Fiscal Deficits and Price Level Stability in Nigeria: Long-Run Intertemporal Optimization Model Analysis

Okanta, Sunday U[1]. & Ogbulu, Onyemachi Maxwell[2]

[1]Department of Banking & Finance Abia State University, Uturu E-mail: sundayokanta@yahoo.com 08065733343
[2]Department of Banking & Finance Abia State University, Uturu Nigeria E-mail: hrhogbulu@yahoo.com 08033401924

Abstract

The objective of this paper is to establish a long-run relationship between fiscal deficits and price level (inflation) stability in Nigeria. The new look of the paper is that it used an econometric specification explicitly derived from an intertemporal optimization model that related long-run inflation to the permanent component of the fiscal deficits where the later was scaled by the size of the inflation tax base (measured by the ratio of narrow money to GDP). The aim was to introduce a desired non-linearity in the relationship between the two phenomena. To allow for a non-linear long-run equilibrium and fluctuations in the business cycle, the paper introduced explanatory control variables of economic openness and foreign exchange rate. Secondary data were collected from the Central Bank of Nigeria (CBN) annual reports and statistical bulletins for the years. A simple bivariate analysis revealed that the relationship between a ratio of fiscal deficits to narrow money supply and inflation was strong but statistically insignificant. Even with the introduction of control variables, the relationship between the two was still strong but insignificant at 5% significance level. When more robust long-run equilibrium tests were employed, the findings showed that the relationship between the two was not strong, though insignificant at 5% level.

1.0 Introduction

One of the common government budgetary policies that may be adopted for stabilizing the economy is the fiscal deficit. According to Bello (2003), fiscal deficit represents a change in government expenditure not covered by a corresponding change in revenue; it is the consequence of the disparity and imbalance between government expenditure and revenue. The discourse of fiscal deficit has become a topical issue in the contemporary macroeconomic literature; perhaps, because of its controversial impacts on macroeconomic performance. In principle, fiscal deficits can serve a useful role by providing the ability to smooth the path of the business cycle. Longer-term deficits are justifiable if they finance long-term expenditures (as with an individual who finances the purchase of a home) or if they are expected to payoff in higher national income in the future (as an investment). In a growing economy, even a permanently increasing deficit (if it is not increasing too fast) is sustainable in the long-run (Pakko , 2009). Sergeant and Wallace (1981) established the view that any fiscally dominant government that continues to run persistent deficits sooner or later finances those deficits with money creation (Seignorage), and thereby produces inflation. While subsequent researches have highlighted a number of other mechanisms through which inflation can be fuelled and may become highly persistent (Catao and Terrones, 2001; Ljunqvist, et al, 2000), fiscal imbalances have remained at the centre stage of most theoretical models.

The on-going debate on the relationship between inflation and fiscal deficit has persisted. The issue has been whether or not fiscal deficit is a good measure of price level stability. Well-established studies are bound in the literature, either supporting or rejecting the arguments. The global challenge today is to find better and sustainable approaches to explaining the fiscal deficit–price level (inflation) puzzle. Many questions are being asked: Which approach, short-term or long-term, is appropriate? Which econometric methodology is appropriate? To what extent have studies separated developed countries from developing ones? To what extent have studies controlled for fiscal dominance? Relative to previous studies, this paper focuses on the experience of a single developing country - Nigeria; and it uses an econometric specifications that explicitly derives from a robust time-dependent series model that relates long-run inflation to fiscal deficit, where the later is scaled by the size of the inflation tax (measured by the ratio of narrow money supply to GDP). A main novelty of this paper, in the context of the inflation literature, is the use of a dynamic panel approach, intertemporal optimization model , that explicitly separates short-run dynamics from the long-run equilibrium relationships, using a specific-country analysis. Consequently, the paper hypothesizes that the long-lasting episode of persistent fiscal deficits are strong, but insignificantly influences price level stability in Nigeria. The alternative is that persisted fiscal deficits are strong, but significantly related to price level stability in Nigeria. The report of this paper is structured into six sections. Following section 1 (introduction) is section 2 , which reviews the related literature and theoretical issues. An overview of the trend of fiscal deficits and inflation variabilities in Nigeria is presented in section 3. The research methodology is discussed in section 4. The results of the tests and discussions are presented in section 5. Section 6 concludes the paper.

2.0 Literature Review

The theoretical framework of this study revolves around the issues of financing deficits and the implications on the varied economic performance indicators. The theorists' arguments seem to conclude that, deficits depending on the financing, may not matter after all in the mathematical equation of economic performance. The views could be more feasible in developed than developing countries as we argue in this section.

2.1 The Conventional Views

The conventional view argues that fiscal deficit is inevitable in periods of economic recession when government must borrow to restore the economy to its full-employment level. In this case, the government reduces taxes and raises expenditure, thereby raises national debt. An increase in taxes can provide initial stimulus, particularly if the government presents the same conclusion as the conventional view that "fiscal deficit does not matter after all". David Ricardo in (Humpage, 1993) argues on the platform of the general principle that government deficit is equivalent to future tax rise. According to him, government cuts taxes today, runs deficit, then raises taxes in the future to pay off the debt. To this end, the rational consumer, understanding that government's borrowing today gives him temporary disposable income and unaffected permanent future income but higher future taxes, does not change his/her consumption pattern; he remains neutral and indifferent. The consumer sees the cut in taxes today as "future rise in taxes equating future taxes with the current taxes. Hence, financing government fiscal deficit today is equivalent to financing it by taxes. The implication is that a deficit financed by a tax cut leaves consumption unaffected and consumers save extra income to pay for the future tax liability. This increase in private savings just offsets the decrease in public savings. Since national savings (private savings plus public savings) remain the same, government deficit has no effect on real interest rates or real exchange rates. To this end, deficit does not matter.

2.2 Balanced-Budget Theory

The proponents of this theory believe that the federal budget is always imagined to balance. In reality, it is not possible. The proponents believe that the changing pattern of expenditure between the government and the private sector results to changes in the purchasing power of money. A budget surplus or a deficit may be partly or fully counter-balanced by the opposite behaviour of the private sector. The resultant effect on interest rate and/or inflation would depend on the pattern and composition of government expenditure compared to those of the private sector (Humpage 1993). Suppose the government implements a fiscal policy of imposing lump-sum taxes. (A lump-sum tax is a straightforward naira assessment as opposed to being a proportion of income, wages or expenditure). Lump-sum taxes do not affect individuals' savings and working decisions. The inclination is that their future tax liability will be met. If government spends the revenue generated on current output, the consumption pattern of the private sector might change. The resultant effect might be a reduction in national savings. Interest rates and/or inflation would rise to balance savings and investment. The effects on interest rates, exchange rates and inflation are purely those of the fiscal policy in place, not as a result of the existence of a deficit. The changes in these indicators arise solely because of the difference between government and private spending patterns.

2.3 Summary of the Debate

The empirical evidence and theoretical arguments outlined above suggest that fiscal deficits may be unrelated to any of the ecponomic fundamentals (interest rates, exchange rates and inflation rates), and that they pose no direct threat to our economic well-being. The conditions under which the conventional view (Ricardian equivalence) and the balanced-budget theory hold, even from a theoretical perspective, are quite restrictive; so, they are unlikely to be a literal description of the impact of deficit on inflation (Pakko, 2009). Nevertheless, the theories serve as a baseline for evaluating the relevance of crowding out effects that might be present if, for example, consumers are myopic about their own future tax burden or fail to consider the welfare of future generations, or if credit-market imperfections prevent them from responding optimally to government deficits.

Moving away from the above debate, Catao, et al (2001), in their study of fiscal deficit-inflation puzzle, argue that a government that runs deficit through borrowing and continues to accumulate debts is prone to inflation burden. Catao and his associates conclude that fiscal deficit might not be a significant cause of inflation in advanced countries, but it is significant in developing countries. This paper seeks to confirm Catao and associates' evidence in a specific-country in the developing world.

2.4 Trend of Fiscal Deficits and Inflation Variabilities in Nigeria

Statistics have shown that large budget deficits have persisted for more than three decades in Nigeria (see table 1-1 and figure 1-1). The domestic standard of living has lowered over the years. Basic economic indicators, such as GDP growth rate (in %),and the rate of price change (inflation rate), have fluctuated seriously. Amid a swirl of proposed tax hikes, expenditure cuts, and constitutional amendments to the federal budget processes by the successive Nigerian governments, the economy is still basking in the doldrums. Thus the question arises: to what extent does a cut or a rise in the size of budget deficit prove of significant consequence on price level stability in Nigeria? In other words, is there any significant relationship between persistent large budget deficits and rising inflation in Nigeria?

Table1.1 Federal Government Total Retained Revenue, Total Expenditure and Overall Deficit/Surplus (in ₦'m)

Year	Retained Revenue (₦'m)	Total Expenditure (₦'m)	Overall Surplus(+) /Deficit (-) (₦'m)
1980	5321.90	7122.10	-1800.20
1981	7511.60	11413.70	-3902.10
1982	5819.10	11923.20	-6104.10
1983	6272.00	9636.50	-3364.50
1984	7267.20	9927.60	-2669.40
1985	10,001.40	13041.10	-3039.70
1986	7969.40	16223.70	-8254.30
1987	16129.00	22018.70	-5889.70
1989	25893.60	41028.30	-15134.70
1990	28152.10	60268.20	-22116.10
1991	30829.20	66584.40	-35755.20
1992	53264.90	92797.40	-39532.50
1993	126071.20	191228.90	-65157.70
1994	90622.60	160893.20	-70270.60
1995	249768.10	248768.10	+1000.00
1996	325144.00	337217.60	-12073.60
1997	351262.30	428215.20	-76952.90
1998	353724.10	487113.40	-133389.30
1999	662585.30	947690.00	-286104.70
2000	597282.10	701059.40	-103777.30
2001	796976.70	1018025.60	-221048.90
2004	716754.20	1018155.80	-301401.60
2005	1023241.20	1225965.90	-202724.70
2006	1253600.00	1426200.00	-172600.00
2007	1660700.00	1822100.00	-161400.00
2008	1836605.00	1938002.50	-101397.50
2009	2338659.60	2450896.70	-117237.10
2010	3193440.00	3240820.00	-47380.00
2011	2642982.34	3452990.80	810008.46
2012	3088778.10	4194217.80	-1105439.78
2013	3140636.70	4299155.10	-1158518.40
2014	4217743.81	4531228.60	-313484.81
2015	2349860.51	4214426.31	-1864565.80

Source: CBN Annual Reports and Statements of Accounts (various years); CBN Statistical Bulletin, Vol. 22, 2011.

Table 1.1 and figure 1.1 show that over the last three decades, the federal government has exceeded its budgets by a string of deficits. Between 1980 and 1987, the deficits fluctuated on a small scale. That is, the deficits were kept low. This low level could as well be described as a period of balanced budget. During the period, Nigeria's publicly held deficits maintained an average of 3.70 percent of the GDP. Between 1988 and 2000, the deficits tended to rise marginally and the publicly held deficits have jumped to an average of 5.72 percent of GDP. This indicates that the nation's publicly held debt profile has gone up. Between 2003 and 2007, the deficits managed to fluctuate on a low scale (1.1 percent of GDP on average), thanks to the government aggressive fiscal reforms.

Public sector deficit is determined primarily by government's fiscal policy. Tight fiscal policy engenders deficit reduction and this is seen as essential for the pursuit of right monetary policy.

Is there any direct link between the government growing deficits and rising inflation? Table 1-2 shows that there is no direct and immediate link between the size of the budget deficit and inflation rate. Nigeria has had significantly higher inflation rates but lower budget deficits relative to GDP. The stylized arguments outlined above set the stage upon which this paper tests for a significant level between the persistent large deficits(scaled by nominal GDP) and the size of the inflation tax base(scaled by the rate of narrow money supply to GDP) in Nigeria for more than 30 years.

Fig **1.1. A string of Deficits**

The federal government achieved annual budget surpluses for three years, out of over twenty years of consideration. For above twelve years the Federal Government maintained very low budget deficits.

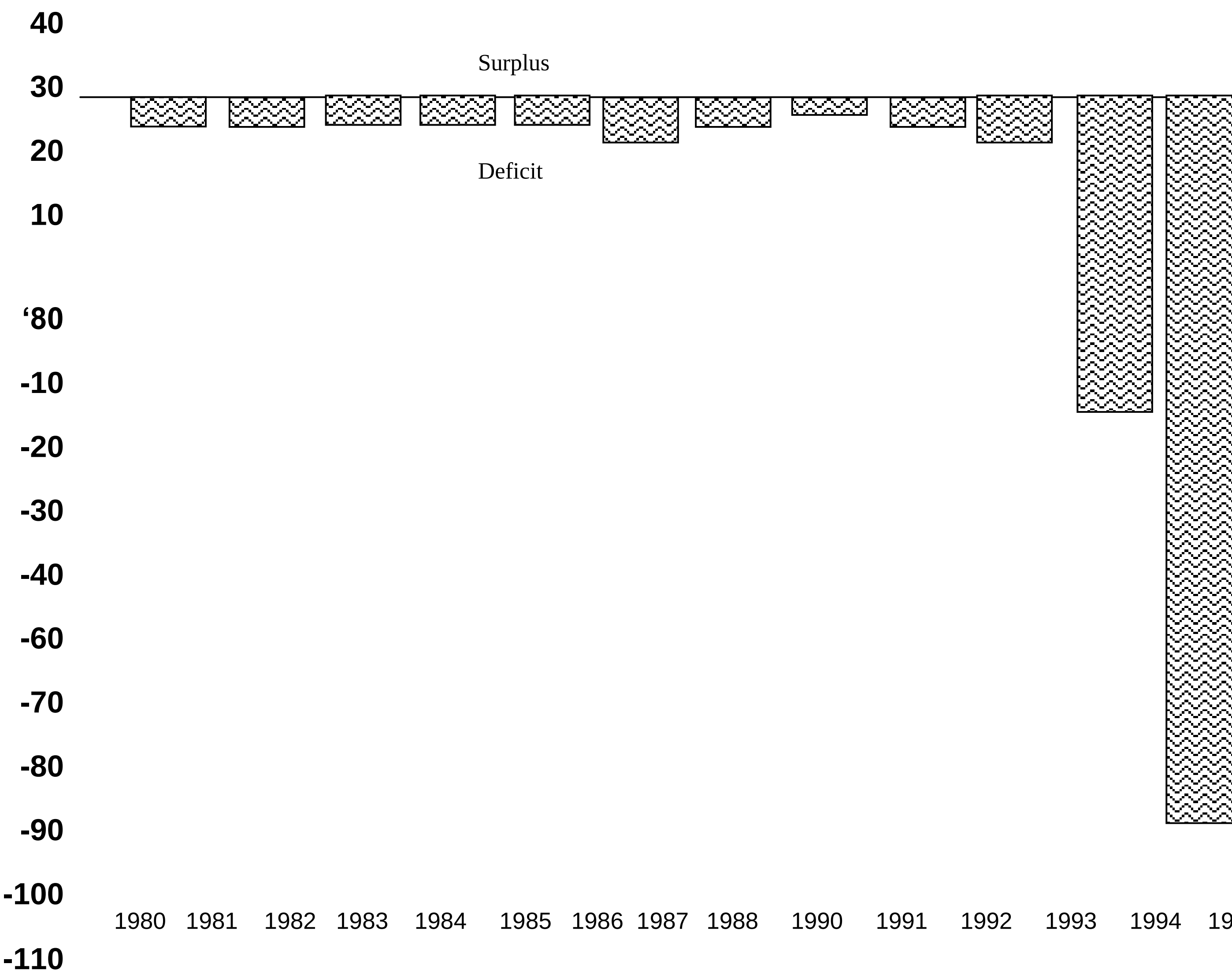

Table 1.2: Rate of Price Change in Nigeria Between 1980 and 2015

Years	Price Change (%)	GDP (at current mkt. Price) Growth - % change
1980	10.8	
1981	7.7	12.7
1982	23.2	7.2
1983	29.5	8.3
1984	32.8	5.0
1985	35.8	15.7
1986	38.7	-0.8
1987	45.5	41.4
1988	49.8	35.5
1989	55.6	46.7
1990	29.2	23.2
1991	41.4	15.5
1992	51.6	58.4
1993	60.4	24.4
1994	70.1	28.7
1995	72.8	105.3
1996	28.0	38.2
1997	8.5	4.0
1998	9.8	-4.6
1999	6.6	17.0
2000	6.8	42.7
2001	18.9	3.0
2002	12.9	13.2
2003	14.0	27.0
2004	15.0	15.2
2005	17.9	26.9
2006	8.2	25.3
2007	5.4	23.1
2008	11.6	6.3
2009	12.5	2.0
2010	13.7	37.1
2011	10.8	10.5
2012	7.8	12.1
2013	11.0	7.6
2014	10.4	3.2
2015	12.4	2.4

Source: CBN Annual Reports & Statements of Accounts (Various Years); Federal Office of Statistics; CBN Statistical Bulletin.

3.0 Methodology

3.1 Model Specifications

A central point of Sargent and Wallace (1981), and Catao and Terrones (2001), is that the relationship between budget deficit and inflation is dynamic. Under the environment of fiscal dominance (which is a case in Nigeria) deficits determine the present value of Seignorage but not necessarily current seignorage. This is because borrowing allows governments to allocate Seignorage intertemporally, implying that fiscal deficits and resort to the inflation tax need not be contemporaneously correlated.

The model adopted in this paper is:

$$\pi = b\left(\frac{def}{M1}\right) \quad \text{----------- equation (1)}$$

Where,
π is the nominal inflation rate;
def is the nominal fiscal deficit;

M_1 is the stock of narrow money;
'b' is a positive parameter.
The above model yields a simple functional form in steady state equilibrium, postulating that inflation is positively and linearly related to the fiscal deficit scaled by narrow money. This is an attempt to turn fiscal deficit to a monetary dynamic as is inflation.

Dividing the numerator and the denominator of equation (1) by GDP yields the conventional measures of the fiscal deficit (i.e fiscal deficit scaled by nominal GDP) and of the size of the inflation tax base (measured by the ratio of narrow money to GDP) respectively, i.e,

$$\pi = b\left(\frac{\frac{Def}{GDP}}{\frac{M1}{GDP}}\right)$$

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$$\pi = b\left(\frac{\frac{Def}{GDP}}{\frac{GDP}{M1}}\right)$$

$$\pi = b\,\frac{Def}{GDP}$$ ------------------ (see equation 1 above)

Table 4.1 Nigeria: Fiscal Deficit, GDP, Narrow Money (M_1) and the Ratios (1980 - 2015)

Year	Fiscal deficit (def.) (₦'m)	GDP at current mkt price) (₦'m)	Narrow Money- M_1 (₦'m)	$\frac{def}{GDP}$ (%)	$\frac{M1}{GDP}$ (%)	$\frac{def}{M1}$ (%)	Price Change (Inflation) (π)
1980	-1800.20	91,078.70	6110.2	2.00	6.70	29.51	2.90
1981	-3902.10	102,686.80	9915.3	3.80	9.66	39.35	20.90
1982	-6104.10	110,029.80	10291.8	5.55	9.35	59.31	7.70
1983	-3364.50	119,117.10	11517.8	2.82	9.67	29.21	23.20
1984	-2660.40	125,074.80	12497.1	2.13	9.9,9	21.29	39.60
1985	-3039.70	144,724.10	13878.0	2.10	9.59	21.90	5.50
1986	-8254.30	143,623.90	13,560.4	5.75	9.44	60.87	5.40
1987	-5889.70	203,037.10	15,195.7	2.90	7.48	38.76	10.20
1988	-12,160.90	275,198.20	22,232.1	4.42	8.08	54.70	38.30
1989	-15134.70	f403,762.90	26268.8	3.75	6.51	57.61	40.90-
990	-22116.10	f497,351.30	39156.2	4.45	7.87	56.48	7.50
1991	-35755.20	574,282.10	50,071.7	6.23	8.72	71.41	13.00
1992	-39532.50	909,754.20	75,970.30	f4.35	8.35	52.04	44.50
1993	-65157.57	1,132,181.20	118,753.40	5.76	10.49	54.87	57.20
1994	-70270.60	1,457,129.70	169,391.50	f4.82	11.63	f41.48	57.00
1995	+1000.00	2,991,941.70	201,414.50	0.00	6.73	0.50	72.80
1996	-12073.60	4,135,813.60	227484.40	0.29	5.50	5.31	29.30
1997	-76952.90	4,300,209.00	268,622.90	1.79	6.25	28.65	8.50
1998	-133389.30	4,101,028.30	318576.00	3.25	7.77	f41.87	10.00
1999	-285104.70	4,799,966.00	393078.80	5.94	8.19	72.53	6.60
2000	-103777.30	4,799,966.00	393078.80	5.94	8.19	72.53	6.60
2001	-221048.90	7,055,331.00	816,707.60	3.13	11.58	27.07	18.90
2002	-301401.60	7,984,385.30	946253.40	3.77	11.85	31.85	12.90
2003	-202724.70	10,136,364.00	1225,559.30	2.00	12.09	16.54	14.00
2004	-172600.00	11,673.20	1,330,657.80	1.48	11.40	12.97	17.60
2005	-161400.00	14,810,882.00	1725395.8	1.09	11.65	9.35	17.90
2006	-101397.50	18564610.00	2280648.9	0.55	12.28	4.45	9.40
2007	-117237.10	22848921.00	3138934.2	0.51	13.74	3.73	10.50
2008	-47,380.00	24296329.29	4857312.2	0.20	19.99	0.98	11.60
2009	-810,008.46	24794238.66	5017115.9	3.27	20.24	16.14	12.50
2010	-1.105.439.78	33984754.13	5571269.89	3.25	16.39	19.84	13.70
2011	-1.158,518.40	37543,654.70	6771581.5	3.09	18.04	17.11	10.80
202	-1105439.78	39866774.50	7069871.8	2.77	15.64	**15.6**	10.4
2013	-1158518.40	42344812.20	8487653.6	2.74	**20.0**	**13.6**	11.5
2014	-313484.81	45480755.55	**10267471.0**	0.69	22.6	3.1	9.8
2015	-1864565.80	38411118.90	**12540122.0**	4.85	**32.6**	14.9	13.3

Sources: CBN Annual Reports & Statements of Account (various Years); CBN Statistical Bulletin and Author's Computed Ratios

Equation (1) is derived from an intertemporal optimization model that relates long-run inflation to the permanent component of the fiscal deficit, where the later is scaled by the size of the inflation tax base (measured by the ratio of narrow money to GDP). The use of this scaling variable distinguishes our model from that found in most studies in Nigeria, which scales the relevant budgetary (fiscal) variable by nominal GDP. The use of narrow money (M_1) as a scaling variable is not only theoretically and intuitively appealing, but also introduces a desired non-linearity in the relationship between the fiscal deficits (scaled by GDP) and inflation. Such non-linearity seems to accord well with stylized facts about inflation dynamics and is shown to have clear micro-foundations.

Allowing for a 'dynamism' in the way inflation adjusts to changes in the fiscal deficit or to any other variable, we restructure equation (1) further as follows:

$$\pi = b_o + b1\frac{Def}{M1} + u \quad \text{-------------------------equation 2}$$

Where b_o represents fixed effects, and 'u' is the error term .

4.1 Data Analysis Techniques

4.1.1 Ordinary Least Square Method (OLS)

Since equation (2) is of a linear form, we apply Ordinary Least Squares (OLS) method and estimate the parameters, b_o and b1 (Bowers, 1990). The parameters are shown in Table 4-1.

Assuming $\pi = Y$; $= X$, the normal equations are:

$$\sum Y = b_o n + b1\sum X$$

$$\sum XY = b_o \sum n + b1\sum X^2$$

Solving the normal equations for bo and b1 with the E-View computer package, we obtain the OLS estimates.

$$\frac{\text{Def1}}{\text{M1}}$$

4.1.2 Unit Root Test

Equation 2 is a fitted model, which is assumed to be correctly specified. Since our time series data exceeds 20 observations, our conclusion using OLS and descriptive statistics could be spurious in the sense that superficially the results could look good but on further investigation they look suspect. To avoid this, we introduce the concept of non-stationarity of variables. According to Osuala (2010), stochastic variables are said to be stationary if their means and variances are constant over time and the value of the covariance between two time periods depends only on the distance or lag between the periods and not on the actual time at which the covariance is computed. A unit root test is applied to test for the stationarity of the variables which involves checking for statistically significant differences of the parameters on the covariance, $\pi = \sum[(\pi - U)(\pi - U)]$, from a general formulation:

$$\pi_t - \pi_{t-1} = a_o + (a_1 - 1)\ \pi_{t-1} + a_2\ DF\ \ M_1 + u \quad \text{…. Equation 3}$$

The long-run impact of persistent fiscal deficits on inflation rate is shown in equation 3. Assuming a possibility that the time series could be affected by business cycle fluctuations over the period, we therefore, controlled such fluctuations by incorporating the variables of change in economic openness (OPE) and foreign exchange (FXR). Hence, the long-run equilibrium model is:

$$\pi = a_o + a_1\ DF\ M_1 + a_2 OPE\ + a_3\ FXR + u \quad \text{…. Equation 4}$$

The highlighted in equation 4 is the augmentation terms. They were used to "clean up" any serial correlation which could exist in the series. Due to the problem with the use of the student- 't' tables, which have lower critical values, we applied the Augmented Dickey-Fuller (ADF) test which have higher critical values than student 't' tables. The null hypothesis (H_o) is that a_1, the coefficient of π_{t-1} is zero, which is another way of saying that the underlying time series is non-stationary. This is the unit root hypothesis.

4.1.3 Co-integration

Co-integration test is the second stage of pretesting the time series. This test was used to explore the nature of the relationship between the variables, resulting to the description of the stationarity properties of the individual series, i.e., 1(0); and where they were not of 1(0), we tested the residual (or error terms) for co-integration.

4.1.4 Error Correction Model (or Mechanism) - ECM

The mere fact that we have already performed the pre-tests for unit root and co-integration and finding out that the individual series were 1(0), we employed ECM to see to the appropriate representation in which the equations (equations that co-integrated) could move from short-run to long-run equilibrium. The ECM consists of running an equation in differences (which may be lagged to various years) with an added variable consisting of the lagged residual from an OLS equation in levels. ECM is used to prove the 'superconsistency' of the OLS estimators of the long-run parameters.

5.0 The Findings

The OLS estimated result of model 1 is :

$$\pi = 20.232 + 0.017\ DF/M,$$

(5.673) (0.149)

[3.566] [0.114]

{0.001} {0.910}

$R^2 = 0.0004$

The standard errors, t-statistics and p-values are shown in parentheses, ( ), [ ] and { }, see Appendix 2. The estimated short-run coefficient of 0.017 indicates that 1% point increase in the ratio of fiscal deficit to M_1 should lead to a short-run increase in inflation of about a third of a percentage point. Going by the standard error test, our model is not statistically significant (i.e 0.149>0.0085) at 5% significance level. Since t* (i.e t-statistic calculated) falls in the acceptance region (i.e $t^* < t_{0.025}$ or 0.11<2.04), we accept the null hypothesis, concluding that the estimated coefficient is not statistically significant at 5% level of significance. Therefore, DF/M_1 does not appear to contribute to the explanation of the variation in π. The probability value, p-value, of 0.91 (approximated to 1) shows how less significant the estimated parameter are and the tendency to accept the null hypothesis (H_0).

With F-statistic being less than 1, we accept the Ho, but reject the fact that the regression is significant. The Durbin-Watson Statistic (DW) of 0.85 indicates a positive first order autocorrelation. The fact that DF/M_1 not appear to contribute to the explanation of the variations in π, the overall regression line is not significant. One possible reason for th poor performance of the model specification (equation 2) is the presence of non-linear disturbing variables in the fiscal deficit-inflation relationship. The fact that a 1% point change in DF/M_1 does not lead to the same % point change in inflation regardless of the level of inflation may be unrealistic.As a way of solving the problem, we tried to improve the non-linearity of the specification by incorporating controlled variables because of the large observations and time variations.Appendix 3 presents the panel equation (equation 4) in which fiscal deficit was scaled by M_1. The estimated values are:

$$\pi = 25.83 - 0.14DF/M_1 + 0.78\,OPE - 0.18FXR$$

(12.78) (0.17) (0.93) (0.09)
[2.02] [-0.79] [0.83] [-2.07]
{0.05} {0.43} {0.41} {0.05}

Standard errors, t-statistics and p-values are shown in the parentheses in the order ( ), [ ] and { }.
The estimated long-run coefficient of -0.14 indicates that a 1% point reduction in DF/M_1 does not lead to a 1% point increase in inflation. Among the controlled explanatory variables, OPE shows a greater association to inflation with a positive coefficient of 0.78, indicating that more than 1% increase in economic liberalization induces a 1% increase in inflation. Foreign exchange rate movements have less significant association with inflation. The DF/M1 – inflation result above is supported by standard error test, indicating a statistically insignificant relationship at 5% level of significance (0.17>0.07). The $t^* < t_{0.025}$ (-0.79<1.70) falls in the acceptance region and we accept H_o. The p-value, which is 0.43, is an indication of a more significant estimated parameters and the tendency to accept Ho. The F-statistic of approximately 2.00 is an indication of a significant regression line. The DW of approximately 1 (not up to 2) is a positive first order autocorrelation, showing that the overall regression is insignificant. Since R^2 is less than DW, the regression is autocorrelated and the reliability and robustness of the model become suspect. As a result of the presence of autocorrelation, we moved further to test for the time dependent features of the variables. A more robust test-ADF test – was conducted. Table 4-1 shows the ADF test results (see Appendix 4a b, c, d, e and f).

Table 4.1. ADF Unit Root Test Results

Variable	ADF Test Statistical level	ADF Test Statistic at 1st Difference	ADF Test Statistic at 2nd Difference	Order of Integration
Π	-	-5.281674	-	1(1)
DF/M_1	-	-4.956207	-	1(1)
FXR	-	-3.758371	-	1(1)
OPE-	-	-4.827326	-	1(1)
ECM(01)	-3.491389	-	-	1(0)
Ecm(02)	-3.671117	-	-	1(0)

Critical values 1%: -3.6752; 5% : -2.9665 and 10%: - 2.6220

All variables in Table 4.1 are integrated of order one 1(1) and the residuals (ECM) are integrated of order zero 1(0), showing that there is a long-run equilibrium relationship.

To find out the number of co-integrating equations, we carried out the Johansen co-integration test (Appendix 5). The test was conducted using one and two lags to preserve sufficient degrees of freedom. The test parameters-trace and eigen value statistics – confirm the existence of co-integration relationship between the variables. The hypothesis, π = f(DFM, FXR, OPE) , is rejected at 5% (1%) significance level. The long-run test indicates one co-integrating equation(s) at 5% significance level.

The Error Correction Model or Mechanism (ECM) tests (Appendix 6a and b) were conducted to find out the adjustment between the short-run and long-run equilibrium. This helps us to assess the shocks and the extent to which the models returned to equilibrium. It also helps us to identify and assess the extent of significance at level of the independent variables; this is done using the step-by-step elimination of significant variables starting with the one having the lowest observed p-values. The over-parameterized ECM test contains all the variables with lagged ECM variables. However, the one-lagged residual, ECM01 (-1),of model 2 (Appendix XIV) is less significant at level (see p-value of 0.0175). the parsimonious test (Appendix XV) of the residual is more significant at level (see p-value of 0.0004), and is more preferred because, in the case of a shock, the short-run equilibrium is easily achieved at 107% coefficient, unlike the over-parameterized test which occurs at 102% coefficient. The ECM results show that only OPE is the most statistically significant variable that affects inflation. DFM is less significant in affecting inflation.

5.1 Discussion of Findings

The null hypothesis we seek to test is that there exists no long-run relation between government fiscal deficits and inflation. As discussed above, the main econometric techniques we used are OLS and the more robust unit root tests. Apart from the evaluation of the robustness of the results, the unit root tests permits comparability with other studies and helps answer the question of whether the failure of other studies in detecting a significant relationship between fiscal deficits and inflation are due to differences in econometric techniques, or in model specification and sampling. Yet, econometric work has had little success establishing a statistically significant connection between fiscal deficits and inflation for a broad range of countries. Our result is consistent with king and Plosser's (1985) comprehensive analysis of the determinants of seignorage in USA, and other countries, using both single equation OLS regression and vector Auto-regressive methods, which find no significant causality running from fiscal deficits to changes in base money and inflation. Our result is also consistent with Montiel, et al (2004) who finds little support for the fiscal deficit view, suggesting instead that exchange rate shocks have been the main driving force behind inflation. However, our result is not consistent with respect to exchange rate impact on inflation. More recently, Fisher, Sahay and Vegh (2010) using a very broad cross-country panel and fixed effects estimates have indicated that fiscal deficits have been a determinant of high inflation; however, they find no evidence of a significant relationship between inflation and fiscal balances. This is consistent with the findings of this paper.

6.0 Concluding Remarks and Policy Implications

This paper looked at the long-run relationship between fiscal deficits and inflation in Nigeria. The analysis reveals that fiscal deficit scaled to narrow money does not affect Nigeria's inflation significantly. However, only OPE was found to be significant. The theoretical connection between dynamics of high inflation processes. Another reason is that the relationship between fiscal deficits and inflation tends to be less obvious in countries with efficient institutional arrangements that curb fiscal dominance, and that have wide access to external financing and broader money creation tax bases. Our paper has sought to address the dynamic nature of inflation by using a theoretical model that scales the fiscal deficits by narrow money so as to control for differences in the inflation tax base and employing an econometric models that allow for rich dynamics. The fiscal deficits and inflation in the long-run is not easily detectable in our data. One reason is the complex short-run significance of our model appears to be robust with the additional tests. One of the variables, much heralded in the inflation literature, openness to foreign trade, did not yield result consistent with the theoretical priors. The other one, foreign exchange rate, however, yielded results consistent with the theories. This possibly suggests that foreign exchange movements contribute to changes in inflation mainly through fiscal channels.

The dynamic nature of inflation and its observed long-run impact obscurity through fiscal channels can be deceitful. The impact can ordinarily be assumed to be zero. Such analysis does not look like a panacea for Nigeria's hard-biting high inflation over the years. This paper suggests that if, for the long-run, the Nigerian government opts for a stable price economy, this should be in the form of an inflation targeting regime. The institutional commitment to price stability – defined by a long-run numerical target between 1% and 4% in line with other emerging market economies that target inflation – would in fact clarify the mandate of the Central Bank of Nigeria (CBN). This could make it harder for the government to conduct fiscal policies that are plainly incompatible with the announced monetary policy objective.

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APPENDIX 1: Estimates for Regression

Obs	DF/M	FXR	Π	OPE
1980	29.51000	0.590000	9.900000	10.56000
1981	39.35000	0.640000	20.90000	11.42000
1982	59.31000	0.670000	7.700000	9.100000
1983	29.21000	0.750000	23.20000	6.950000
1984	21.29000	0.810000	39.60000	5.430000
1985	21.90000	1.000000	5.500000	4.600000
1986	60.87000	3.320000	5.400000	3.810000
1987	38.76000	4.190000	10.20000	8.070000
1988	54.70000	5.350000	38.30000	7.180000
1989	57.61000	7.650000	40.90000	6.740000
1990	56.48000	9.000000	7.500000	5.830000
1991	71.41000	9.760000	13.00000	6.850000
1992	52.04000	19.66000	44.50000	5.960000
1993	54.87000	22.63000	57.20000	9.660000
1994	41.48000	21.88000	57.00000	9.930000
1995	0.500000	21.89000	72.80000	19.33000
1996	5.310000	21.89000	29.30000	10.87000
1997	28.65000	21.89000	8.500000	15.85000
1998	41.87000	21.89000	10.00000	17.25000
1999	72.53000	98.20000	6.600000	16.52000
2000	16.27000	110.0500	6.900000	16.52000
2001	27.07000	113.4500	18.90000	17.49000
2002	31.85000	126.9000	12.90000	17.05000
2003	16.54000	137.0000	14.00000	18.47000
2004	12.97000	132.8500	17.60000	17.02000
2005	9.350000	129.0000	17.90000	18.47000
2006	4.450000	128.2700	9.400000	15.24000
2007	3.730000	117.9700	10.50000	15.58000
2008	0.980000	132.5600	11.60000	19.44000
2009	16.14000	149.5800	12.50000	18.48000
2010	19.84000	150.6600	13.70000	20.43000
2011	17.11000	158.2700	10.80000	25.26000
2012	15.60000	178.5600	10.40000	26.10000
2013	13.60000	188.8000	11.50000	22.50000
2014	3.100000	190.8100	9.800000	18.00000
2015	14.90000	197.6600	13.30000	15.16000

APPENDIX 2: OLS Estimate (Model 1)

Dependent Variable π Method Least Squares Date 08/02/16 Time 11:41 Sample 1980 2014 Included observations 35				
Variable	Coefficient	Std. Error	t-Statistic	Prob
C	20.23223	5.673387	3.566164	0.0012
DF/M	0.017031	0.149061	0.114256	0.9098
R-squared	0.000435	Mean dependent var		20.77188
Adjusted R-squared	-0.032884	S.D dependent var		17.49491
S.E of regression	17.78023	Akaike info criterion		8.654513
Sum squared resid	9484.098	Schwarz criterion		8.746121
Log likelihood	-136.4722	F-statistic		0.013054
Durbin-Watson stat	0.846894	Prob(F-statistic)		0.909796

APPENDIX 3: OLS Estimates of variables in a Panel (Model 1)

Dependent Variable π Method Least Squares Date 08/02/16 Time 11:41 Sample 1980 2014 Included observations 35				
Variable	Coefficient	Std. Error	t-Statistic	Prob
C	25.82533	12.77916	2.020893	0.0529
DF/M	-0.138490	0.174580	-0.793277	0.4343
OPE	0.778249	0.932975	0.834159	0.4113
FXR	-0.182004	0.088004	-2.067132	0.0481
R-squared	0.161020	Mean dependent var		20.77188
Adjusted R-squared	0.071129	S.D dependent var		17.49491
S.E of regression	16.86123	Akaike info criterion		8.604380
Sum squared resid	7960.432	Schwarz criterion		8.787597
Log likelihood	-133.6701	F-statistic		1.791285
Durbin-Watson stat	0.915436	Prob(F-statistic)		0.171714

APPENDIX 4(a): Augmented Dickey-Fuller Unit Root Test on D (π)

ADF Test Statistic	-5.281674	1% Critical Value* 5% Critical Value 10% Critical Value		-3.6752 -2.9665 -2.6220
* Mackinnon critical values for rejection of hypothesis of unit root. Augmented Dickey-Fuller Test Equation Dependent Variable: D(π, 2) Method Least Squares Date 08/02/16 Time 11:38 Sample (adjusted): 1983 2014 Included observations: 33 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob
D(π(-1))	-1.347973	0.255217	-5.281674	0.0000
D(π(-1),2)	0.358350	0.179264	1.999005	0.0562
C	0.141601	2.967311	0.047720	0.9623
R-squared	0.565828	Mean dependent var		0.355172
Adjusted R-squared	0.532430	S.D dependent var		23.36592
S.E of regression	15.97741	Akaike info criterion		8.477926
Sum squared resid	6637.217	Schwarz criterion		0.619370
Log likelihood	-119.9299	F-statistic		16.94202
Durbin-Watson stat	1.907087	Prob(F-statistic)		0.000019

APPENDIX 4(b): Augmented Dickey-Fuller Unit Root Test on D (DF/M)

ADF Test Statistic	-4.956207	1% Critical Value* 5% Critical Value 10% Critical Value		-3.6752 -2.9665 -2.6220
* Mackinnon critical values for rejection of hypothesis of unit root. Augmented Dickey-Fuller Test Equation Dependent Variable: D(π, 2) Method Least Squares Date 08/02/16 Time 11:38 Sample (adjusted): 1983 2014 Included observations: 33 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob
D(π(-1))	-1.466312	0.295854	-4.956207	0.0000
D(π(-1),2)	0.166045	0.187512	0.885517	0.3840
C	-1.733732	3.660906	-0.473580	0.6398
R-squared	0.650286	Mean dependent var		-0.782414
Adjusted R-squared	0.623385	S.D dependent var		32.09017
S.E of regression	19.69341	Akaike info criterion		8.896143
Sum squared resid	10083.59	Schwarz criterion		9.037587
Log likelihood	-125.9941	F-statistic		24.17321
Durbin-Watson stat	1.916902	Prob(F-statistic)		0.0000001

APPENDIX 4(c): Augmented Dickey-Fuller Unit Root Test on D (OPE)

ADF Test Statistic	-4.827326	1% Critical Value* 5% Critical Value 10% Critical Value		-3.6752 -2.9665 -2.6220
* Mackinnon critical values for rejection of hypothesis of unit root. Augmented Dickey-Fuller Test Equation Dependent Variable: D(π, 2) Method Least Squares Date 08/02/16 Time 11:38 Sample (adjusted): 1983 2014 Included observations: 33 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob
D(π(-1))	-1.695451	0.351219	-4.827326	0.0001
D(π(-1),2)	0.136145	0.202156	0.673463	0.5066
C	0.768194	0.641024	1.198384	0.2416
R-squared	0.741802	Mean dependent var		0.246552
Adjusted R-squared	0.721941	S.D dependent var		6.462082
S.E of regression	3.407541	Akaike info criterion		5.387556
Sum squared resid	301.8947	Schwarz criterion		5.529000
Log likelihood	-75.11956	F-statistic		37.34901
Durbin-Watson stat	1.942365	Prob(F-statistic)		0.000000

APPENDIX 4(d): Augmented Dickey-Fuller Unit Root Test on D (FXR)

ADF Test Statistic	-3.758371	1% Critical Value* 5% Critical Value 10% Critical Value		-3.6752 -2.9665 -2.6220
* Mackinnon critical values for rejection of hypothesis of unit root. Augmented Dickey-Fuller Test Equation Dependent Variable: D(π, 2) Method Least Squares Date 08/02/16 Time 11:38 Sample (adjusted): 1983 2014 Included observations: 33 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob
D(π(-1))	-0.995118	0.264774	-3.758371	0.0000
D(π(-1),2)	0.075598	0.195138	0.387409	0.7016
C	5.406544	3.166328	1.707512	0.0996
R-squared	0.466773	Mean dependent var		0.261379
Adjusted R-squared	0.425755	S.D dependent var		20.30292
S.E of regression	15.38534	Akaike info criterion		8.402405
Sum squared resid	6154.426	Schwarz criterion		8.543849
Log likelihood	-118.8349	F-statistic		11.37984
Durbin-Watson stat	1.989498	Prob(F-statistic)		0.000282

APPENDIX 4(e): Augmented Dickey-Fuller Unit Root Test on ECM01)

ADF Test Statistic	-3.491389	1% Critical Value* 5% Critical Value 10% Critical Value		-3.6752 -2.9665 -2.6220
* Mackinnon critical values for rejection of hypothesis of unit root. Augmented Dickey-Fuller Test Equation Dependent Variable: D(ECM01) Method Least Squares Date 08/02/16 Time 11:38 Sample (adjusted): 1983 2014 Included observations: 34 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob
ECM01(-1)	-0.612784	0.175513	-3.491389	0.0017
D(ECM01(-1)	0.295473	0.179027	1.650440	0.1104
C	0.419504	2.469894	0.169847	0.8664
R-squared	0.311075	Mean dependent var		0.157941
Adjusted R-squared	0.260043	S.D dependent var		15.70149
S.E of regression	13.50654	Akaike info criterion		8.138865
Sum squared resid	4925.519	Schwarz criterion		8.278984
Log likelihood	-119.0830	F-statistic		6.095737
Durbin-Watson stat	1.911007	Prob(F-statistic)		0.006536

APPENDIX 4(f): Augmented Dickey-Fuller Unit Root Test on ECMO2

ADF Test Statistic	-3.671117	1% Critical Value* 5% Critical Value 10% Critical Value		-3.6752 -2.9665 -2.6220
* Mackinnon critical values for rejection of hypothesis of unit root. Augmented Dickey-Fuller Test Equation Dependent Variable: D(ECM02) Method Least Squares Date 08/02/16 Time 11:38 Sample (adjusted): 1983 2014 Included observations: 34 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob
ECM02(-1)	-0.628366	0.171165	-3671117	0.0010
D(ECM02(-1))	0.349262	0.176007	1.984363	0.0575
C	0.375201	2.440284	0.153753	0.8789
R-squared	0.334744	Mean dependent var		0.130609
Adjusted R-squared	0.285466	S.D dependent var		15.78835
S.E of regression	13.34591	Akaike info criterion		8.114936
Sum squared resid	4809.057	Schwarz criterion		8.255056
Log likelihood	-118.7240	F-statistic		6.792955
Durbin-Watson stat	1.866854	Prob (F-statistic)		0.004077

APPENDIX 5: Johansen Co-integration Test

Date 08/02/16 Time 11:52 Sample (adjusted): 1980 2014 Included observations: 34 Test assumption Linear deterministic trend in the data Series: π D/FM FXR OPE Lags Interval: 1 to 1				
Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No of CE(s)
0.619525	55.14235	47.21	54.46	None **
0.385782	26.15230	29.68	35.65	At most 1
0.301893	11.53015	15.41	20.04	At most 2
0.024646	0.748642	3.76	6.65	At most 3
*(**) denotes rejection of the hypothesis at 5% (1%) significance level L R test indicates 1 cointegrating equation(s) at 5% significance level				

APPENDIX 6(a): Over- Parameterized ECM of D(π)

Dependent Variable: D (π)
Method: Least Squares
Date 08/07/13 Time 12:00
Sample (adjusted): 1983 2011
Included observations: 29 after adjusting endpoints

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	0.833890	3.203625	0.260296	0.7980
D(π(-1))	0.434295	0.241973	1.794808	0.0916
D(π(-2))	0.060102	0.228359	0.262191	0.7958
D(DF/M)	-0.315499	0.202264	-1.559836	0.1384
D(DF/M(-1))	-0.165113	0.221324	-0.746025	0.4665
D(DF/M(-2))	0.110352	0.178442	0.618419	0.5450
D(FXR)	-0.254018	0.231483	-1.097352	0.2887
D(FXR (-1))	-0.067897	0.234336	-0.289741	0.7757
D(FXR(-2))	-0.085150	0.238094	-0.357632	0.7253
D(OPE)	2.304112	1.022383	2.253667	0.0386
D(OPE(-1))	1.559728	1.216522	1.282121	0.2181
D(OPE(-2))	1.355676	1.042793	1.300044	0.2120
ECM01(-1)	-1.018489	0.384389	-2.649631	0.0175
R-squared	0.594327	Mean dependent var		0.106897
Adjusted R-squared	0.290073	S.D dependent var		16.53840
S.E of regression	13.93479	Akaike info criterion		8.408499
Sum squared resid	3106.853	Schwarz criterion		9.021424
Log likelihood	-108.9232	F-statistic		1.953388
Durbin-Watson stat	1.901562	Prob(F-statistic)		0.105307

APPENDIX 6(b): Parsimonous ECM of D(π)

Dependent Variable: D (π)
Method: Least Squares
Date 08/07/13 Time 12:02
Sample (adjusted): 1983 2014
Included observations: 29 after adjusting endpoints

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	0.353131	2.873876	0.122876	0.9035
D(π(-1))	0.439481	0.206212	2.131208	0.0464
D(DF/M)	-0.336800	0.151447	-2.223876	0.0385
D(DF/M(-1))	-0.243934	0.171448	-1.422840	0.1710
D(FXR)	-0.239231	0.210788	-1.132936	0.2705
D(FXR (-2))	-0.111034	0.208475	-0.532600	0.6005
D(OPE)	2.435834	0.835462	2.915555	0.0089
D(OPE(-1))	1.623601	1.056931	1.536146	0.1410
D(OPE(-2))	1.422264	0.951866	1.494185	0.1515
ECM01(-1)	-1.071102	0.247503	-4.327632	0.0004
R-squared	0.581371	Mean dependent var		0.106897
Adjusted R-squared	0.383073	S.D dependent var		16.53840
S.E of regression	12.99003	Akaike info criterion		8.233040
Sum squared resid	3206.077	Schwarz criterion		8.704521
Log likelihood	-109.3791	F-statistic		2.931906
Durbin-Watson stat	1.802125	Prob(F-statistic)		0.023163