HUMAN CAPITAL DEVELOPMENT AND ECONOMIC GROWTH IN NIGERIA

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DECLARATION

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DEDICATION

This work is dedicated to the Almighty God for making it a dream come true.

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Abstract

This study attempts to provide empirical evidence on the role of human capital development (proxied by federal government expenditure on health, education, health, gross fixed capital formation, primary, secondary and tertiary school enrolment and other social and community services) on economic development process from 1980 to 2012. The study applied the autoregressive distributed lag (ARDL) bounds testing approach to cointegration. The estimated long run relationship established the positive contribution of human capital development in the economic growth process of Nigeria. The impact however is low relatively to the contributions of physical capital accumulation. For a sustainable economic growth in Nigeria, the study posits that government should make a conscious effort to encourage the establishment of labour-intensive industries, restructure the educational system coupled with good governance.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Nigeria with a population of approximately 168.8 million spread over an area of about 923,800sq. kilometers is among the few nations in the universe amply blessed with abundant human and natural resource for development. The existence of the rich natural endowment in the country necessitated investment in human capital in order to efficiently harness the resources for economic development.

Investment in human capital has been shown to be positively related to economic growth and development of a nation (Gbosi, 1996: Yesufu, 2000; Guptal et al, 2001; Olaniyi & Adam 2002). It has been argued however that human capital development raise the income of the poor in a nation, thus raising the income spread between the poor and the rich which of course is a worldwide objective of macroeconomics. A simplified implication of this is that human capital development promote equity and reduces poverty besides aid in the efficient allocation and civilization of scale resources. It has also been argued that human capital development is closely tied to the issues of education and economic growth and development. Economic growth and development is largely a function of human capital, which is an embodiment of good health, education, knowledge, skills, attitudes, expertise and technological known-how (Nwankwo, 1981; Babalola 2003; Adeyemi & Akpotu 2004).

Human capital theorists are of the view that education as an investment in human capital pays off in the form of higher lifetime earnings of the individual as well as enhancing the efficient productive capacity of the nation's economy. The human capital theory as propounded by Schultz (1960), modified by Gunderson and Raddell (1980) and reported by Nafziger (1990); Chamberlain, Cullen and Lewin (1980) saw investment in human capital as involving such activities as;

i. All expenditures on health facilities and services that affect and improve the life expectancy, strength and stamina, and the rigour and vitality of a people.

ii. On-the-job training, including old style apprenticeship organized by firms.

iii. Formally organized education at the primary, post-primary and tertiary levels including research.

iv. Study programmes for adults that are not organized by firms, including extension programmes notably in agriculture, and

v. Migration and job search by individuals and families to adjust to changing job opportunities.

The human capital theory is thus, an extension of the investment theory applied to human resources. It postulates that expenditure incurred by individuals and societies in the course of providing education, health care delivery and the likes tend to increase their future productive capacity at the expense of current consumption. In effect, just as investment in machines and factories result in future flow of output and income for the firms, investment in all forms of education and health care services and other services aimed at environmental protection and indeed poverty eradication equally yield knowledge and skills, aptitude and talents, vigour and strength that provide a future flow of earnings for individual and society. Education and health, thus have a symbolic relationship just as they both contribute to economic growth and development (Omotor, 2003).

However, the extent to which government is disposed to spending in education, health care delivery services and poverty eradication largely determines how well they can contribute to economic growth and development. This fact is succinctly articulated by Awaritefe (1998); Akpotu (1996); Kyloh (2007); and Nwadiani (1998).

The authors stressed that a vital component of the economic growth and development base of any country is its manpower force and the degree to which the development potential of any country is actualized depends largely on the quality and level of education and training with which its manpower force is located. Thus, a country which is unable to develop and utilize her human resources skills and knowledge will certainly not be able to develop economically and otherwise.

However, some studies on a number of developing countries have also reportes weak evidence to support the view that human capital development necessarily improves economic growth (Caselli, et al 1996, Markiw et al 1992, Benhabib & Spiegel, 1994 & Pritchett 1996).

Three reasons advanced for this argument are; that excess supply could lead to a decline in the rate of return; education labour can be associated with social waste and counterproductive activities and that schooling may not necessarily ignite cognitive skills. These arguments are well documented in Pritcnett (1996).

The role of human capital development in the economic growth and development process has however been recognized by the local, state and federal government of Nigeria. Human capital development has been recognized by the Delta State Government through its various skills and acquisition programmes in the state amongst other state government of the federation. Human capital development was a key element in late president Yar'Adua's Seven Point Agenda. This goal is also not left out in the present administration steered by president Goodluck Ebele Jonathan. Consequently, resources have been channeled into the development of the social service sectors of the economy (comprising health, education and other socio-economic services). Despite this recognition and efforts, studies on human capital development as an engine of economic growth and development in Nigeria are scanty. Some attempted references includes works of Ekpo (1996); Odusola (1998) and Olaniyi and Adams (2002). These studies incontrovertibly highlight and analyze public expenditure pattern and human development.

The issue of investment in human capital resulting in economic growth and development of Nigeria has therefore at best received peripheral attention. A recent attempt is Adamu (2012) where the emphasis was more on determining the aggregate effects of human capital on economic growth in Nigeria using an error correction approach.

1.2 Statement of the Problems

In general some factors have been identified as militating against effective human resource development, utilization and management in Nigeria. In Nigeria, the rate of illiteracy is very high. Most of the workers are unskilled and they make use of outmoded capital, equipment and methods of production. By implication, their marginal productivity is extremely low and this leads to low real income, low savings, low investment and consequently low rate of capital formation. Thus, human capital contributions to economic growth has been insignificant and its performance has not increase significantly over the years. Government investment in education, health, and other social and community services like poverty eradication, provision of portable water, irrigation, and environmental protection have had little impact on economic growth over the years. The labour market is weak with a poor rewarding system which has encouraged brain drain. Underemployment and unemployment is the order of the day, as thousands of graduates are seen roaming the streets of major cities in the country. Corruption and mismanagement of

public funds is rampant as political considerations now outweighs economic considerations in most government decisions.

Vision 20-2020 aimed at making Nigeria one of the twenty nations that is most industrialized in the world. The strategy aimed at empowering the citizenry to acquire the skills and knowledge that would prepare them for the vast challenges.

Overtime, the following issues relating to the concept have remained unresolved. Uneven distribution of skilled manpower, misemployment of human capital in Nigeria, poor reward system retarding the acquisition and development of human capital.

1.3 Research Questions

i. What is the relationship between human capital development and economic growth?
ii. What are the determinants of human capital development in Nigeria?
iii. Is human capital performance increasing in Nigeria?
iv. Has human capital development policies and strategies enhance economic growth in Nigeria?

1.4 Objectives of the Study

The broad objective is to examine the role of human capital development on the economic growth in Nigeria.

The specific objectives are to:

i. examine the relationship between investment in education, health, physical capital formation and other social services expenditure and economic growth in Nigeria.
ii. examine the determinants of human capital development in Nigeria.
iii. determine whether human capital performance is increasing in Nigeria.
iv. determine the relationship between human capital development policies and strategies and economic growth in Nigeria and
v. proffer some policy recommendations to the government in order to improve on human capital development in Nigeria

1.5 Research Hypotheses

The relationship between human capital development and economic growth will be tested using Nigerian data. Therefore, the following hypothesis will be tested.

$H_{O\,1}$: There is no significant relationship between human capital development and economic growth in Nigeria.

$H_{O\,2}$: There is no significant relationship between investment in education, health, physical capital formation and other social service expenditures and economic growth in Nigeria.

$H_{O\,3}$: There is no significant relationship between primary school enrollment, secondary school enrollment and tertiary school enrollment on economic growth in Nigeria.

1.6 Significance of Study

The study of this nature is prompted by the slow rate of Nigeria's economic growth despite the huge contributions of the government and other private bodies. Researches on this topic carried out over the years have not really achieved its prior objectives. The effects of human capital development on economic growth hold a lot of benefits to our overall economic progress. The government and its agencies will find this work resourceful in formulating policies, directives and regulations for human capital development, including corporate bodies and students carrying out research work, to aid economic growth.

1.7 Scope of the Study

This study examines the impact of human capital development (proxied by total federal government expenditure on education, health, gross fixed capital formation, other social and community services, primary, secondary and tertiary school enrollment) on economic growth of Nigeria from 1980 to 2012. This period is so desired for this study because the petroleum sector, that required highly skilled manpower of which Nigeria was lacking, dominated the Nigerian economy, thus leading to capital flight.

1.8 Limitation of the Study

Some of the limitation to this work are distance constraints and problems of gathering relevant data from various sources and relevant books, journals and other materials.

1.9 Meaning of Terms

The following terms were defined as used in the study:

Human Capital: Human capital refers to the productive skills and degree of knowledge possessed by an individually worker directed towards production.

Gross Fixed Capital Formation (GFCF): Gross fixed capital formation refers to the net increase in physical assets (investment minus disposals) within the measurement period.

Gross Domestic Product (GDP): This is the monetary value of final output of goods and services produced in a country over a period of time.

Social and Community Services (SCS): These are benefits and facilities such as education, food subsidies, health care, and subsidized housing provided by a government to improve the life and living conditions of the children, disabled, the elderly, and the poor in the national community. SCS captures the federal government expenditure on poverty eradication, provision of portable water, irrigation and environmental protection. A combination of these enhances the living standard of people and hence higher productivity.

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CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Conceptual Framework

The pioneering work regarding human capital development and economic growth is the growth rate of human capital, which also depends on the amount of time allocated individuals to acquire skills. Rebelo (1991) later extended the model by introducing physical capital as an additional input in the human capital accumulation function. However, the model of endogenous growth by Romer (1990) assumes that the creation of new ideas is a direct function of human capital which manifest in the form of knowledge. As a result investment in human capital led to growth in physical capital which in turn leads to economic growth. Other studies that supported human capital accumulation as a source of economic growth include (Barro & Lee, 1993; Romer, 1991; Benhabib & Spiegel, 1994). Some studies have examined different ways through which human capital can affect economic growth.

The endogenous growth literature captures the insight that the crucial force behind positive growth rates is the elimination of the tendency of diminishing returns to investment in a broad class of capital goods, including human capital. Antecedents of this literature utilize theories of technological progress, innovation and imitation (Romer, 1989; Grossman & Helpman, 1991), learning by doing (Stokey, 1991), and population change, fertility and human capital investment (Becker & Barro, 1988) in order to introduce increasing or constant returns to scale to the cumulative factor of production. Recent advances in the new growth theory identify among many others, the degree of educational attainment as a crucial determinant of the long-run rate of economic growth (Gallipoli et al, 2011; Canton, 2007). Following the lines of Uzawa (1965) and Lucas (1988), many theories have been developed to explain the process of human capital accumulation via investment in education, both public and private. In Uzawa (1965), and individual's productivity depends on how many time she devotes to education. In Lucas (1988), human capital is the engine of growth and is produced by a technology where the only input is human capital itself.

Studies of the effects of human capital on growth, such as Mankiw, Romer and Weil (1992) and Barro (1991), were based on data sets pertaining to a very diverse array of (more than 100) countries during the post-1960 era. They used narrow flow measures of human capital such

as the school enrolment rates at the primary and secondary levels, which were found to be positively associated with output growth rates. Barro reported that the process of catching up was firmly linked to human capital formation: only those poor countries with high levels of human capital formation relative to their GDP tended to catch up with the richer countries.

While there is persuasive evidence about the positive relation between initial human capital levels and output growth and (weaker) empirical support for the relation between changes in human capital and growth, it is not all clear that this implies a causal relationship running from human capital to economic growth. Motivated by the fact that schooling has increased dramatically in the last 40years while the "productivity slow down" became manifest in many of the higher income economies, Bills and Klenow (2000) suggest that the casual direction may run from growth to schooling. That relationship would be predicted by a Mincerian model in which high anticipated growth leads to lower discount rates in the population, and so to higher demands for schooling. Of course, both variables might be driven by other factors. From the results of different empirical tests, Bils and Klenow conclude that the channel from schooling to growth is too weak to explain the strong positive association found by Barro (1991), and Barro and Lee (1993), as described above. However, they argued that the "growth to schooling" connection is capable of generating a coefficient of the magnitude reported by Barro.

Azariadis and Drazen (1990) model the mechanism of human capital transmission across generations in the more plausible framework of an overlapping generation's model (Lucas followed Ramsey in the simplifying assumption that households, as well as firms, are infinitely lived). In these models agents inherit the human capital accumulated by the previous generations; they then decide how much time to devote to train a young graduate in acquiring further skills in technology that increase labour quality, thereby affecting their marginal productivity when older. Since a given generation deciding its own human capital investment does not take into account the inter-temporal spill-over upon the human capital endowment of future generations, there is a technological externality that can result in constant or increasing returns to human capital at the social level. This state of affairs could be ascribed to the impossibility of contracting with the future generations, and sometimes is described as allocations inefficiency due to "incompleteness of markets". The source of this problem affecting human capital investment is therefore, rather different from the set of conditions previously seen to impair the allocation efficiency of markets that do exist.

Acemoglu (1998) has offered a formal demonstration of how positive spill-over effects (pecuniary externalities) created by workers' educational and training, investment decisions can give rise to macro-level increasing returns in human capital. His model supposes that workers and firms market their investments in human capital and physical capital respectively before being randomly matched with one another. The direct consequences of random matching is that the expected rate of return on human capital is increasing in the expected amount of (complementary) physical capital with which a worker will be provided. Similarly, the return on physical capital is increasing in the average human capital that the firms expect the workers to bring to the job. Hence an increase in education for a group of workers induces the firms to invest more in tangible assets, thereby increasing the returns to all workers in the economy. Through the model, it can be seen that there are "social increasing returns" in physical capital.

In a recent development, Gupta and Chakraborty (2011) develop an endogenous growth model of a dual economy where human capital accumulation is the source of economic growth. They argued that the duality between the rich individual exists in the mechanism of human capital accumulation. Rich individuals allocate labour time not only for their own production and knowledge accumulation but also train the poor individuals. In a different dimension, Bratti et al (2004) estimated a model of economic growth and human capital accumulation based on a sample of countries at a different stage of development. Their result revealed that the increase in the primary and secondary level of education contributes to an increase in productivity. They posit that human capital accumulation rates are affected by demographic variables. For example, they established that an increase in life expectancy at birth brings about an increase in secondary and tertiary education while a decrease in the juvenile dependence rate negatively affects secondary education. Finally, they added that geographic variables have a considerable importance in the human capital accumulation process. Nevertheless, studies differed on the impact of human capital on productivity growth.

As a source of productivity, Haouas and Yagoubi (2005) examined openness and human capital as source of productivity growth for Middle East and North Africa (MENA) countries. Controlling for fixed effects as well as endogeneity in the model, they found that while human capital significantly influenced growth, it has no underlying effect on productivity growth. Park (2004) empirically investigates the growth implication in terms of educational attainment levels.

Based on a polled of 5-years interval time series data set of 94 developed and developing countries between 1960 and 1965, the study revealed that the dispersion index as well as the average index of human capital positively influences productivity growth. They concluded that education policy that creates more dispersion in the human capital will promote growth. Similarly, but in a slightly different manner, Leoning (2002) investigates the impact of human capital on economic growth in Guatermala through the application of an error correction methodology. He examined two different channels by which human capital is expected to influence growth. The result from his study revealed that a better-educated labour force appears to have a positive and significant impact on economic growth both via factor accumulation as well as on the evolution of total factor productivity.

The importance of education and human capital has been brought out in many studies of economic growth and development. Robert (1991) developed a human capital model which shows that education and the creation of human capital was responsible for both the differences in labour productivity and the differences in overall levels of technology that we observe in the world. More than anything else, it has been the spectacular growth in East Asia that has given education and human capital their current popularity in the field of economic growth and development. Countries such as Hong Kong, Korea, Singapore, and Taiwan have achieved unprecedented rates of economic growth while making large investments in education. In the statistical analysis that accompanied his study, the World Bank (1993) found that improvement in education is a very significant explanatory variable for East Asian economic growth. There are several ways of modeling how the huge expansion of education accelerated economic growth and development. The first is to view education as an investment in human capital. A different view of the role of education in the economic success is that education has positive externalities. "Educate part of the community and the whole of it benefits". The idea that education generates positive externalities is by no means argued strongly for government active support of education on the grounds of the positive externalities that society would gain from a more educated labour force and populace. (Van-Den-Bery 2011). Smith (1986) views the externalities to education as important to the proper functioning not only of the economy but of a democratic society.

Maddison (1980) reported the effect of education and health expenditure on growth for 22 developed countries for the period spanning 1950-1965. This study was unique in one respect.

It makes a distinction between growth that has been induced by policy and growth that would have occurred spontaneously. It was reported from the study that on the average policy induce growth in the form of investment and improved health and education. Again Thirwall (2010) confirmed the initial findings of other researchers by concluding that the major sources of growth in developing countries is increased factor inputs, aided by improvements in the quality of labour through health improvement and education. In the same vein, Hanushek (1995) argued that incentives, decentralized decision making and proper evaluation are key variable that could promote high quality schools which is vital to human capital development. He concluded that the poor relationship between educational inputs and outputs is due to the fact that schools all over the world pursue very inefficient policies. Thirwall (2010) further reveals that, though resource transfers induced growth, it is not very important for developing countries, because of the inability of the industrial sector to absorb the surplus labour increase and the weakness of the education system to produce a quality graduates for the economy.

A broader approach of analyzing the impact of social spending is to consider the investment on human capital. Todaro (2000) reported that such investment takes many forms, including expenditures on health facilities, on-the-job and institutional training, formally organized education, study programmes and adult education. Investment in human capital can overcome many of the characteristics of labour force that act as impediments to greater productivity such as poor health, illiteracy, unreceptiveness to new knowledge, fear of change, lack of incentive and immorality. Education might raise productivity (Todaro, 2000) and there has been sufficient demand for this more productive educated labour to maintain or increase private return but the demand for educated labour comes, at last in part, from individually remunerative yet socially wasteful or unproductive activities. In this case, the relative wage of each individual could rise with education producing the micro evidence while an increase in average education would cause aggregate output to stagnate or fall (Pritchett 2001).

Again Mincer (1984) and Temple (1999) separately reported that, the quality and structure of education matter on its impact on growth. It has the tendency to stunt growth if the quality is low and resources allocated to it are not well-targeted. Growth theories have always treated human capital development as given in the growth process. Classical theory emphasizes the importance for capital accumulation, while Neo-classical extended Keynes (1936) analysis of

static equilibrium by looking at what will happen if changes in income produce investment (Harrod,1945 & Domar, 1946).

An empirical review of the theory by Garba (2002) showed that cross-country regressions have shown a positive correlation between educational attainment and economic growth and development. Odekunle (2001) affirms that investment in human capital has positive effects on the supply of entrepreneurial activity and technological innovation as an investment has future benefits of creation of status, job security and other benefits in cash and in kind. However, Ayara (2002) reported that education has not had the expected positive growth impact on economic growth in Nigeria. Hence, he proposes three possibilities that could account for such results which are:

i. Educational capital has gone into privately remunerative but socially unproductive activities.

ii. there has been a slow growth in the demand for educated labour.

iii. The education system has failed, such that schooling provides few (or no) skills.

Foster and Rosenziweig (1995) demonstrate that increased education is associated with faster technology adoption in Green Revolution India. Similarly, higher education levels have been shown to increase innovation in business in Sri Lanka. In this sense human development may also enter into an Uzawa-Lucas type endogenous growth model as a factor affecting growth rates through its effect on technological change. Statistical analysis of clothing and engineering industries in Sri lanka (Deraniyagala, 1995) showed that the skill and education levels of workers and entrepreneurs were positively related to the rate of technical change of the firm. Education alone, of course transform an economy.

2.1.1 Investing in Education and Health: The Human Capital Approach

In development economics, human capital has been considered as a principal input into the production function. This is because reasonable proportion of development objectives are linked to human capital and its associated components. Based on research findings, human capital have been conveniently categorized into two major components.

i. Health Human Capital (HHC)

ii. Education Human Capital (EHC)

Like human capital, HHC and EHC are also considered as integral parts of the realization of development objective either at the household or economy level (Todaro, 2011). Due to their importance, HHC and EHC are considered as inputs into the production function or the development process. In terms of integration into the production function. These components of human capital are overwhelmly applied in either the exogenous or endogenous growth theories as seen in the previous section. It is important to note that these components are not only seen as inputs into the development process but are equally referred to and seen as investment made into either the individual, household or the entire population. (Todaro,2011). This view/argument is derived from the following basic facts.

First, greater investment in HHC may improve or raise the returns to investment in EHC. Second, greater investment in EHC may also improve or raise returns to investment in HHC (Todaro, 2011).

The above arguments are predicated on the fact that the improvements in the productive efficiency from the investment made in EHC may raise the returns on a lifesaving investment in HHC. However, controversies have trailed the questions relating to income and investment in both HHC and EHC. For instance, increase in income often does not lead to substantial increase in investment in the health or education of the population in less development countries. This has been attributed to market failures and impoverished standard of the health facilities in most LDCs (Todaro, 2011).

Although there are a lot of approaches to the analysis to the investment in HHC and EHC, the human capital approach has been recognized as relatively superior to other approaches (Todaro,2011). This is because the human capital approach has the following unique characteristics.

(i) It gives us a preview of the pattern of the initial investment in EHC which is expected to lead to a stream of higher future income.

(ii) Also, the HHC approach incorporates the presented discounted value of the stream of future income as compared to the cost of the investment made in either of the human capitals.

(iii) Furthermore, the human capital approach gives a fundamental information on the private returns that accurate to EHC as the level of education attained increases. It has been argued in the development literature that the private returns to EHC are very high and are expected to be higher than the social returns to EHC.

2.1.2 Investment Decisions in Human Capital Theory

Investment decisions usually entail an initial cost that is expected over a period of time. For many labour supply decisions, current wages and working condition are not usually the only deciding factors. To have a better understanding of these decisions, we need to develop a behavioural framework that incorporates investment behaviour. Every worker seems to make three major types of investments.

They are:

(1) Education and Training,

(2) Migration; and

(3) Search for new jobs.

These three types of investments entail an initial cost. They are made with the expectation that the investments will pay off well into the future. To differentiate them from other types of investments we usually refer to them as investments in human capital. Health facilities and services are also another type of investment in human capital. This aspect of investment in human capital provides for good medical care, descent housing and better food. This will lead to an improvement in the quality of labour in employment. It will also increase the quantity of labour available for work either by reducing the amount of working times or by reducing the incidence of death among workers.

2.1.3 Education and Training

For the purpose of simplicity, society wealth is a combination of both human and non-human capital. Each of them are briefly described below.

Human Capital: By human capital we mean the productive skills and degree of knowledge possessed by an individually worker. Labour is a productive resource. However, not all kinds of labour yield the same value of product. For example, making managerial decisions about what to produce is considered to be a more productive work than ordinarily performing a manual task in an industry. But in order to perform successfully, the highly productive job of a managing director, a worker must have a number of specialized skills which he has developed through either formal education or on the job training. Hence, it is generally argued that the productive

skills and degree of knowledge possessed by an Individual worker is part of his human capital. Human capital is acquired by the expenditures of money usually function payments for education and training. Specifically human capital includes accumulated investments in such activities as education, training and other social and community services rendered by the government and other bodies.

Non-Human Capital: According to classical economists, capital is viewed as any stock which exists at a given period and yields a stream of services overtime. Consequently, they contended that all flows of incomes belong to the product of some stream of capital whose value can be calculated by capitalizing the income flow with an appropriate discount rate. Capital goods are referred to as physical goods that can be used as factor inputs for further production. Capital can also be defined as items such as tools, machines and buildings that are used in the production process. To put It another way, capital refers to society's physical means of production which include factories, buildings, machines, tools and inventories of goods in stock.

It is important to know that the expected returns to human capital investments are higher level of earnings, greater job satisfaction over one's life-time and greater approximation of market activities. Generally speaking the investment expenditures can be classified into three categories. Thus, we have the following:

(i) Direct Expenses,

(ii) Forgone Earnings; and

(iii) Psychic Losses.

Direct expenses include tuition and books (education) traveling expenses (migration and petrol (job search). *Forgone earnings* are the costs incurred because during the investment period it is usually impossible to work at least full time. Psychic losses are the third kind of costs incurred because education is difficult and often boring, because job search is tedious and nerve breaking and because migration means saying good bye to old friends.

It is important to add that such investments are clearly related to the supply of labour in a particular occupation or different occupations. Specifically, this study of human capital theory adds more depth to the understanding of occupational choice. There are many ways open to

workers as well as potential workers to enhance their earning capacity through education. They can attend secondary school, Colleges of Education or Universities. They can also attend trade school or technical institute. Another method is that they can enter an apprenticeship programme or they can even acquire skills on the job. We can use the same approach to analyze any of the types of education and training mentioned above. For simplicity purposes, we shall analyze the demand for university education as an illustration of human capital theory. People will want to attend university when they believe within themselves that they will be better off after doing so. For some, the benefits may be short term. They like the courses taught at the university or the lifestyle of students. This is because they attend the University for the satisfaction it provides during the period of attendance.

On the other hand, there are other categories of people who attend the University for the Long-term Benefits it will provide. These benefits may be in the form of higher earnings, gaining access to more interesting, challenging, or pleasant jobs or in the form of prestige.

In Nigeria today, the Economics of education has become a major field for professional economists. For many, however, the major question raised is: Does education real pay? If so, how much and for whom?

Furthermore, economists like Adam Smith (1936), David Richardo (1917), Thomas Malthus (1820), Alfred Marshal and Karl Marx (1942), just mention a few of them, realized the importance of education and training in the improvement of labour as a factor of production. Unfortunately, none of them ever attempted to specify a rate of returns. Today, however, economists have attempted to measure the benefits from education with the help of cost Benefits Analysis. Briefly stated, cost benefit analysis provides a technique for evaluating public programmes or policy changes from an economic view point by comparing the benefits of the programme with its costs. Both the benefits and the costs have to be measured in marginal terms. It is therefore basically a technique used in the evaluation of marginal benefits of a programme or policy compared to its costs. This type of comparison is necessary for the public sector if economically efficient resource allocation decisions have to be made. This does not in any way mean that the model cannot be used in the private sector. The argument, however, is that cost benefit analysis is widely used in the public sector.

It is important to mention that the model has some theoretical problems. This therefore can lead us to the measurement problems. It is usually difficult to measure the intangible benefits and costs. This is quite true with public programmes where there are many beneficiaries. Despite this limitation, the model is widely used in screening public programmes.

The costs of going to school (university) are usually incurred over a relatively short period of time. These costs include:

(1) The direct cost of tuition fees and books;

(2) Forgone earnings associated with school; and

(3) Psychic costs. It is important to know that the costs of going to school are thus very high with the monetary costs alone (direct costs + forgone earnings).

From this brief analysis, one can see that university education is time consuming and involves monetary and non- monetary costs. However, university education is a worthwhile venture because the benefits are always greater than the costs. These benefits may include increased earnings, high employment opportunity, status and prestige.

In deciding whether to attend college, no doubt few students make the very private considerations expressed in equation. Nevertheless, if they make less formal estimates that take into consideration the same factors, four procedures concerning the demand for college education can be made.

(1) Present-oriented people are likely to go to college rather than forward- looking (other things being equal)

(2) Most college students will be young

(3) College students will increase if the costs of college education fall (other things being equal).

(4) College of graduates will increase if the gap between the earnings of college graduates and high school graduates widens (other things being equal).

We now throw more light on each of the procedures in the discussion that follows.

Present-oriented people. Psychologists generally refer to present-oriented people as those who do not weigh future events or successes very heavily. All people discount the future with respect to the present. But those who discount it more than average or at the extreme ignore the future altogether could be considered present-oriented. The rates of discount that people use in making investment decisions are rarely available. This is because the discount rates are not made as factually as equation implies. However, the model suggests that people who have a high propensity to invest in education will also engage in other forward — looking behaviour. Indeed, certain medical statistics tend to support this prediction.

(5) **Age**: When considering some yearly benefits of going to college, young people have a higher present value of actual benefits than older worker. This is simply because they have a higher remaining work life ahead of them. Therefore we expect younger people to have a greater propensity than older people to obtain college education or engage in other forms of training activity.

(6) **Costs:** A third prediction of our model is that human capital investments are more likely when costs are lower. The major opportunity costs of college attendance are forgone earnings and the direct costs of tuition, books and fees. Food and clothing are not regarded as direct opportunity costs of going to college. This is because much of the costs would have to be incurred in any event. Thus, if forgone earnings or major costs fall, other things being equal, we would expect an increase in college enrolments.

The costs of college education offer an additional reason why we observe older people attending less often than younger people. Normally, when workers acquire certain levels of experience, majority of employers are willing to reward them with higher wages. The psychic cost of going to college, however, cannot be ignored. These costs cannot be easily observed. However, they are likely to be related to activity. People who learn easily and do well in school settings have an entire and more pleasant time in college than people who do not.

(7) **Earning Differentials**: The fourth prediction of human capital theory is that the demand for education is positively related to the returns. That is, it is related to the increases in life time earnings or possible benefits that a college education allows. In practice, the predication can be treated only with reference to monetary returns since people returns are uncalculateable.

2.1.4 Human Capital and its Measurement

With perceiving about the importance of human capital, many countries have tried to effectively and efficiently measure their human capital to understand their current status and thereafter implemented various ways to improve their human capital. Therefore, it can be recognized that human capital measurement is an important source in terms of suggesting various policies regarding human resources.

Despite this necessity of human capital measurement, traditional method of the human capital measurement includes a few limitations. To begin with, Wolf (2002) suggests that some indicators can be actually considered as incomplete ones. To support his assertion, he exemplifies that a worker's wage one of human capital indicators as proxies-hardly measures 'authentic human capital'. By the drawback of traditional human capital measurement, it is acceptable to measure the authentic human capital instead of utilizing proxies such as income and productivity.

Second, it is difficult that human capital itself independently contributes to individual development and national economy growth. According to Ashton & Green (1996), it is necessary that the link between human capital and economic performance should be considered within a social and political context to precisely measure the human capital. Furthermore, many empirical literatures present that financial, human and social capital positively influence 'something like individual health' (Blakey, Lochner, & Kawachi, 2002; Veenstra, 2001; Veenstra et al., 2005; Wilson et al., 2004).

2.1.5 Characteristic of Human capital

Indigenous Characteristics

According to Crawford (1991), compared to physical labour, human capital as broad meaning includes expandable, self-generating, transportable, and shareable characteristic. To begin with, the expandable and self-generating characteristics of human capital are closely linked to the possibility that the stock of knowledge increases individuals' human capital. Furthermore, the increase of human capital can be expanded by either endogenous or exogenous factors. It is possible that original knowledge can be continuously elaborated and developed through the relationship between external knowledge, information, skills, experiences, and other knowledge-

based factors as well. In the economic perspective, the characteristic of human capital focusing on knowledge can be a core element to solve 'problem of scarcity' which little materials is equivalently distributed to economic agents. Throughout expanding and self-generating the human capital, it is sufficiently possible that the portion of that capital as an economic agent is extended.

Secondly, the transportable and shareable characteristics of human capital mean that the original holder of knowledge can distribute his/her knowledge to others. On the circumstance that the original knowledge-holder's exclusive ownership is slightly acceptable, the equivalent distribution between the holders and the takers can be actualized. Consequently, the former two characteristics extend the 'volume' of human capital, and the latter two expand the 'range' of human capital.

2.1.6 Impacts of Human Capital

The impact of human capital is largely categorized into three parts: individual, organization, and society. In the perspective of individual in the internal labour market, most of researchers refer to the possibility of increasing individual income, resulting from the individual productivity (Becker, 1993 & Sidorkin, 2007). Because of the increment of an individual's productivity on human capital, for the purpose of maximizing organizational profits, most of employers prefer to high productive individuals. Furthermore, it is considerable that individual mobility increases owing to the improvement of productivity in the internal labor market. By the increase of productivity in the workplace, the high-productive individual is recognized as the worker with much possibility to move to higher level in the internal market (Sicherman, 1991; Galor 1990).

In the perspective of individual in the external market, an unemployed individual's human capital affects his/her job-seeking and employable opportunities (Greider, Denise-Neinhaus, & Statham, 1992; Vinokur et al., 2000). On the internalized human capital, an individual easily holds the possibility to access job related information with high level of human capital, and thereafter he/she can easily obtain the occupational chances compared to otherwise.
With respect to organization, Lepak & Snell (1999) suggest that the potential of human capital is closely linked to core competences and competitiveness of organization. Similar to this perspective, Edvison and Malone (1997) present individual human capital can affect

organizational human capital such as ‘collective competences, organizational routines, company culture and relational capital’ as well.

Finally, the social perspective of human capital is the synthesis of both individual and organizational perspective. McMahon (1999) depicts the possibility of human capital for ‘democracy, human rights, and political stability’ on common consciousness of social constituents. According to Beach (2009), human capital can increase social consciousness of constituents within community. Consequently, the link between human capital and social consciousness is based on a close inter-relationship resulting in sociopolitical development (Alexander, 1996; Grubb & Lazerson, 2004; Sen, 1999).

2.1.7 Division of Human Capital

Generally, some researchers present three distinguished kinds of human capital such as general, firm specific, and task-specific human capital (Gibbons & Waldman, 2004; Hatch & Dyer, 2004). Otherwise, Becker (1984) delineates that human capital is categorized into general and specific one. General human capital is ‘to be defined by generic knowledge and skill, not specific to a task or a company, usually accumulated through working experiences and education’ (Alan at al., 2008). The general human capital holds ‘transferable’ characteristic across jobs, firms and industry. It is relatively easy that the general human capital embedded in an individual transfers to different industries. Contrast to the general human capital, firm/task specific human capital is usually accumulated through education, training, working experience on ‘knowledge specific to a firm/task’ (Alan at al., 2008). As pointed out by Becker (1994, 1986), the specific human capital is rarely transferable to be applied to other jobs, firm, and industry, and thus it is impossible to transfer much income in the labour market.

Furthermore, human capital is ‘specific’ if it increases a worker’s productivity only at the firm (Becker,1984). Consequently, it is difficult that the specific human capital embedded in an individual transfers to different industries.

2.1.8 Conventional Measurement Method of Human Capital

The conventional standard to measure human capital stock has been largely categorized into three parts: Output-, Cost-, and Income-based approach. School enrollment rates, scholastic attainments, adult literacy, and average years of schooling are the examples of output-based approach; cost-based approach is based on calculating costs paid for obtaining knowledge; and income-based approach is closely linked to each individual's benefits obtained by education and training investment.

(i) Output-Based Approach

For the purpose of analyzing relationship between human capital and economic growth, some economists attempted to measure the stock of human capital utilizing 'school enrollment rates' as a proxy of human capital (Barro, 1991; Barro & Lee, 1993). Throughout calculating the ratio between individuals of school age and students enrolling in the educational institutions, the economists show the stock of human capital that each country holds. However, the method includes a drawback that a student's effectiveness can be recognized after participating in production activities. In the perspective of educational attainment, Nehru, Swanson, &Dubey (1993) attempted to measure relationship between human capital and students' 'accumulated years of schooling' in the employable age as educational attainment. Assuming that the stock of human capital is the sum of each individual's years of schooling; it is difficult to clearly demonstrate this relationship, because educational attainment is a part of regular [school] education. Actually, many of adults tend to participate in many formal education and training activities to improve their productivity.

Besides measuring the stock of human capital with school enrollment rates and educational attainment,

Romer (1990) suggested the ratio between skilled-adults and total adults to measure the stock of human capital in the national economy.

Furthermore, Organization for Economic Cooperation and Development (OECD) utilizes International Adult Literacy Survey (IALS), the ratio between literate adults and total adults, to measure the stock of human capital. However, the method of IALS includes a few drawbacks in that literacy can be slightly related to labour productivity, and the productivity can be increased by informal/non-formal learning activities such as personal learning and On-the-Job training.

Finally, Psacharopoulos and Arriagada (1986) suggested the average years of schooling to measure the stock of human capital. They refer that the average years of schooling is meaningful to measure the stock of human capital as a proxy. This suggestion assumes that an individual's productivity is increased in proportion to his/her average years of schooling; they exemplify that someone's productivity with completing twelve years of schooling is twelve times compared to otherwise productivity with doing one years. As mentioned above, this method includes a drawback that an individual's years of schooling can be slightly related to his/her productivity.

(ii) Cost-Based Approach

Cost-based approach is based on measuring the stock of human capital through summing costs invested for one's human capital. For the purpose of calculating the invested costs, Kendric (1986) utilized an individual's investment costs considering depreciation, and Jorgenson &Fraumeni (1989) presented discounted income in the future. Considering that this approach is based on indirectly measuring stock of human capital, it is difficult to precisely classify boundary between investment and consumption in the perspective of costs for the human capital.

(iii) Income-Based Approach

This approach is based on the returns which an individual obtains from a labor market throughout education investment. Mulligan and Sala-i-Martin (1995) defines that aggregate human capital is the sum of quality adjustment of each individual's labor force, and presents the stock of human capital utilizing an individual's income. Considering that 'human-unrelated factors' can more influence an individual's income, this approach rarely presents a complete measurement for human capital.

2.1.9 How is Human Capital Measured Currently? : Based on OECD Measures

Hansson (2008) shows that OECD measurement on human capital is closely linked to international comparable statistics considering investment in human capital, quality adjustments, and result of education.

2.1.10 Demerits of the Conventional Measurement

According to Winkler (1987), the conceptual critique of human capital measurement is closely linked to screening theory which expresses relationship between an individual's credentials and employability.

This critique addresses the unclear causality whether education credentials reflect the productivity. On the criticism that an individual's human capital increases his/her employability, Winkler (1987) surmises that human capital investment rarely influence his/her outcome of it. Rather, the capital-unrelated factors more affect the effectiveness of human capital investment. In this sense, it is necessary to seriously consider which one can clearly express the concept of human capital.

Second, the conventional measurement of human capital slightly considers the qualitative benefits of human capital such as family health, fertility and child morality (Lewin et al., 1983; Woodhall, 2001).

Actually, McMahon (1998) presents that the impact of human capital includes both of financial monetary and social nonmonetary benefits with 'lower fertility rates, lower population rates, public health, democratization, human rights, political stability, poverty reduction, property crime rates, environmental effects, higher divorce rates, later retirement, more work after retirement, and community service'.

Third, other indicators that can contribute to estimate more accurate concept of human capital are rarely considered. For example, Bassani (2008) shows that social capital can be related to human capital to some extent. Similar to the mentioned conceptual framework, Coleman (1988) suggested that 'certain aspects of social capital could be directly linked to a child's academic success in that they provided a more supportive environment that enhanced individual levels of achievement'. Overall, for the purpose of more precise measurement of human capital as stock, it is necessary to consider relationship between human capital and other related factors such as social capital.

Fourth, the increase of human capital can rarely ensure that of social progress. Schuller (2001) refers to 'merely increasing the stock of human capital in any given society will not ensure social or economic progress. On the reference about the limitation of human capital, the conventional measurement of human capital can slightly measure the extent of social progress. Considering that human capital should contribute to constituents' development in the normative perspective, it is essential that new additional approach of human capital measurement deliberates the aspects of social progress.

2.1.11 New Approach of the Measurement

On the above-mentioned demerits of conventional human capital measurement, new additional approach of the human capital measurement should be based on the following consideration; what are more precise proxies for human capital measurement with the evolving of the human capital?

To begin with, the new approach of human capital measurement partially needs to accept the conceptual framework of Human Development. Since 1990, United Nations Development Programme (UNDP) has reported Human Development Index (HDI) investigating most of countries, measuring a country's human development and well-being. The structure of the index is constituted to health, knowledge, and standard living with many sub-variables such as life expectancy at birth, adult literacy rate, gross enrollment ratio, and GDP per capita. Considering that the HDI index includes quality aspects, the approach of HDI focuses on all of individuals' life quality and economic situation. Furthermore, International Labour Office (ILO) tends to utilize the similar index considering the quality aspects such as the Key Indicators of the Labour Market (KILM).

Therefore, it is necessary that the advanced measurement of human capital considers the concept of 'human development', assuming that the concept of development includes both of quantitative growth and qualitative progress. With referring to the concept of human development, it is necessary that the new approach of human capital measurement needs to pay more attention to social capital. As mentioned, an individual's social capital is closely linked to his/her human capital focused on the stock of knowledge.

Considering that the core of the social capital is based on the networking among constituents, it is possible that the networking component of social capital contributes to the increase of human capital owing to the characteristics of that: transportable, and shareable. The accumulation of one's human capital is easily performed through social capital. Actually, someone's level of knowledge and skills can be more improved by the networking of family, colleagues, social and constituents rather than isolated situation (Coleman, 1988). This assumption can provide an important clue in terms of understanding how human capital can play a role in social progress.

Finally, it is necessary that the new approach of human capital measurement clarifies what indicators can be considered to precisely measure more accurate human capital. It is likely that the conventional measurement of human capital utilizes proxies such as an individual's productivity. OECD presents that the measurement on human capital is closely linked to education-related factors such as high-level qualification, graduation and enrollment rates, time invested in education, and investment in education in the perspective of the human capital investment as well (Hansson, 2008). However, these proxies have to do with the possibility that human capital takes place. A new approach need to seek indicators that are more strongly related with the possibility and identify how to measure them.

2.1.12 The Role of Higher Education in Human Capital Development

We define higher education as all post — secondary education in Colleges of Education, Technology, polytechnics and Universities. Higher Education plays a very important role in labour markets and human resource development. Post- Secondary education is also a significant industry providing employment to about 720,000 faculty members in the country's higher educational institutions. According to the Federal Bureau of Statistics (1990), this system had total expenditure of about N5.5 billion during the 1984/85 academic year. About 108,720 degree students were enrolled in the nation's higher institutions during the same period.

Statistics on student's enrolment in Nigeria's higher educational institutions are inaccurate, and often not available. This is peculiar to institution like Colleges of Education, Colleges of Technology and Polytechnics.

Quite unlike the case of the universities, information has been very scanty on other institutions of higher learning. Only limited time series data are available on the intakes, enrolments, teacher supply, and out turn in institutions such as the Advanced Teachers' Training Colleges, Polytechnics, Colleges of Technology, and Schools of Agriculture thereby limiting the degree of quantification of their development (Adesina & Fashoyin, 1986).

Available evidence tells us something about students' enrolment and academic staff strength in Nigerian University from 1974/75 academic year to 1984/85 academic year

respectively. Unfortunately such data only provided universities; Higher educational institutions are indeed a major sector of the Nigerian economy. Its contribution in terms of employment also, needs no further dramatization. For example, in the 1974/75 academic year, a total of 3, 455 lecturers were employed in Nigeria's only six universities at that time. In the same year, total students enrolment was 26,131. But by the 1983/84 academic year, students' enrolment in the nation's universities had risen to 112,056. Similarly, the number of lecturers rose to 9,016 in 1983/84 (during the same period). Within a 10-year period, 1974/75 to 1983/84, the number of students enrolled in Nigerian Universities rose significantly.

The proportion of secondary school and university graduates in self-employment was quite small and insignificant. It is important to mention that the bulk of the illiterates were engaged in the agricultural sector. This was something in the neighborhood of 75 percent. But only 33 percent of primary school leavers were in agriculture, while secondary school graduates represented only 10 percent.

In the view of this author, the educational structure of the Nigerian labour force has improved dramatically over the past 25 years. This has not been unconnected with both the State and Federal Government's policies toward educational development. A clear testimony of this is the increase in the number of universities in Nigeria today. In 1970, immediately after the Civil War, there were only 6 universities in Nigeria. These were the Universities of Ibadan, University of Nigeria Nsukka, Ahmadu Bello University Zaria, Obafemi Awolowo University, Ile-Ife and University of Benin. These are collectively known as first generation of universities in Nigeria. In Nigeria today, there are so many tertiary institutions in the country. Student enrolments have also risen dramatically over the past 15 years. Enrolment at all levels of education in Nigeria has been increasing since her independence in 1960. The unprecedented increase in total enrolment arose as a result of the introduction of the National Policy on Education in 1974.

In relating education to earnings, Aboyade (1987) found that the average earnings of workers with primary education were about 17 times those of illiterates. Workers with secondary school education had average earnings about 16 times the level of those with primary education and about 17 times those of illiterates. But in the case of university graduates, they had average earnings of about 12 times the level of illiterates and about 5 times the level of secondary school graduates.

Another indication of the disparity in earning by educational level can be obtained by analyzing the Elongated Salary Structure (ESS) in the Federal Civil Service which was approved by the federal Military Government in January, 1988. The Elongated Salary Structure runs from Grade level 01 to Grade level 17. Grade level 01 is for the lowest paid worker such as an office messenger, while Grade level 17 is for the highest paid executive, such as a High Court Judge. The lowest paid worker is expected to have a minimum educational qualification of primary school education. But a fresh worker possessing the West African School Certificate (WASC), such as a clerical officer is expected to be on Grade level 04.

In Nigeria post-secondary schools supply a large proportion of technical staff, managers and professional workers. These situations have also enhanced knowledge, preserved cultural heritage and facilitate upward social and economic mobility. The efficiency of the country's post- secondary educational system and the access to it by all sectors of the population is therefore very important for human resource development; and economic, social and political stability.

Within the Nigerian context, the importance of higher education to the nation's socio-economic development needs no further dramatization. Our higher education system is a very important ingredient that is necessary to provide the human resources needed for the operation of a society that is undergoing profound structural changes. The number of scientists and doctors increase during the 1970's due mainly to government policy and the demand for university lecturers and other related staff in the nation's higher educational institutions rather than demand for highly educated manpower by the private sector.

Indeed, available data support the view, that higher education increases the income of individual's whether or not there is casual relationship between this type of education and Gross Domestic Product. As previously stated, the evidence shows that Workers with university degrees will have a higher employment and income advantages such as higher beginning salaries, low unemployment rates and higher income earning. Although has clear economic significance, it has also been argued that higher education cannot be evaluated on monetary terms alone. Our higher educational system has done much to preserve the cultural and intellectual traditions that can influence our quality life. Furthermore, our higher educational institutions have brought about benefits, such as extending the general use and technology,

contributing to the advancement of knowledge and arts of providing support for public leadership. The benefits accrue to society as well as individuals and therefore they cannot be measured in market terms alone. Therefore, the role of higher education in the socio-economic development of Nigeria cannot be overemphasized.

2.1.13 Educational Levels and Earnings

According to the theory of marginal productivity, the returns to a factor of production depend on the productivity of that factor. Thus, it is usually accepted that the productivity and hence the returns to labour depend to a great extent on the investment in human capital. This is usually through the process of educational earnings.

Two major approaches have been used to analyze the relationship between income and education. The first approach attempts to study the dispersion in earnings wage levels of labour with different educational levels. The second approach attempts to compute lifetime stream of earnings that accrue to an average worker at different levels of education. After doing so, we then compute the disparities in the computed lifetime stream of earnings between workers with various educational achievements.

Unfortunately, there are no current studies which provide data on income differentials and educational levels in Nigeria that are based on these two approaches. We can, however, obtain some indications of these disparities from Aboyade's and Boule's studies. Aboyades's study of 1987 was a major household survey which involved 2000 respondents drawn from all parts of the country. Unfortunately, the former Eastern Nigeria was not included in the survey. This was so because the Nigerian Civil War was still going on at that time. The analysis of the survey results did provide the following information about the Nigerian labour force in relation to different levels of education. The analysis showed that 87 percent of the Nigerian labour force was illiterate, 26 percent had primary education, 7 percent had secondary education and less than 0.5 percent had university education. In the l986/87 fiscal year, the National Manpower Board

Survey presented different results. According to the survey, about 73 percent of the Nigerian, labour was illiterate. Those with primary school education school education accounted for only 4 percent while those having secondary school education accounted for only 1 percent of the labour force. Those having university education accounted for only 0.05 percent.

From a careful analysis of the results of both surveys, we see that in 1987 about 70 percent of the Nigerian labour force was illiterate and less than 1 percent had university education. Those that had some primary education accounted for about 25 percent of the labour force (Aboyade, 1989).

2.1.14 Theoretical Problems Associated With Human Capital Theory

There are several conceptual problems associated with the human capital theory. First, as with any cost benefit 'analysis, measurement of educational costs and benefits is not simple. As a result, the choice of an appropriate discount rate usually predetermines the results. Furthermore, in calculating the returns on education and training, non-monetary benefits like the alternative of post-training jobs should be included. But these benefits cannot be calculated in monetary terms. Training, education and health will obviously increase worker's satisfaction as consumers of these things. But they actually contribute nothing to available national output. There is no doubt; these decisions would cause the internal rate of discount to under- estimate the actual returns to training. There are also difficulties in determine costs as well as benefits. For example, it usually makes expenditure for such things as food, clothing, housing and medical care which is maintenance costs of the human investment. These things are needed in order for the worker to live. It is difficult to determine precisely how much we should estimate the maintenance of capital and how much to consume respectively. It is usually argued that labour cannot be separated from its owner. Therefore, it becomes more difficult than in the case of physical capital to borrow funds to make enough human investment to equalize costs and benefits. Another serious problem has been observed by (Levitan, Margum & Marshall, 2000). For example, owners of physical capital maximize monetary returns from that capital. Unfortunately, human capital theorists have not been able to determine what those who invest in themselves actually maximize. Human capital theory is unable to specify very precisely what it is that employer's demand and what it is that workers supply from the traditional demand- supply analysis.

However, inspite of the conceptual problems associated with the approach, the model is widely used to analyze the costs and benefits associated with investments in human resource, including education arid training. At least, in principle, it enables us to know the tangible costs and benefits associated with investments in human resource (Gbosi, 2003).

2.1.15 Computation of Private and Social Rate of Returns on Education Human Capital

The rates of returns to the investment in education human capital are usually assessed according to the level of education attained. These rates differ from one country to another. For a calculation of the private rate of return to four years of university education, benefits are estimated by taking the difference between existing statistics of the mean post-tax earnings of university graduates by age and those of a sample group of secondary school graduates. The earnings of the latter also represent the opportunity costs of staying in school. Direct costs are obtained from statistics on a student's out-of-pocket expenditure that are strictly due to the cost of college attendance.

***Private rate of return can be computed as follows*:**

$$\frac{\{\text{Mean of the annual post-tax earnings of university graduates}\} - \{\text{Mean annual post-tax earnings of secondary school graduates}\}}{\{\text{4 years of study}\} \times \{\text{mean annual post-tax earnings of a secondary school graduates}\} + \{\text{Mean annual private direct cost of study}\}}$$

A social rate of return to college education could be calculated in the same way, although earnings are pretax (as taxes are a transfer from the point of view of society at large) and the direct cost include the full amount of resources committed per student for higher education, rather than the usually smaller part of expenditures borne by the student.

Social rate of return can be computed thus:

$$\frac{\left\{\begin{array}{l}\text{Mean of the annual pre-tax}\\ \text{earnings of university graduates}\end{array}\right\} - \left\{\begin{array}{l}\text{Mean annual pre-tax}\\ \text{earnings of secondary school}\\ \text{graduates}\end{array}\right\}}{\left\{\text{4 years of study}\right\} \times \left\{\begin{array}{l}\text{mean annual pre-tax}\\ \text{Earning of secondary}\\ \text{school graduates}\end{array}\right\} + \left\{\begin{array}{l}\text{Mean annual}\\ \text{social direct cost of study}\end{array}\right\}}$$

Source: Return to Investment in Education: A global update- World Development 22 (1994): 1325-1343

2.1.16 Human Development Index (HDI)

The HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. As in the 2011 HDR a long and healthy life is measured by life expectancy. Access to knowledge is measured by:

(i) Mean years of schooling for the adult population, which is the average number of years of education received in a life-time by people aged 25 years and older; and

(ii) Expected years of schooling for children of school-entrance age, which is the total number of years of schooling a child of school-entrance age can expect to receive if prevailing patterns of age-specific enrolment rates stay the same throughout the child's life. Standard of living is measured by Gross National Income (GNI) per capita expressed in constant 2005 international dollars converted using purchasing power parity (PPP) rates.

To ensure as much cross-country comparability as possible, the HDI is based primarily on international data from the United Nations Population Division, the United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics (UIS) and the World Bank. The HDI values and ranks in this year's report are not comparable to those in past reports (including the 2011 HDR) because of a number of revisions done to the component

indicators by the mandated agencies. To allow for assessment of progress in HDIs, the 2013 report includes recalculated HDIs from 1980 to 2012.

2.1.17 Nigeria's HDI Value and Rank

Nigeria's HDI value for 2012 is 0.471—in the low human development category—positioning the country at 153 out of 187 countries and territories. Between 2005 and 2012, Nigeria's HDI value increased from 0.434 to 0.471, an increase of 9 percent or average annual increase of about 1.2 percent.

The rank of Nigeria's HDI for 2011 based on data available in 2012 and methods used in 2012 was– 154 out of 187 countries. In the 2011 HDR, Nigeria was ranked 156 out of 187 countries. However, it is misleading to compare values and rankings with those of previously published reports, because the underlying data and methods have changed.

Table A reviews Nigeria's progress in each of the HDI indicators. Between 1980 and 2012, Nigeria's life expectancy at birth increased by 6.8 years, mean years of schooling increased by 0.2 years and expected years of schooling increased by 2.4 years. Nigeria's GNI per capita increased by about 34 percent between 1980 and 2012.

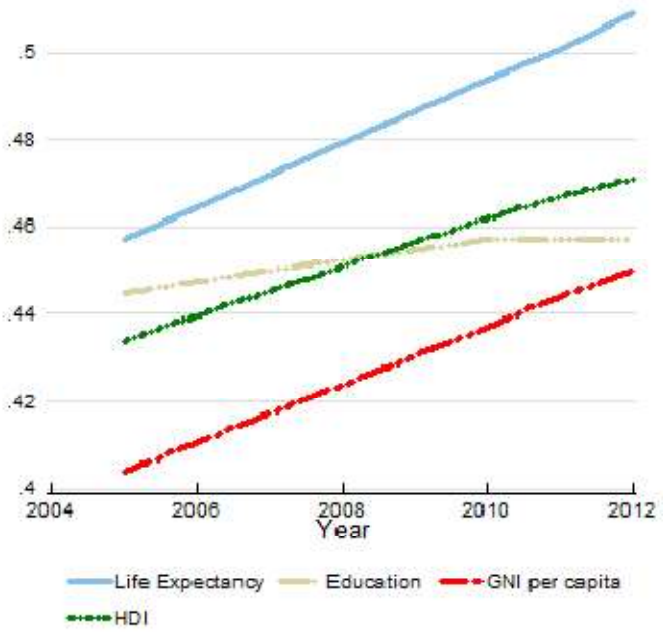
Table A. Nigeria's HDI Trends Based on Consistent Time Series Data, New Component Indicators and New Methodology

	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2005 PPP$)	HDI value
1980	45.5	6.6		1571	
1985	45.9	8.4		1202	
1990	45.6	6.5		1274	
1995	45.1	6.5		1303	
2000	46.3	7.9		1285	
2005	49	9	5	1540	0.434
2010	51.4	9	5.2	1928	0.462
2011	51.9	9	5.2	2017	0.467
2012	52.3	9.0	5.2	2102	0.471

Source: Federal Bureau of Statistics

Figure 1 below shows the contribution of each component index to Nigeria's HDI since 2005.

Figure 1: Trends in Nigeria's HDI component indices 2005-2012



2.1.18 Assessing Progress Relative to Other Countries

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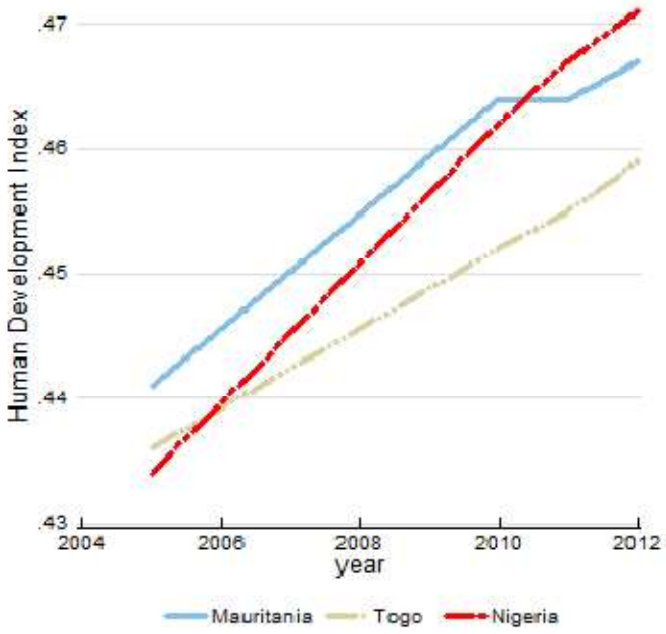
Long-term progress can be usefully assessed relative to other countries–both in terms of geographical location and HDI value. For instance, during the period between 2005 and 2012 Nigeria, Togo and Senegal experienced different degrees of progress toward increasing their HDIs (see figure 2).

Figure 2: Trends in Nigeria's HDI 2005-2012



Nigeria's 2012 HDI of 0.471 is above the average of 0.466 for countries in the low human development group and below the average of 0.475 for countries in Sub-Saharan Africa. From Sub-Saharan Africa, countries which are close to Nigeria in 2012 HDI rank and population size are Ethiopia and Congo (Democratic Republic of the), which have HDIs ranked 173 and 186 respectively (see table B).

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Table B: Nigeria's HDI Indicators for 2012 Relative to Selected Countries and Groups.

	HDI value	HDI rank	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (PPP US$)
Nigeria	0.471	153	52.3	9.0	5.2	2102
Ethiopia	0.396	173	69.7	8.7	2.2	1017
Congo (DRC)	0.304	186	48.7	8.5	3.5	0319
Sub-Saharan Africa	0.475		54.9	9.3	4.7	2010
Low HDI	0.466		59.1	8.5	4.2	1633

Source: Federal Bureau of Statistics

2.1.19 Inequality-adjusted HDI (IHDI)

The HDI is an average measure of basic human development achievements in a country. Like all averages, the HDI masks inequality in the distribution of human development across the population at the country level. The 2010 HDR introduced the Inequality Adjusted HDI (IHDI), which takes into account inequality in all three dimensions of the HDI by 'discounting' each dimension's average value according to its level of inequality. The HDI can be viewed as an index of 'potential' human development and the IHDI as an index of actual human development. The 'loss' in potential human development due to inequality is given by the difference between the HDI and the IHDI, and can be expressed as a percentage.

Nigeria's HDI for 2012 is 0.471. However, when the value is discounted for inequality, the HDI falls to 0.276, a loss of 41.4 percent due to inequality in the distribution of the dimension indices. Ethiopia and Congo (Democratic Republic of the), show losses due to inequality of 31.9 percent and 39.9 percent respectively. The average loss due to inequality for low HDI countries is 33.5 percent and for Sub-Saharan Africa it is 35 percent.

Table C: Nigeria's IHDI for 2012 Relative to Selected Countries and Groups

	IHDI value	Overall Loss (%)	Loss due to inequality in life expectancy at birth (%)	Loss due to inequality in education (%)	Loss due to inequality in income (%)
Nigeria	**0.276**	**41.4**	**43.8**	**45.2**	**34.5**
Ethiopia	**0.269**	**31.9**	**35.4**	**38.3**	**20.8**
Congo (DRC)	**0.183**	**39.9**	**50**	**31.2**	**36.8**
Sub-Saharan Africa	**0.309**	**35**	**39**	**35.3**	**30.4**
Low HDI	**0.31**	**33.5**	**35.7**	**38.7**	**25.6**

Source: Federal Bureau of Statistics

2.1.20 Gender Inequality Index (GII)

The Gender Inequality Index (GII) reflects gender-based inequalities in three dimensions – reproductive health, empowerment, and economic activity. Reproductive health is measured by maternal mortality and adolescent fertility rates; empowerment is measured by the share of parliamentary seats held by each gender and attainment at secondary and higher education by each gender; and economic activity is measured by the labour market participation rate for each gender. The GII replaced the previous Gender-related Development Index and Gender Empowerment Index. The GII shows the loss in human development due to inequality between female and male achievements in the three GII dimensions. (For more details on GII please see Technical note 3 in the Statistics Annex). Due to a lack of relevant data, the GII has not been calculated for this country.

2.1.21 Multidimensional Poverty Index (MPI)

The 2010 HDR introduced the Multidimensional Poverty Index (MPI), which identifies multiple deprivations in the same households in education, health and standard of living. The education and health dimensions are based on two indicators each while the standard of living dimension is based on six indicators. All of the indicators needed to construct the MPI for a household are taken from the same household survey. The indicators are weighted, and the deprivation scores are computed for each household in the survey. A cut-off of 33.3 percent, which is the equivalent of one-third of the weighted indicators, is used to distinguish between the poor and non poor. If the household deprivation score is 33.3 percent or greater, that household (and everyone in it) is multi-dimensionally poor. Households with a deprivation score greater than or equal to 20 percent but less than 33.3 percent are *vulnerable* to or at risk of becoming multi dimensionally poor.

The most recent survey data available for estimating MPI figures for Nigeria were collected in 2008. In Nigeria 54.1 percent of the population lived in multidimensional poverty (the MPI 'head count') while an additional 17.8 percent were vulnerable to multiple deprivations. The intensity of deprivation – that is, the average percentage of deprivation experienced by people living in multidimensional poverty – in Nigeria was 57.3 percent. The country's MPI value, which is the share of the population that is multi-dimensionally poor adjusted by the intensity of the deprivations, was 0.31. Ethiopia and Congo (Democratic Republic of the) had MPI values of 0.564 and 0.392 respectively.

Table E compares income poverty, measured by the percentage of the population living below PPP US$1.25 per day, and multidimensional deprivations in Nigeria. It shows that income poverty only tells part of the story. The multidimensional poverty headcount is 13.9 percentage points lower than income poverty. This implies that individuals living below the income poverty line may have access to non-income resources. Table E also shows the percentage of Nigeria's population that live in severe poverty (deprivation score is 50 percent or more) and that are vulnerable to poverty (deprivation score between 20 and 30 percent). The contributions of deprivations in each dimension to overall poverty complete a comprehensive picture of people living in poverty in Nigeria. Figures for Ethiopia and Congo (Democratic Republic of the) are also shown in the table for comparison.

Table D: The Most Recent MPI Figures for Nigeria Relative to Selected Countries

	MPI value	MPI value	Headcount (%)	Intensity of deprivation (%)	Population			Contribution to overall poverty of deprivations in		
					Vulnerable to poverty (%)	In severe poverty (%)	Below income poverty line (%)	Health	Education	Living Standards
Nigeria	2008	0.31	94.1	57.3	17.8	33.9	68	32.2	27	40.8
Ethiopia	2011	0.564	87.3	64.6	6.8	71.1	39	27.6	25.9	46.5
Congo (DRC)	2010	0.392	74	53	15.1	45.9	87.7	25.1	18	56.9

Source: Federal Bureau of Statistics

2.1.22 Human Capital Theory and Education

Throughout western countries, education has recently been re-theorized under human capital theory as primarily an economic device. Human capital theory is the most influential theory of western education, setting the framework of government polices since the early 1960s. It is seen increasingly as a key determinant of economic performance has been to employ a

conception of individuals as human capital and various economic metaphors such as technological change :research", "innovation", "productivity", "education", and "competitiveness".

In the "Wealth of Nations" (1976) Adam Smith formulated the basis of what was later to become the science of human capital. Over the next two centuries, two schools of thoughts can be distinguished. The first school of thought distinguished between the acquired capacities that were classified as capital and the human beings themselves, who were not. A second school of thought claimed that human capital theory, all human behavior is based on the economic self-interest of individuals operating within freely competitive markets. Other forms of behavior are excluded or treated as distortions of the model.

A prominent explanation for that move is provided by a recent reformulation of Human Capital Theory which has stressed the significance of education and training as the key to participation in the new global economy. In one of its recent report the OECD (1997a:7) for example claims that the radical changes to the public and private sectors of the economy introduced over recent years in response to globalization will be "severe and disturbing to many established values and procedures". In another report that explains internalization in higher education as a component of globalization, the OECD (19976:II) believes that "internationalism should be seen as a preparation for the 21st century capitalism". That organization also boldly asserts that "internationalism is a means to improve the quality of education" (OECD, 1997b:8). In keeping with Human Capital Theory it has been argued that "the overall economic performance of the OECD countries is increasingly more directly based upon their knowledge stock and their learning capabilities". (Foray & Lundvall, 1996:21). Clearly, the OECD is attempting to produce a new role for education in terms of the capital subject required in globalized institutions.

In terms of structural reforms, under Human Capital Theory the basis for nation state structural policy frameworks is the enhancement of labour flexibility through regulatory reform in the labour market, as well as raising skill levels by additional investment in education, training and employment schemes, and immigration focused on attracting high-quality human capital.

2.1.23 Criticism of the Human Capital Theory

Human capital theory has been criticized on a number of counts. Two critiques are outlined here: one external and one internal. The clearest statement of the deficiencies of human capital theory goes to the heart of neoclassical economics. The revival of economic sociology, in particular at the hands of Fred Block (1990:21), seeks to challenge the basic assumptions motivating the methodology of neo-classical economics. He claims these rest on two basic building blocks. The first is the idea that the economy is an analytically separate realm of society that can be understood in terms of its own internal dynamics. The second key foundation is the assumption that individuals act rationally to maximize utility. For Block (1990), these assumptions on which neo-classical, and therefore also, human capital theory depends, are cast in universal and a historical terms. Together, the two assumptions provide a basis for the model of the self-regulating market which harmonies transactions for products, labour and capital. Economic sociology challenges the first assumption by arguing that the society and culture cannot be arbitrarily split off from the economy. Both the society and culture shape the preferences of individuals in various ways.

Human capital theory, then is an impoverished notion of capital. It is unable to understand human activity other than as the exchange of commodities and the notion of capital employed is purely a quantitative one. This misses the point that capital is an independent social force where the creation of social value comes about through its capital accumulation and continual transformation through the circulation of commodities. The individual under capitalism can only come to grips with the means of production through selling his or her labour commodity. The struggle of the labourer to improve life's conditions is meditated then through the social relations within which they find themselves. Given this explanation, human capital is an abstract form of labour-a commodity-and not capital. Commodities such as human capital are therefore part of the life cycle of capitalism as a form of labour and not able to be exchanged independently of it.

The second assumption exposed by Block (1990) which is of primary importance to human capital theory, is also open to criticism on a variety of grounds. In modern human capital theory all human behavior is based on the economic self-interest of individuals operating within freely competitive markets. Other forms of behavior are excluded or treated as merely distortions

of the model. Friedman (1982:100-101), for example, has argued that all the benefits of vocational and professional education are limited to the individual who is education. The maximization of rational self-interest separate from the social group that the individual belongs, is a central article of faith in human capital theory. A criticism of the rational utility maximize (Block, 1990:25) suggests that the elevation of self-interest to a position of dominance on which much economic analysis rests, is itself a consequence of social arrangements.

Further criticism of human capital theory concerns a more technical problem with criticisms about the employment of the theory as a means of accounting for national economic growth. Arguments about economic growth accounting such as Becker (1994), show at best that education contributes to differences in earnings between people and then only in certain circumstances.

2.1.24 Challenges for Human Capital Development in Nigeria

One major challenge facing the global community is how to achieve sustainable development. According to the IMF (2002), sustainable development is made up of three pillars. They are economic development, social development and environmental protection. The essences of these pillars are to maintain and enhance the capacity and capability of future generations while meeting the needs of the present generation. To achieve these multi-dimensional tasks, human capital should be strategically cultivated and positioned for the preservation of both the present and future economic growth and development.

The World Bank (2010) specifies that Nigeria has found it difficult to grow her economy in her quest to become a knowledge – based economy because of the challenges faced in the national educational system. According to the report, some major challenges limiting the advancement of Nigeria's education system are low tertiary enrolment level, teaching with obsolete methods, strikes and administrative hiccups corrupt teachers asking bribes or sex to pass student, frequent absence of teachers during teaching periods, lack of ICT infrastructure and other teaching methods, and poor funding.

Poor funding is a major challenges confronting knowledge and skill development in Nigeria. And in the case where there is funding, it is not efficiently allocated. Research and development (R and D), which facilitates the creation of knowledge to drive economic growth is poorly funded by the government. The World Bank (2010) is of the view that government

funding for university research and infrastructural development is too low to attract partners in the economic and business work environment into R and D agreements. This is one of the major reasons why Nigerian universities were on strike for about seven months in 2013. This is unlike the case in Singapore, Korea and other advanced knowledge economies.

Ndulu (2010) examined the negative impact of human capital flight on economic growth in Nigeria. The study reported that the challenges of human capital in Africa is not limited only to low level of education and training, but it also includes the current inability of the country to retain a large proportion of its skilled and professional personnel. Thus, Nigeria has been losing a significant proportion of her skilled and professional manpower to other national market and increasingly depending on expatriate for many crucial functions.

Several other mitigating factors relating to human capital development emanate from the health sector. For instance, the Federal Ministry of Health (2005) reported that communicable disease account for 72% of deaths while non-communicable disease account for 21%. These reports are reflections that the health care system in Nigeria is currently weak, thus, limiting the chances of the people and impeding their capability to be part of contributing to the growth of the economy. According to WHO (2001), the preponderance of health-related problems could be attributed to the observed shortage of skilled medical workers at the level of primary health care.

2.1.25 Challenges of Human Capital Development through Vocational Education

1. The occurrence and prevalence of involuntary unemployment – retrenchments, redundancy, underemployment, and reduction in the workforce and employment.
2. Declining production in the industries
3. Sharp cuts in human resource training budgets
4. Reduction in wages and salaries, voluntary and involuntary
5. Uncertainties and the attendant low morale among the existing workforce
6. Inflation as a result of decline in production of goods and services.

In stating the key challenges of human capital development in Nigeria, Gumbel and Wartzman (2005) in Anygom (2010) noted thus:

- **Environment**

Rise of the internet, Workforce diversity, Globalization, Legislation, Evolving work and family roles.

- **Organization**

Downsizing, decentralization, organizational restructuring, organizational culture, outsourcing competitive position, cost and quality.

- **Individual**

Matching people and organization, Empowerment, Brain drain, Job insecurity, Ethnical dilemmas and social insecurity.

Furthermore, Okoroafor (2010) also noted that, the main problem is lack of sponsorship.

Management of the tertiary institutions find it difficult to sponsor the lecturers to seminars, Conferences, and short courses claiming that there is lack of fund. This has reduced the rate the lecturers are upgraded because they find it difficult to sponsor themselves.

- **Inadequate Infrastructure**

The Lecturers do not have the opportunity to put what they have learnt into practice due to lack of infrastructure. According to Nwachukwu (1998) in Enyekit and Obara (2009) noted that many of the development programmes are not properly planned and there are no sequences to the courses offered from year to year.

- **Inadequate Timing**

Time should be provided for lecturers to go and upgrade themselves.

Work load should not be so demanding that they preclude lecturers from research and time to develop new skills, abilities and knowledge through research and innovation. Intellectual properties are developed to enhance socioeconomic growth and competitiveness as globalization heightens.

- **Lack of Reward for Excellence**

All academic staff should be inspired to initiate inventions and seek resources for research. There should be promotion reward for scholarly excellence.

2.1.26 Addressing Human Capital Challenges in Nigeria

In order to address the challenges face by human capital development in Nigeria, Odia and Omofonmwan (2007) recommended that the government should be more responsible with funding. Besides, private educational investors, teachers, parents, guidance and student should be re-oriented. They further suggested that technical education and innovation adaptation centres should be encourage and properly finance to produce the quality of human capital required to develop the service sector and become a knowledge based economy.

Furthermore, the World Bank (2010) recommends that recent initiatives such as Nigeria University Network Project, which aims at linking several Universities-federal and private – and developing shared infrastructures for cooperation and cost-reduction, should be employed as a good start to addressing the challenges.

To address heath care challenges in Nigeria, the Nigerian government has developed a Health Sector Reform (HSR) plan of action to guide investments and actions by all levels of development partners in health. The plan aims at addressing primary health care, disease control, sexual and reproductive health, secondary and tertiary health care, drug production and management, coordination of development partners, organization and management furthermore, the Federal Ministry of Health has created the division of international health to coordinate development aid to the health sector (WHO,2010).

According to Asuzu M. C, in his commentary on the necessity for a health system reforms in Nigeria, published in the journal of community medicine and primary health care the state governments will focus on and develop the currently ailing or even hardly existing secondary health care system and minimize or eliminate any unnecessary involvements in tertiary health care.

Community nursing and medical care will be developed properly as the only real basis for raising the health status of the country. Community involvement and participation will be automatically developed as each community is uniquely able to give. Auxiliary health workers as community health officers or health extension workers who show particular talents for community medical or nursing care may be sent to be fully trained into the professional cadres. The Philippines is the best example of a third world country that has developed this system of community health professional development.

In the face of inability of local governments to employ, pay and equip the primary health care system, the state government may assist them there at, as many are already doing so by employing the professional health cadre under the Local Government Service Commission. The Federal Government may also do so by requiring the youth corps doctors in each state to be primarily deployed for PHC work. In this regard, it will be obvious that without self-owned and administered transport system with enough recurrent budgets by the medical officer of health to do so, no reasonable community health work may be achieved by the PHC system. The orientation, reorientation and continuing education of the state and local government political class will improve the above requirements for an effective PHC.

The other issue such as health information, health insurance, inter-sectorial collaboration and healthy relationships between the western and traditional health practices will be able to be implemented properly and smoothly because full-fledged health professionals are involved at the apex of the health system at all its three crucial levels. Community physicians in the country have a responsibility to work for the production of enough critical mass of their members in this country and for their deployment and devoted work to produce the needed change in the health care system in this regard.

2.1.27 Achieving Human Capital Development in Nigeria Through Vocational Education for Nation Building

Vocational and technical education is a vehicle upon which the skills of workforce are built. Without effective implementation of vocational and technical education, we cannot hope for a future self-reliant graduate with the required skills and flexibility for sustainable human capital development in the global age. Vocational and technical education is an instrument for change and development and a provider of service oriented skills, which play a significant role in economic revival for sustainable human capital development. It is on the recognition of these needs that the National Policy on Education places on vocational and technical skills at the secondary and tertiary institution was inaugurated (Awotunde, 2004). Effective utilization of vocational and technical education and implementation of the programme will inculcate the necessary skills and competencies that would help the youth to be self-reliant. This would lead to the much desired human capital development in the economy. Also Amaehule & Enyekit

(2010) went further to explain that vocational and technical education equips youth with technological skills and managerial skills to manage human and material resources of their own business through the acquisition of skills and competencies in areas of vocational and technical education.

The teaching of vocational and technical subjects requires integrated application of teaching methods and creative approach to their selection and structuring. The specific nature of this kind of teaching requires the application of methods based image and performance, rather than methods solely based on discoursed, hence, Toby (1988) in Onojetah (2010) listed methods used for instruction in vocation technical subjects as: demonstration, lecture, discussion, simulation, direct research, visual presentation, supervised performance as the work station, trips, conferences, homework, written and practical examinations.

The complexity of the instructional process coupled with a variety of facts and problems associated with the teaching of vocational subjects, requires skill in making the correct choice of methods in a specific teaching situation. As a matter of fact, theoretical explanations should be accompanied by, diagrams, drawing, graphs, demonstrations as well as schedules and tables for effective teaching and understanding of vocational subjects.

2.2 Theoretical Framework

The specified models used in this research work are a modification of the endogenous growth model also called the New Growth Model by the creation of a separate model that examines the impact of primary, secondary and tertiary school enrollment on GDP. Hulten (2000) says that the new growth theories have the new assumption that the marginal product of capital is constant rather than in diminishing as in the neoclassical theories of growth. Capital often in the new growth models includes investment in knowledge, research and development of products, and human capital. The convergence theory postulated that developing countries will catch up with developed countries in the long run but today the New Growth Theory (Endogenous Theory) tries to explain why instead of catching up with the developed countries, developed countries are moving far from developing countries in terms of development. According to the New Growth Theory, the developed countries did not just depend on labour and capital but invest in human capital development through education, good health, etc.

A basic concern of development economies is to explain why per capita income and growth rates differ among countries. Thus, the main motive of New Growth Theory is to explain difference in growth rates among countries and what are contributions of different factors to rates of growth observed in them. Thus, the new growth theory extends the neoclassical theory by making the rate of technological progress or rate of population growth or both as endogenous factors. The new growth theory goes more deeply into ultimate sources of growth.

Hence, the New Growth Theory is specified as:

$Y= b_o + b_1L + b_2K + b_3IE + b_4IH + b_5INFR + u$

Where L=Labour; K= Capital; IE=Investment in Education; IH=Investment in Health; INFR= Investment in Infrastructure; u= error term.

As a modification to the New Growth Theory, this study has made Primary, Secondary and Tertiary school enrollment as endogenous factors to growth. As a vacuum, the New Growth Theory neglects the role of institutions which this research work adequately captures through the relationship between the educational institutions, via school enrollment, and skills acquired by human capital. This is because the quality of these institutions (proxied by total government expenditure on education) is expected to be positively related to the quality of skills acquired by human capital when enrolled in schools.

2.3 Appraisal of the Reviewed Literature

This chapter thoroughly examines various literature on the effect of human capital development on economic growth of Nigeria from 1980 to 2012. Some studies reports a positive relationship of human capital variables on growth while others reports negative relationship between human capital variables and growth. The various studies also examine the causes, effects and implications of their results on the economy and proffer possible solutions for the benefit of Nigerians and the world at large. But for every economy to achieve sustainable development, her human capital development objective should be made a priority, most studies concluded.

CHAPTER THREE

RESEARCH METHOD

3.1 Research Design

This study attempt to provide empirical evidence on the role of human capital development (proxied by total government expenditure on education, health, gross fixed capital formation, other social and community services, primary, secondary and tertiary school enrollment) on economic growth. The data were sourced from various issues of the statistical Bulletin and Annual Report and Statement of Accounts published by the Central Bank of Nigeria (CBN).

The study applied the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration. The order of integration is determined using the Augmented Dickey Fuller (ADF) and Phillips Perron unit root test.

The test for stationarity of the coefficient estimates and serial correlation of the residuals were conducted by using the Cumulative Sum of Squares residuals (CUSUMSQ), the CUSUM of recursive residuals and Durbin-Watson statistic.

3.2 Population of the Study

The population of this study is the entire Nigerian states which are richly endowed with abundant human capital resources.

3.3 Estimation Technique

This study applied the ARDL bounds testing approach to cointegration to examine the relationship between the expenditure on human capital, gross fixed capital formation and output growth in Nigeria for the period 1980 – 2012.

One advantage of using the first difference series is that it helps to eliminate the influence of the term that does not contain time (Koutsoyannis, 1977:280) in the estimable model. The ECM_{t-1} is the error correction factor. The bounds testing approach involves the estimation of a Wald test (F-Stat). Wald test as applied in this research involves testing the null hypothesis of no cointegration relationship between gross domestic product and human capital formation variables and other regressors.

The approach tests for the existence of a long-run relationship which is applicable irrespective of whether the underlying regressors are I/0, I/1 or mutually cointegrated. Pesaran, Shin and Smith (2001) have in fact established that the approach is not only consistent, the derived asymptotic distributions of the Wald test are non-standard under the null hypothesis that there exist no relationship between the levels of regressors in the two models be they I/(0), I/(1) or mutually cointegrated.

The procedure for the bounds test thus allow for the computation of the Wald or F-statistics which is compared with two sets of asymptotic critical values of two polar cases. One of the cases assumes that all the regressors are I/(1), while the other assumes they are I/(0). If the computed Wald or F-statistics falls inside the critical value bounds, an inconclusive inference is reached. However, a conclusive inference is drawn if the computed Wald or F-statistics falls outside the critical value bounds. For instance, if the computed F-statistics exceed the upper bounds, I/(1), then the alternative hypothesis of cointegration holds. The implication is that there is a stable long-run relationship among the selected variables. However, if the computed F-statistics falls below the lower bounds, I/(0), the null hypothesis of no cointegration cannot be rejected. A region of inconclusive inference is when the F-statistics falls between the upper and lower bounds. Conclusion here may only be drawn after being able to establish the order of integration for the explanatory variables.

Furthermore, coefficients attached to the first differencing variables are interpreted as short run elasticities.

3.4 Method of Data Collection

Secondary data were sourced from various issues of the statistical Bulletin and Annual Report and Statement of Accounts published by the Central Bank of Nigeria (CBN).

3.5 Method of Data Analysis

Data collected were analyzed using the Ordinary Least Squares (OLS) and the ARDL bounds testing approach to cointegration. The order of integration is determined using the Augmented Dickey Fuller (ADF) and Phillips Perron unit root test.

The test for stationarity of the coefficient estimates and serial correlation of the residuals were conducted by using the Cumulative Sum of Squares residuals (CUSUMSQ), the CUSUM of recursive residuals and Durbin-Watson statistic.

Model Specification

Using two models that explain the various forms of human capital development can be functionally expressed as follows:

MODEL 1: GDP = f(TEE, TEH, GFCF, SCS) (3.1)

MODEL 2: GDP = f(PSE, SSE, TSE) (3.2)

Where: GDP is Real Gross Domestic Product

TEH = Expenditure on the health sector by the federal government

GFCF = representing Gross fixed capital formation

PSE = Primary School Enrolment

SSE = secondary School Enrolment

TSE = Tertiary School Enrolment

TEE = Total government expenditure on education

SCS is other social and community services expenditure which captures the federal government expenditure on poverty eradication, provision of portable water, irrigation and environmental protection.

A combination of these enhances the living standard of people and hence higher productivity.

Equations (1) and (2) can be transformed into a log-linear form as:

$$L_nGDP_t = b_o + b_1L_nTEH_t + b_2L_nSCS_t + b_3L_nGFCF_t + \alpha_1L_nTEE + U_t \quad (3.3)$$

$$L_nGDP_t = b_o + b_1L_nPSE_t + b_2L_nSSE_t + b_3L_nTSE_t + U_t \quad (3.4)$$

Where U_t is a random term assumed to be orthogonal to all determinants that are normally distributed with constant variance and L_n is natural logarithm.

The bounds procedure according to Tang (2003) is based on ARDL model for test of cointegration relationship. Following this lead, the two models as analysed by this research is respecified as:

$$DL_nGDP_t = b_o + \Sigma b_1 DL_nTEH_{t-1} + \Sigma b_2 DL_nGDP_{t-1} + \Sigma b_3 DL_nSCS_{t-1} + \Sigma b_4 DL_nGFCF_{t-1} + \Sigma b_5 DL_nTEE_{t-1} + b_6 DL_nTEH_{t-1} + b_7 DL_nGDP_{t-1} + b_8 DL_nSCS_{t-1} + b_9 DL_nGFCF_{t-1} + b_{10} DL_nTEE_{t-1} + \Psi ECM_{t-1} + U_t \quad (3.5)$$

$$DL_nGDP_t = b_o + \Sigma b_1 DL_nPSE_{t-1} + \Sigma b_2 DL_nSSE_{t-1} + \Sigma b_3 DL_nTSE_{t-1} + \Sigma b_4 DL_nGDP_{t-1} + b_5 DL_nPSE_{t-1} + b_6 DL_nSSE_{t-1} + b_7 DL_nTSE_{t-1} + b_8 DL_nGDP_{t-1} + \Psi ECM_{t-1} + U_t \quad (3.6)$$

Where D is the first difference series (i.e$L_nX_t - L_nX_{t-1}$)

CHAPTER FOUR

PRESENTATION, ANALYSIS OF DATA AND DISCUSSION OF FINDINGS

4.1 Presentation of Data

The data used for analysis are annual and covered the period 1980 to 2012. The dependent variable is Gross Domestic Product (GDP) and the explanatory variables include Total Expenditure on the health sector by the federal government (TEH), Total government expenditure on education (TEE), social and community services expenditure (SCS) which captures the federal government expenditure on poverty eradication, provision of portable water, irrigation and environmental protection, Gross fixed capital formation (GFCF), Primary School Enrolment (PSE), secondary School Enrolment (SSE) and Tertiary School Enrolment (TSE).

Federal government expenditure on education (TEE), expenditure on health (TEH), PSE, SSE, and TSE represent the basic human capital determinants of the economy in the models. However, in the conventional measure of economic output, health and education contributions are measured essentially by expenditures on medical facilities and schools respectively. (Appleton & Teal, 1998)

PSE, SSE, and TSE are used in a separate model for comparative purpose with so that we can determine which of these variables impact more significantly on output growth.

GDP is used to measure economic growth. It is expected that variation in PSE, SSE, and TSE would positively impact aggregate output level.

The data were sourced from various issues of the statistical Bulletin and Annual Report and Statement of Accounts published by the Central Bank of Nigeria (CBN). The use of annual data finds justification in Hakkio and Rush (1991) and Davidson and Mackinon (1993). These authors argue that increasing the numbers of observations (by using monthly and quarterly data) does not add any robustness to the results of cointegration and that seasonal adjustment of quarterly or monthly data in analysis may be biased.

4.2 Analysis of Data

Unit Root Tests

The order of integration of variables is determined using the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) unit root tests. Table 1 reports the results of the unit root tests. The statistics for the ADF and PP at levels for output growth and the explanatory variables (TEE, TEH, GFCF, SCS, PSE, SSE and TSE) do not exceed the critical values (in absolute terms). Taking the first difference of each of the variables however, both the ADF and PP statistics are found higher than their respective critical values (in absolute terms).

The conclusion is that the variables are integrated of order one or $I(1)$.

Table 1: Unit Root Test Table (ADF and Phillips Perron)

Variables	At Level	Remark	1st Difference	Remark	Order of Integration
PSE	ADF = 0.046381 10% critical value= -2.6181	Presence of unit root	ADF = -3.539775 10% critical value = -2.6200	Absence of unit root	*I*(1)
SSE	ADF = -0.182376 10% critical value = -2.6181	Presence of unit root	ADF = -2.803581 10% critical value = -2.6200	Absence of unit root	*I*(1)
TSE	ADF = -1.122228 10% critical value = -2.6181	Presence of unit root	ADF = -5.656474 10% critical value = -2.6200	Absence of unit root	*I*(1)
SCS	ADF = 0.083406 10% critical value = -2.6181	Presence of unit root	ADF = -4.413792 10% critical value = -2.6200	Absence of unit root	*I*(1)
TEE	ADF = 0.060089 10% critical value = -2.6181	Presence of unit root	ADF = -4.609811 10% critical value = -2.6200	Absence of unit root	*I*(1)
THE	ADF = -2.032746 10% critical value = -2.6181	Presence of unit root	ADF = -4.549777 10% critical value = -2.6200	Absence of unit root	*I*(1)
GFCF	ADF = 0.276648 10% critical value = -2.6181	Presence of unit root	ADF = -4.758261 10% critical value = -2.6200	Absence of unit root	*I*(1)
GDP	ADF=-0.559341 10% critical value=-2.6168	Presence of unit root	ADF=-3.619930 10% critical value=-2.6200	Absence of unit root	*I*(1)

Table 2: ARDL Bounds Test for Cointegration Analysis

Critical value (F Statistic) for the bounds test: Unrestricted intercept and no trend

Computed F – Statistic	5% Critical Values	
	Lower Bounds	Upper Bounds
8.2301	2.86	4.01

From the computed F-statistic we can reject the null hypothesis of no cointegration at 5% significant level for output growth. The computed F-statistics, F_{stat} = 8.2301, is higher than the upper bound critical value of 4.01

Our main results of interest are the coefficients of the error correction variable (ECM) which is represented as RESID01 in the parsimonious model, and the human capital variables (i.e., the explanatory variables). The coefficients of the variables are interpreted as short run elasticities and the error correction variable (ECM) represents the speed of adjustments from short-run to long run equilibrium.

4.3 Discussion of the Findings

The coefficient of the Error Correction Mechanism, ECM (-1)) of -0.515116 suggests an average convergence to equilibrium. Thus, there is a long run equilibrium between the dependent and independent variables and that confirms the presence of cointegration. The coefficient in the error correction term implies that disequilibrium in output growth during the current period will be corrected by 51.51 percent in the next period.

The regression results show that human capital development in Nigeria is increasing at a very slow rate. The results also show that the explanatory variables (i.e. Total Expenditure on Education, Total Expenditure on Health, Gross Fixed Capital Formation, Social and Community Services, Primary School Enrolment, Secondary School Enrolment and Tertiary School Enrolment) are determinants of human capital development in Nigeria.

The coefficients of Total Expenditure on Education (TEE), 0.283921 show a positive relationship with output growth and is significant at 10%. This implies that a 1 percent increase in expenditure on education in the current period will cause a 28.39 percent rise in output.

The coefficient of Total Expenditure on Health (TEH), 0.461316 show a positive relationship with output growth and is significant at 10%. This implies that a 1 percent increase in Expenditure on Health will cause a 46.13 percent increase in output after a one period lag.

The coefficient of Gross Fixed Capital Formation (GFCF), 0.449361 show a positive relationship with output growth and is significant at 10%. This implies that a 1 percent increase in gross fixed capital formation will cause a 44.936 percent increase in output after a two period lag.

Social and Community Services (SCS) had the least positive effect on output growth with a coefficient of 0.124655. This implies that a 1 percent increase in Social and Community Services will cause a 12.4655 percent increase in output after a one period lag.

Primary school enrolment (PSE) contributed positively to output growth with a coefficient of 0.709972. This implies that a 1% increase in primary school enrolment will cause a 70.99 percent increase in output after a two lag period.

Secondary school enrolment (SSE) also contributed positively to output growth with a coefficient of 0.844961. This implies that a 1 percent increase in secondary school enrolment will cause an 84.4961 percent increase in output.

Tertiary school enrolment (TSE) had a positive coefficient of 0.388457. This implies that a 1 percent increase in tertiary school enrolment will cause a 38.8457 percent increase in output.

Diagnostic Testing

The test for stationarity of the coefficient estimates and serial correlation of the residuals were conducted by using the Cummulative Sum of Squares residuals (CUSUMSQ), the CUSUM of recursive residuals and the Durbin- Watson statistic.

Instability of parameters is established if the CUSUM of squares residual curves goes outside the area between the two critical (dotted) lines. The results from the back pages indicate the absence of any instability of the coefficients because the plots of the CUSUMSQ, CUSUM statistic and recursive residuals are confined within the 5% critical bounds of parameters stability. This implies that the model has high ability to capture turning points with remarkable tracking of dates.

The serial correlation test (Durbin- Watson statistic) also inferred that the model is not serially correlated. This establishes the reliability of the model for policy formulation.

CHAPTER FIVE

SUMMARY, CONCLUSION and RECOMMENDATIONS

5.1 Summary

This study applied the ARDL bounds testing approach to cointegration to examine the relationship between the expenditure on human capital, gross fixed capital formation, primary, secondary and tertiary school enrollment and output growth in Nigeria for the period 1980 – 2012. The estimated results established a cointegration relation among the variables used. The study modified the Endogenous Growth Model by making Primary School Enrollment, Secondary School Enrollment and Tertiary School Enrollment endogenous factors to growth, in a separate model. The estimated long-run relationship established the positive contribution of human capital development in the economic growth process of Nigeria. The impact however is relatively low within the period of this study.

5.2 Conclusion

The results from the estimation show that a positive relationship exist between total expenditure on education, gross fixed capital formation, social and community services and output growth. However, a negative relationship exists between total expenditure on health, primary school enrolment, secondary school enrolment, tertiary school enrolment and output growth. Over all, the results show that the contribution of human capital to economic growth in Nigeria is low. This may be related to the high rate of underemployment and unemployment especially of educated labour force. Moreover, inadequate use of the stock of human capital accumulation affects aggregate income, which reduces consumption levels of domestically produced goods and services. This results in slow economic growth. In Nigeria, the output of the local industries (except the oil) is mostly traded in the domestic markets because of their relative low level of their competitiveness. Besides, the quality and efficiency of human capital in Nigeria cast doubt on its contribution to economic growth especially when viewed against the backdrop of the labour market condition which encourages brain drain.

Furthermore, as a result of corruption and in a bid to score cheap popularity and ensure that they continue to remain in power, politicians and government officials sometimes increases expenditure and investment in unproductive projects or in goods that the private sector can produce more efficiently. Thus, government activities sometimes produce misallocation of resources and impede the growth of national output. Unfortunately, rising government expenditure has not yet translated to meaningful growth and development, as Nigeria ranks among the poorest countries in the world. In addition many Nigerians have continued to wallow in abject poverty, while more than 50% live on less than US$2 per day. Coupled with this, is dilapidated infrastructures (especially roads and power supply) that has led to the collapse of many industries including high level of unemployment. Moreover, macroeconomic indicators like the balance of payments, import obligations, inflation rates, exchange rates and national savings reveal that Nigeria has not fared well during the period of this research.

5.3 Recommendations

Job-creating growth sustenance in Nigeria therefore requires a conscious effort of government and the private sector over how much to invest in health and education (emphasizing human capital development) as well as enhancing labour intensive growth. Government investing in both education and health is particularly important as there are indirect benefits of such investments which individuals may not allow for their investment decisions. Although, there had been some form of improvements in the funding of education and health, this has not been proportionate to the rise in physical capital in view of their complementarities.

Adequate skills are thus needed to match the growth in machines. Indeed, investing in both machines and people simultaneously is necessary and the proportion of how much to invest in the alternative forms of capital should however be dynamic.

There should be adjustment in the admission process in favour of core sciences and technical oriented courses with adequate funding of schools.

Furthermore, government should re-structure the curricular of higher education making it more practical oriented more importantly in technical and engineering courses. Adequate practical that could solve day-to-day problems should be emphasized. Due emphasis should be placed on on-the-job training.

Government should increase her partnership with the private sector to promote investment in the economy which will improve employment and encourage physical capital formation.

Good governance can only thrive in a corrupt-free environment hence, the government, private firms and other corporate bodies together with the general public must ensure that corruption is reduced to its barest minimum if not completely eradicated.

Lastly, school intake especially into the university system should be of quality type. This will ensure quality graduates that are employable.

5.4 Contributions to Knowledge

(1) As a modification to the New Growth Theory, this study has domesticated the Endogenous Growth theory by integrating the roles of primary, secondary and tertiary education in the process of economic growth with specific reference to Nigeria. Thus, the study has made school enrollment an endogenous factors to growth. School enrollment may not contribute instantaneously to GDP because students need to acquire the necessary skills now before they make meaningful contributions to the GDP in the future.

(2) Furthermore, the New Growth Theory neglects the role of institutions which this research work adequately captures through the relationship between the educational institutions, via school enrollment, and skills acquired by human capital. This is because the quality of these institutions (proxied by total government expenditure on education) is expected to be positively related to the quality of skills acquired by human capital when enrolled in schools.

(3) A methodological novelty was established by the use of the bounds testing method to establish the long run relationship between GDP growth and investment in human capital development using Nigerian data.

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APPENDIX

Dependent Variable: DLGDP
Method: Least Squares
Date: 05/16/16 Time: 09:37
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints

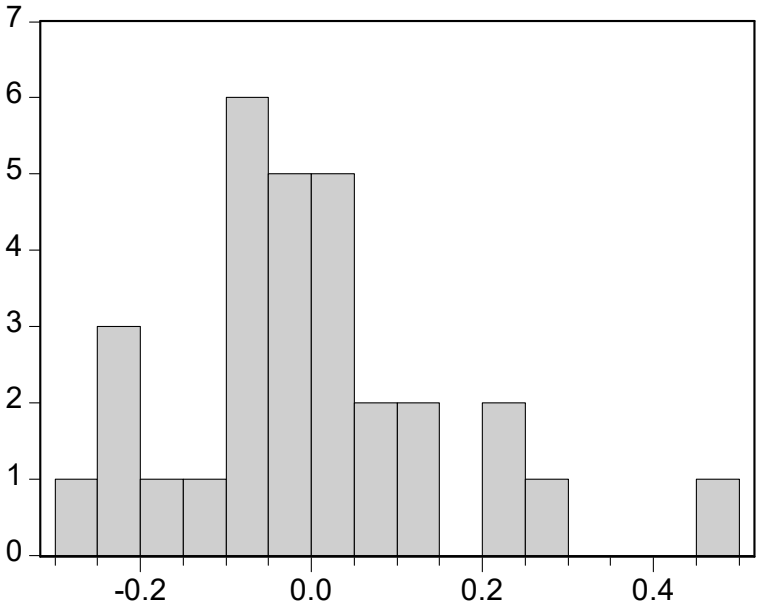
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLTEE	0.053192	0.024896	2.136584	0.0426
DLTEE(-1)	0.805474	1.089784	0.739113	0.4705
DLTEE(-2)	0.244749	1.021298	0.239645	0.8136
DLTEH	0.005316	0.038780	0.137073	0.8927
DLTEH(-1)	0.479142	0.196846	2.434094	0.0201
DLTEH(-2)	0.017129	0.038773	0.441765	0.6646
DLGFCF	0.401676	0.232305	1.729090	0.0971
DLGFCF(-1)	0.083604	0.053743	0.555627	0.1324
DLGFCF(-2)	1.208251	0.246136	4.908867	0.0000
DLSCS	1.740364	1.338906	1.299841	0.2121
DLSCS(-1)	0.648557	0.155729	4.164638	0.0002
DLSCS(-2)	0.151808	1.034848	0.146696	0.8852
ECM(-1)	-0.161179	0.067820	-2.376591	0.0254
C	0.248838	0.060107	4.139916	0.0008

R-squared	0.671400	Mean dependent var	0.225477
Adjusted R-squared	0.639338	S.D. dependent var	0.174493
S.E. of regression	0.186254	Akaike info criterion	0.218688
Sum squared resid	0.555048	Schwarz criterion	0.435204
Log likelihood	17.28032	F-statistic	20.27183
Durbin-Watson stat	2.072988	Prob(F-statistic)	0.000000

Dependent Variable: DLGDP
Method: Least Squares
Date: 05/16/16 Time: 09:45
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLTEE	0.283921	0.135872	2.089620	0.0440
DLTEH(-1)	0.461316	0.160090	2.881610	0.0071
DLGFCF(-2)	0.449361	0.135530	3.315583	0.0000
DLSCS(-1)	0.124655	0.137699	6.123596	0.0000
ECM(-1)	-0.515116	0.221153	-2.329223	0.0324
C	0.205318	0.045070	4.555548	0.0001

R-squared	0.729855	Mean dependent var	0.225477
Adjusted R-squared	0.701075	S.D. dependent var	0.174493
S.E. of regression	0.172645	Akaike info criterion	-0.498304
Sum squared resid	0.715350	Schwarz criterion	-0.218065
Log likelihood	13.47456	F-statistic	24.14868
Durbin-Watson stat	2.149157	Prob(F-statistic)	0.000000



Series: Residuals	
Sample 1983 2012	
Observations 30	
Mean	-3.70E-18
Median	-0.022581
Maximum	0.464231
Minimum	-0.256374
Std. Dev.	0.157058
Skewness	0.801189
Kurtosis	3.993855
Jarque-Bera	4.444200
Probability	0.108381

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.123818	Probability	0.884152
Obs*R-squared	0.333926	Probability	0.846231

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/16/16 Time: 09:48
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLTEE	0.001107	0.078669	0.014076	0.9889
DLTEH(-1)	0.003877	0.035790	0.108327	0.9147
DLGFCF(-2)	1.95E-08	2.21E-07	0.088443	0.9303
DLSCS(-1)	0.001938	0.079942	0.024244	0.9809
ECM(-1)	-0.004842	0.417255	-0.011605	0.9908
C	-0.001915	0.047692	-0.040143	0.9683
RESID(-1)	0.028154	0.464945	0.060553	0.9523
RESID(-2)	-0.109279	0.237138	-0.460824	0.6494

R-squared	0.011131	Mean dependent var	-3.70E-18
Adjusted R-squared	-0.303509	S.D. dependent var	0.157058
S.E. of regression	0.179315	Akaike info criterion	-0.376164
Sum squared resid	0.707387	Schwarz criterion	-0.002512
Log likelihood	13.64246	F-statistic	0.035377
Durbin-Watson stat	1.972344	Prob(F-statistic)	0.999927

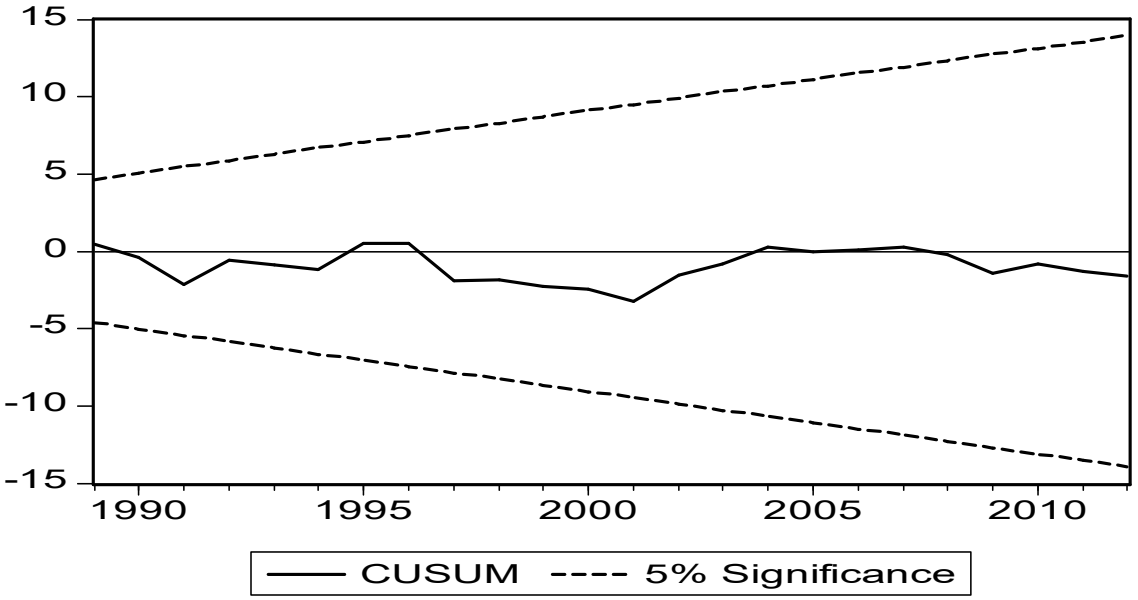
White Heteroskedasticity Test:

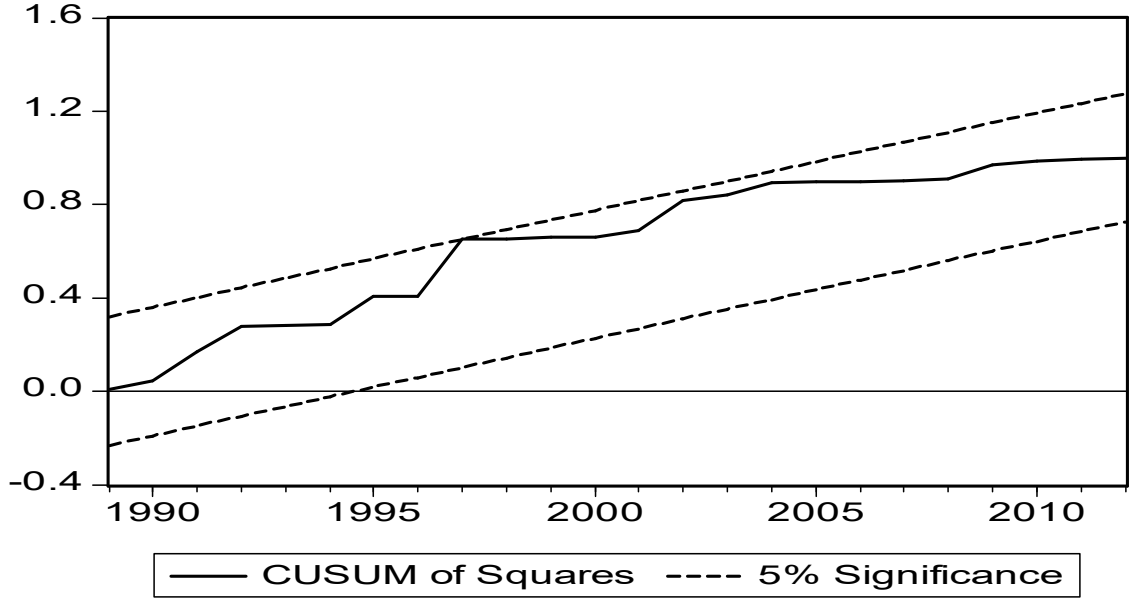
F-statistic	0.530209	Probability	0.847874
Obs*R-squared	6.545231	Probability	0.767567

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/16/16 Time: 09:49
Sample: 1983 2012
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.036501	0.013774	2.649890	0.0158
DLTEE	-0.015975	0.036669	-0.435658	0.6680
DLTEE^2	-0.005348	0.036221	-0.147647	0.8842
DLTEH(-1)	-0.008382	0.015335	-0.546577	0.5910
DLTEH(-1)^2	-0.000218	0.004109	-0.052945	0.9583
DLGFCF(-2)	6.23E-08	1.06E-07	0.586657	0.5643
DLGFCF(-2)^2	-3.20E-13	2.55E-13	-1.256101	0.2243
DLSCS(-1)	0.049030	0.039665	1.236087	0.2315
DLSCS(-1)^2	-0.040879	0.034900	-1.171316	0.2560
ECM(-1)	-0.009965	0.069410	-0.143572	0.8874
ECM(-1)^2	-0.130697	0.207281	-0.630528	0.5359

R-squared	0.218174	Mean dependent var	0.023845
Adjusted R-squared	-0.193313	S.D. dependent var	0.041964
S.E. of regression	0.045841	Akaike info criterion	-3.050714
Sum squared resid	0.039926	Schwarz criterion	-2.536942
Log likelihood	56.76071	F-statistic	0.530209
Durbin-Watson stat	2.212972	Prob(F-statistic)	0.847874


15
10
5
0
-5
-10
-15
1990
1995
2000
2005
2010
CUSUM
5% Significance


1.6
1.2
0.8
0.4
0.0
-0.4
1990
1995
2000
2005
2010
CUSUM of Squares
5% Significance

Date: 05/16/16 Time: 09:53
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: LGDP LGFCF LTEE LTEH LSCS
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.886440	123.6745	68.52	76.07
At most 1 **	0.617779	58.41168	47.21	54.46
At most 2	0.562134	29.55897	29.68	35.65
At most 3	0.131377	4.783694	15.41	20.04
At most 4	0.018439	0.558319	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 2 cointegrating equation(s) at both 5% and 1% levels

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.886440	65.26284	33.46	38.77
At most 1 *	0.617779	28.85271	27.07	32.24
At most 2 *	0.562134	24.77527	20.97	25.52
At most 3	0.131377	4.225375	14.07	18.63
At most 4	0.018439	0.558319	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 3 cointegrating equation(s) at the 5% level
Max-eigenvalue test indicates 1 cointegrating equation(s) at the 1% level

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

LGDP	LGFCF	LTEE	LTEH	LSCS
1.884667	-5.683738	-53.04503	-0.317747	56.29531
5.491446	-11.31644	-11.09404	-0.562090	15.57253
-3.278231	0.006848	36.76851	0.172467	-34.12762
-1.928743	2.782020	-17.06194	-0.509910	16.83107
0.522599	-0.509768	-5.515907	0.634501	5.962373

Unrestricted Adjustment Coefficients (alpha):

D(LGDP)	0.009686	0.046415	-0.004012	-0.012157	-0.017148
D(LGFCF)	0.061851	0.114490	-0.040191	-0.029702	0.002631
D(LTEE)	-0.032123	-0.009377	-0.279495	-0.013719	0.005048
D(LTEH)	0.069406	0.178121	-0.110692	0.306372	-0.012363
D(LSCS)	-0.051515	0.000246	-0.274995	-0.014111	0.004361

1 Cointegrating Equation(s): Log likelihood 77.33554

Normalized cointegrating coefficients (std.err. in parentheses)

LGDP	LGFCF	LTEE	LTEH	LSCS
1.000000	-3.015778	-28.14557	-0.168596	29.87015
	(0.28711)	(2.57365)	(0.04320)	(2.58848)

Adjustment coefficients (std.err. in parentheses)

D(LGDP)	0.018255
	(0.06376)
D(LGFCF)	0.116568
	(0.07906)
D(LTEE)	-0.060541
	(0.16743)
D(LTEH)	0.130807
	(0.39646)
D(LSCS)	-0.097088
	(0.16467)

2 Cointegrating Equation(s): Log likelihood 91.76190

Normalized cointegrating coefficients (std.err. in parentheses)

LGDP	LGFCF	LTEE	LTEH	LSCS
1.000000	0.000000	54.35180	0.040568	-55.49777
		(8.25240)	(0.13369)	(8.31661)
0.000000	1.000000	27.35525	0.069357	-28.30710
		(3.36774)	(0.05456)	(3.39394)

Adjustment coefficients (std.err. in parentheses)

D(LGDP)	0.273143	-0.580311
	(0.18586)	(0.40539)
D(LGFCF)	0.745283	-1.647160
	(0.18645)	(0.40669)
D(LTEE)	-0.112035	0.288694
	(0.51561)	(1.12464)
D(LTEH)	1.108951	-2.410183
	(1.19675)	(2.61032)
D(LSCS)	-0.095737	0.290013
	(0.50728)	(1.10646)

3 Cointegrating Equation(s): Log likelihood 104.1495

Normalized cointegrating coefficients (std.err. in parentheses)

LGDP	LGFCF	LTEE	LTEH	LSCS
1.000000	0.000000	0.000000	-0.036618	-0.865212
			(0.04990)	(0.02944)
0.000000	1.000000	0.000000	0.030509	-0.810542
			(0.02472)	(0.01459)
0.000000	0.000000	1.000000	0.001420	-1.005165
			(0.00206)	(0.00122)

Adjustment coefficients (std.err. in parentheses)

D(LGDP)	0.286296	-0.580338	-1.176265
	(0.21335)	(0.40522)	(2.09555)
D(LGFCF)	0.877039	-1.647435	-6.028802
	(0.20459)	(0.38859)	(2.00956)
D(LTEE)	0.804215	0.286780	-8.468621
	(0.39710)	(0.75422)	(3.90041)
D(LTEH)	1.471825	-2.410941	-9.727704
	(1.36329)	(2.58933)	(13.3905)
D(LSCS)	0.805761	0.288130	-7.381300
	(0.39065)	(0.74197)	(3.83705)

4 Cointegrating Equation(s): Log likelihood 106.2622

Normalized cointegrating coefficients (std.err. in parentheses)

LGDP	LGFCF	LTEE	LTEH	LSCS
1.000000	0.000000	0.000000	0.000000	-0.880471
				(0.02993)
0.000000	1.000000	0.000000	0.000000	-0.797830
				(0.01863)
0.000000	0.000000	1.000000	0.000000	-1.004574
				(0.00133)
0.000000	0.000000	0.000000	1.000000	-0.416683
				(0.43790)

Adjustment coefficients (std.err. in parentheses)

D(LGDP)	0.309743	-0.614159	-0.968845	-0.023660
	(0.22120)	(0.41321)	(2.15680)	(0.02679)
D(LGFCF)	0.934327	-1.730067	-5.522025	-0.075793
	(0.20737)	(0.38736)	(2.02187)	(0.02511)
D(LTEE)	0.830675	0.248613	-8.234547	-0.025730
	(0.41277)	(0.77107)	(4.02466)	(0.04999)
D(LTEH)	0.880912	-1.558607	-14.95501	-0.297487
	(1.32773)	(2.48024)	(12.9458)	(0.16081)
D(LSCS)	0.832979	0.248872	-7.140531	-0.024002
	(0.40601)	(0.75844)	(3.95875)	(0.04917)

	LGDP	LGFCF	LTEH	LTEE	LSCS
Mean	14.14681	11.80521	5.071227	12.04182	12.08464
Median	14.80977	11.98850	5.030301	12.20962	12.23374
Maximum	17.56529	15.05475	7.202266	16.10942	16.13412
Minimum	10.77100	8.910140	2.359050	8.752819	8.817461
Std. Dev.	2.365812	2.131762	1.557283	2.610511	2.591249
Skewness	-0.111565	0.030077	-0.128403	0.090881	0.095426
Kurtosis	1.571472	1.474502	1.718416	1.486429	1.487805
Jarque-Bera	2.874409	3.204798	2.349059	3.195411	3.194343
Probability	0.237591	0.201413	0.308964	0.202360	0.202468
Sum	466.8449	389.5718	167.3505	397.3800	398.7931
Sum Sq. Dev.	179.1062	145.4211	77.60419	218.0725	214.8662
Observations	33	33	33	33	33

Variance Decomposition of LGDP:

Period	S.E.	LGDP	LGFCF	LTEH	LTEE	LSCS
1	0.185297	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.302723	90.45622	0.007654	2.543793	6.991957	0.000378
3	0.386263	87.25203	0.007143	7.007834	5.682330	0.050665
4	0.449309	84.80777	0.184612	9.951752	4.971056	0.084805
5	0.500693	83.36192	0.258821	11.38765	4.867825	0.123778
6	0.549413	82.22985	0.293175	12.37009	4.992209	0.114679
7	0.593167	81.40097	0.288375	13.03095	5.176331	0.103372
8	0.633634	80.86153	0.265527	13.42910	5.347810	0.096037
9	0.671823	80.55283	0.245529	13.66691	5.442815	0.091918
10	0.708219	80.36218	0.233503	13.83729	5.477673	0.089356

Variance Decomposition of LGFCF:

Period	S.E.	LGDP	LGFCF	LTEH	LTEE	LSCS
1	0.229754	13.16172	86.83828	0.000000	0.000000	0.000000
2	0.319182	38.25954	55.20542	0.101732	4.436367	1.996943
3	0.417404	37.48555	53.71761	0.429494	6.824660	1.542677
4	0.494653	41.78597	50.06189	0.420333	6.401541	1.330262
5	0.552490	44.17479	48.56747	0.337223	5.767163	1.153353
6	0.603462	46.32798	46.97268	0.305608	5.378969	1.014757
7	0.649527	47.93524	45.64514	0.311504	5.165743	0.942373
8	0.691767	48.86139	44.82999	0.333150	5.079203	0.896261
9	0.732192	49.40712	44.32516	0.340022	5.062770	0.864927
10	0.771037	49.79771	43.97277	0.335173	5.054227	0.840117

Variance Decomposition of LTEH:

Period	S.E.	LGDP	LGFCF	LTEH	LTEE	LSCS
1	1.152189	0.040983	3.678849	96.28017	0.000000	0.000000
2	1.626130	4.736280	2.547154	92.32169	0.016433	0.378445
3	1.913661	6.646252	3.494839	89.17788	0.141715	0.539314
4	2.149686	6.600638	3.658750	88.86734	0.444059	0.429214
5	2.364343	6.824814	4.273286	87.76379	0.783262	0.354846
6	2.563682	6.942223	5.087630	86.64900	1.013567	0.307585
7	2.738968	6.935301	5.651472	86.05295	1.079511	0.280769
8	2.899793	6.878983	5.933233	85.83672	1.087837	0.263221
9	3.054509	6.826060	6.081468	85.75138	1.091636	0.249453
10	3.204871	6.802080	6.178976	85.68303	1.098360	0.237558

Variance Decomposition of LTEE:

Period	S.E.	LGDP	LGFCF	LTEH	LTEE	LSCS
1	0.486578	0.161604	13.29506	1.462869	85.08046	0.000000
2	0.676906	0.511642	25.22679	1.029508	73.14026	0.091802
3	0.788762	0.911669	27.26315	1.365480	70.12356	0.336147
4	0.897904	0.956203	29.60777	2.386557	66.78859	0.260884
5	0.985245	1.518768	30.61625	2.646869	65.00050	0.217610
6	1.054052	1.856517	30.96574	2.745768	64.24097	0.191003
7	1.118647	2.009075	31.13001	2.740412	63.95061	0.169898
8	1.181695	2.076534	31.27304	2.699149	63.79807	0.153205
9	1.242798	2.113192	31.41009	2.674424	63.66108	0.141217

10	1.302369	2.137143	31.55719	2.673992	63.49991	0.131764

Variance Decomposition of LSCS:

Period	S.E.	LGDP	LGFCF	LTEH	LTEE	LSCS
1	0.478565	0.024511	14.59526	1.679383	83.64587	0.054980
2	0.668801	0.525376	27.07153	1.231074	71.02380	0.148222
3	0.780654	1.157215	29.35235	1.692681	67.39594	0.401820
4	0.886395	1.311723	31.65140	2.800733	63.92190	0.314243
5	0.970722	2.048429	32.56190	3.078827	62.04671	0.264131
6	1.037166	2.479850	32.87708	3.169139	61.24084	0.233091
7	1.099668	2.684475	33.02742	3.151995	60.92756	0.208541
8	1.160940	2.778479	33.16771	3.102924	60.76141	0.189482
9	1.220566	2.834889	33.30726	3.075244	60.60627	0.176336
10	1.278763	2.875249	33.45859	3.075068	60.42511	0.165986

Cholesky Ordering: LGDP LGFCF LTEH LTEE LSCS

Dependent Variable: DLGDP
Method: Least Squares
Date: 05/16/16 Time: 10:03
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints

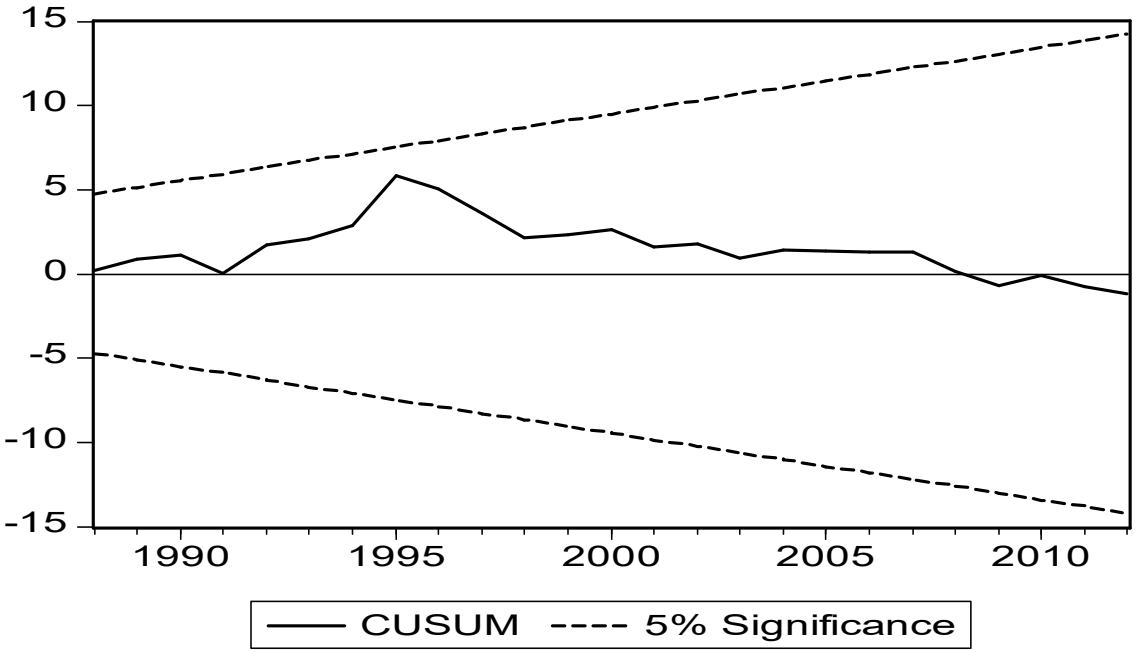
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLPSE	0.084422	0.100307	0.841640	0.4105
DLPSE(-1)	0.034666	0.100532	0.344821	0.7340
DLPSE(-2)	0.712714	0.277869	2.564931	0.0201
DLSSE	1.217184	0.298915	4.072002	0.0008
DLSSE(-1)	0.035903	0.154315	0.232661	0.8185
DLSSE(-2)	0.056561	0.153938	0.367430	0.7174
DLTSE	0.049111	0.099447	0.493837	0.6271
DLTSE(-1)	1.067296	0.364809	2.925626	0.0094
DLTSE(-2)	0.126264	0.101055	1.249450	0.2267
ECM(-1)	-0.466654	0.111772	-4.175055	0.0003
C	0.173978	0.065978	2.636904	0.0163

R-squared	0.623376	Mean dependent var	0.225477
Adjusted R-squared	0.602110	S.D. dependent var	0.174493
S.E. of regression	0.188752	Akaike info criterion	0.220187
Sum squared resid	0.676921	Schwarz criterion	0.293585
Log likelihood	14.30281	F-statistic	39.58399
Durbin-Watson stat	2.223786	Prob(F-statistic)	0.000000

Dependent Variable: DLGDP
Method: Least Squares
Date: 05/16/16 Time: 10:08
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLPSE(-2)	0.709972	0.109648	6.475019	0.0000
DLSSE	0.844961	0.300682	2.910148	0.0089
DLTSE(-1)	0.388457	0.169388	2.293297	0.0323
ECM(-1)	-0.241610	0.111812	-2.160864	0.0424
C	0.183224	0.042866	4.274288	0.0002

R-squared	0.767606	Mean dependent var	0.225477
Adjusted R-squared	0.740377	S.D. dependent var	0.174493
S.E. of regression	0.174526	Akaike info criterion	-0.502472
Sum squared resid	0.761485	Schwarz criterion	-0.268939
Log likelihood	12.53707	F-statistic	20.97269
Durbin-Watson stat	2.199561	Prob(F-statistic)	0.000000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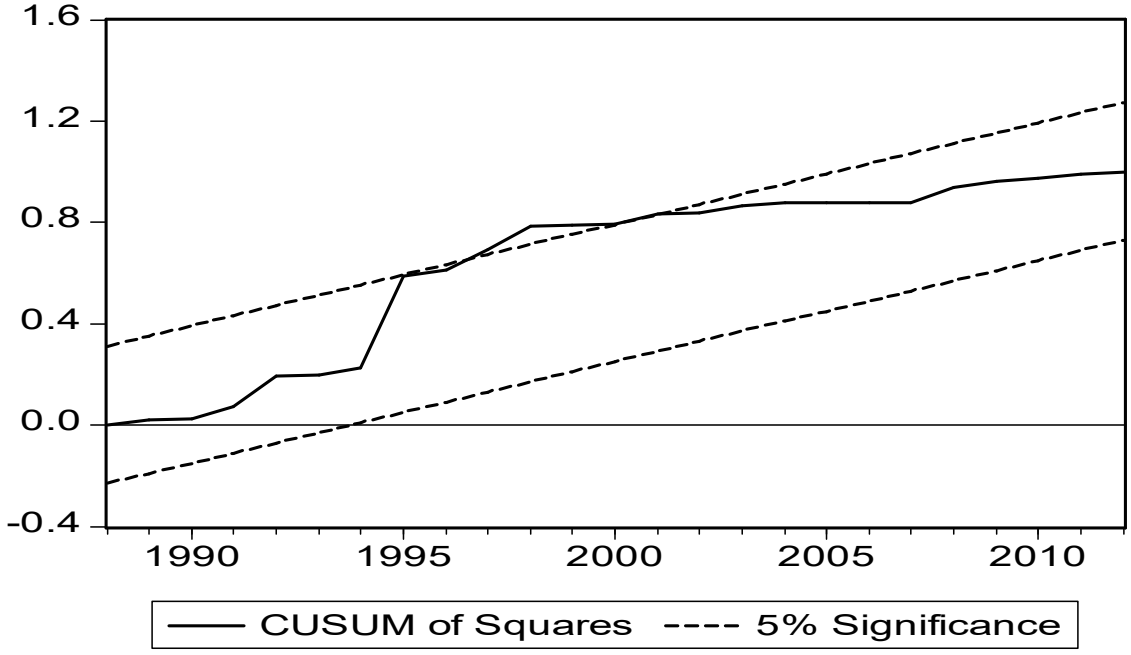
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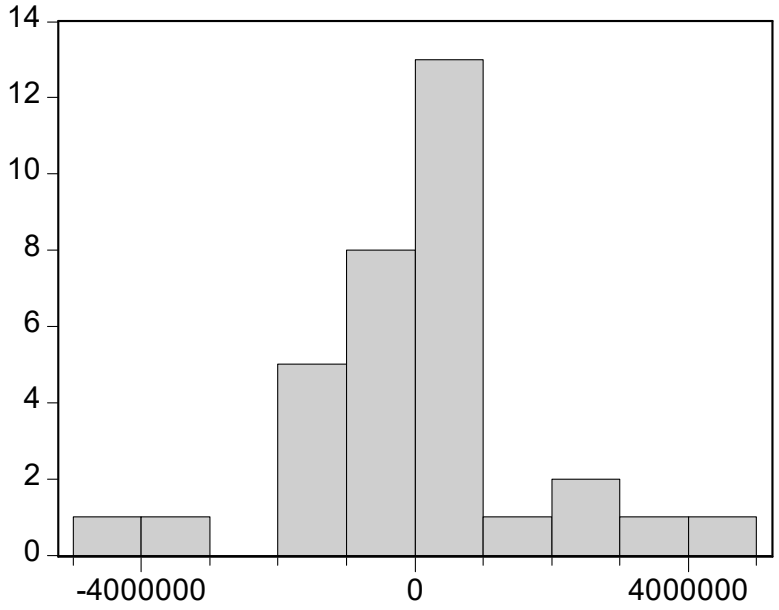
5% Significance



Series: Residuals	
Sample 1980 2012	
Observations 33	
Mean	-7.70E-09
Median	44014.34
Maximum	4206986.
Minimum	-4247043.
Std. Dev.	1641543.
Skewness	0.031970
Kurtosis	4.709509
Jarque-Bera	4.023952
Probability	0.133724

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.097765	Probability	0.907237
Obs*R-squared	0.252890	Probability	0.881223

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/16/16 Time: 10:13
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLPSE(-2)	-0.006732	0.091264	-0.073764	0.9418
DLSSE	-0.013167	0.150060	-0.087742	0.9308
DLTSE(-1)	0.003378	0.084362	0.040039	0.9684
ECM(-1)	-0.137691	0.462637	-0.297621	0.7687
C	0.004563	0.045796	0.099628	0.9215
RESID(-1)	0.180977	0.501220	0.361074	0.7213
RESID(-2)	-0.032861	0.231977	-0.141657	0.8886

R-squared	0.008430	Mean dependent var	-8.33E-18
Adjusted R-squared	-0.250241	S.D. dependent var	0.162044
S.E. of regression	0.181188	Akaike info criterion	-0.377604
Sum squared resid	0.755066	Schwarz criterion	-0.050658
Log likelihood	12.66406	F-statistic	0.032588
Durbin-Watson stat	1.956805	Prob(F-statistic)	0.999819

White Heteroskedasticity Test:

F-statistic	0.240156	Probability	0.978130
Obs*R-squared	2.514589	Probability	0.961047

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/16/16 Time: 10:14
Sample: 1983 2012
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.031794	0.016717	1.901916	0.0710
DLPSE(-2)	0.047090	0.057833	0.814238	0.4246
DLPSE(-2)^2	-0.038579	0.046182	-0.835363	0.4129
DLSSE	-0.001696	0.128458	-0.013199	0.9896
DLSSE^2	-0.020953	0.117040	-0.179026	0.8596
DLTSE(-1)	-0.011414	0.026516	-0.430454	0.6713
DLTSE(-1)^2	-0.008901	0.018575	-0.479197	0.6368
ECM(-1)	0.021010	0.075024	0.280038	0.7822
ECM(-1)^2	-0.195661	0.228664	-0.855670	0.4018

R-squared	0.083820	Mean dependent var	0.025383
Adjusted R-squared	-0.265201	S.D. dependent var	0.049051
S.E. of regression	0.055173	Akaike info criterion	-2.713360
Sum squared resid	0.063925	Schwarz criterion	-2.293000
Log likelihood	49.70039	F-statistic	0.240156
Durbin-Watson stat	2.075388	Prob(F-statistic)	0.978130

Date: 05/16/16 Time: 10:16
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: LGDP LPSE LSSE LTSE
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.817716	88.60773	47.21	54.46
At most 1 **	0.615901	37.54212	29.68	35.65
At most 2	0.238379	8.836499	15.41	20.04
At most 3	0.021998	0.667305	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level

Trace test indicates 2 cointegrating equation(s) at both 5% and 1% levels

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.817716	51.06560	27.07	32.24
At most 1 **	0.615901	28.70563	20.97	25.52
At most 2	0.238379	8.169194	14.07	18.63
At most 3	0.021998	0.667305	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 2 cointegrating equation(s) at both 5% and 1% levels

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

LGDP	LPSE	LSSE	LTSE
-2.928757	1.454578	1.277879	6.579611
-3.173616	2.688694	1.049215	-4.233501
-0.009660	1.249100	-1.843619	1.948433
-0.362410	0.371573	-0.536617	-1.474778

Unrestricted Adjustment Coefficients (alpha):

D(LGDP)	0.045927	-0.038948	-0.010121	0.020138
D(LPSE)	-0.231091	-0.142989	-0.054502	-0.009265
D(LSSE)	-0.061201	-0.006184	0.092494	0.010096
D(LTSE)	-0.154824	0.210848	-0.039364	0.016635

1 Cointegrating Equation(s): Log likelihood 22.83797

Normalized cointegrating coefficients (std.err. in parentheses)

LGDP	LPSE	LSSE	LTSE
1.000000	-0.496654	-0.436321	-2.246554
	(0.05258)	(0.07132)	(0.29214)

Adjustment coefficients (std.err. in parentheses)

D(LGDP)	-0.134508
	(0.09669)
D(LPSE)	0.676810
	(0.16236)
D(LSSE)	0.179244
	(0.13328)
D(LTSE)	0.453442
	(0.20355)

Log likelihood 37.19078

2 Cointegrating Equation(s):

Normalized cointegrating coefficients (std.err. in parentheses)

LGDP	LPSE	LSSE	LTSE
1.000000	0.000000	-0.586098	-7.319401
		(0.10906)	(0.90719)
0.000000	1.000000	-0.301572	-10.21405
		(0.17555)	(1.46030)

Adjustment coefficients (std.err. in parentheses)

D(LGDP)	-0.010901	-0.037916
	(0.13752)	(0.09735)
D(LPSE)	1.130602	-0.720593
	(0.19557)	(0.13844)
D(LSSE)	0.198869	-0.105649
	(0.19643)	(0.13905)
D(LTSE)	-0.215710	0.341703
	(0.22052)	(0.15610)

3 Cointegrating Equation(s): Log likelihood 41.27538

Normalized cointegrating coefficients (std.err. in parentheses)

LGDP	LPSE	LSSE	LTSE
1.000000	0.000000	0.000000	-13.14465
			(1.43224)
0.000000	1.000000	0.000000	-13.21138
			(1.36746)
0.000000	0.000000	1.000000	-9.939035
			(1.71561)

Adjustment coefficients (std.err. in parentheses)

D(LGDP)	-0.010803	-0.050559	0.036483
	(0.13717)	(0.10489)	(0.07866)
D(LPSE)	1.131128	-0.788671	-0.344853
	(0.18836)	(0.14403)	(0.10801)
D(LSSE)	0.197976	0.009885	-0.255219
	(0.17495)	(0.13378)	(0.10033)
D(LTSE)	-0.215329	0.292534	0.095950
	(0.21722)	(0.16610)	(0.12456)

Variance Decomposition of LGDP:

Period	S.E.	LGDP	LPSE	LSSE	LTSE
1	0.180822	100.0000	0.000000	0.000000	0.000000
2	0.285498	97.49955	2.098079	0.396922	0.005444
3	0.382678	91.07227	7.846933	1.046736	0.034059
4	0.444140	90.62824	7.169477	2.089171	0.113111
5	0.503267	89.00856	6.987355	3.701186	0.302901
6	0.560403	88.27767	6.680898	4.458183	0.583250
7	0.613703	87.54889	6.645151	5.126638	0.679320
8	0.664950	87.10126	6.691220	5.455694	0.751826
9	0.710146	86.73914	6.594354	5.860996	0.805506
10	0.753960	86.36931	6.592566	6.175126	0.862998

Variance Decomposition of LPSE:

Period	S.E.	LGDP	LPSE	LSSE	LTSE
1	0.303638	0.019361	99.98064	0.000000	0.000000
2	0.419883	0.710214	75.08519	1.029735	23.17486
3	0.558369	0.446949	69.03393	4.579289	25.93984
4	0.713439	4.044244	66.22538	3.416847	26.31353
5	0.827385	4.687557	65.98727	3.827200	25.49797
6	0.953272	5.695254	65.99733	3.882260	24.42516
7	1.044001	5.825665	64.70270	4.393101	25.07853
8	1.143438	6.092242	64.07674	4.842174	24.98884
9	1.229713	6.424879	63.25268	5.029904	25.29254
10	1.313238	6.609400	62.88960	5.299791	25.20121

Variance Decomposition of LSSE:

Period	S.E.	LGDP	LPSE	LSSE	LTSE
1	0.249256	2.857744	17.20989	79.93237	0.000000
2	0.408646	6.930699	26.15467	66.77949	0.135137
3	0.553997	5.644722	24.14262	69.54072	0.671937
4	0.665117	6.557950	22.23182	70.24544	0.964798
5	0.770420	6.384312	22.59245	70.03476	0.988481
6	0.861952	6.543937	21.85218	70.57060	1.033283
7	0.946928	6.497854	21.95540	70.45266	1.094083
8	1.025151	6.467157	21.71496	70.70504	1.112841
9	1.097235	6.514547	21.65421	70.68378	1.147458
10	1.165657	6.480407	21.59882	70.76417	1.156600

Variance Decomposition of LTSE:

Period	S.E.	LGDP	LPSE	LSSE	LTSE
1	0.380669	0.186414	25.65724	14.31499	59.84135
2	0.396612	0.480535	28.51415	14.58316	56.42215
3	0.408352	0.947593	29.64229	15.42082	53.98930
4	0.423937	2.866190	27.55133	17.96144	51.62104
5	0.440780	4.184103	25.87937	20.12049	49.81604
6	0.452562	5.288584	24.54976	21.19447	48.96719
7	0.462849	6.052850	23.75979	22.28345	47.90391
8	0.471202	6.787530	23.07889	22.84966	47.28392
9	0.481063	7.933693	22.22754	23.60062	46.23815
10	0.490208	8.786516	21.52373	24.15698	45.53277

Cholesky Ordering: LGDP LPSE LSSE LTSE

	LGDP	LPSE	LSSE	LTSE
Mean	14.14681	11.91293	9.393036	13.37631
Median	14.80977	12.00021	9.139231	13.45338
Maximum	17.56529	15.46221	12.02354	13.73135
Minimum	10.77100	8.696778	6.910950	11.97072
Std. Dev.	2.365812	2.443787	1.721569	0.322065
Skewness	-0.111565	-0.008699	0.397114	-2.589331
Kurtosis	1.571472	1.400027	1.713245	12.01784
Jarque-Bera	2.874409	3.520295	3.143986	148.6926
Probability	0.237591	0.172019	0.207631	0.000000
Sum	466.8449	393.1268	309.9702	441.4181
Sum Sq. Dev.	179.1062	191.1070	94.84154	3.319228
Observations	33	33	33	33

ADF Test Statistic	0.046381	1%	Critical Value*	-3.6576
		5%	Critical Value	-2.9591
		10%	Critical Value	-2.6181

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LPSE)
Method: Least Squares
Date: 05/16/16 Time: 10:27
Sample(adjusted): 1982 2012
Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LPSE(-1)	0.001388	0.029931	0.046381	0.9633
D(LPSE(-1))	-0.198700	0.189129	-1.050603	0.3024
C	0.233239	0.358152	0.651229	0.5202

R-squared	0.038531	Mean dependent var	0.207482
Adjusted R-squared	-0.030146	S.D. dependent var	0.378101
S.E. of regression	0.383758	Akaike info criterion	1.014157
Sum squared resid	4.123568	Schwarz criterion	1.152930
Log likelihood	-12.71943	F-statistic	0.561046
Durbin-Watson stat	1.918955	Prob(F-statistic)	0.576894

ADF Test Statistic	-3.539775	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(LPSE,2)
Method: Least Squares
Date: 05/16/16 Time: 10:28
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LPSE(-1))	-1.034731	0.292316	-3.539775	0.0015
D(LPSE(-1),2)	-0.140390	0.189200	-0.742020	0.4645
C	0.225646	0.093440	2.414862	0.0228
R-squared	0.611563	Mean dependent var		0.002579
Adjusted R-squared	0.582790	S.D. dependent var		0.591481
S.E. of regression	0.382048	Akaike info criterion		1.008099
Sum squared resid	3.940938	Schwarz criterion		1.148218
Log likelihood	-12.12148	F-statistic		21.25471
Durbin-Watson stat	2.015520	Prob(F-statistic)		0.000003

ADF Test Statistic	-0.182376	1% Critical Value*	-3.6576
		5% Critical Value	-2.9591
		10% Critical Value	-2.6181

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LSSE)
Method: Least Squares
Date: 05/16/16 Time: 10:29
Sample(adjusted): 1982 2012
Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LSSE(-1)	-0.004905	0.026895	-0.182376	0.8566
D(LSSE(-1))	0.153295	0.188774	0.812054	0.4236
C	0.176897	0.253890	0.696747	0.4917
R-squared	0.023190	Mean dependent var		0.156001
Adjusted R-squared	-0.046583	S.D. dependent var		0.235509
S.E. of regression	0.240931	Akaike info criterion		0.083157
Sum squared resid	1.625343	Schwarz criterion		0.221930
Log likelihood	1.711061	F-statistic		0.332360
Durbin-Watson stat	2.047572	Prob(F-statistic)		0.720020

ADF Test Statistic	-2.803581	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(LSSE,2)
Method: Least Squares
Date: 05/16/16 Time: 10:30
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LSSE(-1))	-0.700464	0.249846	-2.803581	0.0092
D(LSSE(-1),2)	-0.175199	0.190565	-0.919367	0.3660
C	0.106002	0.060312	1.757570	0.0902

R-squared	0.440587	Mean dependent var	-0.004865
Adjusted R-squared	0.399149	S.D. dependent var	0.311868
S.E. of regression	0.241744	Akaike info criterion	0.092761
Sum squared resid	1.577878	Schwarz criterion	0.232880
Log likelihood	1.608590	F-statistic	10.63242
Durbin-Watson stat	1.925078	Prob(F-statistic)	0.000393

ADF Test Statistic	-1.122228	1% Critical Value*	-3.6576
		5% Critical Value	-2.9591
		10% Critical Value	-2.6181

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LTSE)
Method: Least Squares
Date: 05/16/16 Time: 10:31
Sample(adjusted): 1982 2012
Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LTSE(-1)	-0.762230	0.244130	-3.122228	0.0041
D(LTSE(-1))	-0.022821	0.193693	-0.117818	0.9071
C	10.18812	3.261455	3.123798	0.0041

R-squared	0.385341	Mean dependent var	0.003557
Adjusted R-squared	0.341437	S.D. dependent var	0.409299
S.E. of regression	0.332154	Akaike info criterion	0.725330
Sum squared resid	3.089138	Schwarz criterion	0.864103
Log likelihood	-8.242620	F-statistic	8.776847
Durbin-Watson stat	1.969244	Prob(F-statistic)	0.001099

ADF Test Statistic	-5.656474	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(LTSE,2)
Method: Least Squares
Date: 05/16/16 Time: 10:31
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTSE(-1))	-1.763497	0.311766	-5.656474	0.0000
D(LTSE(-1),2)	0.250764	0.185243	1.353701	0.1871
C	0.014800	0.069155	0.214011	0.8321

R-squared	0.725603	Mean dependent var	0.007363
Adjusted R-squared	0.705277	S.D. dependent var	0.697487
S.E. of regression	0.378655	Akaike info criterion	0.990255
Sum squared resid	3.871241	Schwarz criterion	1.130375
Log likelihood	-11.85382	F-statistic	35.69875
Durbin-Watson stat	1.639631	Prob(F-statistic)	0.000000

ADF Test Statistic	0.083406	1% Critical Value*	-3.6576
		5% Critical Value	-2.9591
		10% Critical Value	-2.6181

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LSCS)
Method: Least Squares
Date: 05/16/16 Time: 10:32
Sample(adjusted): 1982 2012
Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LSCS(-1)	0.002685	0.032187	0.083406	0.9341
D(LSCS(-1))	-0.098076	0.191066	-0.513309	0.6118
C	0.222207	0.390506	0.569024	0.5739

R-squared	0.009326	Mean dependent var	0.232070
Adjusted R-squared	-0.061437	S.D. dependent var	0.421031
S.E. of regression	0.433771	Akaike info criterion	1.259168
Sum squared resid	5.268414	Schwarz criterion	1.397941
Log likelihood	-16.51710	F-statistic	0.131790
Durbin-Watson stat	2.026482	Prob(F-statistic)	0.877066

ADF Test Statistic	-4.413792	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(LSCS,2)
Method: Least Squares
Date: 05/16/16 Time: 10:32
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LSCS(-1))	-1.242595	0.281525	-4.413792	0.0001
D(LSCS(-1),2)	0.130941	0.190142	0.688650	0.4969
C	0.294496	0.103217	2.853170	0.0082

R-squared	0.558766	Mean dependent var	0.004863
Adjusted R-squared	0.526082	S.D. dependent var	0.633990
S.E. of regression	0.436449	Akaike info criterion	1.274351
Sum squared resid	5.143178	Schwarz criterion	1.414471
Log likelihood	-16.11526	F-statistic	17.09603
Durbin-Watson stat	2.007719	Prob(F-statistic)	0.000016

ADF Test Statistic	0.060089	1% Critical Value*	-3.6576
		5% Critical Value	-2.9591
		10% Critical Value	-2.6181

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LTEE)
Method: Least Squares
Date: 05/16/16 Time: 10:33
Sample(adjusted): 1982 2012
Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LTEE(-1)	0.001972	0.032824	0.060089	0.9525
D(LTEE(-1))	-0.107283	0.190797	-0.562288	0.5784
C	0.234786	0.397103	0.591247	0.5591

R-squared	0.011226	Mean dependent var	0.233723
Adjusted R-squared	-0.059401	S.D. dependent var	0.433211
S.E. of regression	0.445892	Akaike info criterion	1.314286
Sum squared resid	5.566950	Schwarz criterion	1.453058
Log likelihood	-17.37143	F-statistic	0.158950
Durbin-Watson stat	2.027518	Prob(F-statistic)	0.853803

ADF Test Statistic	-4.609811	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(LTEE,2)
Method: Least Squares
Date: 05/16/16 Time: 10:34
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTEE(-1))	-1.288272	0.279463	-4.609811	0.0001
D(LTEE(-1),2)	0.158682	0.187872	0.844630	0.4057
C	0.312362	0.104171	2.998559	0.0058

R-squared	0.572651	Mean dependent var	0.009896
Adjusted R-squared	0.540995	S.D. dependent var	0.654323
S.E. of regression	0.443303	Akaike info criterion	1.305515
Sum squared resid	5.305984	Schwarz criterion	1.445635
Log likelihood	-16.58272	F-statistic	18.09007
Durbin-Watson stat	1.990799	Prob(F-statistic)	0.000010

ADF Test Statistic	-2.032746	1% Critical Value*	-3.6576
		5% Critical Value	-2.9591
		10% Critical Value	-2.6181

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LTEH)
Method: Least Squares
Date: 05/16/16 Time: 10:35
Sample(adjusted): 1982 2012
Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LTEH(-1)	-0.251928	0.123935	-2.032746	0.0517
D(LTEH(-1))	0.074550	0.190999	0.390318	0.6993
C	1.225678	0.644048	1.903085	0.0674

R-squared	0.130566	Mean dependent var	-0.031141
Adjusted R-squared	0.068464	S.D. dependent var	1.038038
S.E. of regression	1.001874	Akaike info criterion	2.933387
Sum squared resid	28.10504	Schwarz criterion	3.072160
Log likelihood	-42.46750	F-statistic	2.102435
Durbin-Watson stat	1.943653	Prob(F-statistic)	0.141030

ADF Test Statistic	-4.549777	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(LTEH,2)
Method: Least Squares
Date: 05/16/16 Time: 10:35
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTEH(-1))	-1.283341	0.282067	-4.549777	0.0001
D(LTEH(-1),2)	0.221536	0.193320	1.145953	0.2619
C	-0.030732	0.194890	-0.157689	0.8759

R-squared	0.530091	Mean dependent var	-0.048963
Adjusted R-squared	0.495283	S.D. dependent var	1.502323
S.E. of regression	1.067302	Akaike info criterion	3.062785
Sum squared resid	30.75661	Schwarz criterion	3.202904
Log likelihood	-42.94177	F-statistic	15.22897
Durbin-Watson stat	1.889286	Prob(F-statistic)	0.000037

ADF Test Statistic	0.276648	1% Critical Value*	-3.6576
		5% Critical Value	-2.9591
		10% Critical Value	-2.6181

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGFCF)
Method: Least Squares
Date: 05/16/16 Time: 10:36
Sample(adjusted): 1982 2012
Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGFCF(-1)	0.006762	0.024442	0.276648	0.7841
D(LGFCF(-1))	-0.380148	0.175442	-2.166805	0.0389
C	0.188444	0.288014	0.654287	0.5183

R-squared	0.144013	Mean dependent var	0.195728
Adjusted R-squared	0.082871	S.D. dependent var	0.283189
S.E. of regression	0.271201	Akaike info criterion	0.319852
Sum squared resid	2.059397	Schwarz criterion	0.458625
Log likelihood	-1.957699	F-statistic	2.355382
Durbin-Watson stat	2.037370	Prob(F-statistic)	0.113382

ADF Test Statistic	-4.758261	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(LGFCF,2)
Method: Least Squares
Date: 05/16/16 Time: 10:36
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGFCF(-1))	-1.451371	0.305021	-4.758261	0.0001
D(LGFCF(-1),2)	0.023738	0.182560	0.130030	0.8975
C	0.294858	0.076535	3.852583	0.0007

R-squared	0.715701	Mean dependent var	0.004682
Adjusted R-squared	0.694641	S.D. dependent var	0.481232
S.E. of regression	0.265925	Akaike info criterion	0.283435
Sum squared resid	1.909336	Schwarz criterion	0.423555
Log likelihood	-1.251526	F-statistic	33.98515
Durbin-Watson stat	1.751488	Prob(F-statistic)	0.000000

ADF Test Statistic	-0.559341	1% Critical Value*	-3.6576
		5% Critical Value	-2.9591
		10% Critical Value	-2.6181

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGDP)
Method: Least Squares
Date: 05/16/16 Time: 10:37
Sample(adjusted): 1982 2012
Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDP(-1)	-0.007958	0.014227	-0.559341	0.5804
D(LGDP(-1))	0.187196	0.179858	1.040803	0.3069
C	0.291698	0.204032	1.429664	0.1639

R-squared	0.044506	Mean dependent var	0.219171
Adjusted R-squared	-0.023744	S.D. dependent var	0.175116
S.E. of regression	0.177183	Akaike info criterion	-0.531499
Sum squared resid	0.879029	Schwarz criterion	-0.392726
Log likelihood	11.23823	F-statistic	0.652100
Durbin-Watson stat	2.072174	Prob(F-statistic)	0.528682

ADF Test Statistic	-3.619930	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(LGDP,2)
Method: Least Squares
Date: 05/16/16 Time: 10:37
Sample(adjusted): 1983 2012
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDP(-1))	-0.874100	0.241469	-3.619930	0.0012
D(LGDP(-1),2)	0.013265	0.185168	0.071639	0.9434
C	0.197423	0.062395	3.164099	0.0038

R-squared	0.439447	Mean dependent var	0.003143
Adjusted R-squared	0.397925	S.D. dependent var	0.230780
S.E. of regression	0.179070	Akaike info criterion	-0.507438
Sum squared resid	0.865786	Schwarz criterion	-0.367318
Log likelihood	10.61156	F-statistic	10.58338
Durbin-Watson stat	2.016156	Prob(F-statistic)	0.000404