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Macroeconomic Variables and the Dynamic Effect of Public Expenditure: Long-term Trend Analysis in Nigeria

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The paper investigates the long-run relationship between government expenditures and a set of macroeconomic variables (GDP, consumer price index and unemployment) using annual data collected from CBN statistical bulletin for a period of 19891 to 2011. It particularly adopts Johansen multivariate co integration for its estimation procedure and discovers that there is long-run relationship between government expenditure and the specified macroeconomic variables. It also discovers that an increase in capital expenditure improves economic bliss, while recurrent expenditure is detrimental to growth. Finally, our findings show that most of the variables do not Granger cause each other, but however, recurrent expenditure Granger causes prices, in the same veil capital expenditure does granger cause unemployment.

Keywords: *Perceived Public Expenditure; GDP; CPI; Unemployment; Co integration; Causality.*

JEL Classification Code*: E2; C2; E3.*

Introduction

The patterns of government spending in Nigeria have raised concerns to different classes of people in the country; even outsiders hold their mouths in agape when they see the dilapidating nature of the country's infrastructure amidst ever increasing budget of the public sector. Obviously, the frequent changes in the trend of government expenditure do not reflect proportional positive changes in some key macroeconomic variables such as: GDP, unemployment/employment and price structure. This is somewhat, ironical because functional expenditure of public household is expected to trigger economic success (which is) manifested in increased employment rate, low prices and low output gap (see Singh & Sahni 1984, Ram 1986, and Holmes & Hutton 1990). Also, in a more recent time, Abdullah (2000) examines the relationship between government expenditure and economic growth variables in Saudi Arabia and discovers that the size of government is an important determinant of the performance of the economy. Therefore, he concludes that government should increase their spending on infrastructure, social and economic activities as well as encouraging and supporting the private sector to accelerate economic growth. But in Nigeria, most public expenditures are tilted toward consumption and ostentatious items, and that is why the economic bliss of our expectation may not come.

On the contrary, therefore, financing consumption demands through debt or raising higher tax and loan to finance government spending, could have significantly negative effect on macroeconomic variables. Higher tax on labour, decline incentives for working and cut manufacturing activities. Similarly, loan slow down private investment. It also boosts up the incoming taxes. As a result, even if the efficiency of government spending does not reduce, incentive effect of debt and taxes will decline and transfer resources from the private to public leading to negative impact on economic growth (Gwartney, Lawson & Holcombe 1998). In an equal veil, Landau (1983, 1986) Barth, Keleher and Russek (1990) find that government expansion tends to exert a negative impact on economic growth for many developed and less-developed countries. However, Ram (1986) examines 63 developed and developing countries but detects to consistent causal pattern between government expenditure and economic growth.

In the light of the literature, it is seen that government expenditure does not constitute a strain on macroeconomic stability but the sources trends and patterns of the expenditure. The Nigerian government frequently sources credit facility to finance its recurrent or consumption expenditure and thereby increasing aggregate money in circulation without simultaneously stimulating the supply of output. This has consequently resulted in arbitrary upward increase in prices low employment rate and low output gap. Thus, this study is a fresh attempt to investigate the nature of the relationship between government expenditure and selected macroeconomic variables. Specifically, it aims at proffering answers to the question why does government spending in Nigeria is passive and sometime detrimental to economic performance? To achieve these goals, the study is structured as follows: section (1) sets out the introduction, section (2) gives a brief review of empirical studies on the relationship between government expenditure and growth indicators; section (3) explains the method and data employed in the study. This is followed by section (4), which presents the empirical results. Lastly, section (5) stresses on conclusion and some recommendations.

Literature Review

This section examines relevant related literature on the relationship between government expenditure and economic growth variables. In the view of the classist's model, government fiscal policy does not have any effect on the growth of the national output. Contrary to this view, the Keynesian model posits that increase in government expenditure will lead to higher economic growth. The implication of this is that government fiscal policy will help improve the failure that might arise from the inefficiencies of the market. Easterly and Revelo (1993), argue persuasively that government activities influence the direction of economic growth. This same notion was however shared by Baro and Sala (1992), and Baro(1990). In the same vein, Cooray (2009) employs a cross sectional study of 71 countries with respect to government expenditure and quality of governance using an econometric model.

The results reveal that both size and quality of government are associated with economic growth. Folster and Henrekson (2001), in their study on growth effects of government expenditure and taxation in transition economies, employing various econometric approaches confirmed that more meaningful results are generated on the relationship between public expenditure and growth variables Komain and Brahmasrene (2007) examine the association between government expenditures and economic growth in Thailand, by employing the Granger causality test. The results reveal that government expenditures and economic growth are not co-integrated in the long-run. Additionally, the results show a unidirectional relationship, as causality runs from government expenditures to growth. Lastly, the results illustrated a significant positive effect of government spending on economic growth. Olugbenga and Owoye (2007) examine the relationships between government expenditure and economic growth for a group of 30 OECD countries during the period 1970-2005.Their results show the existence of a long-run relationship between government expenditure and economic growth. Also, the authors observed a unidirectional causality from government expenditure to growth for 16 out of the countries, thus supporting the Keynesian hypothesis.

However, causality runs from economic growth to government expenditure in 10 out of the countries, confirming the Wagner's law. Finally, the authors found the existence of feedback relationship between government expenditure and economic growth for a group of four countries. Folster and Henrekson (2001) study the relationship between government expenditure and economic growth for a sample of economically transition countries for 1970-95 periods, using different econometric techniques. The authors submitted that more meaningful (robust) results are generated, as econometric problems are addressed In India, Ranjan and Sharma (2008) examined the effect of government development expenditure on economic growth during the period 1950-2007. The authors discover a significant positive impact of government expenditure on economic growth. They also report the existence of co integration among the variables. Al-Yousif (2000) indicated that government spending has a positive relationship with economic growth in Saudi Arabia.

The study of Ram (19860) examined the relationship between government expenditure and economic growth for a group of 115 countries during the period 1950-1980. The author uses both cross section and time series data in his analysis, and confirmes a positive effect of government expenditure on economic growth. Liu, Hsu and Younis (2008) examine the causal relationship between GDP and public expenditure for the US data during the period 1947-2002. The causality results revealed that total government expenditure causes growth of GDP. On the other hand, growth of GDP does not cause expansion of government expenditure. Moreover, the estimation results indicated that public expenditure raises the US economic growth. The authors conclude that, judging from the causality test Keynesian hypothesis exerts more influence than the Wagner's law in US. Loizides and Vamvoukas (2005) employ the trivariate causality test to examine the relationship between government expenditure and economic growth, using data set on Greece, United Kingdom and Ireland. The authors discover that government size granger causes economic growth in all the countries they investigate. The findings are true for Ireland and the United Kingdom both in the long run and short run. The results also indicate that economic growth granger causes public expenditure for Greece and United Kingdom, when inflation is imported into the system.

Gregoriou and Ghosh (2007) use the heterogeneous panel to examine the impact of government expenditure on economic growth. The authors use the GMM technique, and discover that countries with large government expenditure tend to experience higher growth, but the effect varies from one country to another. In Saudi Arabia, Abdullah (2000) analyses the relationship between government expenditure and economic growth. The author discovers that the size of government is very important in the performance of the economy. He then advises that government should increase its spending on infrastructure, social and economic activities. In addition, government should encourage and support the private sector to accelerate economic growth. Donald and Shuanglin (1993) examine the differential effects of various forms of expenditures on economic growth for a sample of 58 countries. Their findings show that government expenditures on education and defense have positive influence on economic growth, while expenditure on welfare has insignificant negative impact on economic growth. Niloy, Emranul and Osborn (2003) use a disaggregated approach to investigate the impact of public expenditure on economic growth for 30 developing countries in 1970s and 1980s. The authors confirmed that government capital expenditure in GDP has a significant positive association with economic growth, but the share of government current expenditure in GDP is found to be insignificant in explaining economic growth. At the sectoral level, government investment and expenditure on education are the only variables that have significant effect on economic growth, especially when budget constraint and omitted variables are included. Erkin (1988) examine the relationship between government expenditure and economic growth, by proposing a new framework for New Zealand. The empirical results reveal that higher government expenditure does not hurt consumption, but instead raises private investment that in turn accelerates economic growth. Mitchell (2005) argues that the American government expenditure has grown too much in the last couple of years and has contributed to the negative growth. The author suggests that government should cut its spending, particularly on projects/programmes that generate least benefits or impose highest costs. In Sweden, Peter (2003) examined the effects of government expenditure on economic growth during 1960-2001 periods. The author emphasizes that government spends too much and it might slowdown economic growth. Devarajan, Swaroop and Zou (1996) study the relationship between the composition of government expenditure and economic growth for a group of developing countries. The results illustrate that capital expenditure has a significant negative association with growth of real GDP per capita. However, the results showed that recurrent expenditure is positively related to real GDP per capita.

In Nigeria, Oyinlola (1993) posits that there is a positive impact of government expenditure on defence and economic growth. Also, study by Ogiogio (1995) shows a long term effect of government expenditure on economic growth. He also discovers that recurrent expenditure has more influence than capital expenditure. Fajingbesi and Odusola (1999) examine the relationship between public expenditure and growth. Their results reveal that real government capital expenditure has more significant positive influence on growth than real government recurrent expenditure. Also, Akpan (2005) in his disaggregated approach to determine the effect of government expenditure on Economic growth concluded that there is no reasonable relationship between the components of government expenditure and growth. Recent study by Abu & Abdullahi (2010) showed that total capital expenditure, total recurrent expenditure and government expenditure on education have negative effects on economic growth. Also, on the contrary, expenditure on transport & communication and health result in an increase in economic growth in Nigeria.

Methodology and Data

Model Estimation

This study follows the theoretical concept suggested by Devarajan, Swareep and Zou (1996) to investigate the relationship between government expenditure and economic growth. We transform their specification with little modification as follows:

$$Yr_t = \lambda_o + \lambda_1 rRe_t + \lambda_2 rCe_t + \lambda_3 Cp_{it} + \lambda_4 UEr_t + U_t$$

Where Yrt is the growth rate in real GDP at period t

rRet is the rate of changes in recurrent expenditure at period t .

rCet is the rate of changes in capital expenditure at period t

Cpit is the consumer price index in period t

UErt is the employment rate at period t

λo is the intercept term

λ1………………..λ4 are the regression parameters

Ut is the error term

On the a priori, the parameters are concordant with the hypothesis that $\lambda o > 0$, $\lambda 1 \leq 0$, $\lambda 2 \geq 0$, $\lambda 3 \geq 0$, $\lambda 4 \leq 0$

For purpose of avoiding spurious or nonsensicant regression, we conducted a unit root test, we then employ Johansen multivariate cointetegration technique for long-run relationships among variables and error correction Mechanism to determine the speed of adjustment in the event of short-run distortion.

Unit Root Analysis

Testing for the presence of a unit root is based on the assumption that the error term of the two consecutive times period of models are uncorrelated. If they are then, Dickey-Fuller Test can be applied as:

$\Delta yt = \alpha 2 \delta yt\text{-}1 + \mu$ .... without drift and trend.

$\Delta yt = \alpha \neg 1 + \alpha 2 \delta yt\text{-}1 + \mu$ .... with intercept

$\Delta yt = \alpha 1 + \alpha 2t + \alpha 3 \delta yt\text{-}1 + \mu$ .... with drift and trend

Any of these models could be used to test for stationary. However, when the under laying assumption that the error terms are uncorrelated is relaxed, then the Augmented Dickey-Fuller Test can be used as:

$\Delta yt = \alpha 2 \Delta t\text{-}1 + \delta yt\text{-}1 + \mu$.................. no drift and trend

$\Delta yt = \alpha 1 + \alpha 2 \Delta yt\text{-}1 + \delta yt\text{-}1 + \mu$ .... with drift

$\Delta yt = \alpha 1 + \alpha 2t + \alpha 3 \Delta yt\text{-}1 + \delta yt\text{-}1\ \mu$ .... with trend and drift

Johansen Multivariate Co integration

This technique is basically used to test for long-run association in a system. Usually two statistics are involved-Trace Statistics and Max Eigen statistics: when the sample size is smaller (i.e. $n < 40$), Max Eigen value provides the more sophisticated results, but if $n > 40$, then the Trace statistic value gives the more sophisticated results.

Trace Statistics

Null hypothesis Alternative Hypothesis

$H_0: r = 0$ $H_1: r \geq 1$

$H_0: r = 1$ $H_1: r \geq 2$

¦

¦

$H_0: r \leq n$ $H_1: r = n$

Trace statistics see the null hypothesis among remaining all hypotheses.

$H_0: r = 0$ $H_1: r = 1$

$H_0: r \leq 1$ $H_1: r = 2$

¦

¦

$H_0: \leq n$ $H_1: r = n$

Max Eigen Statistics can only check Co integration one by one.

Presentation and Discussion of Empirical Results

In this study, we first of all present the results obtained from the estimated equation in various tables, and then discussion follows immediately in a logical manner.

Presentation of Results

Table 4.1: Unit Root Test based on Augmented Dickey-Fuller (ADF) Analysis

Variable	Critical value at 1%	Level	First Difference
rCe	-4.32	-2.80	(-9.30)*
rRe	-2.65	-1.64	(-12.48)*
Yr	-2.64	-2.05	(-7.11)*
Cpi	-2.64	-0.75	(-4.84)*
Ur	-2.64	1.08	(-5.02)*

Note that Schwarz Information Criteria is employed for the selection of maximum lag length, and the test was conducted under the assumption of no intercept and trend. * implies 1% significance level.

Source: computed from E-View program

To find out co integration between the specified Variables, The Johansen Multivariate Cointegration (i.e. the trace and maximum Eigen values) are employed in the model. The results are shown as:

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Table 4.2: Co integration Test based on Johansen Multivariate Statistics

Trace Test			
Null Hypothesis	**Alternate Hypothesis**	**Trace Stat.**	**Critical value @ 0.05**
r = 0	r ≥ 1	(79.36)*	69.82
r ≤1	r ≥ 2	44.49	47.86
r ≤ 2	r ≥ 3	19.07	29.80
r ≤ 3	r ≥ 4	5.66	15.49
r ≤ 4	r = 5	0.07	3.84
Max Eigen Test			
Null Hypothesis	**Alternate Hypothesis**	**Max Eigen Stat**	**Critical value @ 0.05**
r = 0	r = 1	(34.86)*	33.88
r ≤ 1	r = 2	25.43	27.58
r ≤ 2	r = 3	13.41	21.13
r ≤ 3	r = 4	5.59	14.26
r ≤ 4	r = 5	0.07	3.84

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Notes: Test was conducted under the assumption of intercept but no trend in CE, * denotes 5% significance level. Variables included in the vectors are: yr, rRr, rCe, Cpi & Ur.

Source: computed from E-View program

Table 4.3: Error Correction Model Estimates (Dependent Variable Yr)

Variable	**Coefficient**	**Adjustment Coefficient**
Yr(-1)	1.00	0.03
rRe(-1)	-58.73(9.76)[-6.02]*	0.01
rCe(-1)	87.27(14.02)[6.22]*	-0.01
Cpi(-1)	1.13(22.09)[0.05]	-0.002
Ur(-1)	-0.03(1.07)[-0.03]	-0.01

Note: * mean significance at 5%

Source: computed from E-View program

Table 4.4: Granger Causality Test Result

No	Null Hypothesis:	Obs	F-Statistic	Prob.
1	RE does not Granger Cause GR	29	1.38849	0.2688
2	GR does not Granger Cause RE		0.83423	0.4464
3	CE does not Granger Cause GR	29	0.00561	0.9944
4	GR does not Granger Cause CE		0.77453	0.4721
5	CP does not Granger Cause GR	29	0.73808	0.4886
6	GR does not Granger Cause CP		1.05558	0.3636
7	UR does not Granger Cause GR	29	2.16126	0.1371
8	GR does not Granger Cause UR		0.13029	0.8785

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9 10	CE does not Granger Cause RE RE does not Granger Cause CE	29	0.95045 0.53439	0.4006 0.5928
11 12	CP does not Granger Cause RE RE does not Granger Cause CP	29	0.64185 (4.03096)*	0.5351 0.0310
13 14	UR does not Granger Cause RE RE does not Granger Cause UR	29	0.28633 0.58613	0.7535 0.5642
15 16	CP does not Granger Cause CE CE does not Granger Cause CP	29	1.68513 2.93962	0.2066 0.0721
17 18	UR does not Granger Cause CE CE does not Granger Cause UR	29	(4.32448)* 2.70798	0.0249 0.0870
19 20	UR does not Granger Cause CP CP does not Granger Cause UR	29	0.29565 0.47827	0.7467 0.6256

Note: * means significance at 5%
Source: computed from E-View program

Discussion of Findings

The results reported in table 4.1 show that all the variables which have been used in this study are not stationary at level data, and therefore we do not reject the null hypothesis that there is a presence of a unit root. However, we discover that at first difference, the variables are integrated of order one I(1) because at this level all the observed values are larger than the critical values at one percent.

Since all the specified variables are I(1), the general notion is proceed to co integration test, which we did and the results was presented in table 4.2 above. The test show an indication that the statistical hypothesis of no co integration is rejected for r =0 for both trace and Eigen tests at 5% level of significance. In this case it implies that there is at least one co integrating vector appearing in the system. It is concluded that the linear combinations of the variable series are found to be stationary in the long-run. This empirically means that economic growth, recurrent expenditure, capital expenditure, consumer price index and unemployment maintain an intricate long-run equilibrium relationship.

Furthermore, we apply the Error Correction Mechanism (ECM) to estimate short-run equilibrium relationship among the specified variables, which shows the adjustment coefficient for each variable separately (see table 4.3 above). The ECM results show that recurrent expenditure and unemployment relate inversely with growth. This means an increase in recurrent expenses, increases aggregate consumption and dampens economic bliss. The same thing is true with unemployment. Conversely, capital expenditure and consumer price index have an increasing relationship with growth.

However, the relationships between consumer price index and growth and that of unemployment and growth are found to be insignificant. The adjustment coefficients show that capital expenditure, consumer price index and unemployment are negative and significant (-0.005, -0.002 and -0.01 respectively), suggest that 0.5%, 0.2% and 1% disequilibria in capital expenditure, consumer price index and unemployment will be corrected immediately or in the next period. The adjustment coefficients of growth and recurrent expenditure are positive and therefore insignificant, meaning that their short-run relationship cannot be significant predicted.

Table 4.4 shows the direction of causality which the variables cause to each other. Thus, the Granger Causality Test show that there is no causality between recurrent expenditure and growth, capital expenditure and growth, consumer price index and growth, unemployment and growth, capital expenditure and recurrent expenditure, unemployment and recurrent expenditure, consumer price index and capital expenditure and unemployment and consumer price index. But however, a unidirectional causality is evident between consumer price index and recurrent expenditure with the direction of flows trickling down from recurrent expenditure. Also, unemployment and capital expenditure have a unidirectional causality and the direction of flow runs from capital expenditures. This means, we can use changes in recurrent expenditure to predict prices while capital expenditure can be used to predict unemployment.

Conclusions

This main objective of this study is to appraise or examine the relationship between government expenditure (as a pie of both recurrent and capital expenditures) and a set of macroeconomic variables- GDP, consumer price index and unemployment in Nigeria. It is found that expenditure in capital goods serves as a catalyst to economic growth, while recurrent expenditure is detrimental. Also, an increase in rate of unemployment reduces aggregate output and consequently retards growth; conversely, favorable changes in consumer price index trigger up sustainable economic bliss. Therefore, based on these findings, the study recommends that Nigerian government should increase the proportion of capital expenditure annually, and then initiate a policy that will shrink its ever increasing recurrent expenditure.

More also, the monoculture nature of the economy should be discouraged by the government through effective diversification of the nation resource base which will in turn create job opportunities for the teaming population. Finally, the policy of price control through adequate subsides should be adopted in Nigeria.

Authors' Contribution

We have built an econometric equation based on the a-priori work of Devarajan, Swareep and Zon (1996). In the spirit of making fresh insights to fill the gap in the literature, we modify their specification in such a unique form to show a relationship among growth, recurrent expenditure, capital expenditure, consumer price index and unemployment. We thus, estimate the relationship using various econometric tools applicable in the literature and discover that Nigeria is more consumption prone, its recurrent expenditure exceeds capital expenditure in most of the years and this has constituted a strain on its economic growth. Based on these, we make vital recommendations along with flexible and equilibrium targeting policy both directed to improve the economy in leaps and bound.

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Appendix

YEAR	Gr	rRe	rCe	Cpi	Ur
1981	-	0.136	-0.023	0.100	7.4
1982	-2.7	-0.137	-0.240	0.182	7.0
1983	-7.1	0.227	-0. 161	0.385	6.0
1984	-1.1	0.300	0.330	0.056	6.2
1985	9.5	0.016	0.560	0.053	6.6
1986	2.5	1.033	-0.253	0.100	5.3
1987	-0.6	0.241	0.309	0.591	7.0
1988	7.4	0.339	0.803	0.514	5.3
1989	7.6	0.393	0.510	0.075	4.5
1990	13.0	2.056	0.178	0.123	3.5
1991	-0.8	0.387	0.403	0.438	3.1
1992	2.3	1.578	0.371	0.576	3.4
1993	1.3	-0.342	0.301	0.572	2.7
1994	0.3	0.419	0.708	0.728	2.0
1995	2.1	-0.025	0.758	0.292	5.6
1996	4.4	0.274	0.266	0.106	5.4
1997	2.8	0.123	1.046	0.078	4.9
1998	2.9	1.525	0.612	0.068	4.5

1999	0.4	0.027	-0.519	0.068	4.3
2000	5.4	0.255	0.832	0.189	13.1
2001	8.4	0.203	-0.267	0.129	13.6
2002	21.3	0.413	-0.248	0.141	12.6
2003	10.2	0.049	0.454	0.150	14.8
2004	10.5	0.185	0.479	0.178	13.4
2005	6.5	0.054	0.063	0.083	11.9
2006	6.0	1.132	0.375	0.053	12.3
2007	6.5	0.332	0.480	0.116	12.7
2008	6.0	0.086	0.026	0.561	14.9
2009	6.6	0.439	-0.233	0.687	19.7
2010	7.1	0.567	0.336	0.768	20.1
2011	8.2	0.578	0.442	0.798	21.2

Unit root test result

Null Hypothesis: CE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.803140	0.2078
Test critical values:	1% level	-4.323979	
	5% level	-3.580623	
	10% level	-3.225334	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CE)
Method: Least Squares
Date: 04/10/12 Time: 15:16
Sample (adjusted): 1984 2011
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CE(-1)	-0.897346	0.320122	-2.803140	0.0101

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D(CE(-1))	-0.178110	0.243273	-0.732139	0.4715
D(CE(-2))	-0.387746	0.175420	-2.210384	0.0373
C	0.475238	0.182363	2.605996	0.0158
@TREND(1981)	-0.010905	0.008320	-1.310636	0.2029

R-squared	0.671469	Mean dependent var	0.021536
Adjusted R-squared	0.614334	S.D. dependent var	0.566242
S.E. of regression	0.351648	Akaike info criterion	0.908059
Sum squared resid	2.844092	Schwarz criterion	1.145953
Log likelihood	-7.712831	Hannan-Quinn criter.	0.980786
F-statistic	11.75217	Durbin-Watson stat	2.020914
Prob(F-statistic)	0.000024		

Null Hypothesis: D(CE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.304408	0.0000
Test critical values:	1% level	-4.323979	
	5% level	-3.580623	
	10% level	-3.225334	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CE,2)
Method: Least Squares
Date: 04/10/12 Time: 15:18
Sample (adjusted): 1984 2011
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CE(-1))	-2.441569	0.262410	-9.304408	0.0000
D(CE(-1),2)	0.695080	0.155272	4.476527	0.0002
C	0.195259	0.173009	1.128603	0.2702
@TREND(1981)	-0.009914	0.009426	-1.051786	0.3034

R-squared	0.846148	Mean dependent var	0.000964
Adjusted R-squared	0.826916	S.D. dependent var	0.958418
S.E. of regression	0.398734	Akaike info criterion	1.130519
Sum squared resid	3.815733	Schwarz criterion	1.320834
Log likelihood	-11.82727	Hannan-Quinn criter.	1.188701
F-statistic	43.99786	Durbin-Watson stat	2.098600
Prob(F-statistic)	0.000000		

Null Hypothesis: RE has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.637084	0.0949
Test critical values:	1% level	-2.647120	
	5% level	-1.952910	
	10% level	-1.610011	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RE)
Method: Least Squares
Date: 04/10/12 Time: 15:21
Sample (adjusted): 1983 2011
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RE(-1)	-0.336599	0.205609	-1.637084	0.1132
D(RE(-1))	-0.522655	0.168090	-3.109373	0.0044

R-squared	0.529036	Mean dependent var	0.024655
Adjusted R-squared	0.511593	S.D. dependent var	0.843031
S.E. of regression	0.589162	Akaike info criterion	1.846241
Sum squared resid	9.372020	Schwarz criterion	1.940537
Log likelihood	-24.77049	Hannan-Quinn criter.	1.875773
Durbin-Watson stat	1.993538		

Null Hypothesis: D(RE) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.48313	0.0000
Test critical values:	1% level	-2.647120	
	5% level	-1.952910	
	10% level	-1.610011	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RE,2)
Method: Least Squares
Date: 04/10/12 Time: 15:23
Sample (adjusted): 1983 2011
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RE(-1))	-1.693505	0.135664	-12.48313	0.0000

R-squared	0.847678	Mean dependent var	0.009793
Adjusted R-squared	0.847678	S.D. dependent var	1.554198
S.E. of regression	0.606580	Akaike info criterion	1.871913
Sum squared resid	10.30229	Schwarz criterion	1.919061
Log likelihood	-26.14274	Hannan-Quinn criter.	1.886680
Durbin-Watson stat	2.149667		

Null Hypothesis: GR has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.046887	0.0408
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GR)
Method: Least Squares
Date: 04/10/12 Time: 15:30
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GR(-1)	-0.273143	0.133443	-2.046887	0.0498

R-squared	0.124026	Mean dependent var	0.273333
Adjusted R-squared	0.124026	S.D. dependent var	5.528168
S.E. of regression	5.174004	Akaike info criterion	6.157936
Sum squared resid	776.3392	Schwarz criterion	6.204642
Log likelihood	-91.36904	Hannan-Quinn criter.	6.172878
Durbin-Watson stat	2.209213		

Null Hypothesis: D(GR) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.105370	0.0000
Test critical values:	1% level	-2.647120	
	5% level	-1.952910	
	10% level	-1.610011	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GR,2)
Method: Least Squares
Date: 04/10/12 Time: 15:32
Sample (adjusted): 1983 2011
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GR(-1))	-1.283064	0.180577	-7.105370	0.0000

R-squared	0.643172	Mean dependent var	0.131034
Adjusted R-squared	0.643172	S.D. dependent var	9.004606
S.E. of regression	5.378913	Akaike info criterion	6.236724
Sum squared resid	810.1156	Schwarz criterion	6.283872
Log likelihood	-89.43249	Hannan-Quinn criter.	6.251490
Durbin-Watson stat	2.089860		

Null Hypothesis: CP has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.745997	0.3848
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CP)
Method: Least Squares
Date: 04/10/12 Time: 15:35
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CP(-1)	-0.077239	0.103539	-0.745997	0.4617

R-squared	0.005626	Mean dependent var	0.023267
Adjusted R-squared	0.005626	S.D. dependent var	0.204002
S.E. of regression	0.203428	Akaike info criterion	-0.314249
Sum squared resid	1.200100	Schwarz criterion	-0.267542
Log likelihood	5.713731	Hannan-Quinn criter.	-0.299307

Durbin-Watson stat	1.708374

Null Hypothesis: D(CP) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.838125	0.0000
Test critical values:	1% level	-2.647120	
	5% level	-1.952910	
	10% level	-1.610011	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CP,2)
Method: Least Squares
Date: 04/10/12 Time: 15:36
Sample (adjusted): 1983 2011
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CP(-1))	-0.908275	0.187733	-4.838125	0.0000

R-squared	0.455309	Mean dependent var	-0.001793
Adjusted R-squared	0.455309	S.D. dependent var	0.281217
S.E. of regression	0.207547	Akaike info criterion	-0.273042
Sum squared resid	1.206123	Schwarz criterion	-0.225894
Log likelihood	4.959114	Hannan-Quinn criter.	-0.258276
Durbin-Watson stat	1.937397		

Null Hypothesis: UR has a unit root
Exogenous: None

Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.078028	0.9228
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UR)
Method: Least Squares
Date: 04/10/12 Time: 15:38
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UR(-1)	0.043525	0.040375	1.078028	0.2899

R-squared	-0.006311	Mean dependent var	0.460000
Adjusted R-squared	-0.006311	S.D. dependent var	2.166453
S.E. of regression	2.173278	Akaike info criterion	4.423116
Sum squared resid	136.9710	Schwarz criterion	4.469822
Log likelihood	-65.34674	Hannan-Quinn criter.	4.438058
Durbin-Watson stat	2.057647		

Null Hypothesis: D(UR) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.022500	0.0000
Test critical values:	1% level	-2.647120	
	5% level	-1.952910	
	10% level	-1.610011	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UR,2)
Method: Least Squares
Date: 04/10/12 Time: 15:39
Sample (adjusted): 1983 2011
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UR(-1))	-0.951575	0.189462	-5.022500	0.0000

R-squared	0.473785	Mean dependent var	0.051724
Adjusted R-squared	0.473785	S.D. dependent var	3.104101
S.E. of regression	2.251736	Akaike info criterion	4.495154
Sum squared resid	141.9688	Schwarz criterion	4.542302
Log likelihood	-64.17973	Hannan-Quinn criter.	4.509920
Durbin-Watson stat	1.985649		

Co integration test

Date: 04/11/12 Time: 05:39
Sample (adjusted): 1982 2010
Included observations: 29 after adjustments
Trend assumption: Linear deterministic trend
Series: G RE CE CP UR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.699448	79.35608	69.81889	0.0071
At most 1	0.583876	44.49422	47.85613	0.1000
At most 2	0.370200	19.06783	29.79707	0.4881
At most 3	0.175391	5.659574	15.49471	0.7353
At most 4	0.002309	0.067040	3.841466	0.7957

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

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Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.699448	34.86185	33.87687	0.0381
At most 1	0.583876	25.42640	27.58434	0.0921
At most 2	0.370200	13.40825	21.13162	0.4154
At most 3	0.175391	5.592535	14.26460	0.6659
At most 4	0.002309	0.067040	3.841466	0.7957

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

G	RE	CE	CP	UR
0.051694	-0.418053	-4.780085	1.707650	-0.109796
-0.123431	3.314961	-1.142369	-2.179169	0.122323
-0.245580	0.261163	0.161586	1.102008	0.124449
0.086271	0.960157	-0.062079	3.387242	-0.177333
-0.028393	-0.954424	-0.960248	-2.834218	-0.185323

Unrestricted Adjustment Coefficients (alpha):

D(G)	-0.513040	-0.131415	2.817921	-0.432958	-0.015286
D(RE)	-0.021679	-0.261699	-0.044029	-0.174727	-0.002268
D(CE)	0.375537	0.035945	0.033848	0.010035	0.001698
D(CP)	-0.000890	0.101587	-0.061217	-0.024187	-0.000642
D(UR)	0.192339	0.089089	0.127892	-0.013409	0.090002

1 Cointegrating Equation(s): Log likelihood -156.1125

Normalized cointegrating coefficients (standard error in parentheses)

G	RE	CE	CP	UR
1.000000	-8.087102	-92.46921	33.03393	-2.123968
	(9.10842)	(13.4984)	(13.7710)	(0.68786)

Adjustment coefficients (standard error in parentheses)

D(G)	-0.026521
	(0.05258)
D(RE)	-0.001121

	(0.00603)
D(CE)	0.019413
	(0.00287)
D(CP)	-4.60E-05
	(0.00195)
D(UR)	0.009943
	(0.02086)

2 Cointegrating Equation(s): Log likelihood -143.3993

Normalized cointegrating coefficients (standard error in parentheses)

G	RE	CE	CP	UR
1.000000	0.000000	-136.2982	39.66014	-2.612110
		(19.4955)	(19.9583)	(0.96458)
0.000000	1.000000	-5.419619	0.819355	-0.060361
		(0.81410)	(0.83342)	(0.04028)

Adjustment coefficients (standard error in parentheses)

D(G)	-0.010300	-0.221157
	(0.13607)	(3.39732)
D(RE)	0.031181	-0.858459
	(0.01370)	(0.34203)
D(CE)	0.014976	-0.037840
	(0.00735)	(0.18361)
D(CP)	-0.012585	0.337129
	(0.00413)	(0.10321)
D(UR)	-0.001054	0.214917
	(0.05394)	(1.34687)

3 Cointegrating Equation(s): Log likelihood -136.6951

Normalized cointegrating coefficients (standard error in parentheses)

G	RE	CE	CP	UR
1.000000	0.000000	0.000000	-5.755737	-0.470026
			(6.03571)	(0.26359)
0.000000	1.000000	0.000000	-0.986514	0.024815
			(0.37166)	(0.01623)
0.000000	0.000000	1.000000	-0.333210	0.015716
			(0.15316)	(0.00669)

Adjustment coefficients (standard error in parentheses)

D(G)	-0.702325	0.514781	3.057838
	(0.22942)	(2.74923)	(4.03380)
D(RE)	0.041994	-0.869958	0.395468

	(0.02851)	(0.34163)	(0.50126)
D(CE)	0.006664	-0.029000	-1.830694
	(0.01524)	(0.18258)	(0.26789)
D(CP)	0.002449	0.321142	-0.121689
	(0.00783)	(0.09383)	(0.13767)
D(UR)	-0.032461	0.248318	-1.000501
	(0.11248)	(1.34788)	(1.97768)

4 Cointegrating Equation(s): Log likelihood -133.8989

Normalized cointegrating coefficients (standard error in parentheses)

G	RE	CE	CP	UR
1.000000	0.000000	0.000000	0.000000	-0.661034
				(0.25544)
0.000000	1.000000	0.000000	0.000000	-0.007923
				(0.02344)
0.000000	0.000000	1.000000	0.000000	0.004658
				(0.00957)
0.000000	0.000000	0.000000	1.000000	-0.033186
				(0.02250)

Adjustment coefficients (standard error in parentheses)

D(G)	-0.739676	0.099074	3.084716	1.049123
	(0.23856)	(2.84167)	(4.00850)	(3.67729)
D(RE)	0.026920	-1.037723	0.406315	-0.107097
	(0.02777)	(0.33079)	(0.46662)	(0.42807)
D(CE)	0.007530	-0.019364	-1.831317	0.634250
	(0.01593)	(0.18978)	(0.26770)	(0.24558)
D(CP)	0.000362	0.297918	-0.120188	-0.372283
	(0.00805)	(0.09594)	(0.13533)	(0.12415)
D(UR)	-0.033618	0.235443	-0.999669	0.229827
	(0.11771)	(1.40207)	(1.97778)	(1.81436)

Granger causality test result

Pairwise Granger Causality Tests
Date: 04/10/12 Time: 16:37
Sample: 1981 2011
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.

RE does not Granger Cause GR	29	1.38849	0.2688
GR does not Granger Cause RE		0.83423	0.4464
CE does not Granger Cause GR	29	0.00561	0.9944
GR does not Granger Cause CE		0.77453	0.4721
CP does not Granger Cause GR	29	0.73808	0.4886
GR does not Granger Cause CP		1.05558	0.3636
UR does not Granger Cause GR	29	2.16126	0.1371
GR does not Granger Cause UR		0.13029	0.8785
CE does not Granger Cause RE	29	0.95045	0.4006
RE does not Granger Cause CE		0.53439	0.5928
CP does not Granger Cause RE	29	0.64185	0.5351
RE does not Granger Cause CP		4.03096	0.0310
UR does not Granger Cause RE	29	0.28633	0.7535
RE does not Granger Cause UR		0.58613	0.5642
CP does not Granger Cause CE	29	1.68513	0.2066
CE does not Granger Cause CP		2.93962	0.0721
UR does not Granger Cause CE	29	4.32448	0.0249
CE does not Granger Cause UR		2.70798	0.0870
UR does not Granger Cause CP	29	0.29565	0.7467
CP does not Granger Cause UR		0.47827	0.6256

Error correction mechanism

Vector Error Correction Estimates
Date: 04/10/12 Time: 16:41
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
GR(-1)	1.000000
RE(-1)	-58.73288

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	(9.75566)				
	[-6.02039]				
CE(-1)	87.27272				
	(14.0221)				
	[6.22394]				
CP(-1)	1.130227				
	(22.0886)				
	[0.05117]				
UR(-1)	-0.032413				
	(1.06882)				
	[-0.03033]				
C	-6.051245				
Error Correction:	D(GR)	D(RE)	D(CE)	D(CP)	D(UR)
CointEq1	0.028299	0.011599	-0.005954	-0.002224	-0.012222
	(0.02285)	(0.00276)	(0.00205)	(0.00076)	(0.00890)
	[1.23870]	[4.20455]	[-2.90658]	[-2.93789]	[-1.37327]
C	0.273333	0.014733	0.015500	0.023267	0.460000
	(1.00013)	(0.12076)	(0.08968)	(0.03314)	(0.38963)
	[0.27330]	[0.12200]	[0.17284]	[0.70208]	[1.18060]
R-squared	0.051953	0.387016	0.231786	0.235624	0.063103
Adj. R-squared	0.018094	0.365124	0.204350	0.208325	0.029642
Sum sq. resids	840.2153	12.25067	6.755438	0.922517	127.5230
S.E. equation	5.477927	0.661456	0.491188	0.181513	2.134102
F-statistic	1.534386	17.67821	8.448181	8.631206	1.885881
Log likelihood	-92.55507	-29.13390	-20.20541	9.659544	-64.27464
Akaike AIC	6.303671	2.075593	1.480361	-0.510636	4.418309
Schwarz SC	6.397084	2.169006	1.573774	-0.417223	4.511723
Mean dependent	0.273333	0.014733	0.015500	0.023267	0.460000
S.D. dependent	5.528168	0.830150	0.550664	0.204002	2.166453
Determinant resid covariance (dof adj.)		0.268637			
Determinant resid covariance		0.190261			
Log likelihood		-187.9504			
Akaike information criterion		13.53003			
Schwarz criterion		14.23062			