



The effect of the Fiscal dominance on the Monetary Policy in Algeria from (1998-2020) using the ARDL method

اثر الهيمنة المالية علي السياسة النقدية في الجزائر باستخدام نموذج الانحدار الذاتي للفجوات الزمنية الموزعة (ARDL) خلال الفترة (2020-1998)

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Abstract

The basic goal of this paper investigates the effect fiscal dominance on monetary policy in Algeria using annual time series data during the period (1998-2020) , this study employs inflation rate , budget deficit to GDP, broad money to GDP, official exchange rate, interest rate treasury bills and oil price , yet uses the bound test(ARDL) the Autoregressive Distributed Lag approach, according to our results negative and significant effects variables on inflation rate except the related between official exchange rate and inflation rate was positive and significant , hereunder the research confirms significant long run relationship exist and stable long run linkage between inflation rate and the explanatory variables.

JEL Classification Codes : E51 , E52 , E58 , E61 ,E62 , H62 ,H68 .

Keywords

Fiscal dominance,
Monetary policy,
Fiscal policy,
ARDL, Algeria.

الكلمات المفتاحية

الهيمنة المالية ، السياسة النقدية ، السياسة المالية ، ARDL ، الجزائر .

الملخص

تستهدف هذه الدراسة اثر الهيمنة المالية علي السياسة النقدية في الجزائر، من خلال اعتماد متغير معدل التضخم المحلي كمتغير تابع أما المتغيرات التالية العجز الموازي و العرض النقدي بمعناه الواسع و سعر الصرف الرسمي و سعر فائدة أدون الخزانة وأسعار النفط كمتغيرات تفسيرية ، وذلك بنقد نموذج الانحدار الذاتي للفجوات المتباطئة الموزعة لاختبار علاقة التكامل المشترك بين المتغيرات التفسيرية و معدل التضخم المحلي، كما توصلت الدراسة لارتباط العجز الموازي بعلاقة عكسية مع معدل التضخم المحلي وفقا لنظرية (Woodford) سنة 1995 و معنوية معاملات المتغيرات التفسيرية توضح إمكانية الاعتماد عليها في تفسير النموذج المعتمد عليه علي المدى الطويل.

تصنيف JEL : E51 , E52 , E58 , E61 ,E62 , H62 ,H68

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I.INTRODUCTION:

The issue of relationship between budget deficit , money supply and inflation experienced wide arguably among many economists, they were examine this relationship, during the(1980) of the last century appeared famous study of the both economists (Sargent and Wallace) in (1981) titled "Some Unpleasant Monetarist Arithmetic" this article confirmed the fiscal dominance hypothesis, some studies investigated the theory of fiscal dominance for instance, (Michael, Ricardo, & Irina, 2007), (Nachega, 2005), (Domenico & Ludvig, 2006), (Alfredo & Marcos, 2008), (Mercedes & Víctor, 2008), add the studied of (Michael W. , 1994), (Michael W. , Control of Public Debt: A Requirement for Price Stability?, 1996), that contributed in turning into new theory of fiscal dominance sense fiscal theory of price level (FTPL).

The fiscal dominance is economical mutation, inherited some economics in the world due economic crises and absence coordination between monetary and fiscal policy so fiscal policy weighed heavily monetary policy means weak independence of the central bank.

Through accumulate government debt or internal public debt result budget deficit which leads instability in general price level, and it is negative effects on objectives money policy, the budget deficit is bridge linking between both policies, for finance the budget deficit the governments depend mechanisms such as, creation money ,printing money, the debt monetizing and issuing treasury bills , also affected monetary variables (inflation, money supply, liquidity), likewise budget deficit leads the higher in inflation rate.

The fiscal dominance in oil economics is different from other countries, with reason the nature of oil revenues , the fiscal dominance depends oil rent to finance general expenditures the government is going to central bank to replace for example Algeria Dinar with Dollars so high creation money and monetization the liabilities , this phenomenon which called oil dominance, some oil economics suffers of double domination are fiscal dominance and oil dominance.

Fiscal policy occupies most important location between economic policies, as well budget deficit depends on oil revenues, in fact Algeria's fiscal policy has faced more challenges, difficulties, pressures and problems as petroleum crisis, in this regard the Algeria economy is characterized by structural imbalances in economic structure and suffers from immature economic policies, no clear economic view in Algeria, the main goal of this paper is to investigate the effect fiscal dominance on monetary policy in Algeria during the period(1998-2020) using autoregressive distributed lag(ARDL) model, while the research question of the study:

What is the effect of fiscal dominance on monetary policy in Algeria?

Sub questions of the study:

- What do we mean by fiscal dominance?

-What is the relationship between budget deficit and inflation rate in Algeria?

Hypotheses:

-Fiscal dominance means the situation where the budget deficit leads high inflation rate due printing money.

-There exists relationship between budget deficit and inflation rate in Algeria.

II. PREVIOUS STUDIES:

Literature review:

This phenomenon economic usually spreads in both developing and oil countries, the fiscal dominance refers to the relationship between budget deficit and money supply, if the budget deficit was financed by the mechanisms leads inflation eventually in this case achieves fiscal dominance.

Likewise the hypothesis of fiscal dominance were highlighted from many economists, whereby the made the new theory of fiscal dominance so called (FTPL) fiscal theory of the price level, furthermore many different studies talk about the (FTPL) theory, for example (Pierpaolo & Michael, 2003), (Paul, 2000), (Matthew, Robert, & Behzad, 2001), (Willem, 2001), (Christopher, 1994).

Firstly , during decade eighties of the past century , Hence (Thomas & Neil, 1981) attempted analyze the interaction and coordination between monetary and fiscal policy to determine price level, so it was the beginning of broad arguably for them, from the unclear findings of monetarist therefore both economist demonstrate financing issue by bonds and the role of fiscal policy explanations for inflation, then money supply is the decisive factor under the fiscal dominance. Since the fiscal authority dominant on money growth, the result is inflationary budget deficit lead to increasing in inflation rate , moreover this deficit financing by domestic credit or domestic borrowing, besides persistent deficit means government forced central bank in order printing more money, then monetizing deficit, thus this process called "Seigniorage" consequently causality trend of budget deficit for money growth for inflation, yet this case is famous model of (S-W) of course fiscal dominance regime situation.

Secondly (Michael W. , Price-level determinacy without control of a monetary aggregate, 1995)

Discovered method adopted with government in budget financing lead to determine price level , in addition fiscal policy determined future inflation, moreover he finds real value of government liabilities equal to the present value of future government budget surpluses expected, also fiscal policy is nominal anchor he supposed monetary regime is exogenous, as well as money supply and budget deficit determined price level so non Ricardian regime.

Thirdly (Michael W. , Public debt and the Price Level, 1998) showed public debt and price level, the fiscal authority changes its policies when debt is limit, after central bank aims of Ricardian policy but non Ricardian policy regime to lead unexpected variation in government budget, results indicate that equilibrium price is affected he indicate the non Ricardian fiscal policy impact of central bank , in this study he focused on particular point debt management because public debt necessary in equilibrium inflation . Certainly non Ricardian fiscal policy sense fiscal dominance can make government bonds is a net wealth thus changes in inflation with reason high public debt.

Fourthly (Michael W. , Fiscal Requirements For Price Stability, 2001) presented if fiscal policy is dominant the primary deficit to lead high public debt and borrowing requirement so government will be financed by domestic borrowing , after that price stability achieves when commitment of fiscal rules.

Table(01) : the effect fiscal dominance on monetary policy

Study	Estimation period	Country	Methodology	Variables	Results
(John, 2013)	(1980-2012)	South Africa	VAR	Inflation, money growth and budget deficit to GDP.	Presence fiscal dominance.
(Paresh Kumar, Seema,& Arti Devi, 2006)	(1970-2004)	Fiji	Bounds test approach.	Government deficit , money supply and inflation.	Presence fiscal dominance.
(Fatma Turan, 2014)	(1987-2013)	Turkey	VAR .	Budget deficit, money supply and inflation.	Presence fiscal dominance.
(Ronald, 2020)	(1970-2016)	Malawi	ARDL .	Fiscal deficit ,net domestic credit , money supply, Oil price , exchange rate , agriculture output , trade openness, inflation and GDP per capita.	Absence fiscal dominance.
(Phouthanouphet & Phouphet, 2014)	(1980-2010)	Lao PDR	ARDL and SVAR.	Budget deficit and inflation.	Absence fiscal dominance.

(Yemane Wolde, 2008)	(1964-2003)	ETHIOPIA	Bounds test approach.	Budget deficit , money supply and inflation.	Presence fiscal dominance.
(Bilin, 2003)	(1970-1989)	54 Countries developed and less developed.	GMM.	Inflation , deficits and base money.	Presence fiscal dominance.
(Joseph Olarewaju & Oluwafemi Ariyoosu, 2018)	(1986-2016)	Nigeria	VECM.	Broad money supply, domestic debt , budget deficit and inflation.	Absence fiscal dominance.
(Ignacio, 2008)	(1982-2007)	Colombia	VECM.	Budget deficit , money growth and inflation.	Presence fiscal dominance.
(SUHAIB, MUHAMMAD , MOHSIN, & SALMAN, 2015)	(1986-2011)	Pakistan	The regression analysis.	Budget deficit , Money growth and inflation.	Presence fiscal dominance.
(Maio, Francis, & Venkatesh, 2018)	(1991-2016)	Zambia	ARDL	Inflation, budget deficit , official exchange rate and Gross domestic product.	Presence fiscal dominance.
(Carlo & Franco, 1999)	(1862-1994)	Italy	Small structural linear econometric model.	Import price index, wage, stock of M2, GDP deflator and deficit ratio.	Absence fiscal dominance.
(Khieu Van, 2014)	(1987-2013)	Vietnam	SVAR.	Inflation, money supply, real GDP, interest rate and budget deficit.	Absence fiscal dominance.

(Muntasir, Sakib, & Meem Hasin, 2018)	(1980-2014)	Bangladesh	VECM.	Inflation, broad money and budget deficit.	Absence fiscal dominance.
(Andreas, 2011)	(1980-2009)	Greece	VECM.	Inflation, budget deficit, Gross domestic product and nominal effective exchange rate.	Absence fiscal dominance.
(Eko, 2015)	(2000-2013)	Indonesia	VAR and Nordhaus approach.	The interest rate, Government spending, inflation and output gap.	Absence fiscal dominance.

III. METHOD AND PROCEDURES:

Econometric Methodology and Estimation Techniques:

The (ARDL) methodology was used to test the existence of short run and long run dynamic cointegration, the (ARDL) model as proposed by (Pasaran, Shin and Smith 2001, Narayan and Smyth 2005), furthermore this technique is usually applied in the case of small sample sizes. (Akingbade & Nicholas, 2021)

The annual data obtained from the International Monetary Fund's and the World Bank's, all the data series are for the period (1998-2020) we can get annual time series in order to determine Algeria's prices.

In this paper we try to estimate the effect of fiscal on monetary policy in Algeria, so we indicate some studies that showed the nature of fiscal dominance. First (Emad Omar, 2019) they study highlights about the relationship between inflation rate, the ratio of money supply and budget surplus or deficit, second (Kemal, 2019) which examined the relationship between inflation, budget deficit, broad money, deposit interest rate, official exchange rate and public debt or domestic debt, third the study of (DRAMA, 2018) she adds variable oil price.

The effect of fiscal dominance on monetary policy can be shown by equation:

$$P = (BD/GDP, BM/GDP, OEXR, IRTB, OP)$$

Where:

P : Consumer Price Index (CPI) means inflation rate.

BD/GDP: Budget deficit or surpluses to GDP.

BM/GDP: Broad money to GDP.

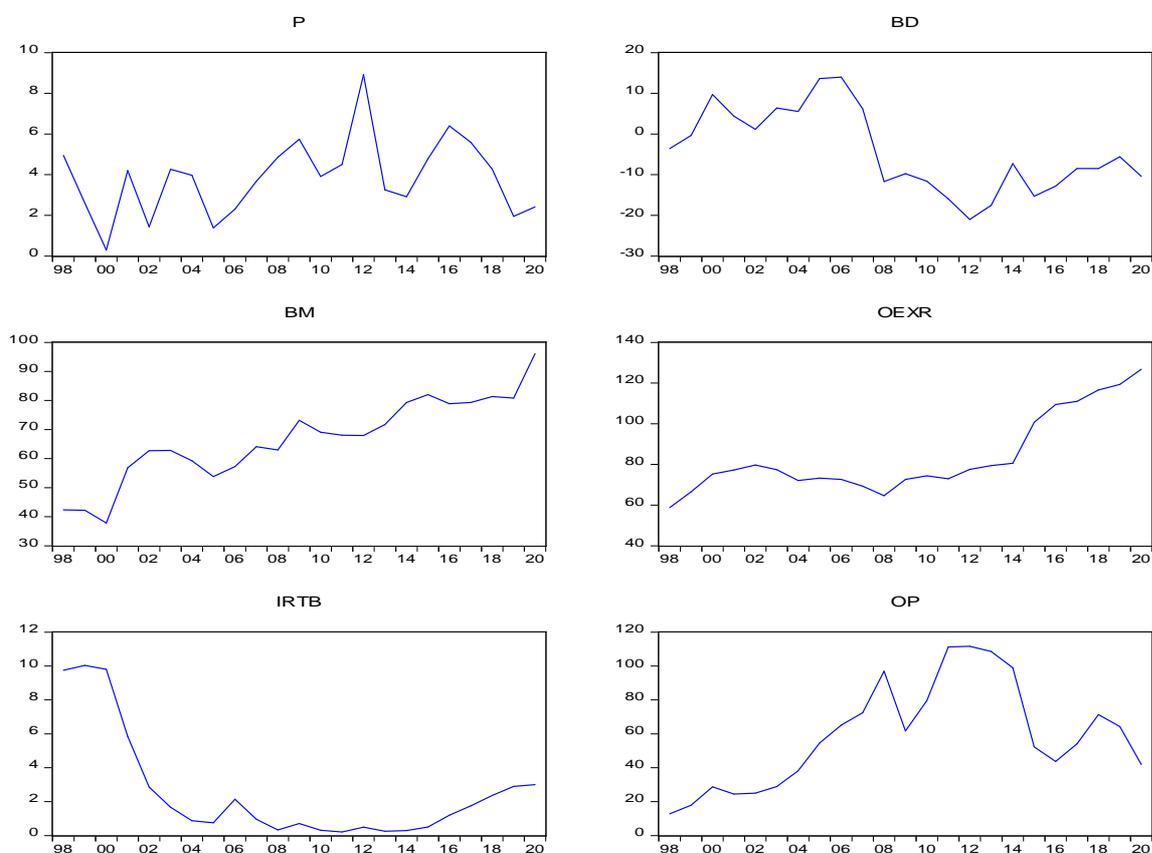
OEXR: Official exchange rate.

IRTB: Interest rate treasury bills.

OP: Oil price.

IV. STUDY RESULTS (ANALYSIS AND DISCUSSION) :

Figure (01) : Graphs Diagram and time series plot of the variables



Source: Prepared by researchers based on Eviews 10

Unit root tests of time series the variables:

TABLE(02): UNIT ROOT TEST RESULTS (ADF)

Null Hypothesis: the variable has a unit root

At Level						
		P	BD	BM	OEXR	IRTB
With Constant	t-Statistic	-3.6296	-1.4266	0.5279	0.6415	-3.8241
	Prob.	0.0136	0.5507	0.9827	0.9876	0.0093
		**	n0	n0	n0	***
With Constant & Trend	t-Statistic	-3.9050	-2.1841	-5.9221	-0.4891	-1.2081
	Prob.	0.0295	0.4745	0.0007	0.9760	0.8836
		**	n0	***	n0	n0
Without Constant & Trend	t-Statistic	-1.5149	-1.2560	4.3510	2.6557	-2.9821
	Prob.	0.1188	0.1858	0.9999	0.9967	0.0047
		n0	n0	n0	n0	***
At First Difference						
		d(P)	d(BD)	d(BM)	d(OEXR)	d(IRTB)
With Constant	t-Statistic	-5.6796	-4.2862	-5.1266	-3.3636	-2.5677
	Prob.	0.0002	0.0034	0.0009	0.0246	0.1151
		***	***	***	**	n0
With Constant & Trend	t-Statistic	-5.8211	-4.1748	-4.9401	-3.6652	-5.0506
	Prob.	0.0007	0.0180	0.0056	0.0494	0.0046
		***	**	***	**	***
Without Constant & Trend	t-Statistic	-5.8455	-4.3815	-3.7491	-2.9025	-2.4988
	Prob.	0.0000	0.0001	0.0007	0.0059	0.0153
		***	***	***	***	**

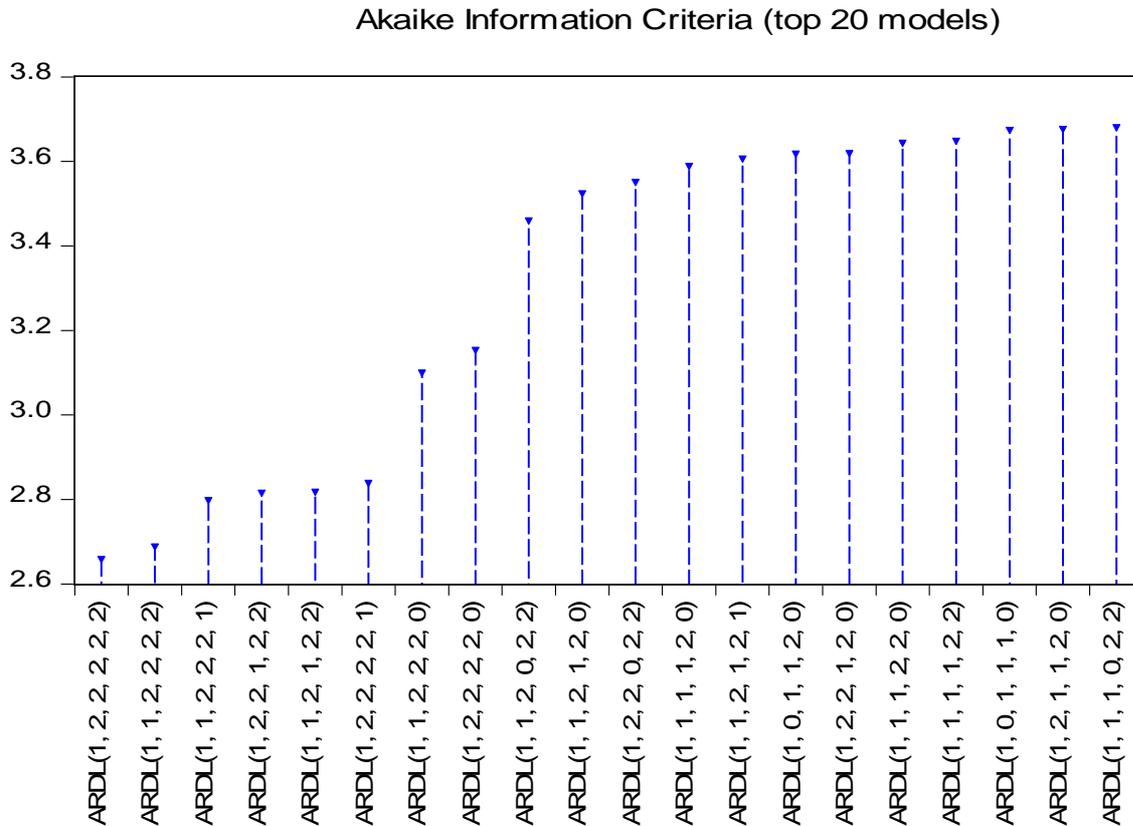
Notes:
a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant
b: Lag Length based on SIC
c: Probability based on MacKinnon (1996) one-sided p-values.

Source: Prepared by researchers based on Eviews 10

We need to check the time series data was stationary or not, because in economic the most time series containing a spurious regression we are applied both the (ADF) Dickey Fuller and (PP) Philips Perron tests, in the both tests the null hypothesis or (H0) there exists the unit root in time series but the alternative hypothesis or (H1) there is not unit root in time series next the hypothesis of (ADF) and (PP) ARE THE SAME , using eviews10 Microsoft after that table() exhibits the summarizes results of the (ADF) and (PP) or unit root tests show that some variables are stationary and stability at levels , such as P , and IRTB% are integrated in order I(0), we than BD%GDP, OEXR and OP thus series are non stationary at levels but after the first difference I(1), in addition conclusions confirmed of (ADF) and (PP) tests non of the variables is I(2), as a result we will apply the bond test also called approach cointegration the Auto Regressive Distributed Lag framework (ARDL) we are using this methodology because all series are integrated at level I(0) and first difference I(1)

Determine periods results of optimal slowdown of the model:

Figure(02): to Determine the optimal slowing period according to the Akaike method



Source : Prepared by researchers based on Eviews 10

Figure (02) indicates the appropriate rank the ARDL model, that was chosen according results of the method Akaike information criteria (AIC) is (1,2,2,2,2,2) to measure the relationship between the general price level (P) and (BD/GDP , BM/GDP ,EXR, IRTB ,OP).

Detected cointegration with using Bounds test(ARDL):

Table (03): Results of the bound test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	10.07469	10%	2.08	3
		5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Finite Sample: n=35				
Actual Sample Size	21	10%	2.331	3.417
		5%	2.804	4.013
		1%	3.9	5.419
Finite Sample: n=30				
		10%	2.407	3.517
		5%	2.91	4.193
		1%	4.134	5.761

Source: Prepared by researchers based on Eviews 10

Bounds test of F(statistic) and testing the existence or non existence long term between all variables means treatment cointegration ARDL model in third table , the results demonstrates adequately F statistic equal(10.07469) was greater than the lower and higher limits tabulated F value under significance level (10% , 5% , 2.5% , 1%) thereafter we find cointegration and equilibrium in long term between variables.

Long run impacts of fiscal dominance on inflation rate in Algeria:

According all probabilities related to coefficients variables was less than 5% level of significance, as follows(0.0011% , 0.0058% , 0.0181% , 0.0016% , 0.0058%) this means statistically significant linked between inflation rate and all variables, obviously existence cointegration and equilibrium relationship in long run, we present the results in table () , long run relationship between dependent variable. Is general price level implies domestic inflation rate and all independent variables are as follows , first budget deficit to GDP, second broad money to GDP, third official exchange rate to GDP, fourth interest rate treasury bills, and fifth oil price , whereas one percent increase in budget deficit/GDP leads to 0.38 percent decrease in the domestic inflation rate, while the variable BD/GDP has negative and significant relation with inflation rate thereby corresponds with study of(Woodford in 1995) or(FTPL), moreover one percent increase in broad money/GDP lead to 0.46% decrease in the inflation rate, additionally the variable BM/GDP has negative and significant relation with inflation rate not corresponds with theory of fiscal dominance during period

of study economic stabilization program, on the other hand when the interest rate treasury bills go up 1% the inflation rate by 1.4% which is reduce percentage , then the variable IRTB has significant and negative relation with inflation rate, may be the interest rate of treasury bills was lower and she did not have much effect on the inflation rate likewise one percent raise in the official exchange rate leads increase 0.14% in inflation rate , then the variable has positive and significant relation with inflation rate because any decline in currency value for another currencies, so domestic exchange rate is affected and reduced purchasing power after that higher exchange rate, this corresponds with economic theory, as well as one percentage higher in the oil price increases in inflation rate by 0.07%, therefore the variable oil price (OP) has significant and negative relation because adopted failed policies leads misleading economic results in Algeria.

Table (04): the results of the error correction model

ARDL Error Correction Regression				
Dependent Variable: D(P)				
Selected Model: ARDL(1, 2, 2, 2, 2)				
Case 2: Restricted Constant and No Trend				
Date: 08/31/21 Time: 01:07				
Sample: 1998 2020				
Included observations: 21				
ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BD)	-0.513836	0.031581	-16.27057	0.0001
D(BD(-1))	0.034314	0.022623	1.516786	0.2039
D(BM)	-0.289316	0.036527	-7.920518	0.0014
D(BM(-1))	0.443493	0.061209	7.245539	0.0019
D(OEXR)	-0.035323	0.036435	-0.969473	0.3872
D(OEXR(-1))	-0.138485	0.042323	-3.272125	0.0307
D(IRTB)	-0.771580	0.186370	-4.140040	0.0144
D(IRTB(-1))	2.047539	0.269085	7.609275	0.0016
D(OP)	-0.112962	0.013015	-8.679228	0.0010
D(OP(-1))	0.041112	0.012189	3.372751	0.0280
CointEq(-1)*	-2.214419	0.166773	-13.27807	0.0002
R-squared	0.970349	Mean dependent var	-0.008810	
Adjusted R-squared	0.940698	S.D. dependent var	2.421368	
S.E. of regression	0.589651	Akaike info criterion	2.087108	
Sum squared resid	3.476877	Schwarz criterion	2.634239	
Log likelihood	-10.91464	Hannan-Quinn criter.	2.205850	
Durbin-Watson stat	1.668481			

Source: Prepared by researchers based on Eviews 10

The parameter of error correction Coin Eq (-1):

In table (04) the results refers that the coefficient of the error correction term was approximately (-2.214) and the linked probability value (prob= 0.002) which means the parameter of ECT is negative and statistically significant , further that (2.214) of the short term errors are corrected in an automatic way in order to achieve the long term relationship and equilibrium between variables.

Diagnostic and validity tests results of the (ARDL) model:

Autocorrelation test of Breush Godfrey serial correlation LM test:

Table (05): the results of LM test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.299371	Prob. F(2,2)	0.4349
Obs*R-squared	11.86707	Prob. Chi-Square(2)	0.0026

Source: Prepared by researchers based Eviews 10

The test is most important for confirmed the model is empty from autocorrelation problems, this test involves two hypotheses the null hypothesis that is no autocorrelation problem, but the alternative hypothesis that exist the autocorrelation problem so the value of F statistic equal 1.29 which is greater than the level of significant 5% and F statistic no significant , we accept the null hypotheses sense not reject H0, after non existent the autocorrelation problem in model.

Heteroskedasticity (ARCH) test

Table (06): Heteroskedasticity (ARCH) test

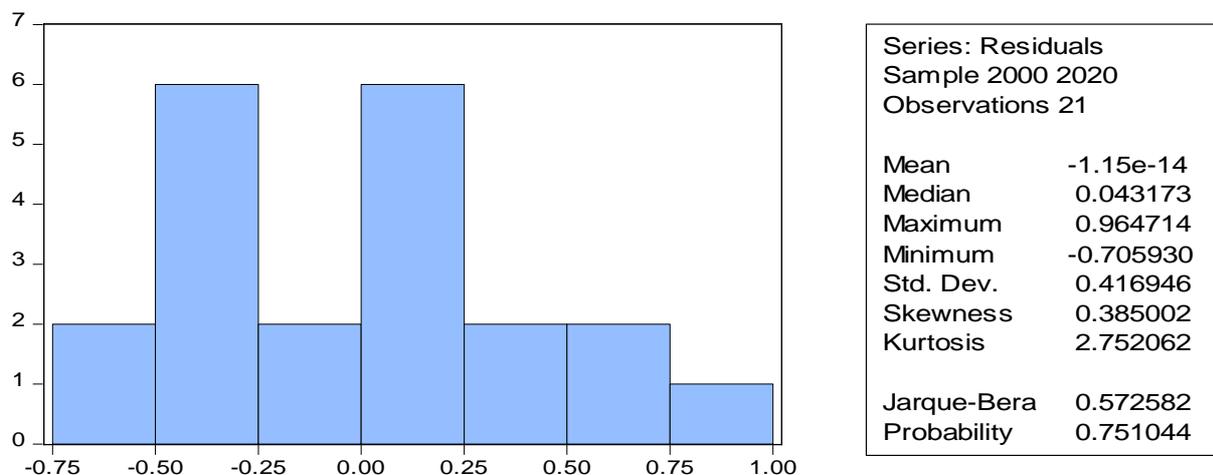
Heteroskedasticity Test: ARCH			
F-statistic	1.254514	Prob. F(1,18)	0.2774
Obs*R-squared	1.303085	Prob. Chi-Square(1)	0.2537

source: Prepared by researchers based Eviews 10

This test utilized ARCH autoregressive conditional heteroskedasticity, indeed to find the problem heteroskedasticity further the value of the F statistic that around (1.18) at a probability level (0.2774) is greater than 5 percent means accepting (H0) the null hypothesis and to reject (H1) alternative hypothesis after that the residuals have constant and homogenous variance (homoscedasticity) in (ARDL) model.

Normality test Distributions of the Random Residuals (J-B) Jarque Bera:

Figure (03): the test of distribution of residues



Source: Prepared by researchers based Eviews 10

The figure(03) presented as the value of statistic Jarque Bera test was(0.572582) with a probability value(prob=0.751044) which is greater than 5 percent, too the residuals or random error are normally distributed due to accept (H0) null hypothesis.

Regression Error specification test(REST) of the linear form:

Table(07): the test of Regression Error specification (REST)

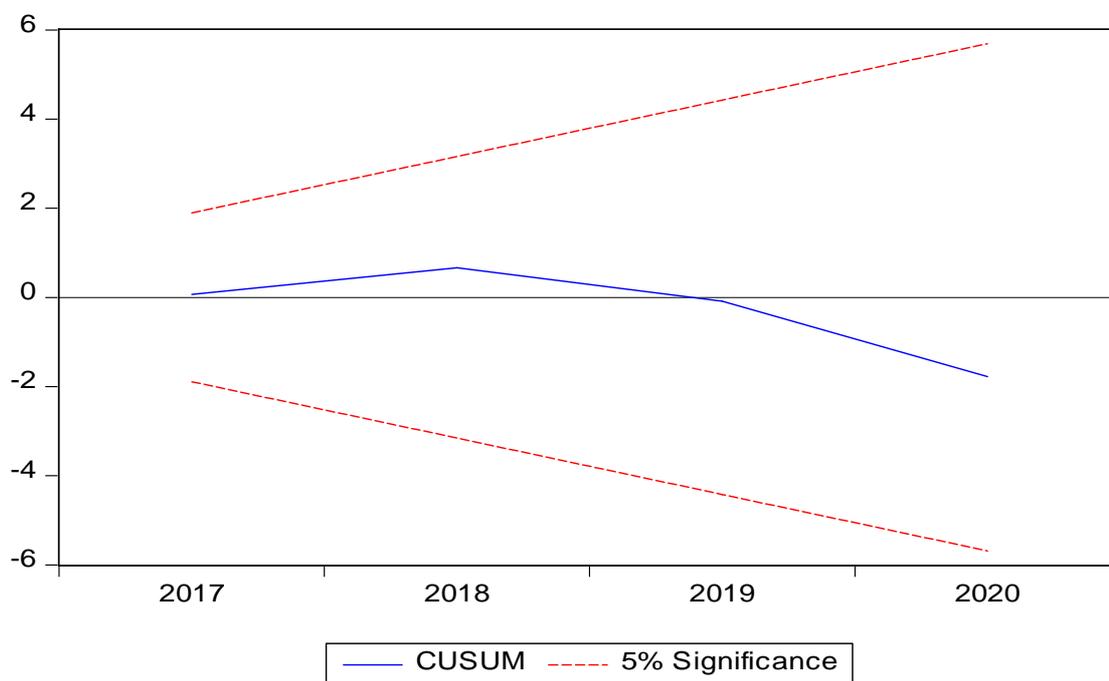
	Value	df	Probability
t-statistic	1.726980	3	0.1826
F-statistic	2.982459	(1, 3)	0.1826

Source: Prepared by researchers based Eviews 10

This test of (Ramsy -REST) is used for confirmed if their present a non semantic (linear) form, hence the results of REST test indicate the probability related calculated 0.1826 was more than 5 percent, then accept null hypothesis which implied we accept the validity and the appropriateness of the model, as well as the (ARDL) model depends linear or semantic form and the residuals in the modal are free of autocorrelation problem.

Diagnostic and Structural Stability test for the estimated (ARDL) model:

Figure (04) : the test of Diagnostic and Structural Stability for the estimated (ARDL) model



Source: Prepared by researchers based Eviews 10

The aim of CUSUM test to analyze the performed add to verify the structural and dynamic stability, for the test of stable in estimated model, we note the figure () it is clear that the trend line of graph falls within the boundaries critical at 5 percent hence coefficients of variables stability as reflected in stability test CUSUM.

V.CONCLUSION:

The main goal of this paper was to study the effect fiscal dominance on monetary policy in Algeria covering the period (1998-2020), the question being presence or otherwise fiscal dominance impacts on inflation rate, for determine the effects of fiscal dominance phenomenon on monetary policy means we evaluated (FTPL) the fiscal theory of price level , So we argued the relationship between general price level, budget deficit to GDP, broad money to GDP, official exchange rate, interest rate treasury bills and oil price, using (ARDL) model . Our results of long run show that the coefficient of budget deficit is inversely and negatively related to the inflation rate that is consistent with the Woodford theory for the year (1995) , besides the parameters of all variables are negatively related with the inflation rate except official exchange rate was positively related with inflation rate, meanwhile the results obtained in Algeria economic policies frequently suffers from problems, pressures, decline, changes and difficulties economic situations because depends on the petroleum revenues and so the oil price impacts and misalignment economic structure.

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