Policy Variables and Economic Growth in South Africa: Understanding the Nexus

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Doi:10.5901/mjss.2012.v3n11p647

Abstract *The South African economy witnessed profound transformation in the post-apartheid era. This transformation was attributed to a lot of factors, particularly the various economic and development policies that accompanied the end of apartheid and the political liberation of 1994. This paper investigates the impact of macroeconomic variables on economic growth in South Africa; and identifies policy variables that have been significant in influencing economic growth in the country. The research adopts a dynamic regression model within the framework of the neo-classical growth model, specifically the adjusted neo-classical model as applied by Ghura & Hadjimichael (1996) and Calanitsis, Basu & Ghura to sub-Sahara Africa. The study found that the political liberation of 1994, government investment, maintenance of fiscal discipline and stable exchange rate have a positive impact on economic growth. On the other hand, private investment and terms of trade have negative impact on economic growth. The paper recommends that the fiscal and monetary adopted in South Africa should be consolidated, while the investment and trade policy should be reviewed to make it growth-inducing.*

Keywords: *Policy, Growth, South Africa, Nexus*

1. Introduction

The South African economy has witnessed profound transformation in the past decades. Between 1950 and 1973, the economy witnessed a modest growth rate of 2.2% per annum in real GDP and 3% in labour productivity. The economy grew by 1% during the period 1984-1993. The growth rate improved to 3% and 5% for the period 1994-2003 and 2004-2006 respectively. According to Manuel (2007), the South African economy has grown by about 40% between 1993 and 2007; and is expected to grow by 6.5% and 8% by 2010 and 2011 respectively. It was also revealed that as at 2006, the economy has grown consistently and consecutively for over eight years, which is regarded as the longest streak since 1945. This substantial economic expansion has also been accompanied by employment growth, increase in labour productivity, tax relief, high real wages, increase in social grants. All these have culminated in increasing the level of household income and consumption and reduction in poverty level.

The economic performance of post-apartheid South Africa has attracted the attention of policy makers. Various factors have been adduced for this phenomenal growth, of which macroeconomic and fiscal management as well as favourable global conditions were core underlying dynamics. Specifically, factors such as public investment, low cost of input, export growth, growth in manufacturing and service sectors and good governance have been identified as crucial to the sudden surge of the economy. Moreso, the volatility of the currency, poor logistics system, shortage of skilled

manpower, limited investment opportunities, poor regulatory environment and deficiencies in governance were identified as constraints to economic growth in the country (Hanival and Maia, 2008). Some studies have posited that economic growth anywhere is a product of sound and quality economic policies (Collier and Dollar, 2001). The post-apartheid period witnessed various macroeconomic and development policies, aimed at promoting economic growth. Were these policies responsible for the improvement in economic growth in South Africa? Which of the policy variables were effective and which are not? Numerous empirical studies have been conducted on the factors that promote economic growth in South Africa. The findings of these studies varies, owing to methodological and specification differences. But, there are limited works on the impact of economic policies on growth in South Africa. This gap is what this present study tries to capture.

This paper investigates the policy frameworks that influence economic growth in South Africa. It also investigates whether economic policies in South Africa have been consistent with theoretical views on how they are expected to affect growth. Specifically, the paper undertakes to:

(i) Investigate the effect of macroeconomic policies on economic growth; and
(ii) Identify the policy variables that have significant effect on economic growth in South Africa.

2. An Overview of Macroeconomic Performance in South Africa

The South African economy is a pre-dominantly mineral exporting economy. It has rich deposits of gold, platinum, diamond and coal, and exports these commodities to the rest of the world. Nonetheless, agriculture, manufacturing, services and trade also form integral parts of the economy. The role of these sectors, particularly the mining sector in economic development cannot be over-emphasized. Mining contributes significantly to economic development due to discovery of new gold mines and increases in gold price. Howbeit, the manufacturing sector sprang up due to the exploits of the mining industry and the inflow of foreign direct investment, vis-à-vis the financial sector that also developed alongside these industries. Furthermore, the efficiency of commercial agriculture soon improved due to increased mechanization (Feinstein, 2005). However, the Apartheid regime limits the potentials of the economy, by creating constraints and problems in the labour market. It also limited people's access to economic activities and created an inefficient public sector. Attempts by the government to transform the economy in the early 1990s was unsuccessful due to rising political dissatisfaction, a highly regulated economy, poor capital inflow and restricted foreign trade.

The period of stagflation in the early 1970s affected the economy severely. Real GDP per capita growth averaged -0.6% during the period 1973 to 1994. The economy also witnessed balance of payment problems occasioned by foreign aversion to the apartheid policy. The economic decline of this period was further exacerbated by the demise of the gold standard in the international monetary system, unfavourable external economic and political changes, and poor performance in the industrial sector (Feinstein, 2005). As at the end of apartheid in 1994, poverty was widespread, unemployment was high, and access to quality education, health care and other social services by the populace was limited.

The end of Apartheid and the political liberation that followed upturned the fortune of the South African economy. GDP growth has been fairly strong since 1994, with the exception of 1998 due to the contagious financial crisis in Asia. Growth recovered thereafter and has sustained an average annual rate of 5% since 2004. The economy recorded a GDP growth of 5.4% in 2006, its best performance since 1984, before slightly reducing to 5.1% in 2007. Average annual growth rate of fixed gross capital formation increased from 9.4% in 2003 to 12% in 2006. Private investment increased by over 12% in 2006, indicating a positive outlook for economic growth and employment generation. Between 1998/1999 and 2006/2007, debt service as a percentage of GDP reduced from 5.6% to 3.2%. The reduction in budget deficit within this period freed up about R33 billion which was invested in infrastructure and other social programmes. On sectoral contribution to economic growth, the service sector and retail and wholesale trade made significant inputs. The contribution of the manufacturing sector to the growth in GDP has also improved considerably due to increase in commercial and civil construction investments. Between 2003 and 2006, investment in the manufacturing sector increased by about 12%. The growth of the construction industry grew from 2.8% in the 1994-2003 periods to 12.1% in 2004-2006 periods (Manuel, 2007). The removal of trade barriers also contributed to the growth in productivity by encouraging the inflow of capital and foreign direct investment into the economy. Nonetheless, the growth witnessed was dulled by the performance of the agriculture sector that was highly volatile because of unfavourable climate conditions, price movements, land reforms and security issues.

2.1 A Brief Review of Macroeconomic Policies and Strategies in Post-Apartheid South Africa

The end of apartheid and the democratization of the political landscape in South Africa in 1994 marked a turning point in the economic fortune of the country. There was urgent need to consolidate the political liberation attained by the country with economic growth, job creation and ultimately, poverty reduction. The first few years of the new government witnessed series of fiscal adjustments; and the initiation of the Reconstruction and Development Programme (RDP) provided the base for the prioritization of the government spending to the poorest segment of the society. The major objectives of the programme were to remove racial biases from the economic and social structure of the economy and address the problems of poverty. The Reconstruction and Development Programme was a socio-economic programme, and therefore needed complementary policy initiatives.

The introduction of the Growth Employment and Redistribution (GEAR) policy in 1996 was a step towards consolidating the gains of the Reconstruction and Development Programme. The broad objectives of the policy include redistribution of income, increasing access to social services, enhancing economic growth and employment and creating conducive environment for productivity. The first specific objective of the programme is to achieve macroeconomic balance, through reduction in budget deficit and rate of inflation. The second objective is to ensure that the economy achieved a minimum growth rate of 6% by 2000. This was expected to be driven by improvement in fixed investment and non-gold exports. The third specific objective is to equitably re-distribute income through job creation realized from growth. The policy was aimed at reducing fiscal deficits, reducing inflation, maintaining exchange rate stability, creating incentives to promote new investments, reducing barriers to trade and liberalizing capital flows. These policy changes were considered necessary for sustainable economic growth and the realization of the other objectives of GEAR. The effectiveness of the policy was, however, questioned by Standing, Sender and Weeks (1996), who argued that the GEAR strategy is capable of inhibiting instead of promoting growth. They argued that a cut in government expenditure without corresponding expansion in investment or exports, may stifle growth, and compound the problem of unemployment and poverty.

The programme was, however, adversely affected by the Asian financial crisis of the late 1990s. The decline in global demand for South African exports, especially gold during these periods, coupled with the quest by the country's firm to remain competitive led to massive retrenchment by firms. Specifically, the growth rate of the manufacturing export sector slumped to 0% in 1999 (Khamfula, 2005). The currency depreciated by about 28% between April and August, 1998. Similarly, the currency also depreciated by 21% between September and December, 2001 due to external crisis. These crises exerted shocks that hindered investment and economic growth during these periods. The failure of the Reconstruction and Development Programme and the Growth Employment and Redistribution led to the launching of the Accelerated and Shared Growth Initiative for South Africa (AsgiSA) in 2006. The programme was aimed at accelerating economic growth to an average of minimum of 4.5% between 2005 and 2009; and further to a sustainable 6% average annual growth rate between 2010 and 2014. Such growth projection was aimed at reducing the level of poverty and unemployment by 50% by 2014. It is a coordinating platform for different policies, including some elements of GEAR and RDP. It emphasizes infrastructural development. Specific amounts were earmarked for building and upgrading of ports, railway lines, airports, petroleum pipeline, stadia, roads, energy, power generation, etc. This is in a bid to ensure that the benefits of economic growth are shared through the provision of these facilities and other complementary social services.
In all, the economy has seen 14 consecutive years of positive real GDP growth. Fixed investment as a percentage of GDP increased from 15% in 2000 to 19% in 2006, and further increasing to 21% in 2007. The incidence of poverty has reduced; and access to education, health care, water, sanitation, electricity and affordable housing has increased significantly. According to the Community Survey released in late 2007, over 88% of the populace has access to piped-water, compared to only 50% in 1996. Similarly, over 70% have access to good housing compared to 64% in 1996. There has also been steady progress in access to education, healthcare, electricity supply, telecommunications and transport facilities.

2.2 Monetary and Fiscal Policies

Before 2000, the monetary authority in South Africa was emphasizing financial stability at the expense of economic growth in the pursuit of its monetary policy objectives (Khamfula, 2005). The authority maintained high interest rate in order to achieve low inflation, and check exchange rate fluctuation and capital flight. Continued emphasis on reduction of fiscal deficit, and the increase in interest rate adversely affects economic growth through dwindling private and public investment. As a result of this, the monetary authority intends to pursue the objectives of exchange rate stability, interest rate flexibility and open capital market simultaneously. The difficulty in achieving these objectives led to active focus on

inflation targeting at the expense of exchange rate stability. The massive capital inflow that greeted the political liberation in 1994 led to increase in money supply.

In addition to pursuing low inflation, the South African Reserve Bank introduced capital account liberalization to maintain competitive real exchange rate. This was an attempt to pursue both monetary and exchange rate targets simultaneously. By 2000, the monetary authority adopted the inflation targeting monetary policy framework, indicating that the rate of inflation is being targeted directly by the apex bank. The objective of the inflation targeting mechanism is to ensure price stability by reducing the inflationary effect of discretionary monetary policy. Khamfula (2004) have empirically investigated the impact of inflation targeting on interest and exchange rate in South Africa; and found that inflation targeting is accompanied by a stable exchange and interest rate in the long-run.

In the area of fiscal policy, there was a significant adjustment in the system of public expenditure management, financial planning and reporting during the post-apartheid era (Manuel, 2007). The budget was contained within the Medium Term Expenditure Framework (MTEF) and output-linked performance indicators were established. The Public Finance Management Act was established to coordinate and ensure stringent controls over financial management in government institutions. As a result of this fiscal measures, fiscal deficit as a percentage of GDP has been kept below 3%, as stated in the GEAR policy. The adoption of expansionary fiscal policy after 2001 led to non-interest expenditure growing by 8% over the next three years, and a fiscal deficit of 3.2% for the 2004-2005 fiscal year. Thus, the level of public debt as a percentage of GDP dropped from about 50% to less than 40% (Khamfula, 2005). There was also reduction in capital budget to free up resources for social spending. According to Van der Berg (2001), there was an increase of about 24% in per capita social spending between 1993 and 1997; this has been sustained in the preceding year.

3. Theoretical Framework

The neo-classical growth model is a long run economic growth model, also known as the Solow-Swan or exogenous growth model. The model explains economic growth by examining the role of productivity, capital accumulation, population growth and technological progress. It is an extension of the Harrod-Domar growth model that investigates the separate effect of technological change, capital accumulation and labour productivity on economic growth. The Harrod-Domar emphasized exogenous factor accumulation as a determinant of growth. In response, the Solow model show that steady state growth is driven by technological change, while the adjustment to stable steady state growth is achieved by endogenous changes in factor accumulation. Thus, from the neo-classical growth model, the source of growth, technological changes, is considered to be exogenous (Solow, 1956).

The model assumes that GDP is produced to an aggregate production function. Thus, the model is expressed with the use of the Cobb-Douglas Production Function, which is stated as follows:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}, \qquad 0 < \alpha > 1$$

where Y_t is the level of output or GDP, K_t is the capital input, L_t is the labour input, α is production elasticity and A_t is total factor productivity. From the mathematical expression, it can be seen that output is produced using capital and labour, where this inputs are turned into outputs through a constant returns to scale and decreasing marginal returns to factor accumulation. Increase in A_t is called technological progress, but ultimately it is a measure of productive efficiency. This is because an increase in A_t leads to increase in the productiveness of other factors.

The neo-classical growth model has both short and long-run implications for output level. In the short run, policy measures can affect only the steady state level of output. Growth is affected as the economy converges to the new steady state output level. The rate of growth of the economy is determined by the rate of capital accumulation, which on its own, is determined by the savings rate and the rate of capital accumulation. In the long run, the rate of growth is exogenously determined. It is believed that the economy will converge towards a steady state rate of growth, which is determined by technological progress and labour force growth rate. A key prediction of the model is that in the long-run, economic growth in developing countries will converge with those of developed countries, given that the countries have the same institutional arrangements, market, trade and educational policy. The model has, however, been criticized for its inability to account for entrepreneurship and institutions. Besides, it fails to explain how and why technological progress occurs.

3.1 Empirical Framework

Empirical research requires accurate and comprehensive data, but finding complete data series for South Africa is very difficult (Sunde, 2012). This is the case for the entire continent. This paper makes use of time-series data. Obtaining the

entire series from a single source proved a challenging task. As a result, the data used in this paper were obtained from various sources[1], with possibly different methods of calculation. This may somewhat impact, but not invalidate the findings of this paper. The time period under investigation is between 1980 and 2010.

We investigated the role of policy variables as determinants of growth, using a modified version of the neo-classical model applied by Ghura and Hadjimichael (1996) and Calanitsis, Basu and Ghura (1999) to sub-Saharan Africa. This model was also recently employed by Akitoby and Cinyabuguma (2004) with minor adjustments to reflect the economy of DR Congo. The growth equation estimated in this paper is in the form[2]:

$$GDPG = \beta_0 + \beta_1 P/Y + \beta_2 G/Y + \beta_3 EXCHR + \beta_4 DEF/GDP + \beta_5 TOT + \beta_6 DUM94 + \mu$$

where the dependent variables is GDPG (GDP growth rate), while the independent variables include EXCHR (exchange rate), TOT (terms of trade), DEF/GDP (deficit as a percentage of GDP), P/Y (private investment as a percentage of GDP) and G/Y (government investment as a percentage of GDP) and DUM94 is the dummy variable, signifying the end of apartheid and the beginning of a new political and economic dispensation. The variable was assigned for 0 for apartheid and 1 for post-apartheid periods.

4. Results and Analysis

We employed the Augmented Dickey Fuller (ADF) test to find out the degree of differencing required to establish stationarity in the series. This is a test to examine the presence of unit root and confirm the order of integration in the data series. The results of the ADF test are summarized in the table below (see appendix for detailed results).

Table 1. Result of Unit Root Test

Series	ADF Statistic	1% Sig. level	5% Sig. level	10% Sig. level	Order of Integration
GDPG	-4.0043	-3.6661	-2.9627	-2.6200	I(0)
EXCHR	-1.1079	-3.6752	-2.9665	-2.6220	I(1)
TOT	-1.2668	-3.6752	-2.9665	-2.6220	I(1)
DEF/GDP	-1.8616	-3.6852	-2.9705	-2.6242	I(2)
P/Y	-0.7793	-3.6752	-2.9665	-2.6220	I(1)
G/Y	-0.04537	-3.6752	-2.9665	-2.6220	I(1)

Source: *Authors' Computation (E-views)*

Using the ADF unit root test, we found that GDP growth rate was the only variable that was stationary at level. All the other variables were non-stationary at levels, implying the presence of unit root. At first differencing, exchange rate, terms of trade, private investment/GDP ratio and government investment/GDP ratio were stationary. Fiscal deficit as a percentage of GDP (DEF/GDP) was stationary after second differencing.

Table 2. Summary of Dynamic Regression Result (See Appendix for detailed results)

Series	*Coefficient*	*Probability*
C	*1.319786*	*0.0059*
D(EXCHR)	*0.876762*	*0.0269*
D(TOT)	*-13.37050*	*0.0004*
D(D(DEF/GDP))	*0.138132*	*0.5089*
D(P/Y(-3))	*-15.57520*	*0.0135*
D(G/Y)	*17.49817*	*0.0643*
DUM94	*2.296991*	*0.0007*
Adjusted R-Square 0.674864	*DW 1.70*	*F- Statistic 8.9566*

Source: *Author's Computation (E-Views)*

[1] Some were obtained from the World Bank, South Africa Treasury, US Central Intelligence Agency, and other economic data sourcing agencies' websites. Some years of a particular series may be found in a particular source, while the remaining years found in another source(s).

[2] Several variables found to have strong impact on growth according to the literature were not included in the model due to unavailability of data.

The result of the dynamic regression model is presented in table 2 above, and discussed below. The dummy variable for the end of apartheid in 1994 have a significant and positive impact on the growth and development of the SA economy. This implies that the apartheid regime has substantially constrained economic growth and development in the country. This is in conformity with earlier studies (Khamfula, 2005). Government investment also has a significant and positive impact on economic growth. The variable for government investment was significant only at 10% level of significance. The huge size of government investments in the country crowds out short term private sector investment, and partly explains the negative relationship found between private sector investment and economic growth. The negative relationship is contrary to a priori expectation, but corroborates the findings of Blomstrom, Lipsey and Zegan (1996), Easterly and Levine (2000). These studies suggest that physical and human capital do not lead to faster growth, and growth promotes investment more than investment promotes growth. Thus, the effect of private sector investment on economic growth in South Africa was disappointing, at least in the short term. The deficit-GDP coefficient captures the impact of fiscal discipline on economic growth. The coefficient is positive but not significant; indicating that fiscal discipline is necessary but not sufficient for economic growth. However, despite the effort in keeping the deficit-GDP ratio low[3], there is still room for improvement in order to optimize its impact on growth. TOT, contrary to a priori expectation was negatively related to GDP. This could be as a result of the primary nature of SA export against its capital import which has affected its terms of trade. At the initial point, South Africa adopted an import substitution trade strategy. However, the opening of its economy through trade liberalization policies has caused the influx of different goods. Exports have, however, been primary commodities such as agricultural products, gold, platinum, diamond, etc that have depreciated in prices. From the result also, exchange rate has a significant positive impact on economic growth, which is an indication of the effectiveness of the monetary policy pursued by the country. An adjusted R-squared of 0.6749 shows that all the policy variables included in the model explains 67% of variations in GDP.

5. Conclusion and Policy Implications

This paper has examined the effect of macroeconomic policies on economic growth in South Africa. It investigates the policy determinants of growth using a modified neo-classical model. Factors that have contributed to the economic performance of the country were also reviewed. Some of these factors were the manipulative variables underlying these policies. The factors for which data are available to the researchers have been used to determine which of them impact economic growth in South Africa. The summary of findings is provided below.

Using a dynamic regression model, the study found that apartheid regime is one of the most important constraints to economic growth in the country. The end of apartheid and the emergence of democracy in 1994 was the turning point in the fortune of the economy. This necessitated the initiation of series of macroeconomic and development policies such as the Economic Reconstruction and Development (ERD), Growth Employment and Redistribution Strategy (GEAR), etc. These policies were developed to correct the structural imbalances and rigidities that had been deeply rooted in the economy by the apartheid regime: and also serve as the foundation for a new emerging economy.

Government investment contributes to the growth performance witnessed in the South African economy. Strategic fiscal adjustments were initiated after 1994, which involved significant and massive investment in infrastructure and social services, particularly focused at the poor and neglected part of the population. Although, these investments were important in contributing to economic growth, they crowd-out private investment.

The fiscal policy regime in the country, focused on ensuring and maintaining fiscal discipline contributes to growth, though there is need to ensure that the impact of fiscal discipline on economic growth is optimized. The terms of trade has a negative impact on economic growth. This indicates the preponderance of non-productive luxury imports and export of primary products as argued by Jager (2004). The positive relationship between exchange rate and economic growth shows that the exchange rate management system has a positive impact on the country's economic performance.

In the light of these findings, to promote economic growth in South Africa, the government should initiate more people-oriented macroeconomic and development policies. Increase in government investment, especially in the area of infrastructure and social services should be sustained. Efforts should be made to create an enabling environment where private investment would significantly and positively contribute to economic growth. Promoting and maintaining fiscal discipline should be at the core of government activities. Imports of productive capital goods, rather than non-productive luxury goods and export of manufactured goods, rather than primary products are essential for the growth of the economy; and should be vigorously sought by the government of South Africa. The monetary authority should mobilize effort to ensure that exchange rate stability is ensured over the long run.

[3] The average deficit-GDP ratio for 1980 to 1993 is -4.38 against it average of -2.47 for 1994 to 2010.

References

Akitoby, B. & Cinyabuguma, M. (2004). Sources of growth in the Democratic Republic of the Congo: A cointegration approach. IMF Working Paper No. 4. Washington: International Monetary Fund.

Blomstrom, M., Lipsey, R. E. & Zejan, M. (1996). Is fixed investment the key to economic growth? NBER Working Paper No. 4436. Cambridge, MA: National Bureau of Economic Research.

Calamitsis, A. E., Basu, A., & Ghura, D. (1999). Adjustment and economic growth in sub-Saharan Africa. IMF Working Paper No. 51. Washington: International Monetary Fund.

Collier, P. & Dollar, D. (2001). Can the world cut poverty in half? How policy reform and effective aid can meet the international development goals. World Development, 29(11), 1787-1802.

De Jager, J. L. W. (2004). Aspects of growth empirics in South Africa. *Unpublished PhD Thesis.* Faculty of Economics and Management Sciences, University of Pretoria.

Easterly, W. & Levine, R. (2000). It's not factor accumulation: Stylized facts and growth models. University of Minnesota Working Paper.

Feinstein, C. (2005). *An economic history of South Africa: Conquest, discrimination and development*. London: Cambridge University Press.

Ghura, D. & Hadjimichael, M. T. (1996). Growth in Sub-Saharan Africa. IMF Staff Papers, 43, 605-634, September.

Hanival, S. & Maia, J. (2008). an overview of the performance of the South African economy since 1994, Paper Commissioned for the Fifteen Year Review.

Khamfula, Y. (2004). Real interest and exchange rate volatility: The rule of ideal inflation target. Department of Economics, University of the Witwatersrand, Mimeo.

Khamfula, Y. (2005). Macroeconomic policies, shocks and economic growth in South Africa. Paper presented at the Macroeconomic Policy Challenges in Low Income Countries Conference, IMF Headquarters, Washington: DC.

Manuel, T. (2007). Economic policy and South Africa's growth strategy. Retrieved online from http://www.treasury.gov.za/comm_media/speeches/2007/2007031901.pdf.

Solow, R. M. (1956). A contribution to the theory of economic growth. *Quarterly Journal of Economics,* 70(1), 65–94.

Standing, G., Sender, J. & Weeks, J. (1996*). Restructuring the labour market: The South African challenge*. Geneva: International Labour Office.

Sunde, T. (2012). Financial sector development and economic growth nexus in South Africa. International Journal of Monetary Economics and Finance, 5(1), 64-75.

Van der Berg, S. (2001) Trends in racial fiscal incidence in South Africa, South African Journal of Economics, 69(2), 243-268, June.

Appendix

ADF Test Statistic	-4.004339	1% Critical Value*	-3.6661
		5% Critical Value	-2.9627
		10% Critical Value	-2.6200

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPG)
Method: Least Squares
Date: 09/10/12 Time: 13:09
Sample(adjusted): 1981 2010
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPG(-1)	-0.676674	0.168985	-4.004339	0.0004
C	1.511884	0.588371	2.569608	0.0158

R-squared	0.364138	Mean dependent var	-0.127900
Adjusted R-squared	0.341429	S.D. dependent var	2.851447
S.E. of regression	2.314018	Akaike info criterion	4.580188
Sum squared resid	149.9310	Schwarz criterion	4.673601
Log likelihood	-66.70282	F-statistic	16.03473
Durbin-Watson stat	1.927961	Prob(F-statistic)	0.000415

ADF Test Statistic	-1.107926	1% Critical Value*	-3.6661
		5% Critical Value	-2.9627
		10% Critical Value	-2.6200

*MacKinnon critical values for rejection of hypothesis of a unit root.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCHR)
Method: Least Squares
Date: 09/10/12 Time: 13:10
Sample(adjusted): 1981 2010
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXCHR(-1)	-0.064744	0.058437	-1.107926	0.2773
C	0.505012	0.302971	1.666868	0.1067

R-squared	0.041998	Mean dependent var	0.218000
Adjusted R-squared	0.007784	S.D. dependent var	0.863878
S.E. of regression	0.860510	Akaike info criterion	2.601756
Sum squared resid	20.73335	Schwarz criterion	2.695169
Log likelihood	-37.02634	F-statistic	1.227499
Durbin-Watson stat	1.589969	Prob(F-statistic)	0.277321

ADF Test Statistic	-4.219279	1% Critical Value*	-3.6752
		5% Critical Value	-2.9665
		10% Critical Value	-2.6220

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCHR,2)
Method: Least Squares
Date: 09/10/12 Time: 13:10
Sample(adjusted): 1982 2010
Included observations: 29 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXCHR(-1))	-0.837332	0.198454	-4.219279	0.0002
C	0.179214	0.172292	1.040177	0.3075

R-squared	0.397353	Mean dependent var	-0.041379
Adjusted R-squared	0.375032	S.D. dependent var	1.118301
S.E. of regression	0.884072	Akaike info criterion	2.657916
Sum squared resid	21.10275	Schwarz criterion	2.752212
Log likelihood	-36.53978	F-statistic	17.80231
Durbin-Watson stat	1.828567	Prob(F-statistic)	0.000247

ADF Test Statistic	-1.266883	1% Critical Value*	-3.6661
		5% Critical Value	-2.9627
		10% Critical Value	-2.6200

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TOT)
Method: Least Squares
Date: 09/10/12 Time: 13:11
Sample(adjusted): 1981 2010
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TOT(-1)	-0.156488	0.123522	-1.266883	0.2156
C	0.169162	0.142087	1.190557	0.2438

R-squared	0.054214	Mean dependent var	-0.009183
Adjusted R-squared	0.020435	S.D. dependent var	0.106588
S.E. of regression	0.105494	Akaike info criterion	-1.595994
Sum squared resid	0.311609	Schwarz criterion	-1.502581
Log likelihood	25.93991	F-statistic	1.604992
Durbin-Watson stat	2.084254	Prob(F-statistic)	0.215634

ADF Test Statistic	-6.773299	1% Critical Value*	-3.6752
		5% Critical Value	-2.9665
		10% Critical Value	-2.6220

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TOT,2)
Method: Least Squares
Date: 09/10/12 Time: 13:11
Sample(adjusted): 1982 2010
Included observations: 29 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TOT(-1))	-1.211212	0.178822	-6.773299	0.0000
C	-0.004914	0.019088	-0.257457	0.7988

R-squared	0.629516	Mean dependent var	0.004937
Adjusted R-squared	0.615794	S.D. dependent var	0.165353
S.E. of regression	0.102493	Akaike info criterion	-1.651567
Sum squared resid	0.283632	Schwarz criterion	-1.557271
Log likelihood	25.94772	F-statistic	45.87758
Durbin-Watson stat	1.787215	Prob(F-statistic)	0.000000

ADF Test Statistic	-1.861696	1% Critical Value*	-3.6661
		5% Critical Value	-2.9627
		10% Critical Value	-2.6200

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEFGDP)
Method: Least Squares
Date: 09/10/12 Time: 13:12
Sample(adjusted): 1981 2010
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEFGDP(-1)	-0.247573	0.132983	-1.861696	0.0732
C	-0.841345	0.498859	-1.686537	0.1028

R-squared	0.110148	Mean dependent var	-0.043333
Adjusted R-squared	0.078368	S.D. dependent var	1.455947
S.E. of regression	1.397734	Akaike info criterion	3.571922
Sum squared resid	54.70245	Schwarz criterion	3.665335
Log likelihood	-51.57882	F-statistic	3.465913
Durbin-Watson stat	1.154474	Prob(F-statistic)	0.073174

ADF Test Statistic	-2.497457	1% Critical Value*	-3.6752
		5% Critical Value	-2.9665
		10% Critical Value	-2.6220

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEFGDP,2)
Method: Least Squares
Date: 09/10/12 Time: 13:12
Sample(adjusted): 1982 2010
Included observations: 29 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEFGDP(-1))	-0.645609	0.258507	-2.497457	0.0189
C	-0.105276	0.273114	-0.385465	0.7029

R-squared	0.187659	Mean dependent var	-0.196552
Adjusted R-squared	0.157573	S.D. dependent var	1.588009
S.E. of regression	1.457536	Akaike info criterion	3.657843
Sum squared resid	57.35908	Schwarz criterion	3.752140
Log likelihood	-51.03873	F-statistic	6.237293
Durbin-Watson stat	1.519205	Prob(F-statistic)	0.018903

ADF Test Statistic	-5.696474	1% Critical Value*	-3.6852
		5% Critical Value	-2.9705
		10% Critical Value	-2.6242

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEFGDP,3)
Method: Least Squares
Date: 09/10/12 Time: 13:13
Sample(adjusted): 1983 2010
Included observations: 28 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEFGDP(-1),2)	-1.192531	0.209345	-5.696474	0.0000
C	-0.219386	0.306884	-0.714884	0.4811

R-squared	0.555174	Mean dependent var	-0.121429
Adjusted R-squared	0.538065	S.D. dependent var	2.385505
S.E. of regression	1.621327	Akaike info criterion	3.873116
Sum squared resid	68.34625	Schwarz criterion	3.968274
Log likelihood	-52.22363	F-statistic	32.44981
Durbin-Watson stat	1.873254	Prob(F-statistic)	0.000005

ADF Test Statistic	0.771376	1% Critical Value*	-3.6661
		5% Critical Value	-2.9627
		10% Critical Value	-2.6200

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PY)
Method: Least Squares
Date: 09/10/12 Time: 13:13
Sample(adjusted): 1981 2010
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PY(-1)	0.023922	0.031012	0.771376	0.4469
C	0.003643	0.002659	1.369862	0.1816

R-squared	0.020809	Mean dependent var	0.005333
Adjusted R-squared	-0.014163	S.D. dependent var	0.008193
S.E. of regression	0.008251	Akaike info criterion	-6.692652
Sum squared resid	0.001906	Schwarz criterion	-6.599239
Log likelihood	102.3898	F-statistic	0.595021

Durbin-Watson stat	1.612305	Prob(F-statistic)	0.446945

ADF Test Statistic	-4.032443	1% Critical Value*	-3.6752
		5% Critical Value	-2.9665
		10% Critical Value	-2.6220

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PY,2)
Method: Least Squares
Date: 09/10/12 Time: 13:14
Sample(adjusted): 1982 2010
Included observations: 29 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PY(-1))	-0.811741	0.201303	-4.032443	0.0004
C	0.004069	0.001942	2.094773	0.0457

R-squared	0.375875	Mean dependent var	-0.000690
Adjusted R-squared	0.352760	S.D. dependent var	0.010327
S.E. of regression	0.008308	Akaike info criterion	-6.676644
Sum squared resid	0.001864	Schwarz criterion	-6.582348
Log likelihood	98.81134	F-statistic	16.26059
Durbin-Watson stat	1.792955	Prob(F-statistic)	0.000406

ADF Test Statistic	0.045370	1% Critical Value*	-3.6661
		5% Critical Value	-2.9627
		10% Critical Value	-2.6200

*MacKinnon critical values for rejection of hypothesis of a unit root.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GY)
Method: Least Squares
Date: 09/10/12 Time: 13:14
Sample(adjusted): 1981 2010
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GY(-1)	0.004958	0.109291	0.045370	0.9641
C	0.006600	0.031424	0.210033	0.8352

R-squared	0.000074	Mean dependent var	0.008000
Adjusted R-squared	-0.035638	S.D. dependent var	0.031991
S.E. of regression	0.032556	Akaike info criterion	-3.947342
Sum squared resid	0.029678	Schwarz criterion	-3.853929
Log likelihood	61.21014	F-statistic	0.002058
Durbin-Watson stat	1.560993	Prob(F-statistic)	0.964135

ADF Test Statistic	-4.238831	1% Critical Value*	-3.6752
		5% Critical Value	-2.9665
		10% Critical Value	-2.6220

*MacKinnon critical values for rejection of hypothesis of a unit root.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GY,2)
Method: Least Squares
Date: 09/10/12 Time: 13:14
Sample(adjusted): 1982 2010
Included observations: 29 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GY(-1))	-0.793784	0.187265	-4.238831	0.0002
C	0.007472	0.006093	1.226376	0.2306
R-squared	0.399569	Mean dependent var		0.001724
Adjusted R-squared	0.377331	S.D. dependent var		0.040538
S.E. of regression	0.031988	Akaike info criterion		-3.980409
Sum squared resid	0.027628	Schwarz criterion		-3.886113
Log likelihood	59.71593	F-statistic		17.96769
Durbin-Watson stat	1.970119	Prob(F-statistic)		0.000235

Dependent Variable: GDP
Method: Least Squares
Date: 09/10/12 Time: 22:54
Sample(adjusted): 1984 2007
Included observations: 24 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.319786	0.419801	3.143836	0.0059
D(EXR)	0.876762	0.362030	2.421797	0.0269
D(TOT)	-13.37050	3.033901	-4.407033	0.0004
D(D(DEF/GDP))	0.138132	0.204704	0.674789	0.5089
D(P/Y)(-3)	-15.57520	5.651405	-2.755987	0.0135
D(G/Y)	17.49817	8.842725	1.978821	0.0643
DUM94	2.296991	0.553689	4.148518	0.0007
R-squared	0.759682	Mean dependent var		2.543875
Adjusted R-squared	0.674864	S.D. dependent var		2.251786
S.E. of regression	1.283984	Akaike info criterion		3.576306
Sum squared resid	28.02646	Schwarz criterion		3.919905
Log likelihood	-35.91567	F-statistic		8.956606
Durbin-Watson stat	1.701926	Prob(F-statistic)		0.000168