OIL PRICE, BUDGET DEFICIT, MONEY SUPPLY AND INFLATION IN WAEMU COUNTRIES

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iD **DRAMA Bedi Guy Hervé**[1+]

iD **Yao Kouadio Ange-Patrick**[2]

[1,2]*Department of Economics, University Peleforo Gon of Korhogo. Republic of Cote d'Ivoire*
[1]*Email:* dramsiben.upgck@gmail.com
[2]*Email:* angepaks@yahoo.fr

(+ Corresponding author)

ABSTRACT

The main target of this paper is to explore both in short and long run the effects of world oil price, budget deficit and money growth on inflation in West African Economic and Monetary Union (WAEMU) running the period of 1990 to 2016. In that end, we utilized the autoregressive distributed lag (ARDL) bounds test approach developed by Pesaran *et al.* (2001) and the granger causality test. The empirical investigation indicates strong evidence of long run relationship among variables in all countries covered by the study except Togo. Oil price and inflation are positively linked in a very large majority of the member countries. There is positive and significant relationship between budget deficit and price level in Burkina Faso and Niger. In addition, our empirical work supports strong evidence that monetary expansion is positively linked with price level in Burkina Faso, Mali and Togo. In short run, the Granger causality demonstrated that budget deficit doesn't cause money growth in WAEMU countries. It should be mentioned that the oil price has not an impact on inflation in all countries at short term. So, the main finding of this study is that oil price drives up inflation in the WAEMU zone in long term, but not in short time. As policy implication, the study suggests, among others, some improvements in growth policy, trade policy, general tax policy, raw material production, fuel efficiency and diversity.

Contribution/ Originality This study is one of very few studies which have investigated the effects of world oil price, budget deficit and money growth on inflation in WAEMU countries. It brings to light the short and long run impacts of world oil price on inflation in West African CFA Franc zone.

1. INTRODUCTION

Containing inflation is fundamental condition for ensuring sustainable economic growth and development. In WAEMU countries, it is noted these last years that inflation remains globally tamed. However, several members of the Union fail to meet the inflation standards set at a maximum threshold of 3 per cent, as was the case for the 2008, 2011 and 2012 years (years of large increase in the oil prices). Indeed, some studies explain this matter by the fact that inflation in WAEMU depends mainly on unstable variations of variables such as oil price, imported inflation, food (mostly cereal) production and vagaries of weather (Doe and Diallo, 1997; Diallo, 2003; DemboToe, 2010). In other words, we remark that inflation level in WAEMU follows changes in international economic environment (notably world prices of oil and food products) and in the frequency (and intensity) of rainfall. This instability of price, by the means of uncertainty generated, affects negatively economic decisions of investors, implementing of

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growth policy, the fight against unemployment and economic convergence. Beyond the shocks on the supply side, some studies focus on the factors of the demand excess. Generally, certain research focussed specially on the money supply and the budget deficit. By browsing through the literature, it is apparent that the studies show conflicting results about the effects of monetary and fiscal variables on the inflation. Keho (2016) indicates that the monetary policy and the budget deficit have not short-term impact on the price changes. In other words, monetary and fiscal policy tools are less important to control the variations of general price level in WAEMU zone in the short term. On contrary, other authors remark that the short-run and long run effects of money supply are significant (Doe and Diarisso, 1998; Nubukpo, 2003; DemboToe, 2010). This major role played by non-monetary factors in inflation process in West Africa incite us to focus primarily on them. The degree and the effects of non-monetary and external variables need to be analysed in more details. In fact, oil price, fiscal deficit and money supply should be considered as the sources of inflation in this study. In reality, there are very little body of empirical literature about the investigation of inflation causes in the WAEMU zone. To the best of our knowledge, apart some studies under the supervision of financial institutions such as Central Bank of West African States (CBWAS) and International Monetary Fund (IMF), empirical researches activities addressing this question are very scarce.

A better understanding of WAEMU countries' inflation determinants is required to ensure a more stable and strict economic convergence among the members of the zone. In fact, the major thrust of our study is to determine the effects of non-monetary variables, notably the oil price on inflation process. A discussion on that topic is fundamental for creating the best macroeconomic conditions before the introduction of a single currency in ECOWAS. The remains part of the study is organized as follow. Section 2 deals with literature review. We specify the model, the methodology applied in section 3. We discuss and interpret the empirical results in section 4 and the last section concludes.

2. LITERATURE REVIEW

There is a large theoretical and empirical literature that investigates the issue of determinants and channels through which oil price, budget deficit, and money supply affect inflation. So, this literature review seeks to answer three fundamental questions: What is the impact of oil prices fluctuations on fiscal deficit? How do the fiscal deficit and the money supply interact with inflation? And finally, what is the effect of oil prices changes on inflation?

2.1. Oil Price and Budget Deficit

There is not a wide body of literature dealing with the effect of oil shocks on budget deficit. It should be noted that the clear majority of the studies emphasises the influence of oil prices on economic cycles and growth (Rahma, 2016). That being so, the correlation between the oil price and the budget deficit seems to be very diverse. Hence, for understanding the impact of oil price on fiscal deficit, there is a need to distinguish the net-oil importing countries from the net-oil exporting ones, and to mention the way budgetary authorities respond to oil prices shocks.

In net-oil exporting economies, the run-up in world oil price should improve the fiscal balance. Indeed, the surging export income should be an important opportunity to consolidate their fiscal positions. However, some countries which follow a procyclicality of government spending may face widened non-oil deficits despite the rise in oil price. In this case, the higher oil revenues incite these governments to implement very costly new projects and investments which lead to unduly large public expenditure. Hence, when an unexpected oil price fall occurs, it is becoming difficult to offset their large fiscal deficit. This situation can put the fiscal policy on an unsustainable path while the prices continue to decline. In contrast, concerning the countries that run counter-cyclical fiscal policy, the rise in oil price is an opportunity to improve their budget balance (York and Zhang, 2009; Omojolaibi and Egwaikhide, 2013). In addition, the relationship between the oil price and the budget deficit could be further explored. For this purpose, Rahma (2016) highlight that oil price shocks have asymmetric effect on Sudan's

government budget. More precisely, positive oil prices failed to cause fiscal deficit while negative oil prices have a significant influence on the budget.

In net-importing economies, rising oil prices tend to increase the costs of production and the fuel subsidies. Therefore, oil price boosts are more likely to enlarge the fiscal deficit and the public debt. In fact, because of the loss of fiscal revenues and the economic downturn, the expansionary fiscal policy results in the widening budget deficit. But, some economies which follow counter-cyclical fiscal policy could reduce negative effects of rising oil prices on the fiscal balance.

2.2. Budget Deficit, Money Supply and Inflation

Different approaches or schools of thought focus on the link between the budget deficit, money supply and the price level dynamics. These include, inter alia, neoclassical school, monetarists, Keynesians, structural school, fiscal theory of price level and public deficit (or public debt) Ricardian approach. Fisher (1911) in the framework of an equation of exchange, highlights that the money is neutral. This author argues that the general price level moves in the same proportion with the quantity of money. This analysis is known as the transaction approach of the quantity theory of money. In the same vein, adopting an income approach, Marshall (1923) and Pigou (1917) also observed the principle of proportionality between the quantity of money and the price level under the assumptions of the fixity of income velocity and the full employment. In a modern view of the quantity theory, Friedman (1956) pointed out the inflationary effects of the expansive monetary policy in long run. Monetarist opinion is based on the hypothesis that inflation is purely monetary phenomenon. This school argues that a budget deficit stimulates inflation, but only in the sense that they are monetized. In order to finance the budget deficit, the government could opt for the money creation, which increases the money supply in the economy. In turn, this rise in monetary aggregate pushes up the price level (Hamburger and Zwick, 1981). In the same way, Burdekin and Wohar (1990) observe that the independence of central banks determine the effect of budget deficits on money growth. That is to say, countries with independent central banks tend to display a poor correlation between budget deficits and the money supply. Keynesian economists reply to monetarist view that excess demand for goods and services result in inflation. However, there are many causes that may lead to this excessive demand, and not just money supply. Contrary to monetarist vision, the increase in aggregate demand in the economy plays a key role in explaining the general level of prices. More precisely, inflation is rising because of some increase in budget deficit, in consumption, in purchase houses, or in investments. In other words, for the Keynesian, the budget deficit generates an increase in the aggregate demand, and after this excess demand for goods and services lead to a rise of general price level.

It should be noted that the literature about inflation determinants integrates the impact of structural constraints or bottlenecks on the price change. In this regard, developing countries face particularly some persistent structural vulnerability that very often causes high inflation. One of the most serious structural rigidities is the budget deficit. The dynamic interaction between budget deficit and inflation has been deeply examined by the fiscal theory of price level (Sargent and Wallace, 1981; Leeper, 1991; Sims, 1994; Woodford, 1994; Buiter, 1998;1999;2017). According to this theory, the coordination between fiscal and monetary authorities (or policies) determined the degree of stability of price level. Hence, two possible regimes are considered before appreciating the real impact of budget deficit on the movement of prices. Under the monetary dominant regime or Ricardian regime, the inflation is derived by the variations of money demand and supply, or by decisions setting interest rates (monetary policy). The management of the intertemporal budget constraint by the government plays a passive role. In other words, fiscal decisions are not the main source of inflation in the economy. Under the fiscal dominant regime or non-ricardian regime, inflation derives from the fiscal policy. In this context, the decisions of monetary authorities (monetary policy) remain without much influence on the price changes. In the view of public deficit (or public debt) Ricardian approach, a tax relief financed by additional borrowing doesn't spur the consumer spending

to the extent that tomorrow's taxes pay for today's obligations. So the budget deficit doesn't lead to an increase in the general price level because of the rational expectations of economic agents (Barro, 1974;1989; Fujiki, 2001).

Several empirical studies in the world attempt to examine the validity of the interaction among macroeconomic variables such as budget deficit, money supply and inflation. Many authors argue that money growth has positive effect on inflation (Akinboade *et al.*, 2004; El-Shagi and Giensen, 2013; Khieu, 2014). Moreover, Keho (2016) used ARDL bounds test applied to data running WAEMU countries and concluded that money expansion increases inflation in Côte d'Ivoire, Burkina Faso and Senegal. He also noted that the budget deficit cannot be held responsible for inflation in this economic area, but it causes an increase in money supply in Côte d'Ivoire, Togo and Mali. Using data of Tanzania from 1967 to 2001 and under the long run monetary neutrality, Solomon and De Wet (2004) verified successfully that the shocks in budget deficit influence significantly the movement of prices. Implementing the frequency domain causality to quarterly data for nine UE countries during the period 1990-2013, Tiwari *et al.* (2015) shows that there is no relationship causality from budget deficit to inflation for these Europeans countries. Applying the bounds test to Nigerian economy's data from 1970 to 2010, Raji *et al.* (2014) conclude to short-run causality between budget deficit and inflation.

2.3. Oil Price and Inflation

The relationship between oil price and inflation has changed substantially over the years. In contrast to the strong relationship between oil price and inflation during the price shocks in the 1970s and the 1990s, there has been a weak link in recent years. Indeed, some studies reveal the significant effect of oil price on inflation (Misati *et al.*, 2013; Abounoori *et al.*, 2014; Kargi, 2014; Ibrahim, 2015). Other research found a limited correlation between these two economic variables (Hooker, 2002; Gregorio *et al.*, 2007; Jiranyakul, 2015). Furthermore, Sill (2007) shows an insignificant effect of oil price on United States inflation. This declining relationship may be explained by a combination of factors such as the better control over monetary policy, the improvement in energy efficiency, the promotion of the energy mix and the real wage rigidities. Regarding African countries, the empirical studies are very few. By the means of panel vector autoregressive approach (PVAR) on Economic and Monetary Community of Central African countries (CEMAC), Bikai *et al.* (2016) find out that oil price is less significant for understanding price level changes in this economic zone. These authors explain this weak short-term relationship by the existence of some Hydrocarbons prices stabilisation funds in different countries in this African region. Along the same lines, DemboToe (2010) investigating the link between oil price and inflation in WAEMU countries, find out that the impact of oil price is not significant in the short term, but significant in the long term. For DemboToe (2010) this low oil price elasticity of inflation is the result of the stabilisation policies of fuel prices at the pump.

3. ECONOMETRIC METHODOLOGY AND DATA SOURCES
3.1. Econometric Model Specification

This paper examines the long run relationship and causality direction between price level, budget deficit, money supply and world oil price. In so doing, our work consists to detect the determinants of price level by using the following equation:

$$LnCP_t = \beta_0 + \beta_1 LnDF_t + \beta_2 LnM2_t + \beta_3 LnOP_t + \varepsilon_t \quad (1)$$

Where CP represents the price level, DF indicates budget deficit defined as a share of GDP, $M2$ is broadly defined money supply as share of GDP and OP is depicted by international world oil price level. The parameters β_1, β_2 and β_3 illustrate respectively the effects of budget deficit, money supply and oil price on price level of seven West African countries.

3.2. ARDL Bounds Test Approach to Cointegration

In this paper we utilize Pesaran *et al.* (2001) autoregressive distributed lag (ARDL) bounds test approach to investigate the long run relationship between price level and its determinants. To start, we firstly test the null hypothesis of no co-integration against the existence of a long run relationship. The ARDL method has econometric advantages compared to other cointegration approach. Among others, the bound testing procedure provides us: First, the utilised variables are integrated at level $I(0)$, first difference $I(1)$ or fractionally integrated; Second, the Bound testing approach resolve the explanatory variables' endogeneity problems and it's impossible to test other hypothesis in long run with the estimated parameters; Third, this procedure allows us to obtain simultaneously both long-run and short-run parameters. Finally, no matter the smaller data base, the technique gives us reliable results (Haug, 2002). According what we mentioned above and based on Bounds testing method, the following $ADRL - ECM$ equation can be written in this form:

$$\Delta LnCP_t = \gamma_0 + \gamma_1 LnCP_{t-1} + \gamma_2 LnDF_{t-1} + \gamma_3 LnM2_{t-1} + \gamma_4 LnOP_{t-1} + \sum_{i=1}^{m} \phi_{1i} Ln\Delta CP_{t-i}$$

$$+ \sum_{i=0}^{n} \phi_{2i} \Delta LnDF_{t-i} + \sum_{i=0}^{p} \phi_{3i} \Delta LnM2_{t-i} + \sum_{i=0}^{q} \phi_{1i} \Delta LnOP_{t-i} + \varepsilon_t$$

(2)

Where the Δ is the difference operator and ε_t is $i.i.d$. In addition, the null hypothesis of no cointegration is $\gamma_1 = \gamma_2 = \gamma_3 = 0$ and that hypothesis is tested by the F-statistic. According Pesaran *et al.* (2001) the asymptotic critical values provided by the computed tabulation. All restricted parameters of lag level variables equal to zero test the presence of long run relationship. Moreover, the lag structure (m, n, p, q) is selected according the criteria of BIC or AIC (Stock and Watson, 2003). Hence, by using the Akaike Information criterion (AIC) and the Schwarz Bayesian Criterion (SBC) we find that the maximum lag length is $k = 5$ for each country. Although the cointegration test helps us to verify the existence of long run relationship or not between our selected variables, the short run causal direction can be provided by Granger causality tests.

3.3. Granger Causality Test

As far as we know, Granger causality test provides us robust framework to investigate the short run causal relationship among our variables. When the presence of cointegration is confirmed, Granger-causality test procedure allows us to incorporate a lagged error correction term within a vector error correction model (VECM). So the model can be written in this form:

$$(1-L)\begin{bmatrix} CP_t \\ DF_t \\ M_t \\ OP_t \end{bmatrix} = \begin{bmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \\ \lambda_4 \end{bmatrix} + \sum_{i=1}^{p}(1-L)\begin{bmatrix} \beta_{1i} & \phi_{1i} & \gamma_{1i} \\ \beta_{2i} & \phi_{2i} & \gamma_{2i} \\ \beta_{3i} & \phi_{3i} & \gamma_{3i} \\ \beta_{4i} & \phi_{4i} & \gamma_{4i} \end{bmatrix} \times \begin{bmatrix} CP_{t-i} \\ DF_{t-i} \\ M2_{t-i} \\ OP_{t-i} \end{bmatrix} + \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_4 \end{bmatrix} ECT_{t-1} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ e_{4t} \end{bmatrix}$$

(3)

Where (1-L) indicates the difference operator and the lag residuals of long run relationship is depicted by ECT_{t-1}. In addition we utilize the Akaike Information criterion (AIC) and the Schwarz Bayesian Criterion (SBC) to get the lag length. If the differenced explanatory variables are significant, this implies the presence of short term

causality. Also the statistical significance of ECT_{t-1} detects the presence of long term causality. Our empirical investigation covers seven West African Economic and Monetary Union (WAEMU) such as Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal and Togo. In this paper, we incorporated the logarithm in our model. The variables utilized are consumer price index proxy to price level, the broadly money supply share to GDP, budget deficit ratio to GDP and international world oil price. The variables are selected from financial statistics published by International Monetary Fund and World Development Indicators of World Bank covering the period of 1990-2016.

4. EMPIRICAL RESULTS AND INTERPRETATIONS

We need first to verify the time series properties of our variables before performing cointegration tests. In this stage, it's important for us to view weather variables is integrated or not because the bounds tests approach allow dependent variable to be $I(1)$. In so doing, we run the unit root test known as Phillips and Perron (1988) with constant and trend at level and first difference. The results illustrated in chart 1 showed that all the variables contain unit root at level but they are all stationary at first difference so integrated in order one $I(1)$ except budget deficit which is stationary in Burkina Faso and Mali. In addition, the second step is to perform the cointegration test using autoregressive distributed lag (ARDL) bounds test approach method developed (Pesaran *et al.*, 2001). The results of the bounds F-test of long run relationship coefficients between price, budget deficit, money supply and world oil price are depicted in Chart 2 bellow.

Chart-1. Unit root tests

Country	CP	DF	$M2$	OP	ΔCP	ΔDF	$\Delta M2$	ΔOP
Benin	2.071	-2.058	1.725	1.416	-5.197	-9.816	-5.362	-7.689
Burkina Faso	3.662	-3.590	1.645	1.416	-5.045	-15.040	-7.742	-7.230
Cote d'Ivoire	2.643	-2.439	1.330	-1.632	-5.102	-5.574	-6.259	-7.315
Mali	0.084	-4.245	-0.828	-0.167	-5.209	-18.125	-8.311	-6.365
Niger	1.079	-2.142	-0.886	-1.631	-7.545	-10.049	-5.683	-6.401
Senegal	2.079	1.631	1.851	1.416	-4.079	-6.543	-5.957	-5.411
Togo	2.293	1.625	1.866	1.342	-4.399	-9.504	-5.942	-7.358

Notes: Critical values at the 5% level are -3.518 (level) and -2.933 (difference).
Source: Computed by the authors.

From chart 2, the cointegration test results indicate that the computed F-statistic exceeds the upper critical values at the conventional level 1%, 5% and 10% respectively. So we reject the null hypothesis of no cointegration between all variables and conclude that long run relationship exist among price level, budget deficit, money supply and world oil price for all countries covered by the study. Furthermore, the estimation of long run coefficients indicates that there is positive and significant relationship between oil price and price level in long term in Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger and Senegal except Togo. In other words, oil price increases price level in long run in these countries. For example for Cote d'Ivoire and Benin, the main driver of inflation is oil price and it impacts negatively the purchasing power of households. In addition, there is positive and significant relationship between budget deficit and price level in Burkina Faso and Niger. These results imply that budget deficit increase price level in Burkina Faso and Niger. For these two countries, which are among the poorest in the WAEMU zone, a strong increase in budget deficits could seriously aggravate the economic situation of the households. However, budget deficit displays positive and insignificant link with price level for Benin and Mali. In opposite, the negative relationship between budget deficit and price level in Cote d'Ivoire, Senegal and Togo indicates that deficit decreases price in these countries. On the other side, our empirical work showed that monetary expansion is

positively linked with price level in Burkina Faso, Mali and Togo. This is consistent with the thinking of monetarist school.

Chart-2. Results Pesaran cointegration tests

Long run relationship				
Country	**F-statistics**	**Budget deficit**	**Money supply**	**Oil price**
Benin	218.99 [a]	2.561(1.648)	–1.464(1.678)	0.505(4.709)*
Burkina Faso	530.699 [a]	1.518(2.238)**	1.258(2.668)**	0.700(3.173)*
Cote d'Ivoire	480.737 [a]	–1.457(3.833)*	–0.181(0.280)	0.309(4.788)*
Mali	20.993 [a]	0.267(0.490)	2.065(2.084)**	0.298(5.271)*
Niger	30.527 [a]	1.534(2.940)*	–1.636(3.787)*	0.261(4.262)*
Senegal	17.404 [a]	–2.911(2.367)**	0.847(1.823)***	0.190(2.627)**
Togo	25.259 [a]	–2.237(2.745)**	1.792(3.126)*	0.130(1.603)

Note: Critical values for **F-statistics** are taken from Pesaran *et al.* (2001). The superscript **'a'** indicates that the null hypothesis of no cointegration is rejected at the 5% level. The asterisks *, ** and *** implies statistically significant at 1%, 5% and at 10% level respectively.
Source: Computed by the authors.

Chart-3. Granger causality test results

Short run causal variable						
Country	**Dep. Variables**	*Price*	**Budget Deficit**	**Money Supply**	*Oil price*	ECT_{t-1}
Benin	*Price*	–	1.351(0.281)	2.872(0.080)***	1.693(0.209)	–0.823(5.359)*
	Budget Deficit	0.015(0.985)	–	2.106(0.148)	3.181(0.063)***	0.329(2.265)**
	Money Supply	0.511(0.607)	1.118(0.347)	–	0.406(0.671)	0.048(0.252)
	Oil price	0.329(0.724)	1.026(0.376)	2.837(0.083)***	–	0.544(0.313)
Burkina Faso	*Price*	–	0.110(0.896)	1.505(0.246)	1.472(0.253)	–0.09(1.928)***
	Budget Deficit	0.861(0.439)	–	0.373(0.693)	1.857(0.182)	0.03(0.921)
	Money Supply	0.131(0.877)	0.697(0.509)	–	0.541(0.590)	–0.044(0.908)
	Oil price	0.329(0.724)	1.026(0.376)	2.833(0.083)***	–	0.544(0.313)
Cote d'Ivoire	*Price*	–	1.256(0.306)	2.123(0.146)	1.701(0.206)	–0.046(4.262)*
	Budget Deficit	1.334(0.284)	–	0.968(0.397)	0.227(0.799)	0.101(5.265)*
	Money Supply	0.336(0.718)	0.696(0.501)	–	0.066(0.936)	0.041(1.408)
	Oil price	0.395(0.679)	0.609(0.553)	3.718(0.042)**	–	0.292(1.017)
Mali	*Price*		1.329(0.287)	2.856(0.081)***	1.496(0.248)	–0.019(1.961)***
	Budget Deficit	0.595(0.594)		0.226(0.800)	0.014(0.986)	0.015(0.492)
	Money Supply	1.363(0.278)	0.538(0.592)	–	0.399(0.676)	–0017(1.799)***
	Oil price	0.758(0.482)	0.186(0.832)	2.567(0.102)		0.233(2.494)**
Niger	*Price*	–	0.937(0.408)	4.043(0.034)**	1.580(0.230)	–0.732(4.299)*
	Budget Deficit	1.114(0.347)	–	5.048(0.017)**	10.412(0.001)*	0.325(1.452)
	Money Supply	2.278(0.128)	0.762(0.479)	–	1.787(0.193)	0.322(1.992)***
	Oil price	0.440(0.649)	0.282(0.757)	3.799(0.039)**	–	–0.894(0.577)
Senegal	*Price*	–	1.923(0.173)	1.961(0.167)	1.359(0.279)	–0.434(7.671)*
	Budget Deficit	6.135(0.008)*	–	0.561(0.579)	1.202(0.321)	0.074(1.263)
	Money Supply	2.075(0.152)	1.456(0.257)	–	1.483(0.251)	0.059(0.691)
	Oil price	0.448(0.645)	0.848(0.443)	1.678(0.212)	–	2.248(3.71)*
Togo	*Price*	–	1.511(0.245)	1.843(0.184)	1.341(0.284)	–0.186(1.003)
	Budget Deficit	4.127(0.316)	–	0.575(0.572)	1.171(0.330)	–0.454(2.501)**
	Money Supply	2.171(0.140)	1.689(0.210)	–	1.483(0.251)	0.252(0.429)
	Oil price	0.679(0.519)	2.095(0.149)	1.679(0.212)	–	1.272(0.429)

Note: Statistics for short-run causality are Chi2-statistics with p-values in parentheses. Column ECT_{t-1} shows coefficients on ECT_{t-1} with t-statistics in parentheses. The asterisks *, ** and *** denote statistical significance at the 1%, 5% and 10% levels, respectively.
Source: Computed by the authors.

The Chart 3 displays the results of the Granger-causality tests. Also the statistical significance of ECT_{t-1} at the conventional level detects the presence of long term causality. More precisely, the results show that a long-run relationship exists between price and its determinants in Benin, Burkina Faso, Cote d'Ivoire, Mali, Niger and Senegal except Togo (one of the countries of large-scale organised smuggling of petroleum products in West Africa). This outcome confirms our previous results and is to some extent linked to those of DemboToe (2010). Regarding the short term causality, oil price does not granger cause inflation in WAEMU countries. May be because of fuel subsidy policies (applied in all WAEMU countries) aimed at avoiding social troubles. Furthermore, our results indicate evidence that money supply granger causes price level in Benin, Mali, and Niger. Also, money growth granger causes oil price in Benin, Burkina Faso, Cote d'Ivoire and Niger. In addition, money supply granger causes deficit in Niger and then, oil price granger causes budget deficit in Benin, in Niger and price causes deficit in Senegal. On the contrary, budget deficit doesn't cause money growth in all countries covered by the study. This situation is in line with significant recent progress regarding the independence of the central bank (BCEAO).

5. CONCLUSION

This paper examines causality relationship between inflation, budget deficit, money growth and international oil price running seven West African countries namely Benin, Burkina Faso, Cote d'Ivoire, Mali, Niger, Senegal and Togo. In so doing, we performed the ADRL bound testing technique coupled with Granger causality tests. The empirical findings report that significant relationship exist between price level, budget deficit, money supply and international world oil price in long run for Benin, Burkina Faso, Cote d'Ivoire, Mali, Niger and Senegal except Togo. So, we found that increase in oil price raises price level in all countries, except Togo. In addition, our empirical investigation supports strong evidence that monetary expansion is positively linked with price level in Burkina Faso, Mali and Togo. In the same order, the study demonstrated that budget deficit accelerates inflation in Burkina Faso and Niger. On the contrary, in Cote d'Ivoire, Senegal and Togo, budget deficits don't contribute to inflation in these countries. From the granger-causality analysis, we can also see that the long run relationship between the price level and its explanatory variables is confirmed. Regarding the short run causality, there is causality between oil price and deficit in Benin and Niger in short term. It was also noted that budget deficit doesn't cause money growth in WAEMU zone. In addition, budget deficit doesn't lead to inflation in the different countries. However, money supply is the cause of inflation in Benin, Mali and Niger. It should be mentioned that the oil price has not an impact on inflation in all countries at short term. So we consider that fuel price stabilization at the pump implemented in every country of the WAEMU zone prevents the transmission of oil price change on inflation. For avoiding economic distortions arising from price caps' policies, stabilization policy should not be only focused on fuel subsidies but should also based on other structural determinants of inflation such as growth, trade policy, general tax policy, raw material production, fuel efficiency and diversity.

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