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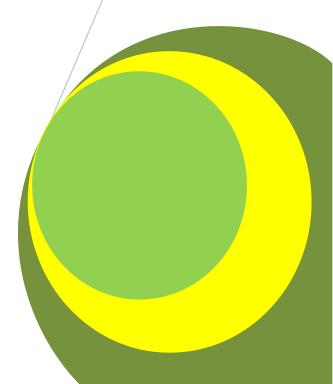Project   Leadership is Influence View project

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Research Article

The Relationship between Fiscal Deficits and Economic Growth in Kenya: An Empirical Investigation

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ABSTRACT

The Kenyan government has been committed to a stable macroeconomic environment, characterized by low and stable inflation and sound fiscal policy. However, in the late 1970s to date, the government has continued to experience high, persistent and unsustainable deficits. Despite the fact that economic reform programs adopted in recent years have emphasized demand management through fiscal restraint, fiscal deficit has been phenomenal to Kenya's economy coupled with a dwindling economic growth. The study therefore attempted to establish the extent to which fiscal deficits and economic growth are related and further investigated ways in which fiscal deficits (transmission mechanism) have effects on the growth and development of the Kenyan economy. The study used both exploratory and causal research designs and employed time series secondary data for a period of 38 years (1970-2007), purposively selected and was estimated using OLS method. The study also performed various econometric tests such as Dickey Fuller (DF) and Augmented Dickey Fuller (ADF) unit root test. Other diagnostic tests like multicollinearity were performed. The study found positive relationship between budget deficits and economic growth, in congruent with the Keynesians assertion and hence recommends prudent financial management and enhanced revenue collection by revenue authority so as not crowd-out private sector investment by borrowing domestically.

Keywords: Fiscal Deficits, Economic Growth, Co-Integration, Error-Correction.

1: INTRODUCTION

Fiscal deficit has become a striking and an institutionalized feature of Kenyan economy like many other developing economies. It has occupied center stage in recent policy deliberations in many developed, developing and transitional economies as concerns with other fiscal dimensions, such as high unemployment, inadequate national savings, high public debt burdens and looming crisis in the financing of pension and health care systems. Although the principal issues of budget deficits are not certainly new, the development of government deficits in the past decades have led to renewed interest. Therefore, a government fiscal operation is recognized as a tool for economic management and plays a very important role in stimulating economic growth. The effects of fiscal operations can be felt through policies, which provide signals to direct private sector investment to the most desired sectors as well as projects, and programs, which are undertaken by the public sector, especially, for infrastructural development. Such projects and programs when undertaken in the economic and social sectors can contribute significantly to the overall level of economic growth (Nelson & Sing, 1994).

The debate on the usefulness of fiscal deficit as a tool for promoting growth and development remains inconclusive, given the conflicting results of current researches. While some studies (e.g. Thornton, 1990) have provided evidence in favour of a net positive effect, others (e.g. Baily, 1980; Feldstein, 1980) have indicated a negative net effect. Also, Ariyo and Raheem (1990) reported that there was no stated objective underlying the deficit

profile to have been observed. They suggested that there should be a framework for assessing the impact of any proposed deficit on economic growth and development efforts in Kenya. Therefore, it is in the light of this that the study aimed at examining the relationship between fiscal deficit and economic growth in Kenya.Moreover, some observers (Barrow (1990) and Kneller et al (1999) have considered government fiscal operations to be generally large and inefficient (due to extra-budgetary spending), and that the regulatory process places excessive burden and costs on the economic system. Further, they observed that government's fiscal and monetary policies especially those relating to taxes and transfers often distort market prices thereby discouraging economic activities such as savings and investment. While others (Easterly and Rebelo (1993), Christal and Price (1995), Mauro (1995), and Foster and Henreskson (1999) have, however, posited that large government expenditure is a more powerful engine of growth. This contention is based on the belief that government reconciles conflicts between private and social interest, thus enhancing optimal allocation of economic resources to achieve economic growth. Also the virtuous circle between growth and good fiscal management has been seen as probable outcome of a policy of low and stable fiscal deficits. However, neither of these societal positions has been revealed by the findings of relevant research. In particular, there is no comprehensive country specific study, which investigates the relationship between government fiscal deficit and economic growth in Kenya and yet the findings of such studies are required to enhance informed policy decision-making on the subject matter. Empirically, however, governments have generally been recording deficits rather than surpluses. The rising magnitude of which has become of concern to economists and other interested parties. In particular, there is increasing concern about the possible unfavorable effects of persistent and large government deficits on some macroeconomic aggregates (Masson, 1985). In view of these concerns, the proposed study aims to fill these gaps by investigating empirically, the determinants of the growing government fiscal deficit and their impact on Kenya's economic performance. In Kenya, the notable study and relevant empirical work to the knowledge of the author is Kiptui (2005). He examined the impact of fiscal policy on private investment in Kenya and conspicuously found that budget deficits have significant effects on private investment, not contemporaneous but lugged, suggesting that the benefits of fiscal restraints are not immediately realized. The study did not find correlation between budget deficits and credit to private sector. The study did not come out with the relation between economic growth and budget deficits and direction of causality or transmission mechanisms through which budget deficits impacts on growth and hence the lacuna of the present study.

1.1: Macroeconomic Performance and Fiscal Deficit

This section highlights Kenya's macro-economic performance since independence (1963) and focuses mainly on the circumstances related to Kenya's budget deficits. The period 1963 – 1973 could be termed as the golden period of Kenya as it experienced a remarkable economic growth (an annual average of 6.5%) and macro-economic stability. However, in 1970 – 71, there were excessive expansionary policies that resulted in a balance of payment crisis that marked the most severe macro-economic imbalance since independence. The growth declined to 5.8% in 1972 and 3.1% by 1974 respectively. Generally, the economy maintained a manageable external balance during the first decade and was for most years in surplus (Economic Survey, 1975).

The period 1974 – 1979 was quite unstable and could be termed as the doom period of Kenya as it was marked by drought and oil crisis. The first drought and oil crisis of 1973 – 1975 led to a worldwide recession, poor export performance and resulted in a 33% decline in terms of trade. These rises further caused a decline in GDP from an annual growth of 5.8% in 1972 to 3.1% in 1974 and 1978. The prevailing situation therefore called for increased external borrowing, especially from the IMF, the World Bank and other commercial sources. The coffee boom of 1976 – 1978 temporarily alleviated the situation of the imbalance of payments and economic decline. There was a 26% increase in the export prices that contributed to 73% improvement in the terms of trade and an annual average growth rate of 8% (Ngeno, 1991)

In 1979, the country was again plagued with drought and oil crisis that triggered the need for the importation of foodstuffs. These crises affected the terms of trade and balance of payments position of the country and therefore the need to control imports and heavy borrowings from commercial sources and credit from IMF and World Bank, bilateral and multilateral donors in order to finance the deficits. These loans however, were obtained on hard terms and hence the increased cost of servicing. For instance, the debt service ratio that stood at 14% in 1975 went up to 28% in 1982 (GoK, 1978)

In the 1980 – 2000 periods, the country embarked on the structural adjustment programs having realized her structural weaknesses. The reforms were undertaken as part of the IMF, World Bank and other multilateral and bilateral agency programs. The reforms were in the nature of economic stabilization and trade liberalization. The specific policies included; reduction of public expenditure, maintenance of positive interest rates and realistic exchange rates, price decontrol, movement towards uniform tariffs, and reduction and eventual removal of quantitative import restrictions. Despite the fact that Kenya began to liberalize her economy in 1980s, the control of the economy remained pervasive . The problem of foreign exchange persisted and hence the continued use of

exchange and import controls. The attempted coup de tat of 1982 resulted in capital flight that further aggravated budget deficit. The situation, however, was ameliorated by the high world prices of tea in the 1983-84. Generally, the period of 1982-85 marked unsatisfactory performance of the economy and the balance of payments, which necessitated the need for external financing (Development Plan, 1985).

The economy improved a bit after the coffee boom of 1986 and the lower oil prices. However, the increased importation over the period further aggravated the balance of payment problem and necessitated large capital inflows. In 1986, the government introduced new measures to correct the structural weaknesses of the economy. These were spelt in the Sessional Paper No.1 of 1986, on "Economic Management for Renewed Growth" (the paper proposed a reduction in the budget deficit to a level not exceeding 2.5 per cent of GDP) and later included in the 1989/93-Development Plan. Tax revenues were projected to rise to 24 per cent of GDP by 1999/2000. The documents also emphasized sectoral reforms, which were preceded by the Budget Rationalization Program (BRP), introduced in 1985. From 1990 to date, Kenya has continued with her structural reforms like privatization of state owned enterprises, civil service reform which aims at thinning the number of those employed in the public sector and improving efficiency and delivery of service by those not retrenched. These reforms however, have not proved successful, as the country has been experiencing a rise in the stock of debt coupled with poor debt repayment level and declining economic growth. For instance, in the period 1970 – 74, the economy did well and recorded an annual average growth rate of 5% but started declining and in the year 2000 registered a negative growth rate of 0.3%, with the outstanding external debt amounting to Kshs.163 billion. The country up to date has also been suspended from the quick disbursing funds mainly from the IMF and World Bank due to non-commitment in the implementation of structural adjustment programs (Economic Survey, 2006**).**

2. REVIEW OF THEORITICAL AND EMPIRICAL STUDIES

The theoretical foundation of the study revolved around the Keynesians propositions that the government intervention in economic activity can help spur long term growth by ensuring efficiency in resource allocation, regulation of markets, stabilization of the economy, and harmonization of social conflicts (Keynes, 1936). The financing of any level of fiscal deficits whether through taxation of borrowing involves the absorption of real resources by the public sector that otherwise would be available to the private sector (the absorption of domestic resources will be delayed, of course, if foreign borrowings or unemployed resources are available). From a purely static allocative point of view, this absorption would improve overall efficiency if the social return (benefit) when public expenditure exceeds its private opportunity costs. However, the classical economists hold the view that government operations are inherently bureaucratic and inefficient and therefore stifle rather than promote growth. It seems then that as whether government's fiscal policy stimulates or stifles growth remains an empirical question. Economic theory reveals that the nature of the tax regime as means of increasing government revenue base can be detrimental or foster growth. A regime that causes distortions to private agent's investment incentives can retard investment and growth while the regime that leads to internalization of externalities by private agents may induce efficiency in resource allocation and foster growth. On the same note with the nature of government expenditure, excessive spending on consumption at the expense of investment is likely to deter growth.

While public expenditure may displace private sector output (the crowding out effect), it may also improve private sector productivity (the externality or public good effect).   The net impact on aggregate output of the crowding-out effect of public expenditure clearly depends on the relative marginal productivities of the public and private sectors. The higher the level of public expenditure, the greater the inefficiency and the lower the level of output. A large budget deficit has considerable effect on national savings and could crowd out private investment. Low investment harms future productivity because each worker has less capital with which to work in the future. The crowding out is brought through higher interest rates as firms that want to borrow for investment projects compete for that smaller pool of available funds. In the process, they bid up the interest rate that they are willing to pay. The higher interest rate dissuade some firms from undertaking their investment projects, with net results that investment declines hence growth (Pichman, 2004).Moreover, Government deficits create a short fall in private capital formation by reducing the pool of saving available for private sector borrowers, thus "crowding out" private capital formation. When the deficits are not used for investment purposes there is bound to be reduction in the total capital formation. An important feature of government borrowing is that, it is insensitive to interest rates. That is, the government will borrow whatever it needs to finance its deficit no matter what the interest rate because its budget deficits are always financed. As a result, deficits reduce the funds available for private capital formation. Faced with a higher required return, firms become more selective in choosing projects and cut back their investment and hence the crowding out effect and reduction of capital formation below the socially optimal level. The crowding out effects of public spending on the private sector may offset its beneficial effects on growth (Blinder and Solow, 1975).

The externality effect of public expenditure, in contrast, enhances growth by raising private sector productivity. Here, a higher level of such expenditure could achieve a high growth rate. In the recent endogenous growth literature, the focus has been on the stock of public infrastructure (or the level of services that flows from it) as a productive input. Another broad fiscal variable that could have implications for growth is budget policy, in the sense that the level of public revenue relative to that of expenditure, that is, the budget balance, may have growth effects that are separate from those related to the absolute level of either taxation or public expenditure. One type of the effects stems from the stability implications of budget imbalances. Another type is related to a possible behavioral response from the private sector triggered by such imbalances. If the private sector regards fiscal deficits (even if financed by debt) simply as taxes delayed, then it may choose to increase its own savings to neutralize the public dissaving, thus leading to an unchanged level of national savings. Alternatively, fiscal deficits might not induce a response in private sector savings, in which case national savings would be reduced and growth hampered (Tanzi and Howell (1997).

Generally, the relationship between growth and fiscal deficits revolve over three pertinent issues such as; excessive domestic borrowing by the government which crowds out private sector investment and push up interest rates; the accumulation of public debts; and the fear that the government may resort to money printing or seigniorage, thus resulting in inflation tax. These effects operate through three channels: First, high budget deficits may lead to higher real interest rates in financial markets, which may reduce investment and growth. Second, high deficits may increase risk premiums on interest rates, particularly raising the inflation risk and default risk premium. High interest rates risk premiums may discourage private investment. Third, high budget deficits may signal a high tax burden in future, which may discourage current aggregate expenditures and therefore private investment (Hermes and Lensink, 2001)

Using Cross Country regressions, Ram (1986) and, Aschauer (1989) found that, although growth in general is positively correlated with the rate of change in total public expenditure and hence economic growth, it is negatively correlated with the level of such expenditure. The latter result was also obtained by Levine and Remelt (1992) and Kormedi et al (1985). Easterly and Rebel (1993) and Grier et al (19890, examined the impact of fiscal policy on economic growth, using a regression analysis with cross-sectional time series data drawn from some developed and developing countries. On the whole, the evidence, particularly from cross-country data, suggested that the response by private sector savings to public sector de-savings does not completely neutralize the latter. The direct tests of the impact of budget deficits on growth based on cross-country data have also been recently performed by a number of studies: Martin and Fardmanesh (1990) find the correlation significant and negative only for middle-income countries, and Levine and Renelt (1992) find the correlation fragile. Also, Kouassy and Bhooun (1994) use a growth model to analyze the relationship between fiscal adjustment and growth in Cote d' Ivoire. The authors established that public investment has a net crowding in effect on the private sector and a positive impact on growth.

Adam and Bevan (2001), did a study to examine the relation between fiscal and growth for a panel of 45 developing countries. Based on a consistent treatment of the government budget constraint, it finds evidence of a threshold effect at a level of the deficits around 1.5% of GDP, a range over which deficit financing may be growth-enhancing. While there appears to be a growth payoff to reducing deficits to this level, this effect disappears or reverses itself for further fiscal interaction. The magnitude of this payoff, but not its general character, necessarily depends on how changes in the deficits are financed (through changes in borrowing or seigniorage) and on how the change in the deficits is accommodated elsewhere in the budget. They also found evidence of interaction effects beween deficits and debt stocks, with high debt stocks exacerbating the adverse consequence of high deficits. Alam, et al (2010), did a study to analyze the long run relationship between social expenditure and economic growth in Asian developing economies. He looked at the long run impact of expenditures on in social sector such as education, health and social security/welfare along with fiscal deficits/surplus on economic growth in case of ten Asian developing countries. The study concludes that expenditure in social sector can affect economic growth since expenditure enhances productivity by providing infrastructure, education, health, and harmonizing private and social interest. Expenditure composition also plays an important role promoting economic growth: fiscal adjustment that reduces unproductive expenditures and protects expenditure in social sector has proved to be more sustainable and more likely to result in faster growth.

Baldacci, et al (2003), concludes that fiscal policy has to be tailored to country-specific condition to foster growth. That is, uniform approach to fiscal policy in which all countries are counseled to reduce their deficits under all circumstances is not appropriate. Although the fiscal policy works differently, fiscal adjustments can also spur growth in the former. Given that a reduction in 1 percentage point in the ratio of fiscal deficits to GDP led to an average increase in per capita growth at least one fourth of a percentage point in the countries under consideration, it is possible that a reduction in the average deficit in low income countries from 4% of GDP to 2% of GDP could boost per capita growth by about half to one percentage point in fiscally vulnerable countries.

Fisher (1991) did a straightforward econometric study to examine the relationship between macroeconomic performance and long run economic growth. In his study, he picked up fiscal deficits, inflation rate and external debt

outstanding as indicators measuring the macroeconomic performance and executed cross-section regression on 73 developing countries. The result of his study clearly indicated that economic growth has a negative relationship to the fiscal deficit, inflation rate and external debt outstanding. The extent that fiscal budget is considered as a tool to achieve social and economic development described by World Bank, and several international bodies have advocated targeting public spending either through broad or narrow targeting strategies. It is believed that public spending can meet equity objectives with limited resources through targeting. Broad targeting is about subsidizing directly or indirectly services or commodities consumed mostly by the poor.

McCandnless (1991) contends that the impact of the budget deficits on economic growth is theoretically explained through the effects of the deficits on the flow of money into the economy and through supply side (infrastructure, education etc.) The more that government expenditures exceed revenue the more money will be circulated in the economy, which leads to higher employment and output. Carrere and Jaime (2007), examine the correlates of growth acceleration in per capita gross domestic product around significant public expenditure episodes by recognizing the data around turning points, or events. They define a growth of at least 2 percent points sustained for 5 years. Fiscal event is an increase in the annual growth rate of primary fiscal expenditure of approximately 1percentage point sustained for 5 years and not accompanied by aggravation of the fiscal deficit beyond 2 % of gross domestic product. These definitions of events are applied to a database of 140 countries (118 developing countries) for 1972-2005. After controlling for growth-inducing effects of positive terms-of –trade shocks and trade liberalization reform, probit estimates indicate that growth event is more likely to occur in a developing country when surrounding by a fiscal event. Moreover, the probability of occurrences of growth event in the years follwing a fiscal event is greater the lower is the associated fiscal deficit, confirming that success of a growth-oriented fiscal deficit expenditure reform hinges on a stabilized macroeconomic environment (through a limited primary deficit).The World Economic Outlook (IMF, 1996) concluded that during the mid-1980s a group of countries with high fiscal imbalances had significantly lower economic growth than countries with low to medium budget deficits. Shojai (19990 puts it that deficit spending that is financed by the central bank can also lead to inefficiencies in financial markets and cause high inflation in the developing countries. In addition budget deficits distort real exchange rates and the interest rate, which in turn undermines the international competitiveness of the economy.

The pioneering work of Rao, (1953) has pointed out the beneficial effects of government spending on infrastructure, health, education, and productive development projects .His study also indicated that government spending on productive development projects in developing countries is not as inflationary as it might be assumed because of the greater output growth. Eisner and Pieper (1987) reported a positive impact of cyclical and inflation-adjusted budget deficits on economic growth in the United States and the Organization for Economic Cooperation and development (OECD) countries. Nelson and Sing (1994) used data on a cross section of 70 developing countries during two time period, 1970-1979 and 1980-1989, to investigate the effects of budget deficits on GDP growth rates. They estimated the relationship between growth (GDP growth rate) and the public policy variables using ordinary least square (OLS) method. Their study concluded that the budget deficits had no significant effect on the economic growth of those nations in the 1970s and 1980s.

Based on cross-country regressions of a large sample of developing countries, Aizenman and Marion (1993) present empirical evidence that suggests that, to varying degrees, there is a significant and negative correlation between growth and uncertainty in a number of fiscal variables, such as levels of revenue, public expenditure, and budget deficits. The uncertainty in a variable is measured in the model employed by the standard deviation of the residuals from a first order autoregressive process of that variable.

Iran, Aghevli and Sassan Pour (1982) developed a small macro-econometrics model to assess the impact of oil revenues on the economy. The model developed, which has its roots in the monetary approach provided some useful results. Their findings clearly indicate that increased oil revenues had stimulative effect on growth of the Iranian economy.

The study by Landau (1983) was quite illuminating. He used a sample of 96 developing countries to determine the relationship between fiscal deficits and economic growth. He inferred that big government spending, measured by the share of government consumption expenditures in gross domestic product (GDP), and reduced growth of per capita income lead to large fiscal deficits. Landau (1986) reaffirmed his earlier findings by examining another set of variables influencing economic growth, including per capita income, the structure of production, population and global economic conditions.

3. RESEARCH METHODOLOGY

Basically, the study used a combination of exploratory and causal research designs. These enabled the establishment of the link between growth and fiscal variables. For the purpose of policy, simulation experiments were conducted from which policy implications were derived . The study concentrated mainly on the relationship

between fiscal deficits and economic growth. The population of the study comprised the period since independence (1963-2007), 43 years. However, the period 1963-1969 was remarkable as Kenya registered growth rate that averaged 6.4 % (Economic Survey, 1970) without conspicuous budget deficits being experienced. The sample of the study focused on the period (1970-2007), 38 years. This sample was purposively selected since the period 1970 to date has been the period that most developing economies have experienced growing budget deficits along side debt repayment burden. The period (sample) of study is above the statistically recommended sample size of 30 that ensures the realization of a normal distribution, reliable and valid inferential statistics for policy implications.

3.1. The model Specification

The study adopted a classical production function that was modified to incorporate other policy variables affecting economic growth like foreign exchange, private investment, and inflation rates. The model that was estimated took the following functional form:

$$GD = \alpha + \sum_{j=1}^{n} \beta_j X_{jt} + \mu_t \ -------------------------------(1)$$

Where:
GD stands for gross domestic product growth rate
X_j = Exogenous variables and
t = Year of observation

α and β_j are parameters to be estimated

μ_t = random unobserved disturbance with zero mean and a constant variance

Based on the priori logic, data accessibility and review of the relevant literature on the relation between economic growth and fiscal variables, the following variables were included in the model to be estimated. These were represented by **X_j** in the above generalized functional model.

GD   = Gross Domestic Product growth rate
K   = Investment-Income Ratio (proxy for capital)
BD   = Budget Deficit
POP   = Proxy for Labour force (population)
PI   = Private domestic investment
IN   = Inflation rate
FE   = Foreign Exchange
(DV)   = Dummy Variable (proxy for Structural adjustment program or government policy shift: the value of zero
              before 1992 and one from 1992
F   = Functional Relationship between the variables

The functional model that was finally estimated for policy implication was therefore specified as below:

GD=f (K, BD, PO, PI, IN, FE, DV)…..………….……………………….……… (2)

In equation (2) the variables should be in rates of growth and hence should be differenced or be estimated in logarithms form. When the dependent variable has been expressed in natural logarithms, the coefficient of any given X is interpreted as a percentage change in the dependent variable given a change in that particular X. In this case, the total differencing of equation (2) therefore resulted to equation three as below:

$$\partial GD = GD_K \partial K + GD_{BD} BD + GD_{PO} POP + GD_{PI} PI + GD_{IN} IN + GD_{FE} FE + GD_{DV}.DV ....(3)$$

NB: ∂ represents differencing term

Where, GDj is the partial derivative of GD with respect to the jth functional argument. Dividing equation (3) through by GD yields the growth equation (4) as below:

$$GD = \beta_K \dot{K} + \beta_{BD} \dot{BD} + \beta_{PO} \dot{PO}P + \beta_{PI} \dot{PI} + \beta_{IN} \dot{IN} + \beta_{FE} \dot{FE} + \beta_{DV} \dot{DV} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4)$$

Where: a dot over each variable indicates the rate of growth while, β_K , β_{BD} , β_{PO} , β_{PI} , β_{IN} , β_{FE} , and β_{DV} are the elasticities of gross domestic product (GD) with respect to Capital (K), Budget Deficits (BD), Population (PO), Private Investment (PI) , Foreign Exchange (FE) , Inflation (IN) and Structural Adjustment Programs (DV) , respectively.

Where also: (β_{1-k}) are the marginal products of the variable in the model specified in equation (4) above. To make the model be estimated, an intercept (β_0) and error term (ε) are added to equation (4) to produce the final model to be estimated using Ordinary Least Square (OLS) as below:

$$GD = \beta_0 + \beta_K \dot{K} + \beta_{BD} \dot{BD} + \beta_{PO} \dot{PO} + \beta_{PI} \dot{PI} + \beta_{IN} \dot{IN} + \beta_{FE} \dot{FE} + \beta_{DV} \dot{DV} + \varepsilon \ldots\ldots\ldots\ldots\ldots(5)$$

To capture the elasticities of output or growth rate (GD) with respect to all the regressors, all the variables in the model were logged and the final estimable model became as equation (6) below:

$$LogGD = \beta_0 + \beta_1 LogK + \beta_2 LogBD + \beta_3 LogPO + \beta_4 LogPI + \beta_5 LogIN + \beta_6 LogFE + \beta_7 DV + \varepsilon...(6)$$

The error term 'ε' captures the stochastic disturbances and is postulated to satisfy all the classical assumptions (**Appendix 1**)

The a prior signs are: **β₁ □0; β ₂ □0; β□ □□0; β₄□0; β₅, <0; β6 <0; β₇ > 0;**

3.2. Data Type and Sources

The study mainly employed annual time series secondary data for a period of 38 years 1970-2007). In order to facilitate time series analysis, data such as; Gross Domestic Product (GDP), Labor Force (Population Figures), Capital (Investment-Income Ratio), Private Investment, Fiscal deficit, Savings, National Income, Exchange Rate, Inflation etc, shall be obtained from KIPPRA, International Financial Statistics, Development Plans (various issues), Statistical Abstract (Kenya National Bureau of Statistic), Central Bank of Kenya Bulletins, World Debt Tables and economic Surveys (various issues). The variables in the model specified were in real terms and hence did not require any further transformation to validate their use in the regression models.

3.3. Time Series Data

Time series data in most cases lack information and generally follows a trend such that anything that grows overtime will fit any aggregated time series data. These normally result in the problem of spurious regression not suitable for policy implication, where there is a high R^2, but no meaningful relationship between or among the variables. Such a high coefficient of determination (R^2) could be due to the presence of the trend, not a true relationship between or among the variables. Stationarity of the time series data is crucial useful in ensuring that a proper and accurate forecasting of events can be realised. The data that was found non–stationary was therefore be differenced before any regression analysis was conducted.

3.4. Stationarity Testing (Unit Root Tests)

Granger and Newbold (1974) recommend differencing the data when spurious correlations are expected. However, differencing all the time series data results in the loss of information about the equilibrium relationship between the levels. The recent literature on co-integration and stationarity testing provides a more rigorous framework for avoiding spurious regression while retaining long-run information about the equilibrium relationship in the variables at levels. The rational behind co-integration is that economic results are legitimate only when time series are stationary. Time series data were therefore tested to determine the degree of differencing before they achieve stationarity. The series are co-integrated if some linear combination of variable results in a 'white' noise (a random walk).

The Dickey-Fuller (Dickey-Fuller, 1987) and, Augmented Dickey-Fuller (Dickey & Fuller, 1981) tests were applied to test if the variables were stationary, I (0) or needed to be of first order difference I (1) or second order difference I (2) to induce Stationarity. The method of estimating error correction model (ECM) with co-integrating series was used to prove a cross-confirmation of the results. First, was a two-step procedure advocated by Engle

and Granger (1987), which tests for co-integration at levels stage before considering the dynamic properties. The validity of the second stage dynamic results depends on the appropriate specification at the level stage. The first stage of Engle and Granger explores the levels or the equilibrium part of the ECM to establish an R^2 that is close to unity at the level stage, significant coefficient, a significant no-zero e.g. DW statistics and DF and ADF tests on the residual from the level regressions. If the variables co-integrate, the coefficient estimates from the regression of these variables in the levels can be interpreted as the long-run multipliers and the short – run error correction model is estimated based on the results of co-integration tests. The second stage involves regressions using stationary time series (variables in difference) and inclusion of the lagged residual variable. This lagged term; RES (-1) is intended to capture the error correction process as agent adjusts for expectations about the equilibrium relationship in the previous period.

3.5. Data Analysis and Presentation

The above model was estimated using the Ordinary Least Squares (OLS) technique. The non-stationarity of the time series data supported the application of the co-integration method (ECM) in each model as recommended by Engle and Granger (1987) to enable the attainment of improved, efficient and consistent results useful for forecasting and policy formulation. Time series properties of the data were examined by carrying out unit root tests (Dickey Fuller and Augmented Dickey Fuller) as well as Johansen Co integration test.

      To test for the stability of the parameters, Chow (1960) breakpoint test was performed to ascertain whether there exist any structural shift in the economy that affects growth before and after SAPs (the tests helps in knowing whether or not an economic relationship has changed e.g. regime shift before and after SAPs). The test also provides a check for structural stability (parameter constancy) of the estimated model. It also tests whether the model specification is externally valid when used in predictions based on post data or policy simulations. The test is based on F test (**see appendix 3**). Other diagnostic tests for econometric problems such as autocorrelation in residual, heteroscedasticity and multicollinearity were performed mainly to ascertain that the model is well specified. If the calculated F test statistics is less than the theoretical value, then there is no proof of a structural break. On the other hand, the null hypothesis of structural stability is rejected if the estimated value exceeds the critical F value, at the chosen level of significance. The regression was performed using E-views statistical packages. The overall significance of the variables in the model was indicated by the coefficient of determination (R^2) (**see R-Square, Appendix9)**

4. RESULTS

4.1. Stationarity Tests

Appendix 1shows the results of stationarity tests that were performed on the variables at level to ascertain the validity and reliability of the data used in the estimations and further enhance policy implications. It shows the results of the unit root test on the variables in the model at levels. Both Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests verified the stationarity of the data. However, the most recommended unit root test was the Augmented Dickey-Fuller (ADF) as it captures a long lag length. Basing on the ADF test results it was concluded that the variables were non-stationary and hence the need to difference them so as to induce stationarity. The table also shows the order of integration of the variables used in the model for the Kenyan data (1970-2007). Elbadawi and Soto (1995) points out that such test for non-stationarity also verify whether the series could be represented more appropriately as trend stationary process or difference. The DF and ADF tests exhibited that all the variables were non-stationary at levels and hence was the need to difference them in order to induce stationarity. The results of DF and ADF tests on the variables, after differencing them to make them stationary (**Appendix 2**), indicated that all the variables were stationary as the Augmented Dickey-Fuller tests pointed to the existence of stationarity for all variables at their first difference, variables followed order one process (integrated of order one, I (1),). Since the study suggested the use of error correction method (ECM) by Engle and Granger (1987), the long run model was first regressed (**see appendix 7**) to help in the computation of the residual on which the test for co-integration of the growth model variables was performed and later used in the formulation of the error correction term in the model. A comparison of the computed Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) test results with critical values of -5.211 and -3.24413 at 1% and 10% respectively (**see appendix 1)**, supported the existence of co-integration between the growth in output (G) and its fundamentals. The existence of co-integration was also upheld by Phllips-Perron (PP) test whose critical values at 5% and 10% significance level are -2.9665 and -2.6220 respectively. This justified the use and specification of the error correction method (ECM) as in equation **7** below. The error correction term formed

from the residual of the regression of the growth function at levels (**appendix 7**) was incorporated in the short-run (dynamic) model as in the equation (7) to capture the short-run dynamics or disequilibria.

$$LNGD = \beta_0 + \beta_1 LNK_t + \beta_2 LNBD_t + \beta_3 LPOP_t + \beta_4 LPI_t + \beta_5 LNIN_t + \beta_6 LNFE \ \beta_7 + \beta_8 \ ECT_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \textbf{(7)}$$

The cointegration test was performed on the residual (**Appendix 4**) of the static long-run model and the results indicated that the errors in the cointegration regression model were stationary, a proof of the cointegration of the regression variables. The residual was found to be stationary at 1% level (DF) and 10% level (ADF). This was also upheld by Phillips-Perron Test. This justified the use of the residual in the error correction model. The lagged value of the residual was therefore incorporated in the dynamic model to capture short run dynamics or disequilibria (**see equation 7)**, where the variables are already made stationary by differencing.

4.2: Diagnostic Tests

The diagnostic tests were performed using E-views. From the judgment of the Durbin Watson (DW) that was found to be 2.01387, very close to the recommended 2, there was neither autocorrelation nor heteroscedasticity. This was confirmed from the Durbin Watson statistics table, as the DW value of 2.013 was found to be falling between Durbin Watson lower (dl) and upper (du) of 0.544 and 2.568 respectively. More so, the fact that the data used in regression was detrended by differencing could be a possible reason of no auto-correlation. The Breuch-Godfray serial correlation LM Test, a general test for autocorrelation was performed and suggested the absence of second order correlation as evidenced by LM test statistics of 0.076148 being less than its critical of 2.46 (at 5% level). The null hypothesis of no serial correlation was therefore accepted.

      The absence of heteroscedasticity was, however, not surprising, as the problem is quite inherent while dealing with cross-sectional data that the study did not apply. This was supported by autoregressive-conditional homoskedasticity (ARCH) test. Given as F-test with null hypothesis that the model is homoskedastic, the computed statistics of 1.509886 was relatively lower than the critical F- value of 2.568, supporting the null hypothesis.

      The F-test showed that R^2 (0.989) is significant at the 1% level ($F_C > F\alpha$). F- Calculated F (16, 17) was found to be 459.4854 and F at 5% critical level was 2.46. The null hypothesis that the model does not explain the growth was rejected and the alternative that growth is significantly affected by the variables in the model was accepted, and therefore the model had significantly high explanatory power.

      It could also be deduced from the test, that the model had the right mathematical form (well specified), basing the judgment from the Adjusted R-squared ($R^{2)}$) of 0.974, the F-Statistic and Standard error obtained from the regression of the growth model (**Appendix 9**). The model was therefore correctly specified and hence fit and applicable for policy analysis and forecasting.

      The normality test for the computed residual and on the regression variables was performed using the Jarque-Bera (**Appendix 6**). The test (JB) is a direct test of the distribution of error term and the variables. As can be noted, the efficiency and consistency of OLS estimator is on the basis of normality distribution of the error terms. The (JB) uses the first four moments of distribution (mean, standard deviation, skewness and excess Kurtosis) along with the minimum and maximum values of the series to construct a distribution, which can then be compared against the equivalent value, produced by the standard normal distribution. JB test (**Appendix 5**)) was performed on all the explanatory variables to investigate the extent to which they could affect the results obtained. The null hypothesis was that the variables are normally distributed. The test results found all the variables except one to be normally distributed.

      The variable PI was found to be not normally distributed although had negligible impact on the regression results as was confirmed by the JB normality test on the error terms (residuals), (Appendix 6)**.** From the normality test results the null hypothesis that the random variable is normally distributed failed to be rejected and hence the statistical reliability of the OLS estimator.

      To test for the structural stability of the model Chow test (F-test) was used. The sample was split into two periods, pre (1970-1983) and post (1984-2007). It was hypothesized that the model is unstable and a forecast of ten years (1995-2005) was allowed. The outcome of Chow test for the model was 1.36 for F- Calculated F (15, 14). The null hypothesis was rejected, since the critical value for $F_{0.5}$ (15, 14), 2.36 was in the rejection region. It was therefore concluded that the model was stable over the period of the study and hence applicable for policy analysis.

      The existence of multicollinearity among the explanatory variables of the regression model was suspected owing to the high R^2, but the fact that all the coefficient of the variables were found to be significant at 1% and 5% levels ruled out multicollinearity. More so the absence of multicollinearity was supported by the fact that most of the variables exhibited their expected signs.

To assess the validity of the model the historical simulation was undertaken and on the whole, the model performed well with the simulated values of the endogenous variable, GDP, closely tracking the corresponding actual data series, over the sample period (see appendix 10. The variance (σ) and Schwarz Criterion (SC) also indicated the improvements in the parsimony of the model, that is, from -3.707707 (over-parameterised model) to -5.079901 (parsimonious model) as can be seen in appendices 8 and 9. This further qualified the use of the model in forecasting and policy formulation.

The significance of the residual (**Appendix 4**) justified its use in the dynamic model to form the error correction term in equation 7, which rests on the idea that there exists an equilibrium relationship between the relevant variables. The parsimonious model upon which the policy conclusions of the study were drawn was got from the regressed over-parameterised model (Hendry, 1990). Ideally, the testing down procedure according to Hendry should lead ultimately to a model, probably an ECM, suitably parsimonious, with a goodness of fit at least approaching that of the general or over-parameterised model (Appendix **8**), using variables in equation (7). The longest lag length that the computer accepted was one. From the over-parameterised model, a parsimonious short-run (dynamic) model was obtained and results reported in appendix 9.

4.3 Discussion of Regression Results

The dynamic growth model results (Appendix 9) explains the relationship between the budget deficits and economic growth not withstanding the impact of budget deficits on Kenya's economic growth. It was noted that most of the variables exhibited the expected signs and were significant at 1%, 5% and 10% levels respectively.

The constant (C) was found positive and significant at 1% at level, suggesting that even if all the variables in the model were held constant, growth would still occur . It showed that 1.46% of variation in growth rate was due to other factors not included in the model.

The lagged GD showed the expected positive sign and was significant at 5% level. This shows that growth level in the previous period affects the current growth positively and that growth has its own momentum. It showed that 0.749% increase in growth would be due to its own momentum

The inflation rate (IN) that was used to also measure the macroeconomic stability of the country showed the expected negative sign and was found to be significant at 1% level. The regression results show that 1% change in inflation contributes to0. 63% decline in growth rate. This could be a case of hyperinflation (above 10%) that raises the interest rate on loanable funds, thereby reducing the demand for investment funds and contributes negatively to the growth of an economy. However, some optimal level of inflation can help spur economic growth especially mild or creeping inflation rate of less than 6% (Drazen, 1979)

The capital accumulation (K) that was a proxy for investment-income ratio was found to be contributing positively to economic growth and was significant at 1% level and showed that a 1% change in investment-income (K) ratio leads to 0.087% increase growth rate. The lagged value of investment-income ratio (K) also showed expected positive sign and was significant at 10% level. This showed that the previous level of investment impacts positively on current level of economic growth.

Budget deficits were found to have unexpected positive impact on growth of an economy at 1% level of significance. It shows that 1% change in budget deficits contributes 6.6% positive change in the growth of an economy. It shows that the expenditure that surpassed the revenue was put on productive ventures. The previous level of budget deficits was also found to have positive impact on economic growth at 5% level and that 1% change in the previous level of budged deficits increases growth by 0.09%. This was expected as previous deficits would imply more expenditure than revenue which is expected to impact positively on the current growth of an economy. This could on the other hand imply that budget deficits crowds-out private sector investment as government borrows extensively from the domestic financial institutions, pushing up the interest rate on investment fund required by the private sector which today considered by many economies as the engine of growth and hence need enabling environment on which to thrive.

The current level of private investment (PI) was found to have positive impact on economic growth and was significant at 1% level. This means that 1% change in private investment increases economic growth by 0.099%. The previous value of private investment (PI (-1) was also found to be significant at 1% level. It shows that 1% increase in investment level leads to 0.082% increase in the level of economic growth and showed the expected positive sign since the impact of investment on growth occurs with a lag.

Current exchange rate exchange rate (FE) exhibited negative sign as was expected and was significant at 1% level. The result indicates that 1% increase in exchange rates contributes to 0.79% decline in growth rate. However, the lagged nominal exchange rate exhibited a positive sign and was also significant at 1% level, showing that 1% increase in exchange rate contributes 0.92% increase in growth rate. The negative relationship was suspect of devaluation of domestic currency, thereby making importation of intermediate products expensive or unaffordable by the investors. On the other hand, the positive sign could mean that the home currency appreciates ; thereby

making imported intermediated goods cheaper and further promotes growth or it could imply devaluation policy aimed at promoting exports that has multiplier effect on the growth of the economy.

The regression results also showed that the current labour force that was proxied by population (POP) negatively affect growth rate although was significant at1% level. It indicates that 1% increase in labour-force contributes 0.64% decline in growth. This was unexpected sign as a positive relationship is expected between current labour (POP) and economic growth. It indicated that Kenya's labour-force is unproductive and hence not positively affects growth rate. However, the lagged value of population exhibited the expected positive sign (significant at 1% level). It shows that 1% change in labour-force contributes 0.36% increase in the growth rate. This shows that labour-force contributes positively to economic growth with a lag. The result found attests to the fact that developing economies like Kenya still suffer from human resource gap and could heavily depend on the foreign expatriates who in most cases channel their earned incomes back to their countries and hence a withdrawal from the circular flow of income.

The dummy variable (DV) that represented structural adjustment program (SAPs), exhibited positive sign and was significant at 1% level. This indicates that the reforms so far undertaken by the government, such civil service reform and economic liberalisation, have positively contributed to Kenya's economic growth. The regression result indicates that 1% change in SAPs, leads to 0.068% increase in growth rate.

The lagged residual was found to be significant at 1% level and exhibited the expected negative sign. This further confirmed that the model was well specified and also validated the use of the error correction method (ECM). It supported the fact that budget deficits positively stimulates economic growth and that there was speed of adjustment of about 0.24% of variables towards their long-run relationship and also suggested that the variables in the model are co-integrated.

The R^2 of the regression showed that most of the variables in the model explain 97% of variation in the growth of Kenya's economy. This is supported by the F-Statistics of 459.4854 and F-Probability of 0.000000 that was significant at 1%level, confirming the overall significance of the model. The Durbin-Watson statistics was not far from the required level of 2.0, a sign of lack of autocorrelation.

In summary, the estimated growth model identified the following factors to be statistically significant (at 1% and 5%) influencing Kenya's economic growth: (IN) inflation (-), (K) capital (+); (BD) budget deficits (+); (BD(-1) previous level of budget deficits; (PI) private investment (+); (PI(-1) previous level of private investment; (FE) foreign exchange (-); (FE(-1) previous foreign exchange (+); (POP) labour-force (-); (POP(-1) previous labour-force and (DV) structural adjustment programmes (+). The diagnostic tests performed showed that the model was quite satisfactory, capable and adequately explains the salient features of the data and therefore consistent with the main implication of economic theory, attesting to the outcome of the robust results. From the results obtained it can be generally concluded that budget deficits has been contributory in spurring economic growth despite the fact that the economy is grappling with large debt burden evidenced by the increasing external debt and the ills associated with it. The results can therefore be used in deriving the sustainability level of budget deficits beyond which further rise can have negative effects on economic growth through its effects on private investment (crowding out private investment).

5. CONCLUSIONS AND RECOMMENDATIONS

This section is devoted to conclusions derived from the empirical findings of the study, the policy recommendations, limitations and suggestion for further research. It is worth noting that the conclusions and recommendations are based on the results of dynamic growth model results (appendix9).

5.1: Conclusions

This study aimed at finding the relationship between economic growth and fiscal deficits using annual time series secondary data (1970-20007). Given the nature of time series data, the study applied recent econometric approaches of error correction and co-integration (Engle-Granger (1987). The empirical analysis suggests the existence of longrun dynamic relationship among variables considered in the models (the cointegration test done on the residuals **(appendix 4**).

Based on the dynamic growth model, the study concludes that fiscal deficits can increase economic growth as it enhance productivity by providing infrastructure, education, health and harmonise private and social interest. The study therefore found a positive relationship between economic growth and budget deficits in Kenya. This finding strongly support the traditional Keynesian tenets that increased government expenditure can help achieve expansionary fiscal policy as it leads to an increase in domestic production, making private investors become more optimistic about future course of the economy and start investing more capital and hence increased capital accumulation that through multiplier process achieves positive economic growth. The Keynesians strongly suggest

that government expenditure increases aggregate demand, which enhances the profitability of private investments and further leads to higher level of investment to capitalize on the improved aggregate demand in the economy. The findings of the study were in congruent with the previous studies (Kouassy and Bourabre (1991), Blinder and Solow (1973), and Kelly (1997) who found that public expenditure positively impact on economic growth.

Prompt correction of fiscal balance in the short run would entail slower growth, but it would be positive for growth and standard of living over the longer run compared with delayed adjustment. Prompt correction of the external deficits via exchange rate adjustments, even if it occurs smoothly, is likely to be associated with lower near-term growth. A delayed correction of the external deficit may involve larger macroeconomic costs of transaction to a sustainable position.

5.2: Recommendations

The study recommends that the government should find ways of enhancing her revenue generation capacity especially by broadening the tax base in order to finance her expenditure adequately and help increase the multiplier that further generate output hence economic growth. The optimal level of government expenditure should be determined so as to avoid deficits and the crowding out effect of private investment which many economies encourage as the impetus to economic growth and development.

The major policy implications of the present study are that stable macro economics, trade liberalisation and growth oriented policies are workable if they are complimented by the provision of important public services like health, education, infrastructure of roads, ports, water resources, quick and impartial judicial system, effective policy making system, strong legal framework, judicious taxation and a professional government. Strong and stable policy planning, professional institutions and competitive public service thus considered prerequisite for growth. The issue of growth, versus welfare trade-off receive serious attention for the economist and policy makers world wide. They may imply cost saving measures, for instance, reliance on flatter commodity taxes, make discriminatory pension, unemployment benefits based on work experience and wage level, disproportionately large spending on education, health and reduction of administrative cost. Expenditure composition can also promote economic growth. Fiscal adjustment that reduces unproductive expenditure and protects expenditure in social sector has proved to be more sustainable and more likely to result in faster growth

As the study revealed that inflation (IN) that measures the macroeconomic stability has been adversely affecting economic growth, the country should continue striving to control inflation to a level not harmful to growth and development by maintaining her commitments on firm fiscal policies and monetary adjustments. However, some optimal level of inflation is recommended as that wound induce growth and development of an economy.

The study recommend further research to be done on the impact of specific components of government expenditure like expenditure on military, education, health and social security and welfare and other variables on economic growth and development to ascertain Keynes' postulation that government expenditure positively spur growth and development through the multiplier effect, thereby crowding-in private sector investment.

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APPENDICES

Appendix 1.Stationarity Test Results (Variables in levels)

Stationarity Test Results (Variables in Levels)

VARIABLES	DF	LAG	ADF	LAG
GD	-2.395	0	-2.280	1
BD	-2.467	0	-2.563	1
POP	0.503	0	0.142	1
PI	-4.354	0	-3.547	1
IN	-2.159	0	-2.290	1
FE	-2.571	0	-2.373	1
NS	-3.675	0	-3.123	1
IR	-2.978	0	-2.423	1
K	-3.606	0	-3.054	1

Source: Authors own Calculation

Note:

Dickey-Fuller Critical Values at: 1% = -4.3082, 5% = -3.5731 and 10% = -3.2203

Augmented Dickey-Fuller Critical Values at: 1% =-4.3226, 5%= -3.5796 and 10%=3.2239

Appendix 2. Stionarity Tests Results (in difference)

Stationarity Test results (in difference)

Variable	DF	(n)	ADF	(n)
LNINF	-4.370774	1	-3.536684	1
LNX	-5.524321	1	-4.401243	1
LNGD	-5.992679	1	-3.783368	1
LNG	-8.372247	1	-4.908320	1
LNIY	-6.806381	1	-5.959413	1
LNL	-4.498962	1	-5.617800	1
LND	-5.378421	1	-6.113338	1

Source: Author's Own Calculation
Note:
(1)   Dickey-Fuller Critical Values (first difference) at: 1% = -4.3082, 5% = -3.573 and 10% = -3.2203
(2)   Augmented Dickey-Fuller Critical Values (first difference) at: 1% = -4.3226, 5% = -3.5796 and
          10% = -3.2239

Appendix 3: Test for Model Stability (Chow Test)

$$F(k, n_1 + n_2 - 2k) = \frac{(RSS - RSS_1 - RSS_2)/k}{(RSS_1 + RSSS_2)/(n_1 + n_2 - 2k)}$$

Where
F = observed F ratio at $n_1 + n_2$ - 2k degrees of freedom
RSS = Pooled residual sum of squares with $n_1 + n_2$ observations
RSS1 = Residual sum of squares with n_1 observations
RSS2 = Residual sum of squares with n_2 observations
K = Number of estimated parameters including the intercept
n_1 = Number of observations in the first sub-period of sample (1970-1990)
n_2 = Number of observations in the second sub-period of sample (1991-2007)

NB. If the calculated F test statistic is less than the theoretical value, then there is no proof of a structural break. On the other hand, the null hypothesis of structural stability is rejected if the estimated value exceeds the critical F value, at the chosen level of significance.

Appendix 4. Static Model: Stationarity Test on the Residuals by Dickey Fuller (DF), Augmented Dickey Fuller (ADF), and Phillip Perron (PP)

Variable	DF	ADF	PP
Residual	-5.210276	-3.245413	-5.309876

Source: Author's Own Calculation
Note:
Critical Values of DF at: 1% = -4.5062   Critical Values of PP at: 1% = -3.6752
                                 5% = -3.5731   5% = -2.9665
                                 10% = -3.2203   10% = -2.6620

Critical Values of ADF at: 1% = -4.3226
                              5% = -3.5796
                              10% = -3.2239

Appendix 5. The normality Test on the Regression Variables

Variable	Skewness	JB (PROB)	Normally Distributed
LNGD	-0.624130	3.206712 (0.201240)	YES
LNK	0.689404	3.052401 (0.217353)	YES
LNBD	0.653896	3.052976 (0.217297)	YES
LNPOP	-0.076060	2.046922 (0.359349)	YES
LNPI	-1.185975	14.39080 (0.446939)	NO
LNIN	0.175769	2.198846 (0.216353)	YES
LNFE	0.402813	3.065104 (0.349349)	YES
RESID (-1)	-0.032859	0.899154 (0.638217)	YES

Source: Authors Own Calculations

Appendix 6. JB Normality Test on the Residuals

Variable	Skewness	JB (PROB)	Normally Distributed
Residuals	0.25764	0.923829 (0.630045)	YES

Appendix 7: Static (Long run) Regression Growth Model

Dependent Variable: LNGD KSH.
Method: Least Squares
Date: 11/02/2010   Time: 17:44
Sample(adjusted): 1971 2007
Included observations: 38 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LogGD(-1)	0.613514	0.265173	2.256216	0.0351
LogIN	-0.679736	0.224042	-2.974523	0.0245
LogK	0.032534	0.038685	0.345679	0.6553
LogK(-1)	-0.060784	0.046345	-1.179815	0.1923
LogBD	0.567231	0.064283	2.461215	0.0275
LogBD(-1)	-0.233123	0.073665	-0.786357	0.2745
LogPI	0.281463	0.032567	2.038643	0.0578
LogPI(-1)	0.175678	0.051663	1.641246	0.0467
LogPOP	-0.230954	3.357346	-1.455457	0.0515
LogPOP(-1)	-0.204537	3.356126	2.456563	0.0546
LogFE	-0.638205	0.132747	-5.068651	0.0002
LogFE(-1)	0.504854	0.284667	2.476082	0.0227
DV	0.013127	0.045731	0.074902	0.0327
C	-1.364742	2.478583	-0.559727	0.6780

R-squared	0.948835	Mean dependent var		8.193692
Adjusted R-squared	0.949832	S.D. dependent var		0.521278
S.E. of regression	0.024637	Akaike info criterion		-4.647223
Sum squared resid	0.006053	Schwarz criterion		-3.914871
Log likelihood	92.06261	F-statistic		1086.739
Durbin-Watson stat	1.921939	Prob(F-statistic)		0.000000

Appendix 8: Results of Over-parameterized (General) Growth Model)

Dependent Variable: D(LNGD KSH)
Method: Least Squares
Date: 11/02/2010   Time: 10:31
Sample(adjusted): 1972 2007
Included observations: 37 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LogGD(-1))	0.545038	0.375536	1.385461	0.3002
D(LogIN)	-0.435957	0.314294	-1.163643	0.3837
D(LogIN(-1))	-0.246956	0.120862	-1.132188	0.3128
D(LogK)	0.055439	0.050865	1.089925	0.3255
D(LogK(-1))	0.044023	0.051982	0.846891	0.4357
D(LogBD)	0.167886	0.087856	1.910925	0.1143
D(LogBD(-1))	-0.112223	0.093806	-1.196331	0.2852
D(LogIPI)	0.035802	0.064306	0.556739	0.6017
D(LogPI(-1))	0.064759	0.039542	1.637740	0.1624
D(LogFE)	-0.899478	0.170375	-5.279413	0.0032
D(LogFE(-1))	0.599380	0.394380	1.519801	0.1890
D(LogPOP)	-5.994531	3.378530	-1.774302	0.1362
D(LogPOP(-1))	5.092371	3.365611	1.513060	0.1907
DV	0.014190	0.022275	0.637071	0.5521
RESID1(-1)	-0.095838	0.216486	-0.442697	0.6765
C	0.082756	0.097423	0.849452	0.4344

R-squared	0.997215	Mean dependent var	-0.043292
Adjusted R-squared	0.984405	S.D. dependent var	0.181440
S.E. of regression	0.022658	Akaike info criterion	-4.839263
Sum squared resid	0.002567	Schwarz criterion	-3.707707
Log likelihood	94.16931	F-statistic	77.84463
Durbin-Watson stat	2.742053	Prob(F-statistic)	0.000063

Appendix 9: The Dynamic (Short-run) Growth Model

Dependent Variable: D(LNGD KSH)
Method: Least Squares
Date: 12/02/2010   Time: 16:13
Sample(adjusted): 1972 2007
Included observations: 37 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LogGD(-1))	0.748614	0.147331	5.358447	0.0004
D(LogIN)	-0.631366	0.089183	-5.8776268	0.0002
D(LogK)	0.087103	0.017958	4.2336448	0.0017
D(LogBD)	0.165603	0.041788	5.162544	0.0005
D(LogBD(-1))	-0.092420	0.042348	-2.712132	0.0257
D(LogPI)	0.098781	0.027154	4.882502	0.0007
D(LogPI(-1))	0.082435	0.016459	4.686742	0.0006
D(Log FE)	-0.789487	0.050987	-1.515813	0.0001
D(LogFE(-1))	0.923727	0.163263	5.451924	0.0003
D(LogPOP)	-6.431617	1.202301	-5.219678	0.0004
D(LogPOP(-1))	3.567130	0.895986	3.789154	0.0026
DV	0.068463	0.043534	0.576061	0.0554
RESID1(-1)	-0.242679	0.065498	-4.215872	0.0018
C	1.456742	0.037583	4.563588	0.0020

R-squared	0.988594	Mean dependent var	-0.043251
Adjusted R-squared	0.976420	S.D. dependent var	0.182145
S.E. of regression	0.010898	Akaike info criterion	-5.928568
Sum squared resid	0.001306	Schwarz criterion	-5.079901
Log likelihood	103.9642	F-statistic	459.4854
Durbin-Watson stat	2.013847	Prob(F-statistic)	0.000000

Appendix10: Actual and Fitted Values of LogGD(LNGD)