Nugraha 2020), (Joshi 2021), (Batarseh 2021), (Eita, et al. 2021). These studies used different methods to measure the impact of public expenditure and money supply on inflation.

3.Data and Methodology

One of the basic concepts of this research is the study variables. Public expenditure is: "It is the sum of the expenses the State spends within a certain period of time with the aim of satisfying the general needs of the society regulated by this State."(Abdulhamid, 2001). It is also defined as "a sum of money issued by the State's finances executed by a public person with the aim of achieving public benefit."(alJanabi, 2009). Hence, public Expenditure is every amount of money spent by a public moral person in order to achieve public benefit.

The second independent variable is money supply, which includes several concepts, namely: -

A. The total means of payment in circulation in society over a certain period of time, i.e., all the means of payment available in circulation held by individuals, enterprises and various institutions(Al Dolimi, 1990).

B. The amount of means of payment available in society, which is the sum of money and the various types of money that exist in society over a certain period of time (Al Shimri, 1988).

C. All means of payment including paper money, metallic money, written money, foreign exchange and quasi-money demanded by individuals and financial and production companies for transactions or speculation. These lead to increased production of goods and services and thus to increased economic growth (Kanan, 2012).

D. All means of circulation available at a given time to individuals, enterprises, banks and administrations (Hani, 2006).

This study focuses on money supply in the broad sense (M2), which expresses the total direct means of payment plus savings and term deposits - both fixed and time- of commercial banks, called domestic liquidity. In other words, this concept includes (M1) plus (Quasi money), represented in high-liquidity assets that do not function directly and fully but can be quickly converted into means of payment (currency and call deposits) and without financial loss; therefore, they are close alternatives to cash and transactions. This concept has received attention from economists because it moves parallel to, and is an important indicator of, economic activity since it illustrates a greater degree of stability than the narrow concept (Al Rufaeei, 2007).

The dependent variable in the study is inflation, which is defined as "The constant and significant rise in the overall level of prices. This means that the price of certain goods and services at a given time from a drop in the prices of other goods is not considered inflation, and a sudden rise in prices at once is also not considered inflation, as prices can return to normal after the causes are gone" (Al Wadi, Al Assaf, & Safi, 2013). According to economic theory, there is an economic relationship between these variables which affect each other.

This paper used government data and statistics from the Central Bank of Iraq for the period 2005-2019, as well as monthly and quarterly data available on the website of the Central Bank of Iraq (Central Bank of Iraq , 2005-2019).

4.Econometric model and data analysis

The determinants of fiscal and monetary impacts of inflation are analyzed using the co-integration method. Different tests allow testing the existence or lack of an integration relationship between the variables of an econometric model. However, the Co-Integration by Delay or Auto Regressive distributed Lags (ARDL) approach of co-integration proposed by Pesaran et al., (1999, 2001) is increasingly used in research. This choice is justified by the fact that this technique has the advantage of being more efficient for small sample studies and is applicable to the series to be integrated in order 1, level 0 or mutually integrated; in contrast to traditional integration tests such as those of Engle Granger (1987), the Johansen test (1988) and the Johansen and Juselius' test (1990).However, the technique ceases to be applicable when the series order of integration is greater than 1. Another advantage of this method is that it allows to estimate the long- and short-term dynamics in the same econometric model (Akpan et al., 2012). Our data for the ARDL specification of the relationship between the inflation (CPI), public expenditure and money supply is represented by equation 1:

$$\Delta CPI = c + \lambda CPI_{t-1} + \beta_1 Exp_{t-1} + \beta_1 MS_{t-1} + \sum_{i=1}^{n} a_1 \Delta CPI_{t-i} + \sum_{i=0}^{m} a_2 \Delta Exp_{t-i} + a_2 \Delta MS_{t-i} + \mu_t \dots\dots (1)$$

However, using the dependent variable in equation (1) at its long-term equilibrium level may not be immediate due to a possible change in one of its determinants. Thus, the adjustment speed between the short- and the long-term levels of the dependent variables can be captured by estimating the following error correction model(Gujarati DN 2003):

$$\Delta(\boldsymbol{Y_t}) = \mathbf{c} + \boldsymbol{\lambda} \mathbf{Y_{t-1}} + \boldsymbol{\beta} \mathbf{X_{t-1}} + \sum_{i=1}^{n} \mathbf{a_1} \Delta(\mathbf{Y_{t-i}}) + \sum_{i=0}^{m} \mathbf{a_2} \Delta(\mathbf{X_{t-i}}) + \boldsymbol{\mu_t} \dots\dots (1$$

it is:

Δ=Represents the first difference

c = fixed limit

N, m represents the upper limits of time lag periods for independent and dependent variables.

λ =Error correction marker or percentage of short-term errors that can be corrected in the unit of time in order to return to long-term equilibrium.

β = Long-term models

a2.....1a Long-Term Parameters

i = Time

μ t Limit Random Error

4.1.Standard test results for study variables using the ARDL model:

4.1.1.characterization of study variables:

The first equation is presented according to the following formula:

$$Y = f(X1, X2) \dots\dots (3)$$

Table 1: Designation of variables included in the model.

Variable	symbol
(CPI)consumer price index	CPI
Public expenditure	Exp
(M2)Extensive Money supply	MS

4.1.2.Graph of time series:

Before the time series is subjected to any test, it is necessary to represent it graphically in terms of time in order to know the type and nature of the series, since the diagonal curve of the time series is an initial indication

of the possible nature of the time series. For instance, if the curve shows a general trend (up or down) this indicates that the time series is unstable, i.e., its average is variable over time.

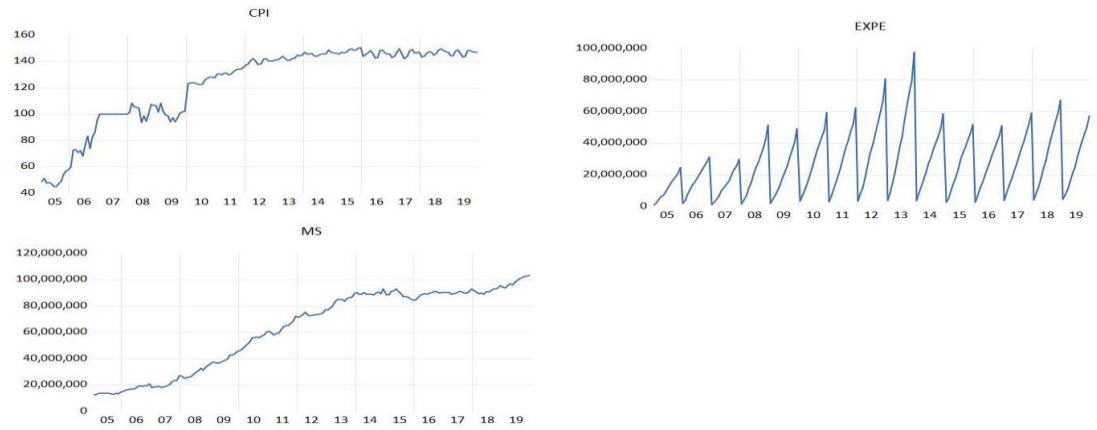

Figure 1: Chart of the study time series
Source: Prepared by the researcher based on Eviews.10 output.

4.1.3.Time Series Tests:

To verify the existence of a cointegration relationship, the first step consists in establishing each variable's order of integration. To do so, we will use the Dickey Fuller (ADF) and Phillips-Perron (PP) tests which are popular unit root tests used to verify the series order of integration. These tests are carried out with different specifications to check if the series is stationary at level or in difference. These tests have a null hypothesis of non-stationarity against a stationarity alternative. The second step consists in verifying the existence of a co-integration relationship. We will use the Bounds co-integration test, which is essentially based on the statistical F of Wald where the null hypothesis assumes the absence of a co-integration relationship. The Bounds test consists of a first step estimated model (1) by the least ordinary square (LOS) method. We then test the joint nullity of the long-term multipliers using the F-test. So, we consider the following two hypotheses:

H0 : $\alpha_{11}=\alpha_{21} = \alpha_{31} = \alpha_{41}= \alpha_{51}= \alpha_{61}= \alpha_{71}=0$ against the alternative hypothesisH1 :$\alpha_{11} \neq \alpha_{21} \neq \alpha_{31} \neq \alpha_{41} \neq \alpha_{51} \neq \alpha_{61} \neq \alpha_{71} \neq 0$.

Finally, the third step consists in comparing the calculated statistical F with the critical value. Indeed, Pesaran et al.,(2001) report two sets of critical values for a given significance level. The first level is computed by assuming that all the variables included in the ARDL model are integrated in order zero I (0), while the second is calculated assuming that the variables are integrated of order I (1).If the calculated F statistics are above the upper critical limits, the non-co-integration relationship is rejected, hence confirming the existence of a co-integration relationship. If the calculated F statistics are lower than the lower critical value, we cannot reject the null hypothesis of non-co-integration. Finally, if the calculated test statistics lie between the terminals, a conclusive inference cannot be made without knowing the order of integration of the underlying repressors. Once estimated, co-integration equations are used to calculate long-run elasticity. If the co-integration relationship is not detected, the short-term causality relationship is measured. After specifying our modeling, the general approach will be pursued by a number of specification tests, namely:

(i) Testing the short- and long-term relationship and the relationship of co-integration of the study variables (ECM); (ii) Series correlation (Breusch-Godfrey LM test); (iii) Heteroskedasticity (ARCH test). These steps are followed by the CUSUM and CUSUM square test to analyze the model's stability. The results are presented and discussed in the next section.

4.1.4. Results and discussions:

Before analyzing these variables using the ARDL approach proposed by Pesaran et al., 2001, the stationarity of all variables was tested, first using ADF (Augmented Dickey-Fuller) and PP (Phillips - Perron) and then the structural break test. The results presented in Table 1 show that all variables are integrated of order 1 I (0) with the exception of the variable Expenditure which is stationary in level I (1). These results confirm that all variables have an order of integration lower than 2.

Table 2: stationarity test

Variables	ADF Test		PP Test	
	In level	First difference	in level	First difference
CPI	-3.3853**	-13.6544***	-3.088054**	-13.7945***
Exp	-1.7998	-3.4858***	-6.256353***	-20.8557***
MS	-3.5645***	-13.2904***	-1.057388	-11.62777***

Note: ***, **, and * indicate the significance of the coefficients at 1%, 5% and 10% levels, respectively.

Table 2 above displays the results of the evaluation of the time series of the study variables. It shows that the time series(CPI) dependent variable, which represents the overall level of consumer prices is stable at the level with a constant at a significant level (5%). After taking the first difference, it was settled by the presence of a constant, a constant, a trend, and without constant and a trend at a significant level (1%). The time series of the independent variables (Exp, MS) are unstable at the level and after the first difference is taken by the presence of a constant, a constant, a trend, without a constant, and a trend at a significant level(5% and 1%).Based on the results of the stability test of the time series above, it is shown that they are stable at the level and at the first difference. So we conclude that the best model for testing these variables is the Autoregressive Distributed Lag (ARDL) model.

Testing the short- and long-term relationship and the relationship of co-integration of study variables:

Table 3: Short and long-term relationship test and co-integration

ECM Regression				
Case 2: Restricted Constant and No Trend				
Short-Term Parameters				
Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0949	1.680456	0.004391	0.007379	D(Exp)
0.0043	2.901478	0.011592	0.033634	D(MS)
0.0000	-7.166409	0.018506	-0.132622	CointEq(-1)*
0.006816	Mean dependent var		0.386175	R-squared
0.035044	S.D. dependent var		0.327529	Adjusted R-squared
-4.173285	Akaike info criterion		0.028738	S.E. of regression
-3.881651	Schwarz criterion		0.129660	Sum squared resid
-4.054971	Hannan-Quinn criter.		376.9892	Log likelihood
			2.051025	Durbin-Watson stat
* p-value incompatible with t-Bounds distribution.				
Levels Equation				
Case 2: Restricted Constant and No Trend				
Long-Term Parameters				
Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.1259	1.539012	0.036152	0.055638	Exp
0.0000	5.119946	0.049534	0.253609	MS
0.4197	-0.809110	0.741281	-0.599778	C
	EC = Y - (0.0556*X1 + 0.2536*X2 - 0.5998)			
Null Hypothesis: No levels relationship			F-Bounds Test	
Long-term equilibrium relationship (Co integration relationship)				

I(1)	I(0)	Signif.	Value	Test Statistic
3.35	2.63	10%	12.59402	F-statistic
3.87	3.1	5%	2	k
4.38	3.55	2.5%		
5	4.13	1%		

Source: Prepared by the researcher based on Eviews output.

Short-term parameters can explain the relationship between the study variables:

a.Government expenditure (Exp) has a direct and significant relationship with the general price index (CPI), which means that a1% increase in government expenditure increases the overall consumer price level (CPI) by 0.007379.

b.Broad cash supply (MS) has a significant impact on and ~~has~~ a direct relationship with the (CPI) general price index, which means that a 1% increase in broad cash supply increases the overall consumer price level (CPI) by 0.033634.

The Eq (-1) was found to be negative and significant and reaches (0.132622). This means that (13%) of short-term errors are automatically corrected over time to achieve long-term equilibrium. In other words, about13% of the imbalance in the last year's shock was corrected in the current year, which means that there is a long-term equilibrium relationship between the study variables, and we also note that the explanatory force ~~is~~ (Adj.R2) for the estimated model was (0.32). This means that the independent variables involved in the estimated model(Exp, MS) explain about 32% of changes in the dependent variable (CPI). The remaining 68% are random variables that the model did not consider, and these variables represent the effects of the random variable on the dependent variable.

The specific results of the long-term relationship show that:

a.The relationship between (Exp, CPI) is positive and non-significant.

b.The relationship between (MS, CPI) is positive and significant.

The long-term equilibrium relationship (co-integration) between the study variables (independent and dependent) was a statistical (F) value (12.59402) greater than the small (4.13) and great (5) value at a significant level (1%), indicating a long-term equilibrium relationship (co-integration relationship) between the variables of the study in the long term.

The autocorrelation test and heterogeneity of the ARDL model:

The estimated models are tested for autocorrelation (serial correlation between values) using the Breusch-Godfrey Secret Correlation LM Test and the Heteroskedasticity Test (ARCH) to ensure that the estimated models do not have the problem of heterogeneity at a significant level (5%) of the relationship between variables.

Table 4: Results of the self-binding test and heterogeneity of the relationship between study variables

Breusch-Godfrey Serial Correlation LM Test			
F- statistic	1.129128	**Prop . F**	**0.3260**
Obs*R-squared	2.532625	**Prob. Chi-Square**	**0.2819**
Heteroskedasticity Test: ARCH			
F-statistic	1.375017	**Prob. F**	**0.2426**
Obs*R-squared	1.380031	**Prob. Chi-Square**	**0.2401**

Source: Prepared by the researcher based on Eviews.10 output.

We note from table 4 above that all the estimated ARDL models have no autocorrelation according to the Breusch-Godfrey Serial Correlation LM Test. Hence, we accept the null hypothesis of the inexistence of an auto-correlation problem because the values of Prop. F and Prob. Chi-Square are non-significant at a significant level (5%). We reject the alternative hypothesis, as well as the absence of a heterogeneity problem in the estimated models, where (Prob. Chi-Square)and (Prop.F) are non-significant at 5% according to the Heteroskedasticity Test (ARCH).

Testing the stability of the estimated model using the CUSUM and CUSUM Squares tests:

The stability test of the estimated ARDL model is one of the important tests in order to ensure that the data used in the study do not have any structural breaks, using the cumulative sum test(CUSUM), as well as the cumulative sum of the residuals (CUSUM sum of squares). These tests are two of the most important tests in

this field because they illustrate two important things: the existence of any structural breaks in data, and the stability and consistency of long-term parameters with short-term ones. These tests are always associated with the (ARDL) method. If the CUSUM SQ graph (CUSUM)is within the critical boundary framework at (% 5); this means that all estimated parameters are stable and that there are no structural breaks, and vice versa, as explained in the figure below:

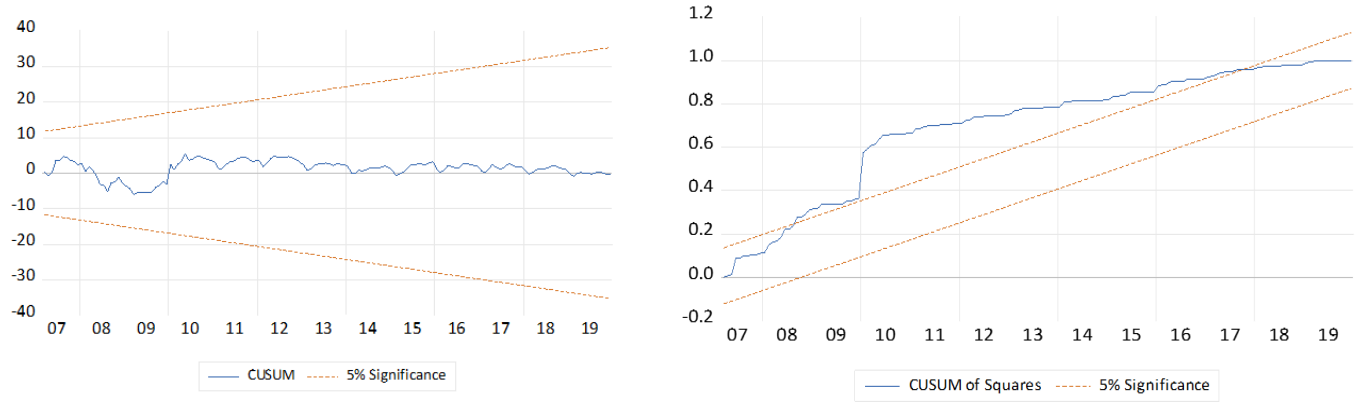

Figure 2:Results of testing the stability of the estimated relationship between the study variables. Source: Prepared by the researcher based on Eviews.10 output.

Note from figure (2) and part (CUSUM) that the cumulative sum of the residuals within the limits of critical values is at a significant level (5%). This indicates the short-term stability of the parameters. The CUSUM of Squares part shows that the cumulative sum of the squares of the residuals was outside the limits of the critical values at a significant level(5%). The CUSUM and CUSUM of squares tests show that there is stability in the short-term model and no stability in the long-term model. This means we have empirical evidence that the estimated coefficients of the co-integration ARDL model (1,0,0) are stable only in the short term. In the long term, they are unstable because of the structural change in research data, as they undergo constant change during the research period due to the change in the fiscal and monetary policies of the hedge, as well as the impact of internal and external economic shocks on the adoption of appropriate policies.

5.Conclusions

a. From the results of the short relationship between government Expenditure and the general level of prices, it is clear that there is a direct and significant relationship, since a 1%increase in government Expenditure leads to an increase in the overall level of prices by 0.007%. This means that increasing government Expenditure does not lead to an increase in prices and therefore to higher inflation rates, because increased government Expenditure is an expansion policy used by the government to increase the rate of economic growth. In the long term, we also note that there is a direct but non-significant relationship, because monetary policy in Iraq is unstable and unpredictable in the long term, as most of Iraq's budgets are balanced.

b. Money supply(M2) has a direct and significant relationship in the short term. That is, a 1% increase in the broad money supply increases the overall level of prices by 0.15%, since an increase in the cash supply leads to an increase in the demand for money and thus an increase in the overall level of prices. In the long term, a 1% increase in the broad cash supply leads to an increase in the overall price level by 0.26%, which is greater than the short-term ratio. This is explained by increased demand for money by individuals, resulting in a higher overall price level but not in a large percentage.

c. The fundamental pattern estimated by the R2 test is0.33.This means that the independent variables (government expenditure and cash supply) account for 33% of changes in the dependent variable (general price level) while the other variables are stable. The remaining 67% are random variables that the model did not consider. These variables represent the effects of the random variable on the dependent variable.

d. We note that the standard model is free of the autocorrelation problem according to the LM test, as well as the estimated model is free of the heterogeneity problem according to the ARCH test.

e.There is a short-term stability of the estimated model according to the CUSUM test but no long-term stability according to the CUSUM SQ test. This result can be explained by economic instability as the estimated model is subject to constant economic volatility and shocks.

f.From the foregoing, to validate the study hypothesis, it is clear that money supply (M2) has a greater impact on inflation than public expenditure, because money supply in the broad sense (M2) includes currency in circulation, which is based on public expenditure since a large part of public expenditure goes to consumer expenditure in the form of salaries and wages. This puts a strain on the volume of aggregate demand within the economy and thus raises the overall level of prices.

g.Despite the significant increase in the volume of public expenditure, its impact is lower because of rampant financial and administrative corruption - confirmed by Transparency World data as in Appendix No. 1 - so it was directed towards hoarding and saving of individuals for the most part. The increase in public Expenditure is apparent and often not real.

6.Recommendations

a. Fiscal and monetary policies must be coordinated with a view towards developing a state strategy for public expenditure through the rationalization of consumption expenditures, which constitute the largest proportion of public expenditure in terms of public sector salaries and wages; and allocating expenditure to investment projects that enhance aggregate supply to counter aggregate demand.

b. It is important to diversify public revenue sources and not to rely on crude oil revenues as the main source of funding for the federal public budget, in order to avoid any shock in global or regional crude oil prices that leads to disruption in the volume of public expenditure, and to go towards sovereign revenues such as taxes and customs duties.

c.While expanding public Expenditure, such as salary and wage increases, the State must offset this increase with a similar increase in goods and services offered within the Iraqi economy by providing a flexible production apparatus to keep pace with this increase in order to avoid any imbalance in the exchange rate or balance of payments and thus an increase in the overall level of prices.

d. It is important to develop the banking structure, thereby enhancing the confidence of customers in saving part of their income in the banking sector rather than being saved by individuals or in circulation. This is likely to increase the volume of money supply within the economy, which in turn increases the overall price level due to the pressure this increase in money supply creates on aggregate demand, through increased banking awareness and the strengthening of the banking investment environment.

e. The elimination of financial and administrative corruption in Iraq, which is one of the greatest problems facing the possibility of improving the reality of public revenues in the Iraqi economy, leads to the orderly and rational orientation of public expenditure.

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