WEST AFRICAN MONETARY AGENCY (WAMA)

IMPACT OF PETROLEUM PRICE FLUCTUATIONS ON KEY CONVERGENCE CRITERIA IN ECOWAS MEMBER STATES

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INTRODUCTION

Background and Statement of the Problem

Over the period 1980-2008, the price of crude oil had fluctuated significantly, with a mean, minimum and maximum values of $ 32.31 (bbl), $ 12.72 (bbl) and $ 140 (bbl) respectively. The above statistics, in addition to a standard deviation of 17.08 over the sample period show that the prices of crude have always been characterised with severe instability. Monthly fluctuations have in fact been more severe than these annual trends, with the price of crude oil reaching $140 (bbl) in July 2008. Such instability in the prices of crude oil is bound to cause macroeconomic distortions, especially in net-oil importing countries, like some ECOWAS countries.

Recently the price of crude oil rose from $ 38.27 (bbl) a barrel in 2004 to a rate of $70.85 a bbl in August 2005. While the price of oil fell slightly in December 2005, it regained its upward trend in the early part of 2006, exceeding $70 a bbl in April 2006. In December 2007 and July 2008, the price of crude oil reached $100 (bbl) and $140 (bbl) respectively. The origin of the increase in the price of crude oil can be linked to both demand- and supply-side explanatory factors, although the former effects far outweigh the latter. The high demand for oil from East Asia, especially China, and to a lesser extent India, largely explained the upsurge in the price of this essential commodity.

In addition to the above strong demand-driven factors, there were also supply-side determinants to the high increase in the price of crude oil. These relate to the upheavals in oil-producing countries as well as refineries capacity constraints, which have created additional pressures in the oil market. Although these supply-side constraints could be addressed in the short- to medium-term, all indications are that the strong demand will prevail in the outlook period and beyond, and thus continue to keep the price of oil high, even if we do not totally exclude the possibility of some decline.

The ECOWAS sub-region, comprising of Nigeria (a dominant economy and oil-producing) and a majority of oil-importing countries presents a unique feature which makes it important to understand the dynamics in the price of oil and its implications on key macroeconomic variables. Under the ECOWAS Monetary Cooperation Programme, fluctuations in oil prices affect, directly or indirectly the primary convergence criteria. For instance, the African Development Bank estimated that the high price of oil translated, as a first round effect, into a higher average inflation of 1.3 and 2.6 percentage points for oil importing African Countries in 2005 and 2006 respectively, while oil exporting countries were expected to grow, on average, by 6 percent per year.

Over the years, it has been observed that meeting the convergence criteria, on a sustained basis remained an impossibility for all ECOWAS Member States, which necessitates more policy oriented research, to better understand the impact of oil shocks on macroeconomic convergence. This could also help bring reflections on the relevant criteria we have to monitor e.g. Core inflation (which isolates some of these seasonal/external factors) instead of headline inflation (which does not). In this regard, high level research therefore becomes an important task, for an institution that is mandated to monitor the processes leading to the single currency goal of ECOWAS, in which observance of the convergence criteria constitutes an important element.

In the light of the above, it could be understood that the high price of oil will invariably affect revenue mobilisation, expenditure (and therefore the fiscal position of government) and inflation. The study is an attempt to analyse the macroeconomic impact of oil price fluctuations in selected ECOWAS member countries using annual data from 1980-2007.

Objective of the Study

The main objective of this study is to investigate the impact of oil price fluctuations on inflation and fiscal deficit in ECOWAS Member States, with a view to giving policy implications/recommendations. The results of the study would serve as a possible aid for policymakers in responding to oil price shocks.

Working Hypothesis

The working hypothesis of this study is that oil price increases have worsened inflationary pressures and the fiscal position in oil-importing ECOWAS Member States and improved these variables in the oil-exporting Members States.

Scope of the Study

The study covers the period 1980 -2008 in four UEMOA countries (Benin, Burkina Faso, Cote d'Ivoire and Senegal) and three WAMZ countries (The Gambia, Ghana and Nigeria). The sample covers both large and small economies in the two zones as well as oil producing and non-oil producing countries. In each of these countries, the impact of oil price shocks on fiscal deficit and inflation were investigated. However, it will be replicated in the rest of the countries.

Significance of the Study

Over the years there has been an increasing trend of petroleum prices, and a close consideration of the demand- and supply-side effects that sparked these price increases shows there is high probability that this trend will continue in the outlook period and beyond. This may affect the key primary criteria being monitored by WAMA under the ECOWAS Monetary Cooperation Programme (EMCP). The impact may differ in the sense that ECOWAS has a dominant economy (that constitutes more than 50% of its size) that produces oil, whereas a majority of its countries are net importers of petroleum and petroleum-related products/inputs. The study is an attempt to better understand the impact of oil price shocks on key macroeconomic convergence criteria, as detailed above, in the respective ECOWAS Member States, which in our view, could be useful to better give the appropriate policy responses, to mitigate the effects of such fluctuations as and when they occur.

Outline of the Study

The paper proceeds with the literature review on the relationship between oil prices and key macroeconomic variables as well as a theoretical framework in sections one and two respectively. Section three contains the methodology adopted for the study, while section four contains a presentation and discussion of results. The paper ends with conclusion and policy implications.

I. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

1.1 Literature Review

A great deal of attention has been given to the relationship between oil prices fluctuations and economic activity since the early 1970s. Empirical studies that these oil price shocks were immediately followed by worldwide recessions and periods of inflation spurred considerable research. By looking at the channel of transmission of oil price shocks to the larger economy, many researchers have argued that fluctuations of oil prices are linked to macroeconomic performance. This theoretical relationship between macroeconomics and oil price movements has been widely applied and tested using various econometric techniques, dealing largely with the economies of the United States and other OECD countries. Nevertheless, the analysis of the impact of oil price volatility on macroeconomic variables is complicated by other key events and changing economic environments during the period in which the price fluctuations occurred. This brought about an important but difficult research question, which does not lend itself to hasty generalisations: The question is what level/degree of causality to the correlations between oil price fluctuations and key macroeconomic indicators/aggregates. The question became more relevant in early periods (1970s and early 80s), but is gradually being resolved as techniques and methodologies become more robust if not sophisticated, in response to increasing complicated economic phenomena and environment.

Despite the fact that the escalating energy prices and disturbances in petroleum supply in the US economy since World War II preceded most of the recessions during that period, this does not mean that oil shocks caused such macroeconomic distortions (Hamilton, 1983). Hamilton propounded three hypotheses for oil-shock and output correlation as follows: (i) historical coincidence (ii) endogeneity of crude oil prices, and (iii) causal influence of an exogenous increase in the price of crude oil. Econometric results showed that there was insignificant evidence that the correlation was neither a consequence of coincidence nor a set of influences that triggered oil shocks and recessions. The causal interpretation leads to the conclusion that the characteristics of the pre-1973 recessions would have been different if such energy shocks and disruptions did not come about (Hamilton, 1983).

Burbige and Harrison (1984) tested the effects of increases in oil prices using a seven-variable vector auto-regression (VAR) model for five countries (United States, Japan, Germany, United Kingdom and Canada) in the Organisation for Economic Cooperation and Development (OECD) using monthly data from January 1961 to June 1982. They found out that substantial effects of oil-price shocks on the general level of prices were evident on the U.S. and Canadian economies and exerted great pressure on industrial production on U.S. and U.K. They also pointed out that the oil shock in 1973 only worsened the incoming recession of that period.

Mork (1989) extended Hamilton's study by using a longer data sample and taking into account oil price controls that existed during the 1970s. Furthermore, he looked into the possibility of an asymmetric response to oil price increases as well as decreases. The results showed that GNP growth was correlated with the circumstances of the oil market and that oil price declines were not as statistically significant as oil price increases.

Cororaton (2000) of Philippine Institute for Development Studies (PIDS) identifies the world oil price increases and the depreciation of the country's exchange rate as the primary reasons for high domestic oil prices. Using Philippine Computable General Equilibrium Model (PCGEM)[1], simulations show that the macroeconomic effects of world oil price increases resulted to a decline in real GDP by 2.3 percent but with an improvement in the balance of trade mainly due to the reduction in the importation of oil products. World oil price increases also had a regressive impact on incomes (income declines are more significant among the low-income groups) but welfare-decreasing (greater decline in welfare among higher income brackets vis-à-vis lower income classes) (Cororaton 2000).

Abeysinghe (2001) revealed that open economies experience both direct and indirect impacts of oil prices on GDP growth whose magnitude depends on whether the economy is a net oil importer or exporter. Abeysinghe concluded that the effects on output growth

[1] PCGEM is a non-linear general equilibrium model of the Philippine economy. It has 34 production sectors, 3 factor inputs (labour, variable capital and capital), and 10 household types in the decile groupings.

in small open economies were greater than in a large economy like the United States. His study concluded that the “actual working of a new shock depends on how it interacts with the consumer and investor confidence”.

In a more recent study by Jimenez-Rodriguez and Sanchez (2004) to assess the effects of oil price changes on real economic activity of the main industrialised OECD countries, using a multivariate VAR analysis with linear and non-linear model specifications. Like Abeysinghe (2001) they include both net oil importers and exporters in the dataset and noticed that both categories’ real GDP differ in response to oil shocks with the exception of United Kingdom (net exporter) and Japan (net importer). The asymmetric (non-linear) specification showed that oil price declines are significant only in a few countries under study. Moreover, the non-linear models provide more accurate and significant results in impulse response functions and real effects of oil shocks. Lastly, oil price shocks, together with monetary shocks, are found to be the largest source of volatility of real output aside from itself.

Some researchers, however, pointed out that monetary policy’s response to oil price shocks caused the aggregate economic fluctuations. Brown and Yucel (1999) tested such hypothesis using a seven-variable VAR model in the US economy and found out that a constant federal funds rate during an oil shock is an accommodative monetary policy stance. On the other hand, holding nominal GDP constant corresponds to a neutral monetary policy.

When almost all researchers dealt with the effects of oil prices, as measured in levels or in logarithmic form, on key macroeconomic variables, J.P. Ferderer (1996) used oil price volatility (monthly standard deviations of daily oil prices) to assess movements in US aggregate output. He also took note of the monetary channel through which the oil prices affect the economy by including federal funds rate and non-borrowed reserves to capture the monetary policy stance during oil shocks. Results showed that contractionary monetary policy in reaction to oil price increases partly explains the correlation between oil and output. However, sectoral shocks and uncertainty channels, but not monetary policy channel, provide partial explanation to the asymmetric relationship between oil price changes and output growth (Ferderer 1996).

A number of researchers dealt with the inflationary effects of oil shocks. Hooker (2002) assessed the contribution of oil price changes on U.S. inflation in a Phillips curve framework, taking into account the asymmetries, non-linearities, structural breaks that had been put forth in the economic literature pertaining to the relationship between oil prices and key macroeconomic variables. The Phillips curve analyses the trade off between inflation and output thus highlighting that some amount of inflation is necessary for growth and thus poverty reduction. He found out that there is a structural break, where changes in the price of oil contributed significant effects on core inflation before 1980 but weakened since that period. The econometric results, as hooker stressed, were robust and highly significant, using different specifications of the Phillips curve framework, oil price variables, sample periods and lag specification.

Cunado and de Gracia (2004) found out that the effects of oil price shocks on economic activity and inflation are significant but limited only in the short-run. If shocks are transformed in terms of the local currency of the country under study, results provide more significant evidence on the effects of the shocks. Asymmetric response of oil price-inflation relationship is found in the cases of Malaysia, South Korea, Thailand and Japan and solely in South Korea if oil-economic growth relationship is considered. Furthermore, they stressed that Asian countries respond differently to oil price shocks (Cunado and de Gracia 2004).

1.2 Theoretical Framework

Volatility of oil prices has negative repercussions on the aggregate economy as abundantly shown by the literature. An oil price shock, as a classic example of an adverse supply shock, i.e. an increase in oil prices shifts the aggregate supply upward, results to a rise in price level and a reduction in output and employment [Dornbusch, Fisher and Startz 2001]. On the other hand, aggregate demand decreases as higher commodity prices translate to lower demand for goods and services, resulting to contraction in aggregate output and employment level. The macroeconomic effects of oil shocks are transmitted via supply and demand side channels and are substantially minimized by economic policy reactions.

1.2.1 Supply Side Channel

Since oil is a factor of production in most sectors and industries, a rise in oil prices increases the enterprises' production costs and thus, stimulates contraction in output [Jimenez-Rodriguez and Sanchez 2004]. Given a firm's resource constraints, the increase in the prices of oil as an input of production reduces the quantity it can produce. Hunt, Isard and Laxton [2001] add that an increase in input costs can drive down non-oil potential output supplied in the short run given existing capital stock and sticky wages. Moreover, workers and producers will counter the declines in their real wages and profit margins, putting upward pressure on unit labour costs and prices of finished goods and services.

According to [Verleger 1994] oil price volatility shrinks investment activities in production of oil and gas. In addition a "permanent increase in volatility might lead to a situation where future capacity will always be a little lower than in a world of zero price volatility and prices a little higher". Hamilton [1996] shares the same point and stresses that concerns on oil prices variability and oil supply disruptions could cause postponement of investment decisions in the economy.

There is also a possibility of a "structural shift" and a period of adjustment within an economy when prices of oil increase. As oil becomes relatively expensive vis-à-vis other intermediate goods, energy-intensive industries contract their production whereas less energy-dependent sectors and more efficient users expand. Such period of adjustment is costly and time-consuming with higher unemployment and resource underutilization.

1.2.2 Demand Side Channel

As presented earlier, oil price increases translate to higher production costs, leading to commodity price increases at which firms sell their products in the market. Higher commodity prices then translate to lower demand for goods and services, therefore shrinking aggregate output and employment level.

Furthermore, higher oil prices affect aggregate demand and consumption in the economy. The transfer of income and resources from an oil-importing to oil-exporting economies is projected to reduce worldwide demand as demand in the former is likely to decline more than it will rise in the latter [Hunt, Isard and Laxton 2001]. The resulting lower purchasing power of the oil-importing economy translates to a lower demand. Also, oil price shocks pose economic uncertainty on future performance of the macroeconomy. People may postpone consumption and investment decisions until they see an improvement in the economic situation.

In sum, an increase in oil prices causes a leftward shift in both the demand and supply curve, resulting to higher prices and lower output.

1.2.3 Economic Policy Reactions

The effects of oil price increases on headline and core inflation may stimulate the tightening of monetary policy [Hunt, Isard and Laxton 2001]. Authorities have the policy tools to minimize, if not totally eliminate, the adverse effects of such shock. The Central Bank (CB) has its key policy interest rates that can influence demand and inflation directions in the economy. However, pursuing one policy can be counterproductive; when CB cuts its interest rate, demand rises, but at the expense of higher inflation, and vice versa.

The credibility of the monetary authorities in responding to oil shocks is at stake if monetary policy reactions appear inconsistent with the announced policy objectives. As a result, inflation expectation and process is disrupted [Hunt, Isard and Laxton 2001]. In the Philippines, where the CB adopts an inflation-targeting framework, monetary policy to prevent further inflationary impulse from the increase in oil prices must be determined on a case-by-case basis. In part, such decision can rely on how such oil shock persists and how long it will take for the economy to adjust back to equilibrium.

Money supply plays a role on the negative correlation between oil prices and economic activity. By means of the real money balances channel, increases in oil prices cause inflation which, in turn, reduces the quantity of real balances in the economy [Ferderer 1996]. Ferderer [1996] further noted that "counterinflationary monetary policy responses to oil price shocks are responsible for the real output losses associated with these shocks". This is because a highly restrictive monetary policy to further bring inflation down would invariably reduce output (trade-off between inflation and output).

1.2.4 Asymmetric Response

Asymmetric responses between oil prices and the variables considered, such as GDP responses and employment should be identified [D&H 2001 and Davis 2001]. One of these include sectoral shifts hypothesis. Oil price shocks can lead to many costs as workers lose jobs in one sector or region and are only slowly rehired in others; costs are masked by net changes in aggregate employment. Second is the demand decomposition mechanism which operates eventually through employment but begins as a disturbance to sector-specific demand. Demand for durable goods is particularly hit during recessions because consumers tend to smooth the reduction in their consumption of non-durables. Last is the investment pause effect in which reductions in orders and purchases remain uncertain. [D&H 2001 and Davis 2001]

Many researchers have argued that the risky economic effects of oil-price hikes may be substantially stronger than the favorable economic effects of oil-price declines. All oil-price changes can induce sectoral reallocations and create uncertainties about the returns to irreversible investments, but oil price decreases, unlike increases, have positive real income (terms-of-trade) effects that offset these negative impacts. To deal with this phenomenon, many time-series modelers include nonlinear, asymmetric oil-price specifications (e.g., Hamilton, 2000).

Hamilton [2000] stressed that previous studies assumed linearity between the log of real GDP and log of real oil prices. Therefore, this implies that if oil price increases result to an economic recession, then oil price declines must cause an economic expansion with the same magnitude, although in reverse direction.

Mork [1983] hypothesized that oil price decreases had little effects on economic activity compared to oil price increases. His results confirmed this hypothesis by incorporating both an oil price increase variable and an oil price decrease variable in the model.

With the above brief theoretical background, highlighting the relationship between oil prices and macroeconomic behaviour, the next section presents a methodology that would enable us to show the relationship between oil prices on the one hand, and inflation and deficit in the selected ECOWAS countries.

II. METHODOLOGY AND DATA

The VAR methodology was used to analyse the impact of petroleum price fluctuations on key macroeconomic variables in ECOWAS Member States, using annual data as stated above. The relationship between oil prices, fiscal deficit and inflation was investigated empirically to determine the pattern/direction of causality from oil price increase to the other variables and estimate the response of variables to exogenous shocks from oil price fluctuations. Correlation matrices, trend analyses and cointegration tests between the variables were also presented all geared towards helping to validate empirically the direction of causality as propounded by economic theory. The test for cointegration used in the study was the Stationarity test on the residual of the equations estimated. If a residual from two or more non-stationary series are found to be stationary, then it means that there is cointegration (long-run relationship) between these variables. The Augmented Dickey Fuller test (ADF) was used to test for a cointegrating relationship between fiscal deficits and oil prices as detailed in the following sections.

2.1 VAR Modelling

Most of the empirical literature outlined in section two have analysed the relationship between oil prices and key macroeconomic variables using some type of a VAR framework. The central feature of the VAR technique is that it possesses a less restrictive structural modelling as it does not impose a priori division of variables into endogenous or exogenous variables. The cointegration analysis and VAR technique can be used to model the long-run and short-run relationships between non-stationary variables (Johanson, 1988). Cointegration techniques are used to establish whether or not a long-run equilibrium (i.e. stationary) relationship exists between non-stationary variables in a single or system of equation(s). Such long-run relationships are normally hypothesized by economic theory, where the theory postulates the existence of an equilibrium relationship that links the variables in question. The concept of cointegration is in essence a statistical characterisation of a situation where the variables in the hypothesized relationship should not diverge from each other in the long run, or if they should diverge from each other in the short-run, this divergence must be stochastically bounded and diminishing over time (Banerjee et al., 1993:136).

An unrestricted VAR was estimated using Econometric Views. As noted above this technique treats all variables in the system as endogenous and regresses each current (non-lagged) variable in the model on all the variables in the model lagged a certain number of periods.

An unrestricted VAR model was estimated as follows:

$$\mathbf{Z_t = A_0 + A_1 Z_{t-1} + \ldots\ldots A_k Z_{t-k} + \varepsilon_t} \qquad \textbf{(1)}$$

Where Z is an (n+1) vector of endogenous variables, A_0 is the intercept vector of the VAR, A_i is the i^{th} matrix of autoregressive coefficients and ε_t is the generalization of a white noise process. In this study the vector Z consists of three variables: oil Prices, budget deficit and inflation. A three-variable vector auto-regression was presented to examine the sources of variations and fluctuations on inflation and fiscal deficits triggered by the oil price shocks.

The results of the estimation outputs as well as trend analyses and correlation matrices are presented and discussed in section four.

2.2 Unit Root Test

An important initial step of the research was to conduct unit root tests on the variables used. In addition, unit root tests were also conducted on the residuals of the relationship between some of the variables to highlight the possible existence of cointegration between such variables. This is due to the fact that if a residual from two or more non-stationary time series variables become stationary, then there is a cointegration between such variables. Thus the unit root analysis, using the Augmented Dickey Fuller Test also was an important part of this research and necessitated its brief discussion under the methodology section.

The order of integration was established using the Augmented Dickey Fuller (ADF) test as specified in equation 2 below. Basically, the ADF test consists in running a regression of the first difference of the series against the series lagged once, lagged difference terms, and optionally, a constant and a time trend. With two lagged difference terms, a constant term and a time trend, the regression can be presented as follows:

$$\Delta y_t = a_1 y_{t-1} + a_2 \Delta y_{t-1} + a_3 \Delta y_{t-2} + a_4 + a_5 t \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The output of the ADF test results and implications are discussed in the following section.

2.3 Data Sources and Definition of Concepts

Oil price (PP) is defined as the spot price of Brent crude oil in the international market and was obtained from the International Monetary Fund and International Energy Agency websites. Fiscal deficit (DEF) refers to the difference between Government revenue and expenditure on commitment basis as percentage of GDP. The series on fiscal deficits were obtained from the African Development Bank (AfDB). The inflation rate (INF) is the percentage change in the general price level, which is measured by the percentage change in the Consumer Price Index and was also obtained from the AfDB website.

III. PRESENTATION AND DISCUSSION OF RESULTS

This section presents a summary of results of the unit root tests, trend analyses/correlation matrices/graphical representations and finally the VAR estimation output as well as cointegration analyses for the study. It started with identification of the order of integration of the series followed by the analyses for the selected countries as follows: Benin, Burkina Faso, Cote d'Ivoire, Senegal, The Gambia, Ghana and Nigeria.

3.1 Order of Integration

The unit root tests for the world oil price variable as well as deficit and inflation rates of the group of countries considered are presented below for the selected (sampled) UEMOA and WAMZ countries in tables 4.1 and 4.2, respectively. In general all the variables were integrated of order one, which is an important initial step for the application of the VAR approach and cointegration tests.

Table 3.1: Summary of Unit Root Test Results in selected UEMOA countries

Country	**Benin**			**Burkina Faso**			**Cote d'Ivoire**			**Senegal**		
Variable	PP	DEF	INF	PP	DEF	INF	PP	DEF	INF	PP	DEF	INF
Order of Integration	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(2)	I(1)

Table 3.2: Summary of Unit Root Test Results in selected WAMZ countries

Country	**Gambia**			**Ghana**			**Nigeria**		
Variable	PP	DEF	INF	PP	DEF	INF	PP	DEF	INF
Order of Integration	I(1)	I(2)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)

3.2 Unit Root Characteristics of the Data for the selected UEMOA Countries

The following table (3.3) presents the ADF test results for Benin, Burkina Faso, Cote d'Ivoire and Senegal in respect of the oil prices, inflation and fiscal deficits. In general, the results show that oil price, fiscal deficit and inflation series are non-stationary as shown by the lower ADF statistics (in bold) than the Mackinnon critical values (in parentheses) at the conventional levels of significance. In other words the variables contain unit roots and thus ADF tests can be conducted on the differenced series to determine the order of integration. The table below shows that all the variables became stationary after first difference thus indicating that they are all integrated of order one (I(1) which is a very important finding for the application of VAR and cointegration analyses.

3.3 ADF Test Results for the selected UEMOA Countries

	Benin	**Burkina Faso**	**C.Ivoire**	**Senegal**
Oil price	**-0.35** (-4.35)* (-3.59)** (-3.23)***	**-0.35** (-4.35)* (-3.59)** (-3.23)***	**-0.35** (-4.35)* (-3.59)** (-3.23)***	**-0.35** (-4.35)* (-3.59)** (-3.23)***
D(Oil Price)	**-4.97** (-4.37)* (-3.60)** (-3.24)***	**-4.97** (-4.37)* (-3.60)** (-3.24)***	**-4.97** (-4.37)* (-3.60)** (-3.24)***	**-4.97** (-4.37)* (-3.60)** (-3.24)***
Deficit	**-2.31** (-4.47)* (-3.64)** (-3.26)***	**-1.79** (-4.41)* (-3.62)** (-3.25)***	**-2.43** (-4.5)* (-3.66)** (-3.27)***	**0.36** (-4.5)* (-3.66)** (-3.27)***
D(Deficit)	**-6.18** (-4.53)* (-3.67)** (-3.28)***	**-4.17** (-4.47)* (-3.64)** (-3.26)***	**-4.24** (-4.57)* (-3.69)** (-3.29)***	**-3.56** (-4.80)* (-3.79)** (-3.34)***
Inflation	**-3.20** (-4.35)* (-3.59)** (-3.23)***	**-3.10** (-4.35)* (-3.59)** (-3.23)***	**-3.47** (-4.35)* (-3.59)** (-3.23)***	**-3.12** (-4.35)* (-3.59)** (-3.23)***
D(Inflation)	**-5.46** (-4.37)* (-3.60)** (-3.24)***	**-4.54** (-4.37)* (-3.60)** (-3.24)***	**5.12** (-4.37)* (-3.60)** (-3.24)***	**-4.89** (-4.37)* (-3.60)** (-3.24)***

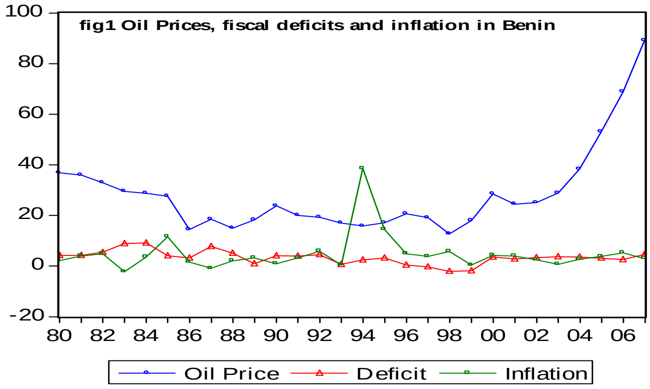
NB: -The values in parentheses represent the Mackinnon Critical Values while the others outside parentheses (in bold) represent the ADF Statistics

NB: * , ** and ***denote the conventional levels of significance of 1%, 5% and 10% respectively

3.3 Trend, VAR and Cointegration Analyses of UEMOA Countries

3.3.1 Benin

Figure 1 below highlights the co-movements between world oil prices, Benin inflation rates and fiscal deficits over the period 1980-2007. It should be noted that there seems to be a close relationship between fiscal deficits and inflation in Benin over the period, with the exception of 1994, when there was a shock in inflation likely due to the CFA franc devaluation undertaken during the year. However, the close co-movements between the two variables returned thereafter and continued throughout the rest of the period.



Regarding the impact of petroleum price shocks on the two variables in question there is a weak positive correlation between oil prices and fiscal deficits but no correlation with inflation rates over the period considered (see table 4.4: Correlation Matrix).

Table 3.4. Benin: Correlation Matrix			
	Oil_Price	**Deficit**	**Inflation**
Oil_Price	1.000000	0.275261	-0.015529
Deficit	0.275261	1.000000	0.093977
Inflation	-0.015529	0.093977	1.000000

The above preliminary findings were also supported by both the VAR estimations and cointegration test results. As can be seen from the VAR estimation output for Benin, contained in appendix 3, the two period lag of the oil price variable has a positive impact on the fiscal deficit position of Benin.

A bivariate relationship was also estimated between fiscal deficit and world oil prices which suggested a positive and significant relationship between Benin fiscal deficit and world oil prices, with high elasticity of 1.09. The residual of this bivariate equation was also tested for stationarity and found to be stationary and went further to support the existence of cointegration between Benin fiscal deficits and world petroleum prices. This also validates the relationship. See appendix 2 for the details.

The policy implication is that although oil price increases are likely to cause fiscal deficit expansion in Benin, effective monetary policy responses helped to avert possible inflationary consequences. The effects of oil prices on fiscal deficits take one year lag. The detailed test results are annexed to the document.

3.3.2 Burkina Faso

As can be seen from figure 2 below there seems to be a close co-movement between world oil prices and fiscal deficit in Burkina Faso over the period considered.

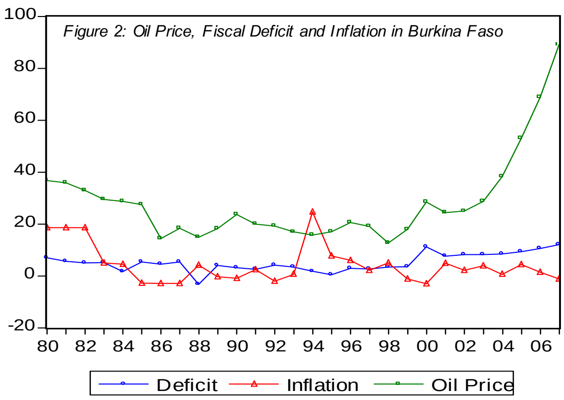


Table 3.5 below also which contains the correlation matrix of the three variables shows a high positive correlation of 0.63 between oil prices and fiscal deficits. However, oil prices and inflation do not seem to be moving closely in Burkina Faso, almost similar to the situation observed in Benin, which was depicted by a very weak positive correlation of 0.046.

Table 3.5. Burkina Faso: Correlation Matrix

	Oil_Price	Deficit	Inflation
Oil_Price	1.000000	0.628565	0.045704
Deficit	0.628565	1.000000	-0.222884
Inflation	0.045704	-0.222884	1.000000

Furthermore, the VAR estimation output presented in appendix 3 suggested that one period lag of world oil price has a positive impact on the fiscal deficits of Burkina Faso.

In addition, a two-variable relationship between Burkina fiscal deficit and world oil price (see appendix 2) also depicted a positive and significant relationship between the two variables, although with a relatively lower elasticity of 0.86, compared to Benin. The stationary residual from these non-stationary variables suggest cointegration between the two variables, which also implies that the relationship is structural and not spurious (see appendix 2 for the details).

The policy implication is that oil price increases have adverse implications for the fiscal position in Burkina Faso, while the impact on inflation could at best be minimal over the period specified. Another important policy implication is that oil price increases take one year lag before their overall effects are felt on the fiscal situation in Burkina and appropriate and timely fiscal policy measures could reduce such an impact.

3.3.3 Cote d'Ivoire

The case of Cote d'Ivoire is different from the other two UEMOA countries presented above in the sense that the country has the largest economy in the zone and also produces oil. Thus it is expected to be affected differently from these two countries, all things remaining equal, and would have been a good test case. The preliminary findings seem to corroborate this fact, although mildly.

Fig 3 below depicts strong co-movements between fiscal deficits and inflation in the country towards the end of the period, while this was not the case prior to the CFA franc devaluation of 1994.

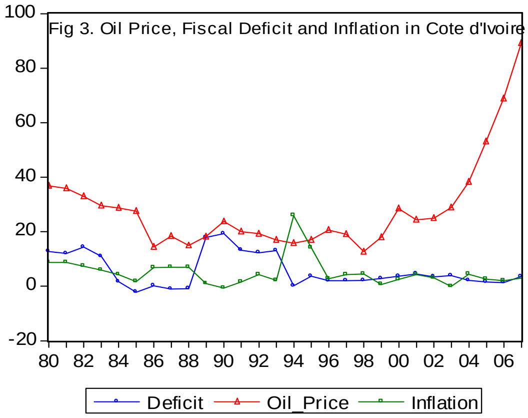


Table 3.6 (correlation matrix) seem to suggest that oil price upward movements positively impact on the fiscal position of Cote d'Ivoire. However, it should be mentioned that this positive correlation was very weak, which could also be attributable to the unfavourable security situation in recent years, a downside risk. Regarding the relationship with inflation, high oil price shocks could be observed to improve the inflationary pressures in this oil producing country, in line with theoretical expectations/postulations.

Table 3.6. Cote d'Ivoire: Correlation Matrix

	Oil_Price	Deficit	Inflation
Oil_Price	1.000000	0.099385	-0.211865
Deficit	0.099385	1.000000	-0.455744
Inflation	-0.211865	-0.455744	1.000000

The VAR estimation output contained in appendix 3 shows that one period lag of oil price had a positive impact on the fiscal position of Cote d'Ivoire, although the variable was not significant at the conventional levels

The bivariate relationship between fiscal deficits in Ivory Coast and world oil price was positive, the relatively low elasticity (0.37) as well as coefficient of determination (0.12) and weak cointegration of the residual between these two variables (see appendix 2), such results should be interpreted with maximum caution. A plausible explanation is that due to the social upheavals that existed in the country for a significant part of the study, the expected positive impact of world oil prices on the fiscal position of Cote d'Ivoire could not be supported empirically.

The policy implication is that although Cote d'Ivoire produces oil, the increase in oil prices does not seem to improve the fiscal position of the country significantly. Perhaps a dummy variable isolating the effect of the war could have given better results which would be more useful for policy analyses and formulation.

3.3.4 Senegal

Figure 4 below and the Correlation matrix contained in table 3.7 seem to suggest a strong correlation between petrol price fluctuations and budget deficits in Senegal over the period of analyses in line with a priori expectations. The high positive correlation of 0.62 seems to indicate that high petroleum prices would exacerbate the fiscal deficit position of this country. The correlation between oil prices and inflation was negative, but negligible.

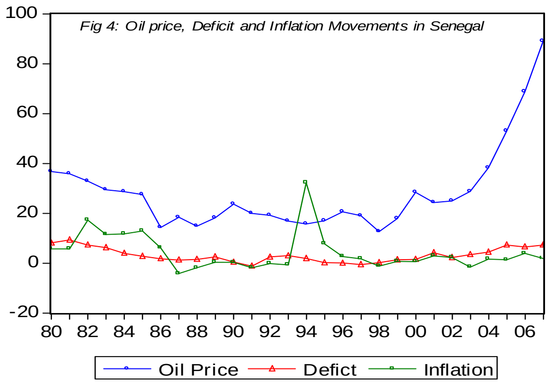


Table 3.7 Senegal: Correlation Matrix			
	Oil_Price	**Deficit**	**Inflation**
Oil_Price	1.000000	0.616518	-0.001265
Deficit	0.616518	1.000000	0.165615
Inflation	-0.001265	0.165615	1.000000

The VAR estimations (see appendix 3) seem to suggest that one period lag of oil prices had an adverse effect on the fiscal deficit position of Senegal.

The relationship between oil prices and fiscal deficit in Senegal was also positive, with a high elasticity of 1.5 percent. The policy implication is that a 1% increase in oil prices would worsen the fiscal deficit position of the country by 1.5%, although the effect could take one year lag. The preliminary cointegration test results of appendix 2 also supported the existence of cointegration between oil prices and budget deficit.

3.4 Unit Root Characteristics of the Data for the selected WAMZ Countries

Table 3.8 shows that the WAMZ picture in terms of the Stationarity of the series is similar to the UEMOA picture and thus all the variables became stationary after first difference as detailed below. It should be noted, however, that in the case of the Gambia while the inflation rate became stationary after first difference, the fiscal deficit variable became stationary after second difference and only at the 5% level of significance. This implies weak stationarity

Table 3.8 ADF Test Results for the selected WAMZ Countries

	The Gambia	Ghana	Nigeria
Oil price	**-0.35** (-4.35)* (-3.59)** (-3.23)***	**-0.35** (-4.35)* (-3.59)** (-3.23)***	**-0.35** (-4.35)* (-3.59)** (-3.23)***
D(Oil Price)	**-4.97** (-4.37)* (-3.60)** (-3.24)***	**-4.97** (-4.37)* (-3.60)** (-3.24)***	**-4.97** (-4.37)* (-3.60)** (-3.24)***
Deficit	**-2.51** (-4.57)* (-3.37)** (-3.29)***	**-3.34** (-4.35)* (-3.59)** (-3.23)***	**-1.75** (-4.8)* (-3.79)** (-3.34)***
D(Deficit)	**-3.96** (-4.8)* (-3.79)** (-3.34)***	**-3.88** (-4.37)* (-3.60)** (-3.24)***	**-3.88** (-4.37)* (-3.60)** (-3.24)***
Inflation	**-2.93** (-4.35)* (-3.59)** (-3.23)***	**-4.49** (-4.35)* (-3.59)** (-3.23)***	**-2.65** (-4.35)* (-3.59)** (-3.23)***
D(Inflation)	**-3.96** (-4.37)* (-3.60)** (-3.24)***	**-4.49** (-4.35)* (-3.59)** (-3.23)***	**-4.74** (-4.37)* (-3.60)** (-3.24)***

NB: -The values in parentheses represent the Mackinnon Critical Values while the others outside parentheses (in bold) represent the ADF Statistics

NB: * , ** and ***denote the conventional levels of significance of 1%, 5% and 10% respectively

3.5 Trend, VAR and Cointegration Analyses

3.5.1 The Gambia

The figure below (fig 5) shows the movement of world petroleum prices, budget deficit and inflation rates in The Gambia. There was very low positive correlation between oil prices and fiscal deficits (0.06) as shown by table 3.9. On the other hand, there was negative correlation (-0.31) between oil prices and inflation rate in The Gambia.

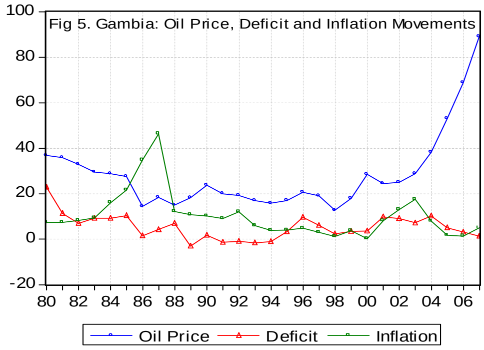


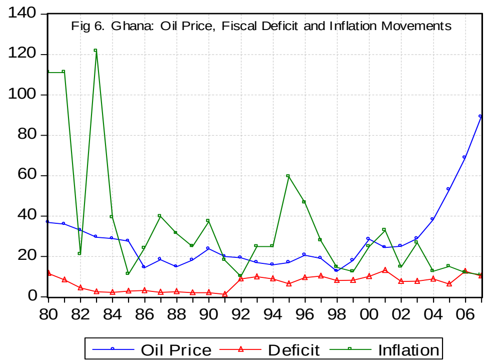
Table 3.9. The Gambia : Correlation Matrix			
	Oil_Price	**Deficit**	**Inflation**
Oil_Price	1.000000	0.060114	-0.311574
Deficit	0.060114	1.000000	-0.055989
Inflation	-0.311574	-0.055989	1.000000

The VAR estimations also seem to suggest that one period lag of the oil price variable had a positive effect on the fiscal deficit variable (see appendix 3, for the details).

Similarly, the bivariate relationship between fiscal deficits and oil price also suggest a positive impact of oil prices on fiscal deficits, with a high elasticity of 1.27 percent (appendix 2). Thus an important policy implication is that high oil prices seemed to have an adverse effect on the fiscal deficit position of The Gambia over the period of analyses, while the effect on inflation seemed minimal for the reasons already advanced (i.e. effective use of indirect instruments of monetary control-open market operations and reserves requirements). The impact of oil price on fiscal deficit is positive and elastic.

3.5.2 Ghana

Figure 6 below highlights the co-movements between world oil prices, inflation and fiscal deficits in Ghana. At the beginning of the period spectacularly high inflation rates could be observed but which trended downwards, up to 1995 when another shock re-occurred. Oil prices and fiscal deficits seemed to be moving upwards towards the end of the period.



The above trends were also supported by the correlation matrix of table 3.10 where a positive correlation between oil prices and fiscal deficits of 0.34 was estimated. This seems to suggest that oil price increases could adversely affect fiscal deficits in Ghana. Inflation and fiscal deficits did not seem to be moving closely over the period as shown by a low correlation of -0.03.

Table 3.10. Ghana : Correlation Matrix

	Oil_Price	Deficit	Inflation
Oil_Price	1.000000	0.342208	-0.045929
Deficit	0.342208	1.000000	-0.034951
Inflation	-0.045929	-0.034951	1.000000

The VAR analyses and preliminary cointegration test results also supported the above preliminary findings. The VAR estimation output contained in appendix 3 suggests an adverse effect of one-period lag of oil price on fiscal deficit position of Ghana, although weak.

The relationship estimated between fiscal deficit and oil price (appendix 2) also suggests a very weak relationship and low coefficient of (0.05). The cointegration test also validates this relationship only at the 10% level of significance. The policy implication is that the adverse effect of oil price increases on the fiscal deficit position of Ghana was relatively small, inelastic and with a lag period of one year.

3.5.3 Nigeria

The case of Nigeria portrays a somewhat unique case among the ECOWAS Member countries considered. This is due to the fact that the country is a significant oil producing country, as far as world oil production is concerned. As shown below, an increase in oil prices is likely to reduce fiscal deficits in Nigeria. This was shown by the negative correlation between oil prices and fiscal deficits in Nigeria (-0.31). Similarly oil price increases seemed to reduce the rate of inflation in the country (-0.34), in line with theoretical expectations. Thus an increase in world oil prices is likely to improve the fiscal position of Nigeria as well as ameliorate inflationary pressures. This largely held view point and the a priori expectations were also supported by the VAR analyses and preliminary cointegration test results as detailed below.

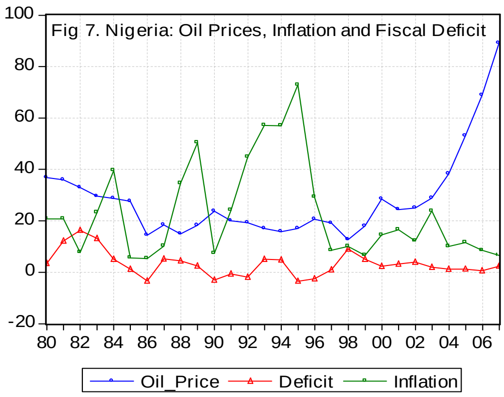


Table 3.11. Nigeria : Correlation Matrix			
	Oil_Price	**Deficit**	**Inflation**
Oil_Price	1.000000	-0.311779	-0.339335
Deficit	-0.311779	1.000000	0.416608
Inflation	-0.339335	0.416608	1.000000

The VAR estimations in appendix 3 shows that one-period lag of oil price had a negative impact on the fiscal deficit variable in Nigeria over the sample period.

The policy implication is that an increase in oil prices would improve the fiscal deficit position of Nigeria, all things remaining equal. This was also buttressed by the preliminary cointegration tests on the bivariate relationship between fiscal deficit and oil price in Nigeria (appendix 2). The oil price variable was significant, with a high elasticity of -1.83 percent. The policy implication is that a 1% increase in oil prices is likely to improve the fiscal position of Nigeria by 1.83%, with a lag of one year.

CONCLUSION, POLICY IMPLICATIONS AND RECOMMENDATION

In sum, the impact of world oil prices on macroeconomic variables have been the subject of scholarly research both for academic purposes as well as for resolving important policy questions. The subject had attracted a lot of research since the oil price shocks of the early 1970s and had evolved over time and across countries (both developing and industrialised countries alike). Recent increases in world oil prices and the indications that these would persist in the outlook period and beyond, as well as prevalent supply constraints underscored the thesis that the impact of oil price shocks on key macroeconomic variables is a research issue of current relevance. The paper was an attempt to investigate the impact of oil price shocks on key macroeconomic convergence criteria (fiscal deficit and inflation) on selected ECOWAS Member countries. The paper had surveyed the existing literature on the subject, using various econometric techniques, particularly the VAR methodology which was also adopted for this study.

In general oil prices take one year lag before their effects are felt on the fiscal deficits of the countries. Regarding the responsiveness of fiscal deficits to changes in oil prices, Senegal, The Gambia and Benin had elastic responses of 1.53, 1.27 and 1.09 respectively. The implication is that a 1% increase in oil prices is likely to worsen fiscal deficits in Senegal, The Gambia and Benin by 1.53, 1.27 and 1.09 percent respectively. Nigeria had an elastic (negative) response of -1.83 percent, which implies that 1% increase in oil prices will reduce fiscal deficits by 1.83 percent, ceteris paribus. On the other hand, Burkina, Cote d'Ivoire and Ghana had inelastic responses of fiscal deficits to oil price changes (0.86, 0.37 and 0.05 respectively). Thus a 1% increase in oil prices is likely to increase fiscal deficits of Burkina Faso, Cote d'Ivoire and Ghana by 0.86, 0.37 and 0.05 percent respectively. Although the elasticities are based on bivariate relationships, they could give a fair indication of the expected responsiveness of fiscal deficits to oil price changes in the countries surveyed which could be useful to policy makers.

In the light of the foregoing analyses it can be concluded that increase in world oil prices have been shown to worsen fiscal deficit positions of oil importing countries. On the other hand, oil price increases largely improved fiscal deficit of oil producing countries.

This could not be validated in the case of Cote d'Ivoire, although this could be attributable to the deteriorating security situation that existed in the country during this period. In general the expected adverse effects of oil prices on the inflation rates of non-oil producing countries was limited. This could be due to appropriate and timely monetary policy responses (indirect instruments of monetary control- open market operations and reserves requirements) by the monetary authorities to address such shocks as and when they occured. In other words, the group of countries considered could have come up with better policy responses to alter the expected negative implications of the oil price variable on their inflation rates. In addition it also seems difficult for some of these countries to reduce oil subsidy due to its politically sensitive nature, as a result of which in some cases these world oil prices cannot be readily transferred to consumers.

Concerning policy implications, it can be said that the high price of oil impacts directly on enterprises (firms), households (consumers) and the government. First, it increases the domestic price of petroleum products, raises the cost of many intermediate inputs, and as a result leads to higher costs of production. Consequently firms may reduce their labour demand, investment and consequently a fall in output becomes an inevitable outcome. Second, as the short-run demand for oil is highly inelastic, consumers are forced to reduce their consumption of other goods and services (the substitution effect) to pay for higher energy bills. Third, net oil-importing countries face balance of payment constraints as they must secure additional resources to pay for the higher oil import bill. Governments also face tighter budget constraints which can affect their capacity to finance social programs which may be necessary to address the high incidence of poverty.

High oil prices will exert a heavy toll on the budget both on the revenue and expenditure sides. On the revenue side, the tax base will be eroded if the profitability of oil-consuming companies is adversely affected and if unemployment increases. Expenditure could increase wherever governments subsidize oil products, or programs, which make intensive use of petroleum products. In that regard, an important question remains as to whether there would be complete pass-through of the oil price increase or not.

Governments are under heavy pressure to intervene to cushion the effect of the oil price increase. If the price of oil is not mean-reverting, price controls will lead to ever increasing losses which will ultimately be borne by current or future tax payers.

Subsidies to public utilities can also worsen the consolidated government budget deficit. In many countries electricity is produced using oil and is sold by law below its cost of production. In this case, the government will have to bear the additional expenditure from a higher oil bill. If the government does not have the resources to do so (for instance, if foreign reserves are too low), it may have to resort to rolling blackouts which have very adverse effects. Moreover, the government will itself face a higher energy bill through its own activities and that of state-owned companies.

With respect to monetary policy Central Banks may pursue tight monetary policy in reaction to the increase in inflation. Previous oil price shocks have produced significant increases in real interest rates which undermined domestic investment, pushed the country deeper into recession and produced stagflation. Furthermore, a rising fiscal deficit, combined with increasing public expenditures due to petrol consumption by public entities, can prompt the authorities to use monetary creation to finance the additional expenditures. As the increase in the price of oil is akin to a supply shock, an accommodating monetary policy would contribute to inflation. It is advisable to adopt a non-inflationary policy to avoid hyperinflation and to maintain monetary credibility.

In view of the above, it would be important at the level of ECOWAS to set up a Solidarity Fund in which non-oil producing countries could borrow from in order to finance fiscal deficits originating from oil price shocks

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Appendix 1: Unit Root Test Results

ADF Test Statistic	-4.974272	1% Critical Value*	-4.3738
		5% Critical Value	-3.6027
		10% Critical Value	-3.2367

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OIL_PRICE),2)
Method: Least Squares
Date: 01/06/08 Time: 11:01
Sample(adjusted): 1983 2007
Included observations: 25 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(OIL_PRICE(-1)))	-1.585131	0.318666	-4.974272	0.0001
D(LOG(OIL_PRICE(-1)),2)	0.315378	0.205223	1.536758	0.1393
C	-0.308232	0.120338	-2.561388	0.0182
@TREND(1980)	0.023975	0.007680	3.121870	0.0052

R-squared	0.644274	Mean dependent var	0.013752
Adjusted R-squared	0.593456	S.D. dependent var	0.354222
S.E. of regression	0.225855	Akaike info criterion	0.007795
Sum squared resid	1.071216	Schwarz criterion	0.202815
Log likelihood	3.902558	F-statistic	12.67808
Durbin-Watson stat	2.110225	Prob(F-statistic)	0.000060

ADF Test Statistic	-0.356789	1% Critical Value*	-4.3552
		5% Critical Value	-3.5943
		10% Critical Value	-3.2321

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OIL_PRICE))
Method: Least Squares
Date: 01/05/08 Time: 19:16
Sample(adjusted): 1982 2007
Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(OIL_PRICE(-1))	-0.047777	0.133908	-0.356789	0.7246
D(LOG(OIL_PRICE(-1)))	-0.159477	0.230888	-0.690710	0.4970
C	-0.071637	0.427123	-0.167719	0.8683
@TREND(1980)	0.018039	0.006736	2.677944	0.0137

R-squared	0.247373	Mean dependent var	0.034930
Adjusted R-squared	0.144742	S.D. dependent var	0.252011
S.E. of regression	0.233060	Akaike info criterion	0.065596
Sum squared resid	1.194972	Schwarz criterion	0.259149
Log likelihood	3.147257	F-statistic	2.410310
Durbin-Watson stat	2.107460	Prob(F-statistic)	0.094179

Appendix 1 (contd.): Unit Root Test Results

ADF Test Statistic	-6.178199	1% Critical Value*	-4.5348
		5% Critical Value	-3.6746
		10% Critical Value	-3.2762

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(DEF_BENIN1),2)
Method: Least Squares
Date: 01/06/08 Time: 11:14
Sample(adjusted): 1983 2007
Included observations: 19
Excluded observations: 6 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(DEF_BENIN1(-1)))	-2.390582	0.386938	-6.178199	0.0000
D(LOG(DEF_BENIN1(-1)),2)	0.725325	0.235580	3.078888	0.0076
C	-0.176398	0.360670	-0.489084	0.6319
@TREND(1980)	0.001203	0.023121	0.052025	0.9592

R-squared	0.771784	Mean dependent var	-0.099226
Adjusted R-squared	0.726140	S.D. dependent var	1.479849
S.E. of regression	0.774428	Akaike info criterion	2.511281
Sum squared resid	8.996092	Schwarz criterion	2.710110
Log likelihood	-19.85717	F-statistic	16.90904
Durbin-Watson stat	2.572492	Prob(F-statistic)	0.000045

ADF Test Statistic	-2.310511	1% Critical Value*	-4.4691
		5% Critical Value	-3.6454
		10% Critical Value	-3.2602

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(DEF_BENIN1))
Method: Least Squares
Date: 01/05/08 Time: 18:40
Sample(adjusted): 1982 2007
Included observations: 21
Excluded observations: 5 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DEF_BENIN1(-1))	-0.987306	0.427311	-2.310511	0.0337
D(LOG(DEF_BENIN1(-1)))	0.078841	0.313795	0.251251	0.8046
C	1.491798	0.774408	1.926373	0.0709
@TREND(1980)	-0.024716	0.024876	-0.993568	0.3344

R-squared	0.334208	Mean dependent var	-0.088330
Adjusted R-squared	0.216715	S.D. dependent var	0.921374
S.E. of regression	0.815448	Akaike info criterion	2.599484
Sum squared resid	11.30423	Schwarz criterion	2.798441
Log likelihood	-23.29458	F-statistic	2.844494
Durbin-Watson stat	1.595733	Prob(F-statistic)	0.068568

Appendix 1 (contd.): Unit Root Test Results

ADF Test Statistic	-3.199816	1% Critical Value*	-4.3552
		5% Critical Value	-3.5943
		10% Critical Value	-3.2321

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF_BENIN)
Method: Least Squares
Date: 01/05/08 Time: 20:20
Sample(adjusted): 1982 2007
Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF_BENIN(-1)	-0.888618	0.277709	-3.199816	0.0041
D(INF_BENIN(-1))	0.046450	0.212960	0.218114	0.8294
C	4.287775	3.646610	1.175825	0.2522
@TREND(1980)	0.005296	0.211688	0.025020	0.9803

R-squared	0.425309	Mean dependent var	-0.038462
Adjusted R-squared	0.346942	S.D. dependent var	9.999003
S.E. of regression	8.080394	Akaike info criterion	7.157397
Sum squared resid	1436.441	Schwarz criterion	7.350950
Log likelihood	-89.04616	F-statistic	5.427148
Durbin-Watson stat	1.994021	Prob(F-statistic)	0.006003

ADF Test Statistic	-1.788153	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(DEF_BURKINA))
Method: Least Squares
Date: 01/07/08 Time: 03:37
Sample(adjusted): 1982 2007
Included observations: 23
Excluded observations: 3 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DEF_BURKINA(-1))	-0.389851	0.218019	-1.788153	0.0897
D(LOG(DEF_BURKINA(-1)))	-0.198714	0.222240	-0.894141	0.3824
C	0.256237	0.363596	0.704731	0.4895
@TREND(1980)	0.024421	0.017500	1.395430	0.1790

R-squared	0.282283	Mean dependent var	0.055478
Adjusted R-squared	0.168960	S.D. dependent var	0.662761
S.E. of regression	0.604182	Akaike info criterion	1.986889
Sum squared resid	6.935691	Schwarz criterion	2.184367
Log likelihood	-18.84923	F-statistic	2.490946
Durbin-Watson stat	2.106634	Prob(F-statistic)	0.091267

Appendix 1 (contd.): Unit Root Test Results

ADF Test Statistic	-4.167499	1% Critical Value*	-4.4691
		5% Critical Value	-3.6454
		10% Critical Value	-3.2602

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(DEF_BURKINA),2)
Method: Least Squares
Date: 01/07/08 Time: 03:43
Sample(adjusted): 1983 2007
Included observations: 21
Excluded observations: 4 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(DEF_BURKINA(-1)))	-1.645233	0.394777	-4.167499	0.0006
D(LOG(DEF_BURKINA(-1)),2)	0.179071	0.236691	0.756558	0.4597
C	-0.140076	0.356438	-0.392988	0.6992
@TREND(1980)	0.015206	0.020422	0.744570	0.4667

R-squared	0.708812	Mean dependent var	0.029618
Adjusted R-squared	0.657426	S.D. dependent var	1.151838
S.E. of regression	0.674169	Akaike info criterion	2.218971
Sum squared resid	7.726561	Schwarz criterion	2.417927
Log likelihood	-19.29919	F-statistic	13.79384
Durbin-Watson stat	2.149214	Prob(F-statistic)	0.000082

ADF Test Statistic	-3.019066	1% Critical Value*	-4.3552
		5% Critical Value	-3.5943
		10% Critical Value	-3.2321

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF_BURKINA)
Method: Least Squares
Date: 01/07/08 Time: 03:55
Sample(adjusted): 1982 2007
Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF_BURKINA(-1)	-0.637579	0.211184	-3.019066	0.0063
D(INF_BURKINA(-1))	-0.049274	0.194427	-0.253430	0.8023
C	2.130841	3.146116	0.677292	0.5053
@TREND(1980)	-0.028333	0.171697	-0.165020	0.8704

R-squared	0.379568	Mean dependent var	-0.758622
Adjusted R-squared	0.294964	S.D. dependent var	7.416378
S.E. of regression	6.227267	Akaike info criterion	6.636390
Sum squared resid	853.1348	Schwarz criterion	6.829944
Log likelihood	-82.27307	F-statistic	4.486396
Durbin-Watson stat	2.097733	Prob(F-statistic)	0.013302

Appendix 1 (contd.): Unit Root Test Results

ADF Test Statistic	-4.541393	1% Critical Value*	-4.3738
		5% Critical Value	-3.6027
		10% Critical Value	-3.2367

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF_BURKINA,2)
Method: Least Squares
Date: 01/07/08 Time: 04:00
Sample(adjusted): 1983 2007
Included observations: 25 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF_BURKINA(-1))	-1.609844	0.354482	-4.541393	0.0002
D(INF_BURKINA(-1),2)	0.197407	0.216087	0.913551	0.3713
C	-4.027695	3.541288	-1.137353	0.2682
@TREND(1980)	0.189649	0.210692	0.900124	0.3783

R-squared	0.683168	Mean dependent var	-0.104000
Adjusted R-squared	0.637906	S.D. dependent var	12.31378
S.E. of regression	7.409723	Akaike info criterion	6.989110
Sum squared resid	1152.984	Schwarz criterion	7.184130
Log likelihood	-83.36387	F-statistic	15.09372
Durbin-Watson stat	1.873601	Prob(F-statistic)	0.000018

ADF Test Statistic	-2.432456	1% Critical Value*	-4.5000
		5% Critical Value	-3.6591
		10% Critical Value	-3.2677

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(DEF_CIVOIRE))
Method: Least Squares
Date: 01/06/08 Time: 23:39
Sample(adjusted): 1982 2007
Included observations: 20
Excluded observations: 6 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DEF_CIVOIRE(-1))	-0.837198	0.344178	-2.432456	0.0271
D(LOG(DEF_CIVOIRE(-1)))	-0.122234	0.254948	-0.479447	0.6381
C	1.581761	1.161811	1.361461	0.1922
@TREND(1980)	-0.037104	0.044310	-0.837377	0.4147

R-squared	0.478309	Mean dependent var	-0.182787
Adjusted R-squared	0.380492	S.D. dependent var	1.348961
S.E. of regression	1.061751	Akaike info criterion	3.134573
Sum squared resid	18.03705	Schwarz criterion	3.333719
Log likelihood	-27.34573	F-statistic	4.889835
Durbin-Watson stat	2.088150	Prob(F-statistic)	0.013399

Appendix 1 (contd.): Unit Root Test Results

ADF Test Statistic	-4.241362	1% Critical Value*	-4.5743
		5% Critical Value	-3.6920
		10% Critical Value	-3.2856

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(DEF_CIVOIRE),2)
Method: Least Squares
Date: 01/06/08 Time: 23:37
Sample(adjusted): 1983 2007
Included observations: 18
Excluded observations: 7 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(DEF_CIVOIRE(-1)))	-1.986637	0.468396	-4.241362	0.0008
D(LOG(DEF_CIVOIRE(-1)),2)	0.292994	0.266951	1.097555	0.2909
C	-1.325607	0.838510	-1.580908	0.1362
@TREND(1980)	0.055970	0.044080	1.269724	0.2249

R-squared	0.777195	Mean dependent var	-0.042650
Adjusted R-squared	0.729451	S.D. dependent var	2.389223
S.E. of regression	1.242739	Akaike info criterion	3.465643
Sum squared resid	21.62161	Schwarz criterion	3.663503
Log likelihood	-27.19079	F-statistic	16.27836
Durbin-Watson stat	2.221566	Prob(F-statistic)	0.000077

ADF Test Statistic	-3.473793	1% Critical Value*	-4.3552
		5% Critical Value	-3.5943
		10% Critical Value	-3.2321

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF_IVOIRE)
Method: Least Squares
Date: 01/06/08 Time: 23:57
Sample(adjusted): 1982 2007
Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF_IVOIRE(-1)	-0.872378	0.251131	-3.473793	0.0022
D(INF_IVOIRE(-1))	0.195304	0.208334	0.937453	0.3587
C	5.641449	2.860211	1.972389	0.0613
@TREND(1980)	-0.104620	0.141394	-0.739919	0.4672

R-squared	0.391715	Mean dependent var	-0.218483
Adjusted R-squared	0.308767	S.D. dependent var	6.292466
S.E. of regression	5.231584	Akaike info criterion	6.287943
Sum squared resid	602.1283	Schwarz criterion	6.481497
Log likelihood	-77.74326	F-statistic	4.722416
Durbin-Watson stat	2.013315	Prob(F-statistic)	0.010840

Appendix 1 (contd.): Unit Root Test Results

ADF Test Statistic	0.362761	1% Critical Value*	-4.5000
		5% Critical Value	-3.6591
		10% Critical Value	-3.2677

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(DEF_SENEGAL))
Method: Least Squares
Date: 01/08/08 Time: 04:59
Sample(adjusted): 1982 2007
Included observations: 20
Excluded observations: 6 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DEF_SENEGAL(-1))	0.086726	0.239071	0.362761	0.7215
D(LOG(DEF_SENEGAL(-1)))	0.135160	0.289933	0.466176	0.6474
C	-0.640472	0.471378	-1.358721	0.1931
@TREND(1980)	0.021151	0.021466	0.985337	0.3391

R-squared	0.114289	Mean dependent var	-0.250045
Adjusted R-squared	-0.051782	S.D. dependent var	0.739802
S.E. of regression	0.758714	Akaike info criterion	2.462473
Sum squared resid	9.210357	Schwarz criterion	2.661620
Log likelihood	-20.62473	F-statistic	0.688191
Durbin-Watson stat	2.032807	Prob(F-statistic)	0.572331

ADF Test Statistic	-3.559767	1% Critical Value*	-4.8025
		5% Critical Value	-3.7921
		10% Critical Value	-3.3393

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(DEF_SENEGAL),3)
Method: Least Squares
Date: 01/08/08 Time: 05:02
Sample(adjusted): 1984 2007
Included observations: 14
Excluded observations: 10 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(DEF_SENEGAL(-1)),2)	-1.914634	0.537854	-3.559767	0.0052
D(LOG(DEF_SENEGAL(-1)),3)	0.120960	0.324479	0.372782	0.7171
C	-0.106252	0.412402	-0.257641	0.8019
@TREND(1980)	-0.004459	0.023885	-0.186683	0.8556

R-squared	0.805599	Mean dependent var	-0.005487
Adjusted R-squared	0.747278	S.D. dependent var	1.514521
S.E. of regression	0.761371	Akaike info criterion	2.527565
Sum squared resid	5.796859	Schwarz criterion	2.710152
Log likelihood	-13.69295	F-statistic	13.81334
Durbin-Watson stat	1.776673	Prob(F-statistic)	0.000688

Appendix 1 (contd.): Unit Root Test Results

ADF Test Statistic	-3.958546	1% Critical Value*	-4.8025
		5% Critical Value	-3.7921
		10% Critical Value	-3.3393

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(DEF_GAMBIA),3)
Method: Least Squares
Date: 01/09/08 Time: 02:36
Sample(adjusted): 1984 2007
Included observations: 14
Excluded observations: 10 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(DEF_GAMBIA(-1)),2)	-2.226348	0.562416	-3.958546	0.0027
D(LOG(DEF_GAMBIA(-1)),3)	0.420852	0.351631	1.196857	0.2590
C	0.375823	0.614885	0.611209	0.5547
@TREND(1980)	-0.021004	0.032537	-0.645529	0.5331

R-squared	0.831691	Mean dependent var	-0.081610
Adjusted R-squared	0.781198	S.D. dependent var	2.169838
S.E. of regression	1.014969	Akaike info criterion	3.102550
Sum squared resid	10.30163	Schwarz criterion	3.285138
Log likelihood	-17.71785	F-statistic	16.47148
Durbin-Watson stat	2.261669	Prob(F-statistic)	0.000339

ADF Test Statistic	-2.508198	1% Critical Value*	-4.5743
		5% Critical Value	-3.6920
		10% Critical Value	-3.2856

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(DEF_GAMBIA))
Method: Least Squares
Date: 01/09/08 Time: 04:19
Sample(adjusted): 1982 2007
Included observations: 18
Excluded observations: 8 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DEF_GAMBIA(-1))	-0.820829	0.327259	-2.508198	0.0251
D(LOG(DEF_GAMBIA(-1)))	0.189781	0.254346	0.746154	0.4679
C	1.611160	0.743201	2.167867	0.0479
@TREND(1980)	-0.017340	0.018261	-0.949598	0.3584

R-squared	0.337595	Mean dependent var	-0.134855
Adjusted R-squared	0.195651	S.D. dependent var	0.720781
S.E. of regression	0.646436	Akaike info criterion	2.158444
Sum squared resid	5.850310	Schwarz criterion	2.356305
Log likelihood	-15.42600	F-statistic	2.378371
Durbin-Watson stat	1.974270	Prob(F-statistic)	0.113608

Appendix 1 (contd.): Unit Root Test Results

ADF Test Statistic	-3.341326	1% Critical Value*	-4.3552
		5% Critical Value	-3.5943
		10% Critical Value	-3.2321

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(DEF_GHANA))
Method: Least Squares
Date: 01/09/08 Time: 05:41
Sample(adjusted): 1982 2007
Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DEF_GHANA(-1))	-0.574051	0.171803	-3.341326	0.0030
D(LOG(DEF_GHANA(-1)))	0.023845	0.182046	0.130986	0.8970
C	0.353109	0.242298	1.457333	0.1592
@TREND(1980)	0.042889	0.014704	2.916784	0.0080

R-squared	0.368831	Mean dependent var	0.007843
Adjusted R-squared	0.282762	S.D. dependent var	0.504521
S.E. of regression	0.427278	Akaike info criterion	1.277874
Sum squared resid	4.016462	Schwarz criterion	1.471428
Log likelihood	-12.61236	F-statistic	4.285318
Durbin-Watson stat	2.030510	Prob(F-statistic)	0.015879

ADF Test Statistic	-3.879939	1% Critical Value*	-4.3738
		5% Critical Value	-3.6027
		10% Critical Value	-3.2367

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(DEF_GHANA),2)
Method: Least Squares
Date: 01/09/08 Time: 05:44
Sample(adjusted): 1983 2007
Included observations: 25 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(DEF_GHANA(-1)))	-1.259044	0.324501	-3.879939	0.0009
D(LOG(DEF_GHANA(-1)),2)	0.066155	0.217606	0.304015	0.7641
C	-0.075460	0.246053	-0.306683	0.7621
@TREND(1980)	0.007404	0.014856	0.498369	0.6234

R-squared	0.604798	Mean dependent var	0.017487
Adjusted R-squared	0.548340	S.D. dependent var	0.772704
S.E. of regression	0.519300	Akaike info criterion	1.672978
Sum squared resid	5.663130	Schwarz criterion	1.867998
Log likelihood	-16.91222	F-statistic	10.71245
Durbin-Watson stat	2.093575	Prob(F-statistic)	0.000177

Appendix 1 (contd.): Unit Root Test Results

ADF Test Statistic	-2.654971	1% Critical Value*	-4.3552
		5% Critical Value	-3.5943
		10% Critical Value	-3.2321

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF_NIGERIA)
Method: Least Squares
Date: 01/09/08 Time: 23:36
Sample(adjusted): 1982 2007
Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF_NIGERIA(-1)	-0.543703	0.204787	-2.654971	0.0145
D(INF_NIGERIA(-1))	0.164928	0.211497	0.779814	0.4438
C	17.14188	9.171085	1.869123	0.0750
@TREND(1980)	-0.331583	0.446143	-0.743221	0.4652

R-squared	0.255606	Mean dependent var	-0.545241
Adjusted R-squared	0.154097	S.D. dependent var	18.37230
S.E. of regression	16.89755	Akaike info criterion	8.632853
Sum squared resid	6281.600	Schwarz criterion	8.826406
Log likelihood	-108.2271	F-statistic	2.518077
Durbin-Watson stat	1.954500	Prob(F-statistic)	0.084477

ADF Test Statistic	-4.741583	1% Critical Value*	-4.3738
		5% Critical Value	-3.6027
		10% Critical Value	-3.2367

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF_NIGERIA,2)
Method: Least Squares
Date: 01/09/08 Time: 23:38
Sample(adjusted): 1983 2007
Included observations: 25 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF_NIGERIA(-1))	-1.445681	0.304894	-4.741583	0.0001
D(INF_NIGERIA(-1),2)	0.299382	0.204610	1.463185	0.1582
C	5.620728	8.626025	0.651601	0.5217
@TREND(1980)	-0.389797	0.519402	-0.750474	0.4613

R-squared	0.605078	Mean dependent var	0.446544
Adjusted R-squared	0.548660	S.D. dependent var	27.74023
S.E. of regression	18.63640	Akaike info criterion	8.833757
Sum squared resid	7293.624	Schwarz criterion	9.028777
Log likelihood	-106.4220	F-statistic	10.72500
Durbin-Watson stat	2.036781	Prob(F-statistic)	0.000175

Appendix 1 (contd.): Unit Root Test Results

ADF Test Statistic	-3.749384	1% Critical Value*	-4.3552
		5% Critical Value	-3.5943
		10% Critical Value	-3.2321

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEF_NIGERIA)
Method: Least Squares
Date: 01/09/08 Time: 23:54
Sample(adjusted): 1982 2007
Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEF_NIGERIA(-1)	-0.667589	0.178053	-3.749384	0.0011
D(DEF_NIGERIA(-1))	0.402804	0.176034	2.288217	0.0321
C	3.120494	1.958936	1.592954	0.1254
@TREND(1980)	-0.088230	0.103393	-0.853343	0.4027

R-squared	0.404480	Mean dependent var	-0.376449
Adjusted R-squared	0.323273	S.D. dependent var	4.345991
S.E. of regression	3.575162	Akaike info criterion	5.526536
Sum squared resid	281.1992	Schwarz criterion	5.720090
Log likelihood	-67.84497	F-statistic	4.980832
Durbin-Watson stat	2.291864	Prob(F-statistic)	0.008699

ADF Test Statistic	-4.982470	1% Critical Value*	-4.3738
		5% Critical Value	-3.6027
		10% Critical Value	-3.2367

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEF_NIGERIA,2)
Method: Least Squares
Date: 01/09/08 Time: 23:58
Sample(adjusted): 1983 2007
Included observations: 25 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEF_NIGERIA(-1))	-1.292573	0.259424	-4.982470	0.0001
D(DEF_NIGERIA(-1),2)	0.288071	0.183139	1.572964	0.1307
C	-2.451774	1.992632	-1.230420	0.2321
@TREND(1980)	0.124467	0.119232	1.043906	0.3084

R-squared	0.585578	Mean dependent var	-0.094430
Adjusted R-squared	0.526375	S.D. dependent var	6.207594
S.E. of regression	4.272092	Akaike info criterion	5.887731
Sum squared resid	383.2661	Schwarz criterion	6.082751
Log likelihood	-69.59664	F-statistic	9.891003
Durbin-Watson stat	2.427629	Prob(F-statistic)	0.000287

Appendix 2. Preliminary Cointegration Test Results

Dependent Variable: **log**(DEF_BENIN)
Method: Least Squares
Date: 01/10/08 Time: 22:37
Sample(adjusted): 1981 2007
Included observations: 27 after adjusting endpoints
Convergence achieved after 4 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(OIL_PRICE)	1.092211	0.294241	3.711964	0.0010
AR(1)	0.571430	0.164739	3.468692	0.0019

R-squared	0.378043	Mean dependent var	3.362963
Adjusted R-squared	0.353164	S.D. dependent var	2.701872
S.E. of regression	2.173011	Akaike info criterion	4.461291
Sum squared resid	118.0494	Schwarz criterion	4.557279
Log likelihood	-58.22743	Durbin-Watson stat	1.861468
Inverted AR Roots	.57		

ADF Test Statistic	-5.037908	1% Critical Value*	-4.3552
		5% Critical Value	-3.5943
		10% Critical Value	-3.2321

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ECT_BENIN)
Method: Least Squares
Date: 01/10/08 Time: 22:42
Sample(adjusted): 1982 2007
Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT_BENIN(-1)	-1.436114	0.285061	-5.037908	0.0000
D(ECT_BENIN(-1))	0.415782	0.199772	2.081285	0.0493
C	1.376422	0.932557	1.475965	0.1541
@TREND(1980)	-0.107206	0.058925	-1.819352	0.0825

R-squared	0.582708	Mean dependent var	-0.046640
Adjusted R-squared	0.525805	S.D. dependent var	2.956687
S.E. of regression	2.036029	Akaike info criterion	4.400518
Sum squared resid	91.19913	Schwarz criterion	4.594072
Log likelihood	-53.20674	F-statistic	10.24029
Durbin-Watson stat	1.814372	Prob(F-statistic)	0.000203

Appendix 2 (contd.). Preliminary Cointegration Test Results

Dependent Variable: LOG(DEF_BURKINA)
Method: Least Squares
Date: 01/13/08 Time: 10:51
Sample(adjusted): 1981 2007
Included observations: 25
Excluded observations: 2 after adjusting endpoints
Convergence achieved after 5 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.284520	1.063813	-1.207468	0.2401
LOG(OIL_PRICE)	0.860392	0.320823	2.681829	0.0136
AR(1)	0.389586	0.201557	1.932888	0.0662

R-squared	0.477790	Mean dependent var	1.506923
Adjusted R-squared	0.430316	S.D. dependent var	0.718038
S.E. of regression	0.541957	Akaike info criterion	1.724905
Sum squared resid	6.461771	Schwarz criterion	1.871170
Log likelihood	-18.56131	F-statistic	10.06432
Durbin-Watson stat	2.026217	Prob(F-statistic)	0.000788
Inverted AR Roots	.39		

ADF Test Statistic	-3.268896	1% Critical Value*	-3.7076
		5% Critical Value	-2.9798
		10% Critical Value	-2.6290

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ECT_BURKINA)
Method: Least Squares
Date: 01/13/08 Time: 10:56
Sample(adjusted): 1982 2007
Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT_BURKINA(-1)	-0.967906	0.296096	-3.268896	0.0034
D(ECT_BURKINA(-1))	-0.033262	0.209019	-0.159133	0.8750
C	-0.004836	0.104203	-0.046408	0.9634

R-squared	0.500106	Mean dependent var	-0.003919
Adjusted R-squared	0.456637	S.D. dependent var	0.720812
S.E. of regression	0.531334	Akaike info criterion	1.681313
Sum squared resid	6.493253	Schwarz criterion	1.826478
Log likelihood	-18.85707	F-statistic	11.50487
Durbin-Watson stat	1.978764	Prob(F-statistic)	0.000344

Appendix 2 (contd.). Preliminary Cointegration Test Results

Dependent Variable: LOG(DEF_CIVOIRE)
Method: Least Squares
Date: 01/13/08 Time: 11:02
Sample(adjusted): 1981 2007
Included observations: 22
Excluded observations: 5 after adjusting endpoints
Convergence achieved after 4 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(OIL_PRICE)	0.369889	0.108320	3.414776	0.0027
AR(1)	0.363382	0.196647	1.847883	0.0795

R-squared	0.115540	Mean dependent var	1.346270
Adjusted R-squared	0.071317	S.D. dependent var	1.100338
S.E. of regression	1.060376	Akaike info criterion	3.041632
Sum squared resid	22.48794	Schwarz criterion	3.140818
Log likelihood	-31.45795	F-statistic	2.612667
Durbin-Watson stat	2.350505	Prob(F-statistic)	0.121678
Inverted AR Roots	.36		

ADF Test Statistic	-3.949148	1% Critical Value*	-4.5000
		5% Critical Value	-3.6591
		10% Critical Value	-3.2677

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ECT_CIVOIRE)
Method: Least Squares
Date: 01/13/08 Time: 11:07
Sample(adjusted): 1982 2001
Included observations: 20 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT_CIVOIRE(-1)	-1.606903	0.406899	-3.949148	0.0011
D(ECT_CIVOIRE(-1))	0.162824	0.245931	0.662071	0.5173
C	0.746069	0.569512	1.310014	0.2087
@TREND(1980)	-0.070700	0.045086	-1.568114	0.1364

R-squared	0.700700	Mean dependent var	-0.044880
Adjusted R-squared	0.644582	S.D. dependent var	1.709641
S.E. of regression	1.019236	Akaike info criterion	3.052841
Sum squared resid	16.62149	Schwarz criterion	3.251987
Log likelihood	-26.52841	F-statistic	12.48604
Durbin-Watson stat	2.074818	Prob(F-statistic)	0.000184

Appendix 2 (contd.). Preliminary Cointegration Test Results

Dependent Variable: LOG(DEF_SENEGAL)
Method: Least Squares
Date: 01/11/08 Time: 14:36
Sample: 1980 2007
Included observations: 26
Excluded observations: 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.145518	1.309251	-3.166328	0.0042
LOG(OIL_PRICE)	1.530887	0.399075	3.836091	0.0008

R-squared	0.380095	Mean dependent var	0.824915
Adjusted R-squared	0.354265	S.D. dependent var	1.192070
S.E. of regression	0.957919	Akaike info criterion	2.825697
Sum squared resid	22.02262	Schwarz criterion	2.922473
Log likelihood	-34.73406	F-statistic	14.71559
Durbin-Watson stat	0.815950	Prob(F-statistic)	0.000796

ADF Test Statistic	-3.459733	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ECT_SENEGAL)
Method: Least Squares
Date: 01/13/08 Time: 11:20
Sample(adjusted): 1982 2005
Included observations: 24 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT_SENEGAL(-1)	-0.851278	0.246053	-3.459733	0.0025
D(ECT_SENEGAL(-1))	0.279958	0.213812	1.309370	0.2053
C	0.412450	0.419990	0.982047	0.3378
@TREND(1980)	-0.034568	0.027970	-1.235912	0.2308

R-squared	0.387786	Mean dependent var	-0.067853
Adjusted R-squared	0.295954	S.D. dependent var	1.042100
S.E. of regression	0.874399	Akaike info criterion	2.720453
Sum squared resid	15.29149	Schwarz criterion	2.916795
Log likelihood	-28.64543	F-statistic	4.222769
Durbin-Watson stat	2.025694	Prob(F-statistic)	0.018197

Appendix 2 (contd.). Preliminary Cointegration Test Results

Dependent Variable: **log**(DEF_GAMBIA)
Method: Least Squares
Date: 01/13/08 Time: 11:30
Sample(adjusted): 1981 2007
Included observations: 27 after adjusting endpoints
Convergence achieved after 4 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(OIL_PRICE)	1.274483	0.388912	3.277045	0.0031
AR(1)	0.450386	0.130525	3.450570	0.0020

R-squared	0.363901	Mean dependent var	4.744444
Adjusted R-squared	0.338457	S.D. dependent var	4.300835
S.E. of regression	3.498097	Akaike info criterion	5.413502
Sum squared resid	305.9170	Schwarz criterion	5.509490
Log likelihood	-71.08228	F-statistic	14.30206
Durbin-Watson stat	1.889801	Prob(F-statistic)	0.000866
Inverted AR Roots	.45		

ADF Test Statistic	-2.948984	1% Critical Value*	-4.3738
		5% Critical Value	-3.6027
		10% Critical Value	-3.2367

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ECT_GAMBIA)
Method: Least Squares
Date: 01/13/08 Time: 11:33
Sample(adjusted): 1982 2006
Included observations: 25 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT_GAMBIA(-1)	-0.931373	0.315828	-2.948984	0.0077
D(ECT_GAMBIA(-1))	-0.034849	0.224972	-0.154906	0.8784
C	0.346054	1.663412	0.208039	0.8372
@TREND(1980)	-0.021646	0.106162	-0.203896	0.8404

R-squared	0.476061	Mean dependent var	-0.110221
Adjusted R-squared	0.401213	S.D. dependent var	4.903114
S.E. of regression	3.794095	Akaike info criterion	5.650416
Sum squared resid	302.2983	Schwarz criterion	5.845436
Log likelihood	-66.63019	F-statistic	6.360337
Durbin-Watson stat	1.913639	Prob(F-statistic)	0.003082

ADF Test Statistic	-3.061724	1% Critical Value*	-3.7204
		5% Critical Value	-2.9850
		10% Critical Value	-2.6318

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ECT_GAMBIA)
Method: Least Squares
Date: 01/13/08 Time: 11:40
Sample(adjusted): 1982 2006
Included observations: 25 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT_GAMBIA(-1)	-0.939009	0.306693	-3.061724	0.0057
D(ECT_GAMBIA(-1))	-0.029095	0.218279	-0.133292	0.8952
C	0.044465	0.744221	0.059746	0.9529

R-squared	0.475024	Mean dependent var	-0.110221
Adjusted R-squared	0.427299	S.D. dependent var	4.903114
S.E. of regression	3.710530	Akaike info criterion	5.572393
Sum squared resid	302.8968	Schwarz criterion	5.718658
Log likelihood	-66.65492	F-statistic	9.953335
Durbin-Watson stat	1.906648	Prob(F-statistic)	0.000835

Appendix 2 (contd.). Preliminary Cointegration Test Results

Dependent Variable: **log**(DEF_GHANA)
Method: Least Squares
Date: 01/13/08 Time: 11:52
Sample(adjusted): 1981 2007
Included observations: 27 after adjusting endpoints
Convergence achieved after 5 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.879124	2.148974	2.270443	0.0324
Log(OIL_PRICE)	0.054376	0.051280	1.060384	0.2995
AR(1)	0.645019	0.150038	4.299028	0.0002

R-squared	0.500603	Mean dependent var	6.688889
Adjusted R-squared	0.458986	S.D. dependent var	3.589122
S.E. of regression	2.639929	Akaike info criterion	4.883820
Sum squared resid	167.2614	Schwarz criterion	5.027802
Log likelihood	-62.93157	F-statistic	12.02897
Durbin-Watson stat	1.946420	Prob(F-statistic)	0.000241
Inverted AR Roots	.65		

ADF Test Statistic	-3.619736	1% Critical Value*	-4.3738
		5% Critical Value	-3.6027
		10% Critical Value	-3.2367

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ECT_GHANA)
Method: Least Squares
Date: 01/13/08 Time: 11:50
Sample(adjusted): 1982 2006
Included observations: 25 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT_GHANA(-1)	-1.225938	0.338682	-3.619736	0.0016
D(ECT_GHANA(-1))	0.042899	0.234418	0.183004	0.8566
C	-1.608824	1.282361	-1.254580	0.2234
@TREND(1980)	0.129995	0.084240	1.543148	0.1377

R-squared	0.575750	Mean dependent var	0.049156
Adjusted R-squared	0.515143	S.D. dependent var	3.664223
S.E. of regression	2.551459	Akaike info criterion	4.856854
Sum squared resid	136.7088	Schwarz criterion	5.051874
Log likelihood	-56.71068	F-statistic	9.499725
Durbin-Watson stat	1.968378	Prob(F-statistic)	0.000364

Appendix 2 (contd.). Preliminary Cointegration Test Results

Dependent Variable: LOG(DEF_NIGERIA)
Method: Least Squares
Date: 01/13/08 Time: 13:10
Sample(adjusted): 1982 2007
Included observations: 17
Excluded observations: 9 after adjusting endpoints
Convergence achieved after 8 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.190704	2.327345	3.089660	0.0080
LOG(OIL_PRICE(-1))	-1.826874	0.671467	-2.720719	0.0166
AR(1)	0.674115	0.181056	3.723248	0.0023

R-squared	0.528208	Mean dependent var	1.264223
Adjusted R-squared	0.460809	S.D. dependent var	0.935407
S.E. of regression	0.686865	Akaike info criterion	2.245428
Sum squared resid	6.604977	Schwarz criterion	2.392466
Log likelihood	-16.08614	F-statistic	7.837048
Durbin-Watson stat	0.786121	Prob(F-statistic)	0.005203

Inverted AR Roots .67

ADF Test Statistic	-2.906858	1% Critical Value*	-3.9635
		5% Critical Value	-3.0818
		10% Critical Value	-2.6829

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ECT_NIGERIA)
Method: Least Squares
Date: 01/13/08 Time: 13:08
Sample(adjusted): 1982 1996
Included observations: 15 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT_NIGERIA(-1)	-0.779304	0.268091	-2.906858	0.0132
D(ECT_NIGERIA(-1))	0.138283	0.239093	0.578366	0.5737
C	-0.118247	0.136558	-0.865911	0.4035

R-squared	0.422265	Mean dependent var	-0.062093
Adjusted R-squared	0.325976	S.D. dependent var	0.636472
S.E. of regression	0.522537	Akaike info criterion	1.716614
Sum squared resid	3.276537	Schwarz criterion	1.858224
Log likelihood	-9.874604	F-statistic	4.385386
Durbin-Watson stat	2.111511	Prob(F-statistic)	0.037185

Appendix 3: Vector Autoregression Estimates

Date: 01/11/08 Time: 12:46
Sample(adjusted): 1982 2007
Included observations: 26 after adjusting endpoints
Standard errors & t-statistics in parentheses

	OIL_PRICE	INF_BENIN	DEF_BENIN
OIL_PRICE(-2)	-0.183340	-0.231973	0.232344
	(0.31706)	(0.41332)	(0.11033)
	(-0.57824)	(-0.56124)	(2.10594)
INF_BENIN(-1)	-0.074722	0.149002	-0.036425
	(0.17192)	(0.22412)	(0.05982)
	(-0.43462)	(0.66484)	(-0.60886)
INF_BENIN(-2)	0.075472	-0.076736	-0.023017
	(0.17435)	(0.22728)	(0.06067)
	(0.43288)	(-0.33763)	(-0.37939)
DEF_BENIN(-1)	-0.871529	-0.614628	0.589551
	(0.59116)	(0.77063)	(0.20570)
	(-1.47427)	(-0.79756)	(2.86601)
DEF_BENIN(-2)	-0.049062	0.765541	-0.299224
	(0.63684)	(0.83018)	(0.22160)
	(-0.07704)	(0.92214)	(-1.35029)
C	-2.428395	7.559995	-0.114366
	(4.17709)	(5.44521)	(1.45349)
	(-0.58136)	(1.38838)	(-0.07868)
R-squared	0.898136	0.090069	0.494896
Adj. R-squared	0.865969	-0.197277	0.335389
Sum sq. resides	788.7502	1340.360	95.50276
S.E. equation	6.443071	8.399122	2.241977
F-statistic	27.92064	0.313453	3.102667
Log likelihood	-81.25299	-88.14616	-53.80616
Akaike AIC	6.788692	7.318935	4.677397
Schwarz SC	7.127410	7.657654	5.016115
Mean dependent	27.85654	4.922692	3.330769
S.D. dependent	17.59909	7.676028	2.750094
Determinant Residual Covariance		5590.513	
Log Likelihood		-222.8519	
Akaike Information Criteria		18.75784	
Schwarz Criteria		19.77400	

Appendix 3 (contd.): Vector Autoregression Estimates

Date: 01/11/08 Time: 12:51
Sample(adjusted): 1981 2007
Included observations: 27 after adjusting endpoints
Standard errors & t-statistics in parentheses

	OIL_PRICE	INF_BURKINA	DEF_BURKINA
OIL_PRICE(-1)	1.194429	-0.077526	0.149836
	(0.13035)	(0.11646)	(0.05134)
	(9.16298)	(-0.66569)	(2.91878)
INF_BURKINA(-1)	-0.207973	0.526665	-0.061536
	(0.19027)	(0.16999)	(0.07493)
	(-1.09307)	(3.09829)	(-0.82125)
DEF_BURKINA(-1)	-0.268203	0.640089	0.275947
	(0.59249)	(0.52934)	(0.23333)
	(-0.45267)	(1.20923)	(1.18265)
R-squared	0.854406	0.263229	0.445449
Adj. R-squared	0.842273	0.201831	0.399237
Sum sq. resides	1136.504	907.1390	176.2600
S.E. equation	6.881450	6.147964	2.710012
F-statistic	70.42076	4.287288	9.639145
Log likelihood	-88.79966	-85.75653	-63.63900
Akaike AIC	6.799975	6.574558	4.936222
Schwarz SC	6.943957	6.718540	5.080204
Mean dependent	28.15556	3.751840	5.137037
S.D. dependent	17.32713	6.881514	3.496388
Determinant Residual Covariance		6603.686	
Log Likelihood		-233.6717	
Akaike Information Criteria		17.97568	
Schwarz Criteria		18.40763	

Appendix 3 (contd.): Vector Autoregression Estimates

Date: 01/11/08 Time: 13:03
Sample(adjusted): 1982 2007
Included observations: 20
Excluded observations: 6 after adjusting endpoints
Standard errors & t-statistics in parentheses

	LOG(OIL_PRICE)	LOG(DEF_CIVOIRE)	INF_IVOIRE
LOG(OIL_PRICE(-1))	1.000510	1.038950	-1.386168
	(0.25326)	(1.28073)	(6.93971)
	(3.95053)	(0.81122)	(-0.19974)
LOG(OIL_PRICE(-2))	0.089325	-0.938307	1.383819
	(0.27557)	(1.39355)	(7.55103)
	(0.32415)	(-0.67332)	(0.18326)
LOG(DEF_CIVOIRE(-1))	-0.076739	0.526232	-0.280875
	(0.07960)	(0.40253)	(2.18115)
	(-0.96406)	(1.30730)	(-0.12877)
LOG(DEF_CIVOIRE(-2))	-0.055408	-0.034720	2.288869
	(0.07520)	(0.38031)	(2.06072)
	(-0.73677)	(-0.09129)	(1.11071)
INF_IVOIRE(-1)	-0.008155	0.091199	0.219617
	(0.01458)	(0.07372)	(0.39944)
	(-0.55942)	(1.23716)	(0.54982)
INF_IVOIRE(-2)	0.000380	-0.059062	0.151989
	(0.01418)	(0.07169)	(0.38846)
	(0.02682)	(-0.82384)	(0.39126)
R-squared	0.863127	0.207911	0.218717
Adj. R-squared	0.814244	-0.074978	-0.060313
Sum sq. resides	0.655171	16.75467	491.9298
S.E. equation	0.216328	1.093966	5.927718
F-statistic	17.65697	0.734957	0.783848
Log likelihood	5.807148	-26.60822	-60.40481
Akaike AIC	0.019285	3.260822	6.640481
Schwarz SC	0.318005	3.559542	6.939200
Mean dependent	3.275013	1.208757	4.971429
S.D. dependent	0.501929	1.055126	5.756659
Determinant Residual Covariance		0.231947	
Log Likelihood		-70.52387	
Akaike Information Criteria		8.852387	
Schwarz Criteria		9.748546	

Appendix 3 (contd.): Vector Autoregression Estimates

Date: 01/11/08 Time: 13:13
Sample(adjusted): 1981 2007
Included observations: 27 after adjusting endpoints
Standard errors & t-statistics in parentheses

	OIL_PRICE	DEF_SENEGAL	INF_SENEGAL
OIL_PRICE(-1)	1.371358	0.060790	-0.251768
	(0.14680)	(0.03099)	(0.15225)
	(9.34166)	(1.96180)	(-1.65363)
DEF_SENEGAL(-1)	-0.475980	0.677859	1.923033
	(0.67320)	(0.14210)	(0.69820)
	(-0.70704)	(4.77025)	(2.75427)
INF_SENEGAL(-1)	-0.178267	-0.067716	0.136716
	(0.17517)	(0.03698)	(0.18168)
	(-1.01766)	(-1.83134)	(0.75252)
C	-5.528069	-0.320212	4.312954
	(3.12825)	(0.66032)	(3.24442)
	(-1.76714)	(-0.48493)	(1.32935)
R-squared	0.878776	0.788039	0.321768
Adj. R-squared	0.862964	0.760392	0.233303
Sum sq. resides	946.2719	42.16209	1017.857
S.E. equation	6.414223	1.353933	6.652415
F-statistic	55.57701	28.50358	3.637238
Log likelihood	-86.32670	-44.32808	-87.31117
Akaike AIC	6.690866	3.579858	6.763791
Schwarz SC	6.882842	3.771834	6.955766
Mean dependent	28.15556	3.081633	4.301759
S.D. dependent	17.32713	2.765966	7.597445
Determinant Residual Covariance		1931.295	
Log Likelihood		-217.0743	
Akaike Information Criteria		16.96847	
Schwarz Criteria		17.54439	

Appendix 3 (contd.): Vector Autoregression Estimates

Date: 01/11/08 Time: 12:58
Sample(adjusted): 1981 2007
Included observations: 20
Excluded observations: 7 after adjusting endpoints
Standard errors & t-statistics in parentheses

	LOG(OIL_PRICE)	LOG(DEF_GAMBIA)	INF_GAMBIA
LOG(OIL_PRICE(-1))	1.140201	0.225395	1.566356
	(0.05854)	(0.15778)	(2.18962)
	(19.4774)	(1.42851)	(0.71536)
LOG(DEF_GAMBIA(-1))	-0.202526	0.447361	-0.733817
	(0.09646)	(0.25999)	(3.60798)
	(-2.09959)	(1.72069)	(-0.20339)
INF_GAMBIA(-1)	-0.005164	0.012133	0.670755
	(0.00470)	(0.01266)	(0.17564)
	(-1.09970)	(0.95863)	(3.81895)
R-squared	0.777711	0.022457	0.426653
Adj. R-squared	0.751559	-0.092548	0.359200
Sum sq. resides	1.076633	7.821418	1506.273
S.E. equation	0.251657	0.678295	9.412985
F-statistic	29.73852	0.195272	6.325220
Log likelihood	0.840163	-18.99011	-71.59538
Akaike AIC	0.215984	2.199011	7.459538
Schwarz SC	0.365344	2.348370	7.608898
Mean dependent	3.315037	1.714854	11.20347
S.D. dependent	0.504892	0.648930	11.75889
Determinant Residual Covariance		1.302505	
Log Likelihood		-87.77921	
Akaike Information Criteria		9.677921	
Schwarz Criteria		10.12600	

Appendix 3 (contd.): Vector Autoregression Estimates

Date: 01/11/08 Time: 13:16
Sample(adjusted): 1982 2007
Included observations: 26 after adjusting endpoints
Standard errors & t-statistics in parentheses

	OIL_PRICE	DEF_GHANA	INF_GHANA
OIL_PRICE(-1)	1.369419	0.156337	-0.527533
	(0.21114)	(0.08861)	(0.81462)
	(6.48585)	(1.76433)	(-0.64758)
DEF_GHANA(-1)	-0.350879	0.496400	-2.084449
	(0.51634)	(0.21669)	(1.99215)
	(-0.67955)	(2.29080)	(-1.04633)
DEF_GHANA(-2)	0.599844	0.132665	2.144187
	(0.49557)	(0.20798)	(1.91201)
	(1.21042)	(0.63788)	(1.12143)
INF_GHANA(-1)	-0.046462	-0.017465	-0.086215
	(0.04820)	(0.02023)	(0.18595)
	(-0.96404)	(-0.86347)	(-0.46365)
INF_GHANA(-2)	-0.088916	-0.018148	0.164059
	(0.04502)	(0.01890)	(0.17371)
	(-1.97487)	(-0.96046)	(0.94443)
C	-2.762270	4.518031	25.95281
	(4.21446)	(1.76870)	(16.2603)
	(-0.65543)	(2.55444)	(1.59608)
R-squared	0.909555	0.628344	0.188994
Adj. R-squared	0.880993	0.510979	-0.067113
Sum sq. resides	700.3366	123.3474	10425.16
S.E. equation	6.071229	2.547934	23.42419
F-statistic	31.84524	5.353761	0.737950
Log likelihood	-79.70744	-57.13221	-114.8129
Akaike AIC	6.669803	4.933247	9.370219
Schwarz SC	7.008521	5.271965	9.708938
Mean dependent	27.85654	6.623077	28.45190
S.D. dependent	17.59909	3.643549	22.67563
Determinant Residual Covariance		48401.71	
Log Likelihood		-250.9120	
Akaike Information Criteria		20.91631	
Schwarz Criteria		21.93246	

Appendix 3 (contd.): Vector Autoregression Estimates

Date: 01/11/08 Time: 13:31
Sample(adjusted): 1983 2007
Included observations: 13
Excluded observations: 12 after adjusting endpoints
Standard errors & t-statistics in parentheses

	LOG(OIL_PRICE)	LOG(DEF_NIGERIA)	INF_NIGERIA
LOG(OIL_PRICE(-1))	1.117425	-2.100913	-17.79223
	(0.33794)	(1.02545)	(18.1962)
	(3.30662)	(-2.04878)	(-0.97780)
LOG(DEF_NIGERIA(-1))	-0.015555	0.805963	4.412855
	(0.08097)	(0.24570)	(4.35992)
	(-0.19211)	(3.28023)	(1.01214)
LOG(DEF_NIGERIA(-2))	-0.258580	-0.228594	0.466189
	(0.07397)	(0.22447)	(3.98306)
	(-3.49561)	(-1.01839)	(0.11704)
INF_NIGERIA(-1)	0.011954	0.002668	-0.129507
	(0.00419)	(0.01271)	(0.22552)
	(2.85420)	(0.20989)	(-0.57425)
INF_NIGERIA(-2)	-0.007430	-0.026573	-0.518601
	(0.00556)	(0.01686)	(0.29912)
	(-1.33748)	(-1.57635)	(-1.73373)
C	0.487616	1.877183	27.50376
	(0.69019)	(2.09434)	(37.1633)
	(0.70650)	(0.89631)	(0.74008)
R-squared	0.941180	0.858338	0.576470
Adj. R-squared	0.882359	0.716676	0.152939
Sum sq. resides	0.166894	1.536729	483.8743
S.E. equation	0.166780	0.506085	8.980296
F-statistic	16.00091	6.059063	1.361106
Log likelihood	9.863548	-4.566797	-41.95589
Akaike AIC	-0.440546	1.779507	7.531676
Schwarz SC	-0.136342	2.083711	7.835879
Mean dependent	3.489490	1.054002	14.21204
S.D. dependent	0.486257	0.950783	9.757384
Determinant Residual Covariance		0.039627	
Log Likelihood		-34.35500	
Akaike Information Criteria		8.516154	
Schwarz Criteria		9.428765	

Appendix 4: Quarterly Data Required for Further Analyses

Period/Variable	Oil_Price	Inflation	Real Ex. Rate	M_2	TTLREV	TTLEXP	TTL_M	TTL_X	OIL_M	OIL_X
1975:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1975:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1975:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1975:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1976:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1976:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1976:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1976:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1977:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1977:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1977:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1977:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1978:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1978:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1978:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1978:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1979:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1979:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1979:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1979:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1980:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1980:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1980:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1980:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1981:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1981:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1981:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1981:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1982:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1982:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1982:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1982:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1983:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1983:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1983:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1983:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1984:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1984:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1984:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1984:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1985:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1985:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1985:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1985:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1986:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1986:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1986:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1986:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1987:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1987:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1987:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1987:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1988:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1988:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1988:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1988:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1989:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1989:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1989:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1989:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1990:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1990:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1990:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1990:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1991:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1991:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1991:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1991:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1992:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1992:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1992:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1992:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1993:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1993:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1993:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1993:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1994:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1994:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1994:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1994:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1995:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1995:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1995:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1995:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1996:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1996:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1996:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1996:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1997:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1997:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1997:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1997:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1998:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1998:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1998:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1998:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1999:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1999:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1999:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1999:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2000:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2000:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2000:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2000:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2001:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2001:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2001:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2001:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2002:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2002:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2002:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2002:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2003:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2003:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2003:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2003:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2004:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2004:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2004:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2004:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2005:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2005:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2005:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2005:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2006:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2006:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2006:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2006:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2007:1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2007:2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2007:3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2007:4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Appendix 5: Annual Data Required for Further Analyses

Period/Variable	Oil_Price	Inflation	Real Ex. Rate	M_2	TTLREV.	TTLEXP.	TTL_Ms	TTL_Xs	OIL_Ms	OIL_Xs
1975	0.000000	0.000000	0.000000	0.0002000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1976	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1977	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1978	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1979	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1980	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1981	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1982	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1983	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1984	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1985	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1986	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1987	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1988	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1989	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1990	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1991	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1992	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1993	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1994	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1995	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1996	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1997	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1998	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1999	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2001	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2002	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2003	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2004	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2005	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2006	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

LIST OF ACRONYMS

M2 = Money supply broadly defined
TTL_REV = Total Revenue
TTL_EXP = Total Expenditure
TTL_Ms = Total Imports
TTL_Xs = Total Exports
OIL_Ms = Oil Imports
OIL_Xs = Oil Exports
OIL REV = Oil Revenue
OIL REV/TTL_REV= % Oil Revenue/Total Revenue