IMPACT OF GOVERNMENT EXPENDITURE ON HUMAN CAPITAL DEVELOPMENT IN NIGERIA

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(SPS/12/MEC/00040)

Thesis submitted to the department of economics, Bayero University, Kano
in fulfilment of the requirements
for the Master Degree.

DECLARATION

This dissertation is a presentation of my original research work. Wherever contributions of others are involved, every effort is made to indicate this clearly with due reference to the literature.

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CERTIFICATION

This is to certify that the research work for this dissertation and the subsequent write up (Abubakar Sule Garko, SPS/12/MEC/00040) were carried out under my supervision. Impact of Government Expenditure on Human capital Development in Nigeria

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DEDICATION

This thesis is dedication to Almighty Allah, The Master of the universe and the day of judgement for the immense blessings added to the successful completion of the work. It is indeed not by our strength and wisdom that we see the end of this programme.

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All praise and thanks be to Allah, the most gracious and most merciful, may the peace and blessings of Allah be upon the last of all prophets and messengers (Prophet Muhammad SAW), his family, his companion and all those who follow his indelible foot print until the end of the universe

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ABSTRACT

The study examined the impact of human capital development on economic growth in Nigeria for the period 1986 to 2013, Using annual time series data on: Technological progress – proxied by gross fixed capital formation, as well as government expenditure on health and education. The study applied the Johansen Cointegration techniques to analyse the long run relationship; and VECM and VAR tools for short run analysis. The result revealed the presence of cointegration for all the three equations suggesting long run co-trending among the variables. The short run analysis revealed that technological progress and public expenditure on education have positive impact on GDP ; while public expenditure on health has negative impact on GDP in Nigeria on account of low allocation to this sector. The study recommends among others that government should significantly increase its budgetary allocations to the health and educational sectors, and savings and investments culture among Nigerians should further be encouraged.

CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Human capital development is an indispensable component of the development process. It is a development strategy aimed at fulfilling the potentials of people by enlarging their capabilities which necessarily implies the empowerment of the people and enabling them to participate actively in their own development. It also serves as a means through which the skills, knowledge, productivity and inventiveness of the people are enhanced. It is one of the most important requirements to ensure the sustenance and improvement of the economy, both at micro and macro level. Human capital development is a continuing process from childhood to old age, and a must for any society or enterprise that wishes to survive under the complex challenges of a dynamic world. For the individual, it should be life-long process, because of the continuously changing environment to which one must also continuously adapt.

The contending views on the meaning and scope of human capital have remained on the centre stage for decades. The Classical argued that skills gained by human are some form of capital while the Neoclassical asserted that the human himself is capital. The proponents of this second view discussed the role of human capital in income distribution and production theory. They argued that differences in levels of education and skills gained by persons require that they receive different wages (Gonçalves, 1999). The implication of this is a shift from a functional distribution of income to an individual distribution of income (Zweimüller, 2000).

The Neoclassical assertion is in line with the compensating principle of labour mobility which gives rise to wage differences that equalize net advantage and disadvantage of the work. This principle has been applied on wage differentials caused by vocational education and suggested that a person receiving education was in loss because of not working. Therefore, such qualified people are to be paid more wages and only then they could fulfil their costs of education and receive gains. This principle has constituted the basis of human capital analysis. Harbison and Meyer (1965) referred to human resources development as the process of increasing the knowledge, skills and the capacities of all the people in a society. In economic terms, according to them, it is the accumulation of human capital. Thus, investments in people in the form of education, training and health care or medical treatment are the means of human capital accumulation.

In the past, more emphasis had been placed on the accumulation of physical or material capital to the detriment of human capital in Nigeria's quest for rapid socio-economic progress. However, previous development strategies which virtually ignored the social or human aspects of development did little to accelerate the pace of development in the country. But since 1990, when the United Nations Development Programme (UNDP) started publishing the Human Development Report year after year, the human development pathway to development has gained currency in many developing countries including Nigeria.

The UNDP human development report on Nigeria for the year 1999 highlighted the overarching problem of pervasive poverty in the country. The report noted that no meaningful policies or programmes for the alleviation of poverty can be successfully developed in the country outside the framework of a holistic sustainable human development paradigm (UNDP, 1999). The federal government of Nigeria, perhaps in response to the 1999 UNDP report on the country, seems to have now embraced the philosophy of human development strategy as evidenced in its declared guiding principle in the 1999-2003 economic policy document which stated that "the economy exists for and belongs to the people, and at all times the general well-being of all people shall be the overriding objectives of the government and the proper measure of her performance".

In this same regard, the National Economic Empowerment and Development Strategy (NEEDS) (2004-2007) document stated that "NEEDS is about the Nigerian people, their welfare, health, employment, education, political power, physical security and empowerment are of paramount importance in realizing the vision of the future (Nigeria, 2004, p.11). Also, Nigeria along with other 191 member countries of the United Nations Organization (UNO) subscribed to the attainment of the Millennium Development Goals (MDGs) by the year 2015. These MDGs are salient to human capital development as they are geared towards reducing poverty, ill-health, and educational deprivation.

Developing Nigeria's human capital is critical especially now that the country is aspiring to be among the 20 leading economies in the world by the year 2020. But this aspiration will be a venture in futility so long as human capital formation is not accorded high priority. Human capital formation is a prerequisite for Nigeria and Nigerians to become competitive in the 21st century globalized economy which is skill and knowledge based. A country's competitiveness in the New International Economic Order (NIEO) is strongly connected to the quality of her human capital. Hence human capital formation is undoubtedly the pivot for any meaningful programme of socio-economic development of Nigeria and indeed of any country.

1.2 STATEMENT OF THE RESEARCH PROBLEM

The importance of human capital development cannot be overemphasized. Despite the tremendous material gains produced by the innovation of man, poverty, disease and deprivation still run rampant in the developing world. With the ripple effect of the global credit crises yet to abate and the rise in food prices across the globe, about 13. 6 % of the world population experience hunger caused by deteriorating economic conditions (UN, 2013). The fact that a majority of people experiencing hunger come from the developing world, is a poignant reminder of the crucial role economic development plays in determining social conditions in civil society.

The 2014 Human Development Index (HDI) puts Nigeria's population at 173.62 million people. The country's 2014 HDI value was 0.504, placing her in the 152 position among the 169 countries with comparative data. Whereas, Ghana ranked 138 with HDI value of 0.573, while South Africa placed 118 with HDI value of 0.658. In the three broad categories of high human development, medium human development, and low human development, Nigeria was grouped among the countries considered to have low human development (UNDP, 2014).

Public spending on social services such as education and health care that are critical to human capital development is generally low in Nigeria. For instance, the average national budgetary allocation to education as percentage of total budget for the period of 2005- 2012 was 6.86% (Federal Ministry of Finance, 2013). The country's budgetary allocations to education is still a far cry from the United Nations Educational, Scientific and Cultural Organization (UNESCO) recommended 26% of national budget to be spent on education in member countries, of which Nigeria is one. The outcome of the low spending on education is the continued decline in educational opportunities and standards in the country. According to a survey carried out by the National Commission for Mass Literacy, Adult and Non-Formal Education (NCMLANE 2010), over 47.50% of Nigeria's population or 60 million Nigerians are still illiterate in the 21st century. Consequently, it is hardly surprising that the Nigerian Education System was placed at lowly 90th position in the world in 2014 (UNDP, 2014).

The health sector in Nigeria is likewise in a state of parlous decay. Budgetary allocation to health as proportion of the national budget fluctuates between 2.70% and 7.00 from 1999 to 2012 (Federal Ministry of Finance, 2012). The country's health system was ranked 189 among 201 countries surveyed by the World Health Organization (WHO) in 2014. However, it is obvious that only a healthy population can be fully productive as healthcare is not only health producing but also wealth producing. The foregoing is indicative that human capital in Nigeria is severely under-developed. It must be re-emphasised that human capital formation should be the vanguard for national development in Nigeria.

1.3 OBJECTIVES OF THE STUDY

The broad objective of this study is to examine the impact of government expenditure on human capital development in Nigeria. The specific objectives are:

(i) To examine the impact of technological progress (as a measure of human capital development) on economic growth;

(ii) To examine the impact of government expenditure in education (as a measure of human capital) on economic growth; and

(iii) To examine the impact of government expenditure in health (as a measure human capital) on economic growth in Nigeria.

1.4 RESEARCH QUESTIONS

Amidst the stated research problem, the following research questions are formulated to guide this study:

i. What is the impact of technological progress (as a measure of human capital development) on economic growth in Nigeria?

ii. What is the impact of government expenditure on education (as a measure of human capital development) on economic growth in Nigeria?

iii. What is the impact of government expenditure on health (as a measure of human capital development) towards economic growth in Nigeria?

1.5 RESEARCH HYPOTHESIS:

The hypothesis of this research work is formulated as follows:

Null hypothesis (Ho)

Ho: Technological progress does not significantly affect economic growth in Nigeria.

Ho: Government expenditure on education does not significantly affect economic growth in Nigeria.

Ho: Government expenditure on health does not significantly affect economic growth in Nigeria.

1.6 JUSTIFICATION FOR THE STUDY

The justification for this study is seen from the observed gaps in some of the literature. These gaps are basically of three: theory, methodology and empirics.

First, unlike the neoclassical growth model that pays little attention to the role of human capital to economic growth, the endogenous growth model emphasises on the importance of human capital development as the major catalyst of economic development and growth. The endogenous growth model highlights the facts that if productivity is to increase, the labour force must continuously be provided with more resources. Resources in this case include physical capital, human capital, and knowledge capital (technology). Therefore, growth is driven by accumulation of the factors of production, while accumulation in turn is the results of investment in private sector. This implies that the only way a government can affect economic growth, at least in the long run is via its impact on investments in capital, education and research and development. While most studies on economic growth determinants in Nigeria placed more emphasis on the physical and capital factors (Bakare and Sanmi 2011; Onisanwa, 2014), this study examined the impact of human capital on growth in Nigeria by considering the different measures of human capital development.

Secondly, this study has contributed to the methodology of some literatures by examining if the impact of human capital on growth varies from one measurement of human capital to the other by creating three equations to show the contribution of technological progress, government expenditure on education and health as measures of human capital to growth in Nigeria during the study period. The study also adopted a dynamic modelling approach to capture the time lag human capital takes to impact meaningfully on growth.

Another contribution is that, apart from the use of Ordinary Least Square (OLS), Generalized Least Square (GLS) and other static regression analysis often adopted in some of the literature, this study has departed from previous studies by estimating an Error Correction Model (ECM) that incorporates both the present and previous values of government expenditure on education and health and revealed both the short and long run impact of these measures of human capital on growth.

To confirm the robustness of the results and to corroborate the importance of human capital, a sensitivity analysis is carried out on the three specified models by removing the measures of human capital in the specifications so as to ascertain the impact of technological progress, government expenditure in education and health on growth. Some scholars use the normal OLS, but this study departed and adopted ECM and the variables of interest are removed from the entire model specification and estimated without them. In sensitivity analysis, the variables are removed from the onset and estimation is made without them, then a comparison is also made with parsimonious model just to ascertain if the variables will have same impact on the depended variable by removing variables of interest.

Finally, empirical evidence on the interaction of human capital on growth is still scanty. Conceptual standpoint that human capital facilitates production needs to be reinforced, by measuring the magnitude of these impacts. Besides, linking human capital development and economic growth is part of the broad goal of understanding the importance a country attaches to development in human capital (Bakare and Sanmi 2011; Onisanwa, 2014). This study explores one of such assertions by determining the impact of three different measures of human capital on economic growth to know which of these measures recorded the most impact and its consequences on economic growth and development.

1.7 SCOPE OF THE STUDY

This study is limited to the examination of the impact of technological progress, government annual budgetary expenditure on education and health as a measure of human capital development towards economic growth in Nigeria. The study has only covered the expenditure made by government from the allocation made out of the country's annual budget, thus, other expenditures were not considered in this study. The constraint of time has also added to the limitation of this study. Time, which is a resource factor, has not fully allowed the researcher to go beyond the current stage of the study to producing more quality work. The analysis covers time series data for a period between1981 to 2013. The study has also been limited by financial constraints, which has seriously restricted the researcher's work from being more qualitative than it is presently.

1.8 ORGANIZATION OF THE STUDY

The study is organized in five chapters. Chapter one is the introductory chapter. The chapter contains the background of the study, statement of the research problem, the research questions, the research objectives, the research hypothesis, the scope of the study, the justification of the study, and organization of the study. A review of the literature and theoretical framework are presented in chapter two. Methodology for this work is presented in chapter three, while chapter four presents and examines the results obtained. The final chapter presents the summary, conclusion and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter focuses on shading light on the concepts used, theories of human capital; the role of human capital in economic growth; the theoretical framework used for the study; and a review of related literature.

2.2 CONCEPTUAL OVERVIEW

2.2.1 Concept of Human Capital

The origin of human capital goes back to the emergence of classical economics in 1776, and thereafter developed a scientific theory (Fitzsimons, 1999). After the manifestation of that concept as a theory, Schultz (1961) recognized the human capital as one of important factors for a national economic growth in the modern economy. With the emergence and development of human capital as an academic field, some researchers extensively attempted to clarify how the human capital could contribute to socio-political development and freedom (Alexander, 1996; Grubb & Lazerson, 2004; Sen, 1999).

Globalization, knowledge-based economy and technological evolution have promoted many countries and organizations to seek new ways to maintain competitive advantage. This gave rise to the need for people with higher levels of individual competence. In the end, the people are becoming valuable assets and can be recognized within a framework of human capital.

Broadly, the concept of human capital is semantically the mixture of human and capital. In the economic perspective, the capital refers to 'factors of production used to create goods or services that are not themselves significantly consumed in the production process' (Boldizzoni, 2008). Along with the meaning of capital in the economic perspective, the human is the subject to take charge of all economic activities such as production, consumption, and transaction. On the establishment of these concepts, it can be recognized that human capital means one of production elements which can generate added-values through inputting it.

Human capital has many definitions postulated and applied by historians of pre-modern economies which excellently explain the concept broadly. Nakamura (1981), in his view defines human capital broadly as 'labor skills, managerial skills, and entrepreneurial and innovative abilities plus such physical attributes as health and strength. Human capital is seen as the human factor in the organization, the combined intelligence, skills and expertise that gives the organization its distinctive character. The human elements of the organization are those that are capable of learning, changing, innovating and providing the creative thrust which if properly motivated can ensure the long-run survival of the organization.

According to Davenport (1998), people possess innate abilities, behaviours and personal energy and these elements make up the human capital they bring to their work. Armstrong (2006) also defines human capital as knowledge and skills which individuals create, maintain, and use.

There is presently a continuous search for a way of estimating a human capital stock that encompasses both the qualitative and quantitative development of skills in the labour force and can be inserted in growth equations. Most of the present proxies only partially conform to these requirements. For example, the databases of Nehru (1995), Kyriacou (1991), and Barro and Lee (1993; 2001), disregarding how they are measured, are all proxies of the average years of education. As we already saw in section 2.2, this approach is based on a very narrow concept of human capital. For one, it excludes experience. Especially for the theories advancing technological development, this is worrisome, as technology is often implemented within a firm either through experience or 'on the job training'. 'Average years of education' does not reflect the increase in quality of human capita either, which could lead to constant marginal returns to human capital accumulation and, as a consequence, endogenous economic growth. Therefore, 'average years of education' seems to be an imperfect indicator of human capital. Thus, we have to look for a definition of human capital that includes both the quantitative and the qualitative aspects of human capital, i.e. all 'educational' and 'experience' components. That is, it has to include all aspects of learning but has to exclude all components associated with the physical body. Costs such as 'raising a child' or 'health' are already accounted for in the data on the labour force. Including them would therefore create double counting in a production function.

Therefore, we will follow a definition in which human capital consists of all forms of knowledge acquiring which is defined by the OECD (2001, 18) as 'the knowledge, skills and competencies embodied in individuals that facilitate the creation of personal, social and economic well-being. This excludes human 'attributes', which is included in the standard OECD definition. The main reason is that innate human characteristics which neither have an investment component nor do they increase human capital. They may make investments cheaper as children can study more easily, but do not increase the stock of human capital.

This approach has three advantages. First, it leaves a difference between human capital and physical labour. This difference is crucial when human capital is inserted into the equation besides labour. Second, it allows for the possibility of directly comparing the theories of Lucas (1988) and Romer (1990). Admittedly, the definition of human capital used here does conform better to the model of Lucas than to that of Romer. However, as human capital may also be used as an input in the R&D sector, no doubt there is a strong correlation between both forms of human capital. Therefore, it does not seem to be unreasonable to assume that any human capital stock created with this definition may be used to test the differences between both branches of the new growth theories. Third, this definition of human capital avoids the problem, which has plagued the cost-based approach, of determining which expenditures are investments in human capital and which are consumption. These problems mainly arise for goods and services that are intended to sustain a physical person, not for increasing his or her knowledge. For example, are food and clothes consumption investments if you consider raising a child being part of human capital formation? We agree with Bowman (1962) that raising a person is no human capital formation, which corresponds to the above definition.

The concept of human capital also refers to the abilities and skills of the human resources of a country, while human capital formation refers to the process of acquiring and increasing the number of persons who have the skills, education and experience that are crucial for the economic growth and political development of a country (NES, 2002).

Yesufu (2000) is of the views that the essence of human resources development becomes one of ensuring that the workforce is continuously adapted for, and upgraded to meet, the new challenge of its total environment. This is because the economy is a dynamic entity, which is constantly changing in response to various stimuli, such as introduction and discoveries of new products or techniques of production. Therefore, those already in the job require retraining, reorientation or adaptation to meet the new challenges. This special human capacity can be acquired and developed in different ways, namely: education, training, health promotion as well as investment in all social services that influence man's productive capacities, including telecommunication, transport and housing. He concluded that, education and training are generally indicated as the most important direct means of upgrading the human intellect and skills for productive employment.

On the other hand, the term empowerment is derived from the word power. Thus to empower means to give power to, to give authority to, to enable a person or group of persons gain power, to uplift their lives, especially their socio-economic lives. Economic empowerment, therefore, entails programs aimed directly at raising people's incomes, such as education, agriculture – focused intervention (training, improved irrigation for farmers), micro-finance, support for small and medium enterprise and distribution of goods and services with the ultimate goal of developing people's potentials, not only to contribute and benefit from socio-economic development and structural change but also to improve the potential of the population through education and workplaces condition, whether through public and/or private channels.

The contending views on the meaning and scope of human capital have remained on the centre stage for decades. The Classical argued that skills gained by human are some form of capital, while the Neoclassical asserted that the human himself is capital. The proponents of this second view discussed the role of human capital in income distribution and production theory. They argued that differences in levels of education and skills gained by persons require that they receive different wages (Gonçalves, 1999). The implication of this is a shift from a functional distribution of income to an individual distribution of income (Zweimüller, 2000).

The Neoclassical assertion is in line with the compensating principle of labour mobility which gives rise to wage differences that equalize net advantage and disadvantage of the work. This principle has been applied on wage differentials caused by vocational education and suggested that a person receiving education was in loss because of not working. Therefore, such qualified people were to be paid more wages and only then they could fulfil their costs of education and receive gains. This principle has constituted the basis of human capital analysis. Harbison and Meyer (1965) refer to human resources development as the process of increasing the knowledge, skills and the capacities of all the people in a society. In economic terms, according to them, it is the accumulation of human capital. Thus, investments in people in the form of education, training and health care or medical treatment are the means of human capital accumulation.

Beyond the investment issue of human that makes up capital, there is a growing literature on the role of human capital in economic development and growth. This is deeply rooted within context of growth theories. Prominent among these theories is the endogenous growth theory which emphasizes that factors such as knowledge, human capital and technological progress that are excluded or assumed to be exogenous by other models should be internalized in the production process. Human capital refers to as the human factor in the production process; and consists of the combined knowledge, skills or competencies and abilities of the workforce. Of all factors of production, only human beings are capable of learning, adapting and changing, innovative and creative. According to Harbison (1973), human capital formation can be seen as the deliberate and continuous process of acquiring requisite knowledge, skills and experiences that are applied to produce economic value for driving sustainable national development.

2.2.2 Concept of economic growth

This concept is usually associated with a nation's annual production. It relates to changes in the capacity of a country's population to produce diverse commodities. Most often this concept is on the rising trend, which is often associated to advances in technology and the institutional as well as ideological adjustment. It is seen as increasing real output or real per capital output of economy. Economic Growth in a nutshell is the rate of change in output realized by an economy over time.

2.3 ROLE OF HUMAN CAPITAL IN ECONOMIC GROWTH

The role of human capital development cannot be emphasised. The development of human capital has been recognised by development economists to be an important prerequisite and as an invaluable asset for a country's socio-economic development. This can only be achieved through increased knowledge, skills and capabilities acquired through education and training by all the people in the country.

In recognition of the importance of human capital development, the United Nations Economic Commission for Africa (1991) describes human resources as the knowledge, skills, attitudes, physical and managerial effort required to manipulate capital, technology, land and material to produce goods and services for human consumption. In the same vein, Mahroum (2007) suggested that the micro- level, human capital management is about three key capacities namely; the capacity to develop talent, the capacity to deploy talent, and the capacity to draw talent from elsewhere. Collectively, these three capacities formed the backbone of any country's human capital competitiveness. In a collaborative view, Simkovis (2013) sees human capital as the most element success in business today. So developing human capital requires creating and cultivating environment in which human beings can rapidly learn and apply new ideas, competencies, skills, behaviours and attitudes, it could therefore, be deduced that human capital represents the stock of competencies, knowledge, habits, social and personality attributes, including creativity, cognitive abilities, embodied in the ability to perform labour so as to produce economic value.

2.4 THEORIES OF HUMAN CAPITAL DEVELOPMENT

Theories related to investment in human capital as well and technological improvements on human capital are relevant to this study. Human capital theory emphasizes how education increases the productivity and efficiency of workers by increasing the level of cognitive stock of economically productive human capability which is a product of innate abilities and investment in human beings. The provision of formal education is seen as a productive investment in human capital, which the propondents of the theory have considered as equally or even more worthwhile than that of physical capital.

According to Babalola (2003), the rationality behind investment in human capital is based on three arguments.

i. That the new generation must be given the appropriate parts of the knowledge which has already been accumulated by previous generations;

ii. That new generation should be taught how existing knowledge should be used to develop new products, to introduce new processes and production methods and social services; and

iii. That people must be encouraged to develop entirely new ideas, products, processes and methods through creative approaches.

According to Fagerlind and Saha, (1997) human capital theory provides a basic justification for large public expenditure on education both in developing and undeveloped nations. The theory was consistent with the ideologies of democracy and liberal progression found in most Western societies. Its appeal was based upon the presumed economic return of investment in education both at the macro and micro levels. A few of the theories considered in this study are; the Human-Capital Approach, The human capital augmented Solow model, Lucas Growth driven by human capital accumulation, Human capital and technological change theory, manpower requirement approach, demand for place theory and benefit – cost theory. These theories are examined in details below.

2.4.1 The Human Capital Augmented Solow Model

Starting with the Solow model, the simplest way to introduce human capital is the one chosen by Mankiw/Romer/Weil(1969) In their influential contribution, they present a simple extension to the Solow model by letting human capital enter as a separate input into an otherwise standard Cobb-Douglas production function with Harrod-neutral (i.e., labor-augmenting) technological progress. The production technology in this model, which has come to be known as the Human-Capital Augmented Solow Model, thus takes the form: $Y_t = K_t^a H_t^b (A_t L_t)^{1-a-b}$

Where: Y is output, K is capital, H is the stock of human capital, A is the level of technology and L is "raw" labor. The exponents a, b and 1-a-b measure the elasticity of output to the respective inputs. Mankiw, Romer and Weil assume a + b < 1, so that the function exhibits constant returns to scale but diminishing returns to reproducible factors Like in the Solow model, the population and the level of technology grow at the exogenous rates n and g, respectively, while capital depreciates at the rate δ.

Mankiw, Romer and Weil make three other important assumptions; namely

i. That people invest in human capital just like they invest in physical capital, that is, by foregoing consumption and devoting a fraction s_H of their income to the accumulation of human capital (analogous to the fraction s_K invested in physical capital),
ii. That human capital depreciates at the same constant rate δ as physical capital, and
iii. That output (the homogeneous good produced in the economy) can be used for either consumption or investment in (physical or human) capital.

2.4.2 Lucas Growth Driven by Human Capital Accumulation

In the model formulated by Lucas, human capital enters into the production function similarly to the way in which technology does in the Solow model, that is, in labor-augmenting form (which would seem like a rather natural way to conceptualize things). The economy consists of identical individuals (or representative agents) maximizing life-time utility. Agents have control over two variables: the level of consumption and the allocation of time between work and skill acquisition. The first variable determines the accumulation of physical capital, while the second variable affects an agent's future productivity. Lucas proposes the following production technology:

$$Y_t = AK_t^b (u_t h_t L_t)^{1-b} h^r_{a,t}$$

where Y, A, K and L are, once again, output, technology, capital and labour, while u is the fraction of an individual's time allocated to work, h is the skill level or human capital of the representative agent, and h_a is the average human capital in the economy. The level of technology, A, is assumed to be constant (so that it could in principle be dropped from the expression or subsumed within the capital term). Population growth is taken as exogenous. Setting aside the last term on the right-hand side for the moment, the most important assumption of the model concerns the law of motion according to which the human capital variable evolves over time. Lucas writes:

To complete the model, the effort 1-u_t devoted to the accumulation of human capital must be linked to the rate of change in its level, h_t. everything hinges on exactly how this is done.

The linearity assumption implies that the growth rate of human capital is independent of its level. In other words, no matter how much human capital has been accumulated, a given effort always produces the same percentage increase.

2.4.3 Human Capital and Technological Change Theory

Another category of endogenous growth models maintains the assumption underlying the Solow model that technological progress is at the heart of economic growth. Though, it is by no longer leaving technological change unmodelled. These theories acknowledge that a large portion of inventions is the result of purposeful research and development (R&D) activities carried out in reaction to economic incentives. This changes the role for human capital, which enters into these models as a catalyst of technological progress rather than as an independent source of sustained growth. Nelson/Phelps were the first to contend that people's educational attainment may have a significant influence on their ability to adapt to change and introduce new technologies. Accordingly, a higher level of human capital would speed up the process of technological diffusion in the economy. This would enable countries lagging behind the world technology frontier to catch up faster to the technological leader. However, in the model developed by Nelson/Phelps, the evolution of the best-practice level of technology is left exogenous, so that human capital only plays a role in helping countries narrow the gap to the technological frontier. Romer(1996) has extended this concept beyond the adoption of existing technologies to the creation of new ones, starting from the observation that R&D

activities require highly skilled labor as the single most important input. A major implication of both of these approaches is that technological progress, and thus growth, depends on the stock of human capital (as opposed to its accumulation). In what follows, the analysis will be limited to a brief description of the general structure of the Romer model. In accordance with the subject of this paper, the aim is to highlight the role of human capital.

New approaches on growth concentrate on two basic views such as accumulation of knowledge and human capital. Knowledge and human capital are not subject to law of decreasing returns and they provide unlimited technical progress. Human capital is the sum of abilities, knowledge and skills that are specific to individuals.

Endogenous growth models differ from Solow model in that they emphasize increasing efficiency of physical and human capital. According to this, a small investment on physical or human capital or an increase of resources allocated to these factors has significant effects on output. The characteristic that makes new theories different than old ones is how they view investment. Old theories consider capital accumulation as the engine of growth. Keynesian economists such as Lewis and Kaldor concenterate on how the savings will be increased in order to finance required investment. The reason that poor countries develop less is because of the insufficient stock of capital. According to Kaldor, there is a linkage between level of savings and income distribution.

2.4.4 Manpower Requirement Approach

The manpower requirement approach attempts to forecast the future demand for manpower in the economy, and then transform manpower requirement into educational requirements. This implies that expenditure (investment) on education will be as a result of forecasted manpower needs of the future for the attainment economic development. Eckaus (1964) further developed this approach by estimating labour requirements on the basis of given hypothesis about the relationship between given types and levels of education. The assumption of this approach is an inelastic demand for labour and capital, on the one hand, and an inelasticity of substitution between different types of labour resources and between types of education, on the other.

A typical manpower forecasting approach can be estimated by assuming the following; a given target of national income, given average labour-output coefficients and mutually exclusive occupational categories (Briggs, 1979). Vaizey, (1973) uses this approach in his study and concludes that since the sole reason for government expenditure on education is to increase its optimal supply of skilled labour at all levels, the more manpower the economy required, the more government would need to invest in education. The main criticism of this approach is that it tends to ignore the base of existing general education upon which future expansion and future flows of human capital are founded. Therefore, this ignores the dynamic nature and gestation period it takes to train a skilled labour (Briggs, 1979).

2.4.5 Demand for Place Theory

The demand for place theory is based on the notion that government expenditure on education or planning of education should be based on the demand by students for placement into various levels of education. Therefore, the amount government would budget on education, should depend on the level of demand for education in country. Ogunlade, (1989); and Olorode, (2003) used this approach in different studies and concluded that educational funding should be increased as student enrolment in increases. however, the limitation of this approach is that other worthwhile public project are competing for the limited available resources which makes this approach to be susceptible to fluctuation in national income.

The benefit-cost theory was propounded by Becker (1964), further developed by Blaug (1967), Schultz, (1969), and others. This approach is based on the technique of evaluating public and private investments on education and the return from investing in education. This approach tends to analyse the end gainer of investing in education, whether it is the private or public that benefits more from investing in education. This approach discounts the benefit to a present value and compares it with the possible cost inquired in cost of educating the individual. However, one of the major objections of this approach is that differential earnings cannot be attributed to educational qualification alone. Briggs,(1979) suggests that the use of income profiles in analysing the benefit accrued from being educated presumes that education is mainly in preparation for employment.

2.5 THEORETICAL FRAMEWORK FOR THE STUDY

One particular source of externalities that has been emphasized in the recent literature is the accumulation of human capital and its effect on the productivity of the economy. From the theories reviewed in this study, the theoretical framework, thus, rests on the augmented Solow Model, Lucas Human Capital Accumulation Growth Model and Technological Change Theory. These endogenous growth models maintain the assumption that technological progress is at the heart of economic growth. They incorporate human capital and various aspect of technical change (technological) that helps in making labour more productive through education and training. These theories emphasize the role of human capital development in production.

However, Lucas (1988) provides one of the best-known attempts to incorporate the spill-over effects of human capital accumulation, in a model built upon the idea that individual workers are more productive, regardless of their skill level, if other workers have more human capital. Governments are considered to play an important role in human capital development through their spending on health and education. As such, government spending on these two sectors, as well as technological progress, seen in term of capital accumulation, lays the theoretical perception from which this study is modelled.

Notwithstanding Lucas (1988) enormous contributions, the other theories (Solow Model, and Technological Change Theory) are essential are incorporated into the theoretical framework of this study in order to complement the aspects of human capital and technological progress.

2.6 EMPIRICAL LITERATURE REVIEW

The empirical literature on the impact of government expenditure in education and health as measures of human capital development on economic growth has witnessed major contributions by different scholars over the years. Observably, the empirical evidence provided by most of these studies has been mixed, and a consensus has not yet emerged.

Mankiw *et al.* (1992) empirically examine the Solow growth model with and without human capital as a factor of production and find that the human capital augmented Solow model fits in explaining cross-country variations. The study employs a data set of 121 countries from 1960 to 1985 and applies the method of OLS for estimation. The authors use cobb-Douglas production function consisting of output as depended variable while labour, physical capital and human capital are explanatory variables. The variable school was use as proxy for human capital. The percentage of people aged between 12 to17 enrolled in the secondary schools was used to proxy human capital. Their result revealed that the model with human capital best explain the variation in income across the countries sampled in the study.

Hasan (2000) investigate the determinants of human resource development; and the nature of the relationship between human development and average income level for developing economies with attention paid to Muslim countries using pooled regression for the period 1965 to 1997. The empirical results shows that the main determinants of human resources development measured by the Human Development Index (HDI) for various economies are usually the level of per capita income, its rate of growth, expenditure on military and the state of income distribution. It founds that even as HDI is positively correlated with GDP, the relationship tends to lag behind income growth and the rise in the military expenditure works against the development of human resources.

Using the growth accounting framework and the OLS estimation technique, Abbas (2000) compares the effect of human capital on economic growth in Pakistan and India between 1970 and 1994. The equation used consists of output as depended variable, while labour, physical capital and human capital are explanatory variable. Enrolment rates at primary, secondary and higher secondary levels were used as proxies for human capital. The results reveal that primary and secondary schooling was positive and significantly related to growth for the two countries but the magnitude of this effect varied across the two countries.

In another study Abbas (2001) examines the effect of human capital on economic growth in Pakistan and Sri-Lanka using OLS and the same proxy for human capital (enrolment into primary, secondary and higher secondary) covering the period from 1970 to 1994. Human capital was found to be positively related with economic growth in Pakistan at 1% level of significance and at 5% level of significance in Sri-Lanka at secondary and higher secondary level respectively.

Wang and Yao (2001) analysed China's rapid growth as a result of factor accumulation as well as Total Fixed Product growth in the post reform period of 1978 to 1999. The study used an annual data set from 1953 to 1999 and employed growth accounting technique in which growth in labour, capital and human capital are inputs while the residual captures growth in TFP. The study used average schooling years of population aged between 15 to 65 years as a proxy for human capital. They conclude that in the pre reform period (1953 to 1977), growth was factor led and TFP growth was negative, while in post reform period, factor accumulation as well as TFP growth played a role in the robust growth.

In his atticle Babatunde (2005) investigates the long run relationship between education and economic growth in Nigeria between 1970 and 2003 through the application of Johansen Cointegration Technique and Vector Error Correction Mechanism. He considered two different channels through which human capital can affect long run economic growth in Nigeria. The first channel is when human capital is a direct input in the production function and the second channel is when human capital affects the technology parameter. The Johansen Cointegration result establishes a long run relationship between education and economic growth. He concluded that a well-educated labour force appears to significantly influence economic growth, both as a factor in the production function and through total factor productivity.

Bildirici et al (2005) examine the relationship between human capital, growth and brain drain for 77 countries using panel data analysis for the period of 1990 to 2001. Their result reveals that education index, adult literacy rate, schooling rate, education investments, per capita income, growth rate and average life expectancy are major determinants of human capital across the countries sampled. They also found a positive relationship between migration, human capital, education investments, literacy, per capita income, workers' savings and growth. They conclude that the pace of increase in urban population, average life expectation index, imports, exports and wages negatively affect growth in Less Developed Countries (LDC).

Duma (2007) uses the growth accounting framework to analyse the sources of growth in Sri Lanka using annual data from 1980 to 2006. Human capital was proxy by average years of schooling ,while Total Factor Productivity (TFP) was measured by the residual in the equation which captures all the unexplained variations in the output growth. The author found a very low contribution of human capital to growth. Human capital only contributed around 10% of output growth while, physical capital and labour contributed 17% and 27%

respectively. The major contribution to growth was TFP which was around 46%. The author justified the results on the ground that in the period after the 1980s, there was a slowdown in the labour intensive product line along with a rapid growth in the output of capital intensive industries with higher productivity level. He concluded that TFP played a significant and dominating role in explaining Sri Lanka's sources of growth after the 1980s.

Abbas and Foreman-Peck (2007) use the Co-integration Technique for estimating the effect of human capital on economic growth of Pakistan between 1961 and 2003. Stock of human capital was used as a proxy for human capital which was calculated through the perpetual inventory method using secondary enrolment data. Another proxy for human capital used in the study was health expenditures as a percentage of GDP. They found an increasing return to physical and human capital specially in case of investing in health sector.

The study by Quadri and Wahab (2013) on the relationship between human capital and economic relationship for Pakistan used OLS estimation technique for the period of 1978 to 2007. A health adjusted education indicator for Human Capital was used in the standard Cobb-Douglas production function which confirms the long run positive relationship between human capital and the economic growth in Pakistan. This indicator was found to be a highly significant determinant of economic growth, which suggests that both health and education sectors should be given special attention in order to ensure long run economic growth. The sensitivity analysis performed to check the robustness of the results corroborates with the initial findings.

In their study on human capital and regional development for 110 countries between 1985 and 2010 Gennaioli etal(2013) reveal the importance of human capital in accounting for regional differences in development. However, their results suggest that entrepreneurial inputs and human capital externalities are essential for understanding variation in growth across regions.

Bakare and Sanmi (2011) examine the trend of health expenditure in Nigeria and its impact on economic growth between 1970 and 2008 using the OLS multiple regression method. They proxy human capital with health care expenditure and secondary School Enrolment and found a significant and positive relationship between health care expenditures and economic. The study recommends that Nigerian policy makers should pay closer attention to the health sector by increasing its yearly budgetary allocation to the sector. Nevertheless, they submit that the key to good results lies not in ordinarily increasing particular budgetary allocation but rather in implementing a public finance system that, to the extent possible, links specific expenditure and revenue decisions and ensure the usage of the allocated fund as transparently as possible.

Ayuba (2014) utilizes Vector Error Correction model based on causality test to investigate the relationship between public social expenditure and economic growth in Nigeria from 1990 to 2009. The study found a unidirectional causality running from economic growth to health expenditure, which supports the Wagner's Law. It also discovers that causality runs from economic growth to education and aggregate social expenditure. The study concludes that public social expenditures amplify economic growth at bivariate (aggregated) levels. He recommends an increase in budgetary allocations to education and health sectors by exploring other sources of financing education and health in Nigeria such as strengthening the education tax collection mechanisms, accessing donations from international agencies such as the United Nations, The International Monetary Fund, The World Bank, Non-Governmental Organizations as well as other philanthropic individuals. He also recommends the efficient allocation of resources to enhance economic growth in Nigeria.

CHAPTER THREE

METHODOLOGY

3.1 SOURCES AND TYPE OF DATA FOR THE STUDY

This study relies on secondary data for its analysis. It uses time series annual data computed for the variables from 1986 to 2013 to analyse the relationship between government human capital development and economic growth. The data used are drawn from sources, which includes: Central Bank of Nigeria publications and World Development Indicators.

Specifically;

Gross Domestic Product (GDP), Gross fixed capital formation (GFCF) which is the proxy used for physical stock of capital, Broad money supply (M2) which measures the financial depth of the Nigerian economy, Exchange Rate (EXR) translated to mean the exchange value of the naira to the US dollar, government expenditure on Education (Eduxp) and Health (Hexp); are all sourced from CBN 2014. Labour force participation (L) representing the total number of persons employed in Nigeria, computed from Employment rate and working population is drawn from World Development Indicators - WDI (2014); Also, Tertiary enrolment and CPI proxied by the annual inflation rate are obtained from WDI 2014.

3.2 MODEL SPECIFICATION

There are two major theories on growth determinants and the role of human capital development. These theories are the neoclassical and Endogenous (comprises of AK, product variety, Schumpeterian and Lucas models). Considering the analytical strength of the endogenous growth model and its flexibility to accommodate other inputs into the production function, this study will augment the endogenous growth model to include government expenditure in education and health as measures of human capital development to account for investment in human capital as suggested by the benefit-cost human capital theory. The study will also include total tertiary enrolment as proxy for technological progress to also measure human capital development and its impact on economic growth.

The starting point is the traditional production function which may be written as follows:

$$Y_t = f(K_t L_t) \tag{1}$$

Where *Y* is real GDP, *K* is capital stock, *L* is labour, and *t* is time.

In line with the spirit of learning-by-doing as proposed by Romer (1996), equation (1) is augmented to include technological progress (A) to account for knowledge that brings about efficiency in capital and labour in the production process. This yields:

$$Y_t = AK_t^{\alpha} L_t^{1-\alpha}, \qquad 0 < \alpha < 1 \tag{2}$$

Where A measures the level of technology and other variables remain the same as defined earlier.

Considering the accumulation of human capital and its effect on the productivity of the economy, measurement of human capital is included in equation (2). Lucas (1988) provides one of the best-known attempts to incorporate the spillover effects of human capital accumulation, in a model built upon the idea that individual workers are more productive, regardless of their skill level, if other workers have more human capital. Human capital is accumulated through explicit "production": a part of individuals' working time is devoted to accumulation of skills. Thus, the production process is described as:

$$Y_t = AK_t^{\alpha} (hL_t)^{1-\alpha}, \quad 0 < \alpha < 1 \tag{3}$$

Following Alogoskoufis (1995), parameter *h* stands for human capital per worker which is a function of the existing total private and public capital stock per worker denoted by *K* and *Λ* respectively so that:

$$h = \phi \frac{K^{\beta} \Lambda^{1-\beta}}{L} \tag{4}$$

where $\phi > 0$ is an efficiency parameter that measures the degree of efficient use of total capital. According to (3) and (4) output is a function of private capital and of the total capital which is available for the economy. The return on private capital from (3) is clearly diminishing since $\alpha < 1$ given the total capital stock.

Thus, based on the objectives of this study, A in equation (2) is proxy by total tertiary enrolment, while h is measured by government expenditure in education and health. Therefore, the functional forms of growth models that will be adopted for this study are:

$$Y = f(A * K, L, \varphi) \quad (5)$$

$$Y = f(K, L * h_1, L, \varphi) \quad (6)$$

$$Y = f(K, L * h_2, L, \varphi) \quad (7)$$

Where: $A * K$ is the impact of technological progress on capital; $L * h_1$ and $L * h_2$ are human capital per worker brought about by government expenditure in education and health respectively. φ is a vector of control and policy variables frequently used as determinants of growth. These variables include real exchange rate, financial depth (M2/GDP) and consumer price index (cpi).

Given the above traditional production function in equation 1 above, to the functional forms presented in equation (5-7), the following models are derived:

i. To capture the relationship between government spending and the physical stock of capital the model used is:

GDP = f(K, ter*K, L, Ex, M2GDP and CPI) (8)

Econometrically, this is represented as:

$$g_t = a_0 + a_1 K_t + a_2 ter * K_t + a_3 L_t + a_4 ex_t + a_5 m2GDP_t + a_6 cpi_t + \varepsilon_t \quad (9)$$

Where:

G is annual GDP in Naira; K is private capital (domestic investment) proxy by gross fixed capital formation also measured annually in naira;

ter*k is a product of tertiary enrolment and capital formation signifying technologically improved private capital; tertiary enrolment is measured in number of students at the secondary school level each year, while capital formation is proxy by gross fixed capital formation also measured annually in naira;

L is total number of employed people;

Ex is exchange rate representing the unit at which the naira is exchange for dollar.

Cpi is consumer price index measuring price stability, representing by the annual inflation rate;

M2GDP is a measurement for financial depth and captured by annual values of broad money supply and GDP in naira;

e is the error term

ii. To estimate the impact of government expenditure on human capital in terms of education, this is captured by the following equation:

G = f (K, Eduxp*L, L, Ex, M2GDP and CPI) (10)

Econometrically it is captured as:

$$g_t = b_0 + b_1 K_t + b_2 eduxp * L_t + b_3 L_t + a_4 ex_t + a_5 m2GDP_t + a_6 cpi_t + \mu_t \quad (11)$$

Where:

G is annual GDP in Naira; K is private capital (domestic investment) proxy by gross fixed capital formation also measured annually in naira;

Eduex*L is a product of annual government education expenditure in naira on the entire labour force;

L is total number of employed people;

Ex is exchange rate representing the unit at which the naira is exchange for dollar.

Cpi is consumer price index measuring price stability, representing by the annual inflation rate;

M2GDP is a measurement for financial depth and captured by annual values of broad money supply and GDP in naira;

u is the error term

iii. The impact of government expenditure on health as one of the ways through which human capital is developed is represented by the following equations.

In its mathematic form, it is represented as:

G = f (K, Hexp*L, L, Ex, M2GDP and CPI) (12)

Econometrically, equation 12 is represented as:

$$g_t = c_0 + c_1K_t + c_2 hexp * L_t + c_3L_t + c_4ex_t + c_5m2GDP_t + c_6cpi_t + v_t \quad (13)$$

Where:

G is annual GDP in Naira; K is private capital (domestic investment) proxy by gross fixed capital formation also measured annually in naira;

Hexp*L is a product of annual government Health expenditure in naira on the entire labour force;

L is total number of employed people;

Ex is exchange rate representing the unit at which the naira is exchange for dollar.

Cpi is consumer price index measuring price stability, representing by the annual inflation rate;

M2GDP is a measurement for financial depth and captured by annual values of broad money supply and GDP in naira; and

V is the error term.

3.3 ESTIMATION TECHNIQUES AND PROCEDURES

In order to address the three specific objectives set for this study, the Error Correction Mechanism (ECM) estimation procedure is adopted for this study. This approach is adopted because of the dynamic nature of human capital and the time lag it takes to impact meaningfully on growth. This impact cannot be captured by static regression adopted by most studies. Therefore, this study makes use of Augmented Dickey Fuller (ADF) unit root test to check for the stationary of the series, Johansen co- integration tests is also used to confirm if the series have long run relationship. VECM and VAR tools of variance decomposition and impulse response are used to determine the short run impacts of human capital development on growth. Three equations are made to address each of the objectives stated for the study

3.3.1 Unit Root Test

Assume we have the following AR (1) process: $Y_t = \rho Y_{t-1} + u_t$ (11)

$-1 \le \rho \le 1$ and u_t is a white noise error term. We can manipulate the above expression by subtracting Y_{t-1} from both sides; $Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + u_t$

$$= (\rho - 1)Y_{t-1} + u_t$$

Thus: $\Delta Y_t = \delta Y_{t-1} + u_t$ (12)

In practice, instead of estimating equation (11), we estimate equation (12) and test the null and alternative hypothesis that δ=0. If δ=0 then $\rho = 1$ that is, we have unit root meaning the time series is non-stationary (H_0 for unit root is non-stationary). Thus, we can take the first difference of Y_t and regress on Y_{t-1} to see if (δ) is zero or not in order to confirm if the series are stationary or not. Under the null, the estimation for δ is not distributed T-student, so the Dickey Fuller test is required. We use the Augmented Dickey Fuller (ADF) table to correct for possibility of the error term (u_t) been auto correlated. The ADF test is specified in the equation below:

$$\Delta Y_t = \beta_1 + \beta_{2t} + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{n} \Delta Y_{t-i} + u_t \qquad (13)$$

Where u_t is a white noise Error Term.

3.3.2 Cointegration Tests

Trended data can be regarded as potentially a major problem for empirical econometrics. Trends may give rise to spurious regression and uninterruptable t- statistics. The stack reality is that in economics most time series are subject to some type of trend while differencing the series until it becomes stationary is one major solution. This has shown that differencing can lead to loss of long run properties of a series. Based on this, the combination of series that are differenced once I(1) will give us a model that is stationary I(0). In achieving this aim, this study will adopt the Johansen Cointegration Test.

3.3.3 Error Correction Model

Cointegration analysis provides a test for spurious correlation. Finding cointegration between apparently correlated I(1) series validate the regression but failure to find cointegration is an indication that spurious correlation may be present, thus, invalidating the inferences drawn from such correlation. However, time series data lose their long run properties when they are differenced, allowing only for conclusions on the short run determinations. Therefore, there is a need to construct a model that would combine both the short run and long run properties of the variables in the model. As suggested by Engle-Granger representation theorem that if two series are cointegrated then they will be efficiently represented by an error correction mechanism.

The Error Correction Model will be used to capture both the short and long run properties of the series. The method involves developing a model from its generalized form (over parameterized) to a specific form (parsimonious). The error correction of the Auto regressive distributed lag (ADL) takes the form of $\Delta Y_t = \alpha_0 + \alpha_1 \Delta z_t + \alpha_2 u_{t-1} + \varepsilon_t$.

CHAPTER FOUR

DATA ANALYSIS

4.1 INTRODUCTION

This chapter analyses the relations identified in the objectives. These include the examination of the impacts of technological progress, impact of human capital development as captured by government expenditure in relation to education and health.

4.2 DESCRIPTIVE STATISTICS OF THE VARIABLES

Table 4.1 indicates the descriptive statistics of the all the variables considered in the study. It shows from the number of observations that data for all the variables is captured for a period of 33 years. With the exception of CPI, all the other variables are normally distributed. The means, medians maximum and minimum values for each of the series vary considerably and none of them is zero. The standard deviations are relatively very low when compared to their means except for Exchange rate whose standard deviation is close to its mean.

Table 4.1: Descriptive statistics of the Variables

	CPI	EDUXPL	EX	GDP	HEXPL	K	L	M2_GDP	TERK
Mean	20.39206	2.43E+08	65.95311	13.33608	1.34E+08	876.0894	0.002058	0.172492	1402337
Median	12.87658	39858235	21.8861	4.0323	10778016	231.6617	0.002044	0.16453	209385.2
Maximum	72.8355	1.40E+09	156.7	80.22213	7.40E+08	4012.919	0.00304	0.379924	6910094
Minimum	5.382224	473787.3	0.6369	0.094325	193329.7	8.79948	0.001325	0.085771	1068.893
Std. Dev.	18.2621	3.69E+08	62.958	21.81625	2.11E+08	1298.474	0.000494	0.05893	2302130
Skewness	1.539861	1.792247	0.26024	1.997649	1.692139	1.463979	0.274847	1.753321	1.556175
Kurtosis	4.080227	5.366042	1.244574	5.788438	4.776631	3.643992	2.069345	7.048806	3.889174
Jarque-Bera	14.64593	25.36428	4.60958	32.63946	20.08841	12.35803	1.606389	39.44788	14.40636
Probability	0.00066	0.000003	0.09978	0	0.000043	0.002072	0.447896	0	0.000744
Sum	672.9378	8.01E+09	2176.453	440.0906	4.42E+09	28910.95	0.067918	5.692233	46277106
Sum Sq. Dev.	10672.14	4.36E+18	126838.7	15230.35	1.42E+18	53953127	7.81E-06	0.111129	1.70E+14
Obs	33	33	33	33	33	33	33	33	33

Source: Researcher's computation from data using Eviews7.0.

It should be noted that mean, median, maximum and minimum values for EDUXPL, HEXPL, GDP, K, L, and TERK for the purpose of describing them are in trillions.

From all the above, the data set is given below for consideration.

4.3 RESULTS OF UNIT ROOT TEST

This section analyses the unit root properties of the variables considered for the study, Augmented Dickey – Fuller unit test was used. The results are as follows:

Table 4.2: Results of the Augmented – Dickey-Fuller Unit Root Test

Series	At Level	At 1st Difference	Order of Integration
	Critical Value	Critical Value	
GDP	-2.32	-5.51	I(1)
TERK	-2.15	-3.84	I(1)
HEXPL	-0.29	-8.95	I(1)
EDUXPL	-0.81	-4.76	I(1)
M2GDP	-2.43	-4.70	I(1)
K	0.21	3.23	I(1)
L	-2.41	-5.47-	I(1)
EX	-2.04	-4.58	I(1)
CPI	1.41	-5.17	I(1)

Critical values are: 1% = -4.4285; 5% = -3.563; and 10% = -3.215.
Source: Researcher's computation from data using Eviews7.0.

From the values in Table 4.2, all variables are stationary only after first differencing. This signifies that all the variables are I(1) variables as indicated by their probabilities and critical values. This is a pre-condition for the application of the Johansen cointegration in all the relationships.

4.4 ANALYSIS OF THE IMPACT OF TECHNOLOGICAL PROGRESS ON ECONOMIC GROWTH

This relationship that looks at the impact of technological progress on economic growth is then estimated.The analysis starts with an examination of the lag length, the stability tests, cointegration and VECM of the relationship and the impulse response function as well as the variance decomposition.

4.4.1 LAG LENGTH

The specified lag length for this relationship is revealed by table 4.

Table 4.3: Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC
0	-32.18945	NA	8.21e-06	2.479297	2.712830
1	120.7393	244.6860	1.67e-09	-6.049285	-4.648087*
2	157.8003	46.94392*	8.69e-10	-6.853351	-4.284489
3	193.6087	33.42125	6.53e-10*	-7.573916*	-3.837390

* indicates lag order selected by the criterion

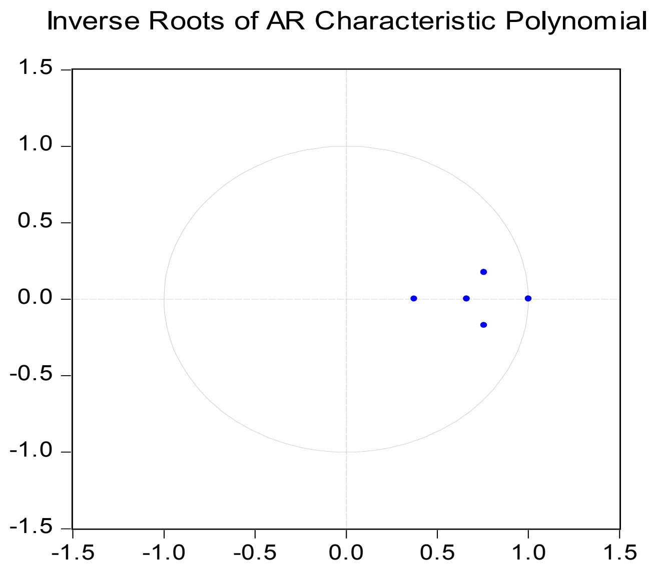
Source: Researcher's computation from data using Eviews7.0.

From Table 4.3, SC specifies 1 lag, LR 2 lags and FPE and AIC specifies 3 lags each. The specification of 3 lags by FPE and AIC is used for this model on grounds of parsimony and on the fact that two criteria agree against that of LR and SC.

4.4.2 Stability Test

The stability test based on the VAR approach is indicated by the unit root circle on figure 1. It illustrates that the model is stable as all variables are within the unit circle.

Figure 1: VAR stability Test



Source: Plotted from research data using Eviews7.0

4.4.3 COINTEGRATION

The Johansen cointegtration is used to determine the long run behaviour of the relationship between technological progress and economic growth. The results of the Johansen cointegration test are presented in Table 4.4.

Table 4.4: Cointegration results between TERK and GDP

Max Rank/No. of cointegrating Equations	Trace Statistic	0.05 Critical Value (Trace Statistic)	Maximum Eigen Value	0.05 Critical Value (Eigen Value)	Prob.**
0	184.6129	69.81889	72.13561	33.87687	0.0000
1	112.4773	47.85613	56.55792	27.58434	0.0000
2	55.91940	29.79707	35.50257	21.13162	0.0000
3	20.41683	15.49471	18.99387	14.26460	0.0083
4	1.422958	3.841466	1.422958	3.841466	0.2329

**MacKinnon-Haug-Michelis (1999) p-values.
Source: Researcher's computation from data using Eviews7.0.

From Table 4.4, the trace statistics and the Max-Eigen Statistics reveal that there are four cointegrating equations. This implies that there exists cointegration among the variables. This goes to support the apriori expectations that technological progress and economic growth in Nigeria are highly related in the long run as they influence the course of each other in the long run.

This cointegration which measures the long run relationships necessitates the examination of the short –run relationship by examining the Vector error correction term, in this case the VECM. This is considered below.

4.4.4 Vector Error Correction Mechanism

This result is presented on Table 4.5. It indicates clearly that ECM term is negative for all the variables in the model as required.

Table 4.5: VECM Results of TERK and GDP relationship

Cointegrating Eq:	CointEq1				
LOGGDP(-1)	1.000000				
LOGK(-1)	0.852662 (0.16196) [5.26479]				
LOGL(-1)	-5.414217 (0.93211) [-5.80853]				
LOGTERK(-1)	-1.120459 (0.13099) [-8.55388]				
EX(-1)	0.006238 (0.00063) [9.88277]				
C	46.95065				
Error Correction:	**D(LOGGDP)**	**D(LOGK)**	**D(LOGL)**	**D(LOGTERK)**	**D(EX)**
CointEq1	-0.186753 (0.13208) [-1.41390]	-0.167333 (0.14633) [-1.14352]	-0.003300 (0.00583) [-0.56628]	-0.004898 (0.19564) [-0.02504]	-87.07379 (11.7288) [-7.42395]

Source: Researcher's computation from data using Eviews7.0.

Clearly, the ECM term with respect to GDP is -0.19 signifying that the speed of adjustment resulting from any distortions in equilibrium is slow. So, GDP will react positively to changes in technological progress but at a low pace. Also, the terms for all other variables are negative in line with a priori expectations. The speeds of adjustments too are also low except for exchange rate that has a high speed of adjustment of 87%.

To further analyse the short run relation and to support the VECM results, impulse response function and Variance decomposition are used to bring out the exact short-run relationship. The two measures are examined below:

a) Impulse Response Function with respect to GDP and TERK

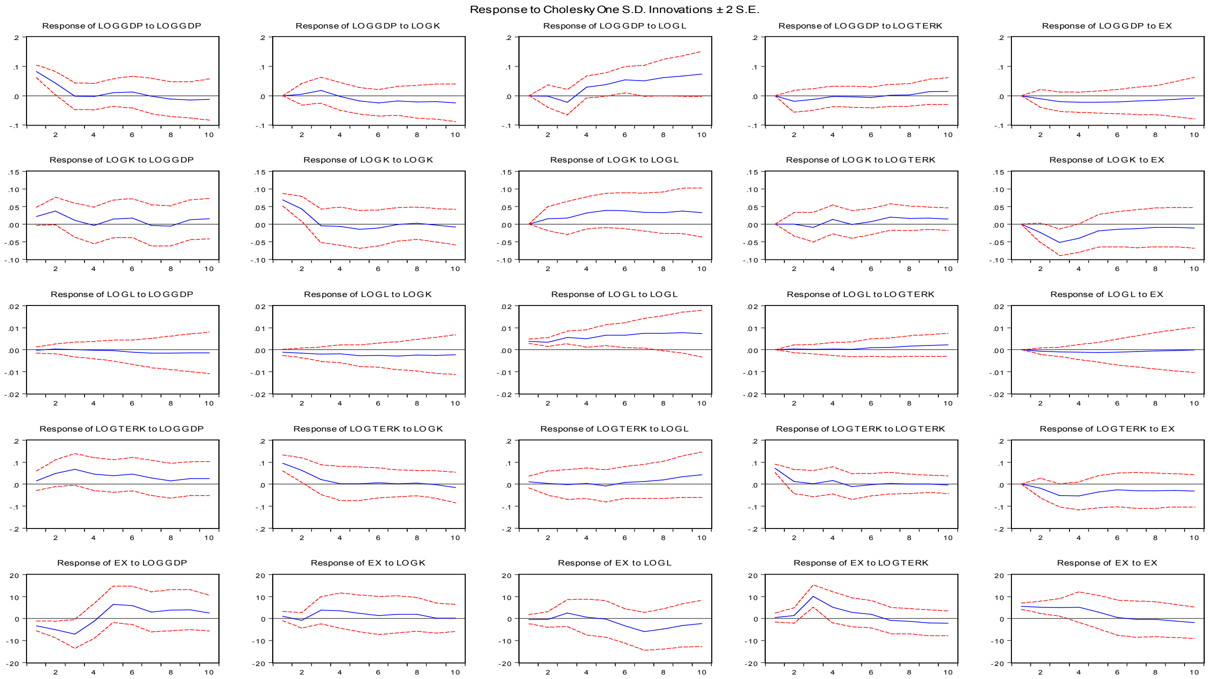
Considering that the interest here is to analyse the relationship between technological progress and economic growth, attention focused on panel one only. This is presented on Table 4.6 and Figure 4.2.

Table 4.6: Impulse Response function table of GDP and TERK relationship

Response of LOGGDP: Period	LOGGDP	LOGK	LOGL	LOGTERK	EX
1	0.082604	0.000000	0.000000	0.000000	0.000000
	(0.01066)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	0.042550	0.004541	-0.001839	-0.019340	-0.009921
	(0.01973)	(0.01849)	(0.01911)	(0.01876)	(0.01513)
3	-0.002054	0.018360	-0.022569	-0.013211	-0.020792
	(0.02274)	(0.02207)	(0.02162)	(0.01840)	(0.01671)
4	-0.003462	-0.003322	0.029043	-0.002788	-0.022897
	(0.02252)	(0.02379)	(0.01868)	(0.01752)	(0.01716)
5	0.010388	-0.018048	0.037405	-0.003984	-0.022241
	(0.02337)	(0.02281)	(0.02009)	(0.01779)	(0.01882)
6	0.011809	-0.024758	0.054354	-0.006527	-0.020994
	(0.02719)	(0.02246)	(0.02244)	(0.01769)	(0.02076)
7	-0.001460	-0.017934	0.050209	0.001047	-0.018303
	(0.03033)	(0.02470)	(0.02663)	(0.01865)	(0.02334)
8	-0.012167	-0.021459	0.061597	0.001960	-0.015764
	(0.02953)	(0.02798)	(0.03094)	(0.01918)	(0.02491)
9	-0.014749	-0.020661	0.066496	0.012924	-0.012381
	(0.03083)	(0.02997)	(0.03456)	(0.02129)	(0.02983)
10	-0.013267	-0.024540	0.073660	0.015065	-0.008719
	(0.03515)	(0.03213)	(0.03853)	(0.02287)	(0.03540)

Source: Researcher's computation from data using Eviews7.0.

Figure 4.2: Impulse Response Graph



Source: Plotted from research data using Eviews7.0

From Table 4.6 and Figure 4.2, it is revealing that GDP has a positive relationship with capital (k) in the short run period and a negative relationship with it in the medium and long term period. On the average the impacts are greater than 0.03 but less than 0.02.

On the other hand, labour force participation has a positive relationship with economic growth in the medium and long term but negatively impacts on it in the short run. This means that more employment could lead to economic growth in Nigeria. So, it can be suggested that solving the problem of unemployment is good for economic growth.

Technological progress has a negative relationship with GDP in the short and medium term, but a positive relationship in the long-run. This is because in the short run, the results of technical progress are not immediate. Its takes time for the results to be realized. As such in the short run, investments in technology which is considered savings will lead to a fall in GDP but eventually will trigger a rise in GDP when it starts to yield the fruits.

Exchange rate as a control variable indicates a consistent negative relationship with GDP throughout the period. This may be because the exchange rate has been consistently depreciating thereby destroying the indigenous production capabilities in Nigeria.

b) Variance Decomposition Analysis with respect to GDP and Technological Progress

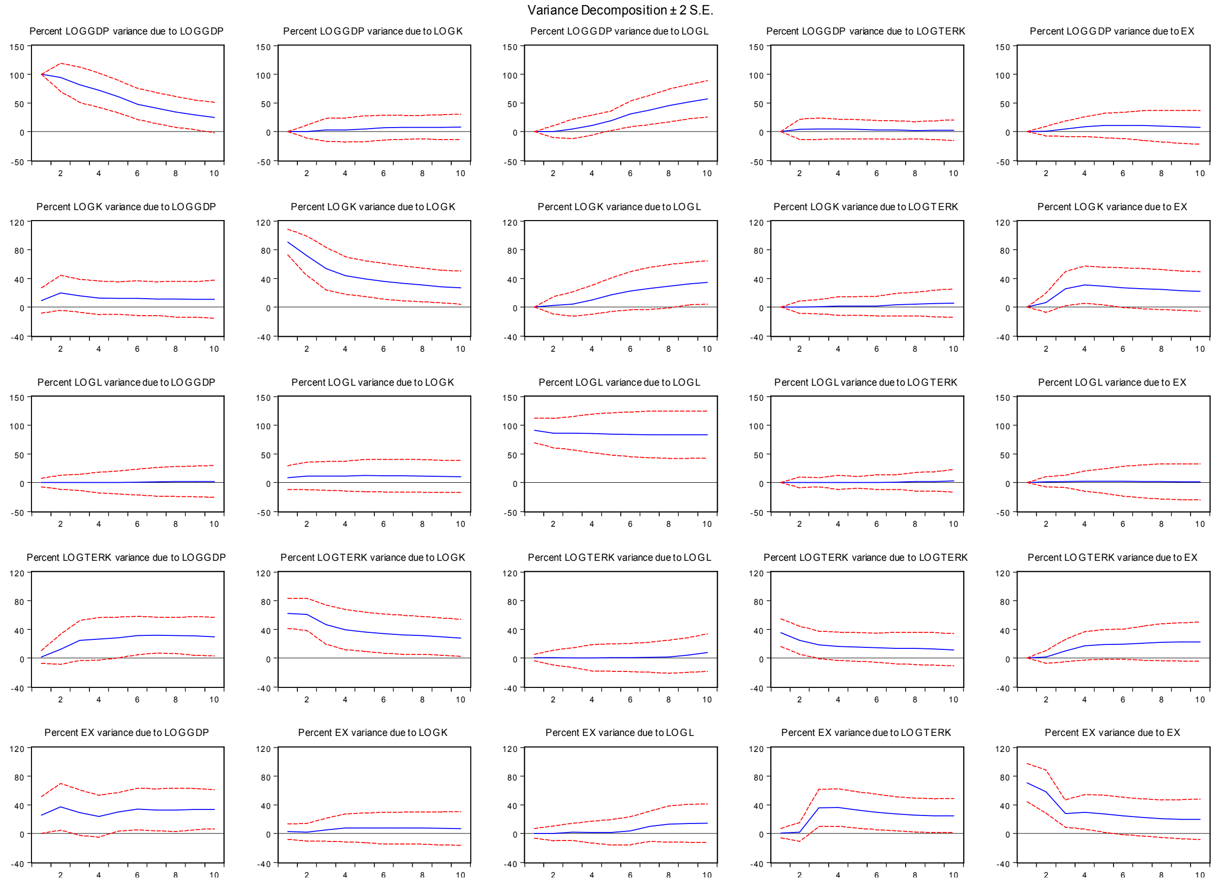
The results of the variance decomposition which examines the future variation of the GDP with respect to technological progress are presented on Table 4.7 and Figure 4.3.

Table 4.7: Variance Decomposition with respect to GDP and Technological progress

Variance Decomposition of LOGGDP:						
Period	S.E.	LOGGDP	LOGK	LOGL	LOGTERK	EX
1	0.082604	100.0000	0.000000	0.000000	0.000000	0.000000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	0.095553	94.56243	0.225869	0.037054	4.096618	1.078033
		(9.32634)	(4.04128)	(4.52282)	(7.14338)	(5.48807)
3	0.102897	81.58531	3.378403	4.842549	5.181057	5.012676
		(13.1080)	(6.63612)	(6.35760)	(9.15759)	(9.10644)
4	0.109483	72.16615	3.076308	11.31445	4.641394	8.801694
		(13.6497)	(8.42660)	(9.18095)	(8.67011)	(9.12153)
5	0.119707	61.11792	4.846349	19.22818	3.993131	10.81442
		(13.6094)	(7.77619)	(11.0761)	(8.70825)	(9.86578)
6	0.136088	48.04281	7.059626	30.83027	3.319734	10.74756
		(12.2830)	(7.60851)	(14.7353)	(8.74563)	(10.3197)
7	0.147312	41.01074	7.507012	37.92811	2.838190	10.71595
		(13.1241)	(8.40288)	(16.0562)	(8.10718)	(10.7361)
8	0.162345	34.32894	7.928324	45.62510	2.351472	9.766162
		(14.0191)	(8.62997)	(17.6951)	(7.76829)	(10.9159)
9	0.178164	29.18893	7.927767	51.81285	2.478626	8.591835
		(13.6254)	(9.36020)	(17.5200)	(8.22370)	(11.8456)
10	0.195574	24.68341	8.153519	57.18379	2.650347	7.328929
		(13.4272)	(9.68684)	(18.2727)	(8.86424)	(12.1494)

Source: Researcher's computation from data using Eviews7.0.

Figure 4.3: Variance Decomposition Graph



Source: Plotted from research data using Eviews7.0

Table 4.7 and Figure 4.3 – variance decomposition table and graph respectively reveals that gross fix capital formation – capital will cause a future variation in GDP ranging from about 0.22% in the short run to 4.8% in the medium term and up to 8% in the long term.

Labour force participation, on the other hand, causes future variations in GDP ranging between 0.04 % in the short run, 19.23% in the medium term and 2.48% at the end of the long term. This indicates that the rate of causation of labour force participation is not constant as it rises and falls over time. This may be linked to the high unemployment profile in the country.

Future variations in GDP arising from Technological progress decreases from the 5.18 in the short –run to 4.0% in the medium term and 2.4% in the long term i.e 10th period on table 4.7. However, this is still considerably good as it is clear that technological progress can contribute significantly to the future increases in GDP though at a decreasing rate. This means that the stock of technology needs to be constantly maintained and upgraded to higher levels to ensure a continuous significant contribution on GDP arising from it.

This analysis brings clearly to light the fact that technological progress in Nigeria has a significant contribution to the country's economic growth both in the long and short run. This means improving the state of technology will also improve the results of economic growth.

4.5 ANALYSIS OF IMPACT HUMAN OF CAPITAL ON ECONOMIC GROWTH

This section examines the impact of human capital captured by education and health variables on economic growth in Nigeria. Two models are specified for the analysis – a model on education and another on health.

4.5.1 Model 1: Public Educational Expenditure and Economic Growth

This aspect analyses the impact of public educational expenditure on economic growth in Nigeria. The variables captured here are: GDP which represents economic growth, K: Capital represented by the gross fixed capital formation, EDUXPL: Educational expenditure in line the labour force, M2GDP: financial depth; and L: labour participation rate.

4.5.1.1 Lag Length Selection Criteria

The results of the selection of the number of lags based on the VAR lag order selection is presented on Table 8.

Table 4.8: Lag length selection criteria results for GDP and Educational expenditure variables

Lag	LogL	LR	FPE	AIC	SC
0	116.5233	NA	4.06e-10	-7.434885	-7.201352
1	256.5900	224.1068*	1.95e-13*	-15.10600	-13.70480*
2	280.6144	30.43084	2.42e-13	-15.04096	-12.47209
3	307.8426	25.41307	3.22e-13	-15.18951*	-11.45298

* indicates lag order selected by the criterion

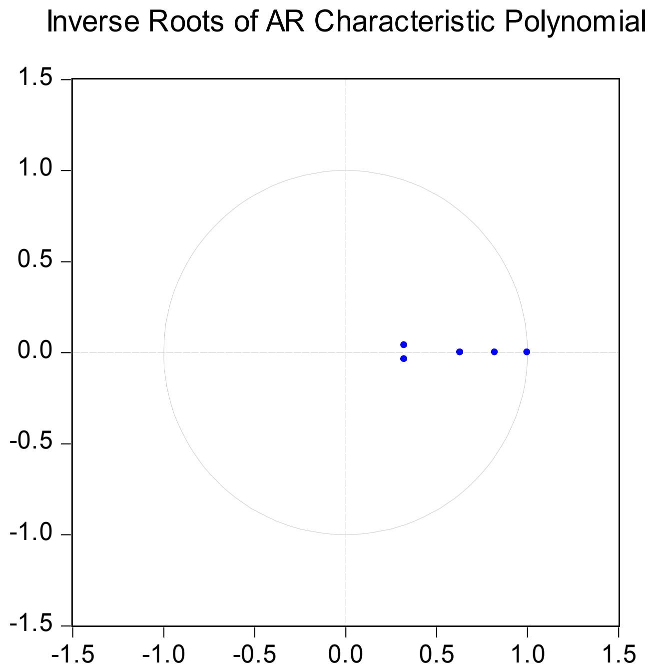
Source: Researcher's computation from data using Eviews7.0.

For this model, a single lag is used for the analysis. This is based on the fact that LR, FPE and SC align to this specification and given the number of 33 observations number of variables, the results will be more appealing with regards to the degree of freedom.

4.5.1.2 Model Stability

The model is tested for its stability using the unit circle. Figure 3 represents the results obtained.

Figure 4.4: Model on Education and GDP Stability



Source: Plotted from research data using Eviews7.0

Clearly, all the variables in the model are within the unit circle signifying that the model under consideration is stable as required.

4.5.1.3 Cointegration Analysis of the Relationship between Education Variables and GDP

The importance of this is to determine whether or not the variables exhibit a cointegration in the long run or not. This is realized with the analysis of the Johansen Cointegration. The results are presented on Table 4.9.

Table 4.9: Johansen Cointegration Results for Education and GDP relationship

Max Rank/No. of cointegrating Equations	Trace Statistics	0.05 Critical Value (Trace Statistic)	Maximum Eigen Value	0.05 Critical Value (Eigen Value)	Prob.**
0	79.55837	69.81889	28.43207	33.87687	0.0068
1	51.12630	47.85613	24.26011	27.58434	0.0239
2	26.86619	29.79707	15.98669	21.13162	0.1050
3	10.87950	15.49471	10.84818	14.26460	0.2190
4	0.031327	3.841466	0.031327	3.841466	0.8595

**MacKinnon-Haug-Michelis (1999) p-values.
Source: Researcher's computation from data using Eviews7.0.

Based on the trace statistics, there are clearly two cointegrating equations in the relationship but this does not agree with the results of maximum-eigen statistics. However the conclusion is that, there exists co integration among the variables in the model. This means that the variables of education and economic growth have a consistent relationship in which human capital development from the stand point of education significantly affects GDP in the long run.

4.5.1.4 Error Correction Mechanism

The results of the VECM analysis which reveals the speed of adjustment to long run equilibrium are presented in Table 4.10. Clearly the speed of adjustment of GDP to changes in the educational variables in the long run stands at -0.147 as seen on Table 10. The sign meets theoretical requirements of a negative sign. The results indicate that the response of GDP to changes in educational variables in the long run is 14%. This speed is slow as it will require a long time for the required balance among them to be restored.

Table 4.10: Error Correction Mechanism

Cointegrating Eq:	CointEq1				
LOGK(-1)	1.000000				
LOGEDUXPL(-1)	0.477384 (0.12673) [3.76698]				
LOGGDP(-1)	-0.345706 (0.37182) [-0.92977]				
LOGM2GDP(-1)	-0.540440 (0.18549) [-2.91358]				
LOGL(-1)	-0.309773 (2.62361) [-0.11807]				
C	-0.435804				
Error Correction:	**D(LOGK)**	**D(LOGEDUXPL)**	**D(LOGGDP)**	**D(LOGM2GDP)**	**D(LOGL)**
CointEq1	-0.357523 (0.21040) [-1.69922]	-1.913211 (0.55591) [-3.44156]	-0.147777 (0.20224) [-0.73069]	-0.164528 (0.25623) [-0.64212]	-0.006572 (0.00842) [-0.78059]

Source: Researcher's computation from data using Eviews7.0.

a) Impulse Response Function of Education Expenditure and GDP

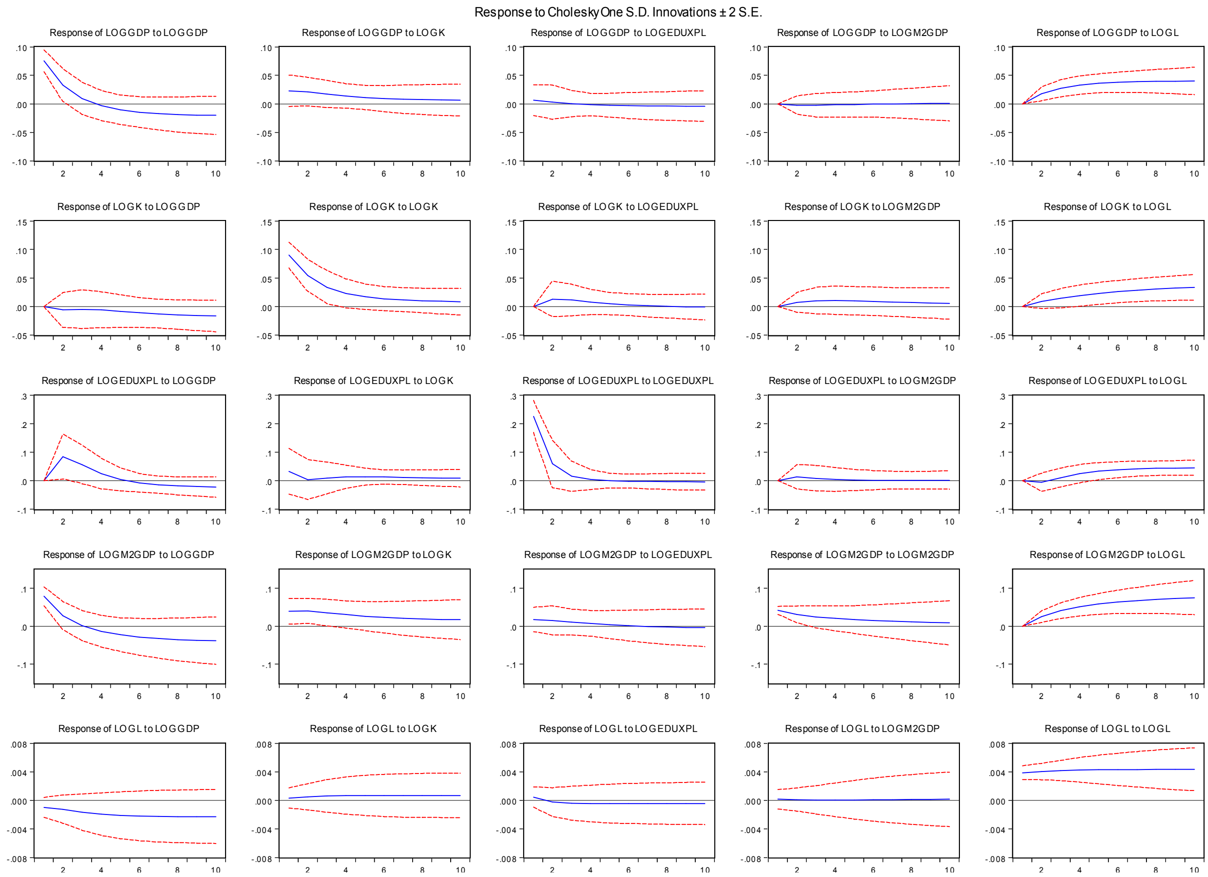
The responses of GDP to changes in government spending on education in Nigeria in the short run are indicated on Table 4.11 and Figure 4.4. Since the consideration here is the response of GDP only to the other variables, only panel 1 is examined. However, the results of the other panels are fully reflected in the appendix.

Table 4.11: GDP responses to educational development

Response of LOGGDP: Period	LOGGDP	LOGK	LOGEDUXPL	LOGM2GDP	LOGL
1	0.075597	0.023023	0.006386	0.000000	0.000000
	(0.00945)	(0.01372)	(0.01339)	(0.00000)	(0.00000)
2	0.032664	0.021433	0.002831	-0.002386	0.017464
	(0.01422)	(0.01259)	(0.01499)	(0.00812)	(0.00597)
3	0.009620	0.017440	0.000418	-0.002429	0.027231
	(0.01415)	(0.01191)	(0.01152)	(0.01023)	(0.00754)
4	-0.003118	0.013761	-0.001282	-0.001795	0.032786
	(0.01320)	(0.01074)	(0.00988)	(0.01068)	(0.00799)
5	-0.010394	0.011032	-0.002424	-0.001083	0.035990
	(0.01286)	(0.01072)	(0.01044)	(0.01098)	(0.00833)
6	-0.014662	0.009190	-0.003151	-0.000470	0.037849
	(0.01345)	(0.01149)	(0.01138)	(0.01157)	(0.00885)
7	-0.017211	0.008011	-0.003588	1.65E-05	0.038924
	(0.01446)	(0.01238)	(0.01212)	(0.01243)	(0.00954)
8	-0.018749	0.007282	-0.003837	0.000392	0.039538
	(0.01543)	(0.01311)	(0.01265)	(0.01343)	(0.01033)
9	-0.019681	0.006846	-0.003967	0.000682	0.039880
	(0.01619)	(0.01364)	(0.01302)	(0.01446)	(0.01116)
10	-0.020244	0.006595	-0.004026	0.000906	0.040063
	(0.01672)	(0.01400)	(0.01329)	(0.01543)	(0.01196)

Source: Researcher's computation from data using Eviews7.0.

Figure 4.5: Impulse Response Function Graph



Source: Plotted from research data using Eviews7.0

Source: Researcher's computation from data using Eviews7.0.

From Table 4.11 and Figure 4.5, GDP responds positively and significantly to stock of physical capital all through the short run, medium term and long term periods. Its values, though better than all others, are below 0.03. GDP responds negatively to Educational expenditure (EDUXPL) in the medium and long term but positively in the short run. This could be based on the fact that it takes time for expenditure to manifest into results. As such, when resources are committed to education, time is required between enrolment and graduation as well as job placement for the benefits of education to be seen in an economy. On the other hand, GDP has a negative relationship with financial deepening in the short term and medium term but a positive on in the long run. This also indicates that it takes time for policies to be implemented and it also takes time for the implementation to materialize into concrete results. Also, the response of GDP to labour force participation is positive throughout the period. This is indicating that as more hands are employed, economic growth increases.

b) **Variance Decomposition**

The future variations on GDP resulting from variables in Model 2 – Education variables are revealed by the Variance Decomposition Table (Table 4.12 and Figure 4.6).

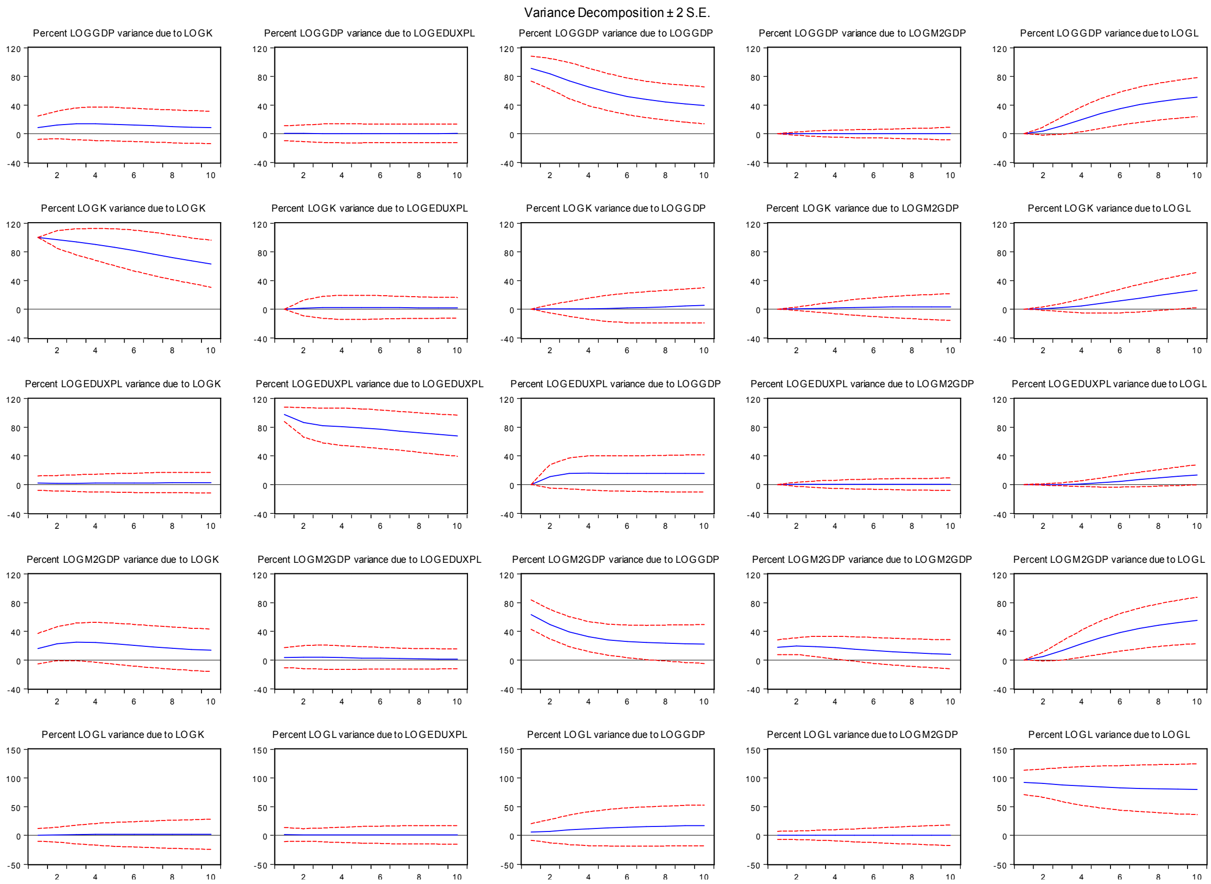
Table 4.12: Variance Decomposition Table

Variance Decomposition of LOGGDP:

Period	S.E.	LOGK	LOGEDUXPL	LOGGDP	LOGM2GDP
1	0.090323	8.432968	0.648842	90.91819	0.000000
2	0.107052	12.16919	0.600213	83.40962	0.070043
3	0.114310	13.94695	0.528044	74.11717	0.125011
4	0.119000	14.05114	0.479621	65.22808	0.140379
5	0.123152	13.27698	0.467435	57.85325	0.132284
6	0.127416	12.21508	0.480324	52.11914	0.117215
7	0.131965	11.15572	0.504541	47.74173	0.103133
8	0.136792	10.20567	0.531204	44.37987	0.092450
9	0.141835	9.388021	0.556010	41.75389	0.085246
10	0.147025	8.694274	0.577401	39.66020	0.080898

Source: Researcher's computation from data using Eviews7.0.

Figure 4.6: Variance Decomposition Graph



Source: Plotted from research data using Eviews7.0

From the values on Table 4.12 and Figure 4.6, in the short run (1st and 2nd periods), future variations in GDP arising from changes in educational indices in the model are between 8.4% and 12.2%. In the medium term, it is between 13.3% and 14% (3rd to 5th periods). In the long run, variations in GDP arising from changes in the variables stand between 8.7% and 12.2%. Clearly, future variations in GDP will be higher in the medium term than in the long and short run.

It can be said here that educational development as revealed by all the analysis significantly affects economic growth in Nigeria. This relationship is positive, which means that if there is an improvement in educational indices in the country, it will consequently be transmitted into economic growth.

4.5.2 Model 2: Analysis of Health expenditure and economic growth

Here the impact of health expenditure alongside labour force influence on economic is analysed. Variables considered here are: GDP represents economic growth, K: Capital represented by the gross fixed capital formation, HEXPL: public expenditure on health in line the labour force, M2GDP: financial depth; and L: labour participation rate.

4.5.1.1 Lag length selection criteria

From the VAR lag length selection approach, the following results are obtained.

Table 4.13: Lag length Selection

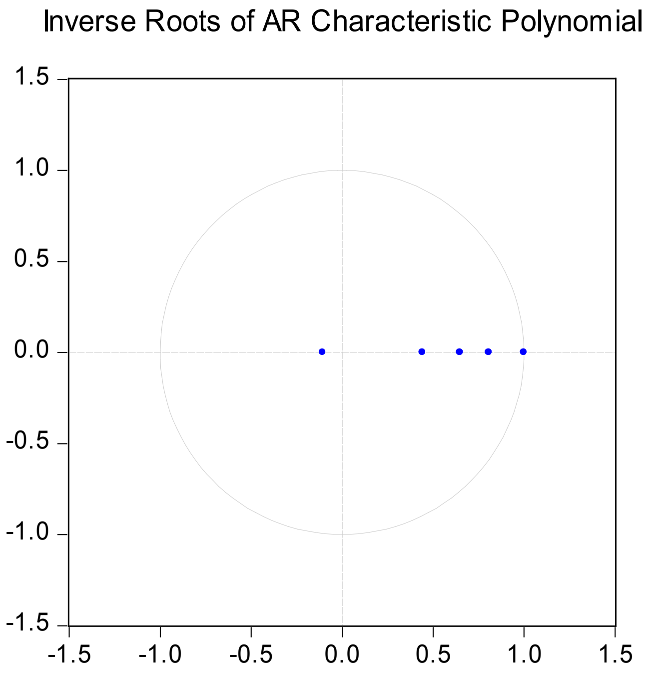
Lag	LogL	LR	FPE	AIC	SC
0	120.8180	NA	3.05e-10	-7.721203	-7.487670
1	262.5181	226.7201*	1.31e-13*	-15.50121*	-14.10001*
2	283.2906	26.31189	2.02e-13	-15.21938	-12.65051
3	309.9629	24.89409	2.80e-13	-15.33086	-11.59433

* indicates lag order selected by the criterion

Source: Researcher's computation from data using Eviews7.0.

Clearly, all four criteria specify that the appropriate lag length for this model is 1. Thus, for the analysis of the impact of human capital development using health as a proxy and other control variables, a single lag is used.

Figure 4.7: Model 3 Stability Results



Source: Plotted from research data using Eviews7.0

Cointegration analysis of Health expenditure and GDP

The results of the Johansen cointegration test meant to establish the long trend between health expenditure and economic growth are reflected on Table 14.

Table 4.14: Cointegration Results of Health Expenditure

Max Rank/No. of cointegrating Equations	Trace Statistics	0.05 Critical Value (Trace Statistics)	Maximum Eigen Value	0.05 Critical Value (Eigen Value)	Prob.**
0	0.597640	73.40323	28.22262	33.87687	0.0251
1	0.523230	45.18061	22.96236	27.58434	0.0873
2	0.415210	22.21825	16.63157	21.13162	0.2866
3	0.164698	5.586673	5.578818	14.26460	0.7437
4	0.000253	0.007855	0.007855	3.841466	0.9289

**MacKinnon-Haug-Michelis (1999) p-values.

Source: Researcher's computation from data using Eviews7.0.

Table 4.14 indicates that based on the trace statistics, there is one cointegrating equation in the relationship, while according to the results of maximum-eigen statistics, there is known. The conclusion that can be drawn from this is that there exists cointegration among the variables in the model as revealed by the trace statistics. This means that the variables of human capital development as indicated by health expenditure and other control variables – M2GDP, Labour force participation and stock of capital in relation to economic growth has a consistent relationship in which human capital development, from the stand point of health significantly, affects GDP in the long run. This simply means that the variables have a consistent impact on one another over time.

Vector Error Correction Mechanism (VECM)

The results of the VECM analysis which reveals the speed of adjustment to long –run equilibrium are presented in Table 4.15. The speed of adjustment of GDP to changes in the Health expenditure and its related variables in the model in the long run stands at -0.147 as seen on Table 15. The sign meets theoretical expectations of a negative sign. The results indicate that the response of GDP to changes in health expenditure and its control variables in the long run is 14%. This speed is relatively slow and also means that it will require a long time for equilibrium to be restored once there is a distortion in the relationship.

Table 4. 15: VECM results of Health expenditure and GDP

Cointegrating Eq:	CointEq1
LOGK(-1)	1.000000
LOGHEXPL(-1)	0.702645
	(0.22734)
	[3.09075]
LOGGDP(-1)	0.546917
	(0.52245)
	[1.04684]
LOGM2GDP(-1)	-1.005003
	(0.41013)
	[-2.45046]
LOGL(-1)	-2.691769
	(3.82951)

	[-0.70290]				
C	17.67674				

Error Correction:	D(LOGK)	D(LOGHEXPL)	D(LOGGDP)	D(LOGM2GDP)
CointEq1	-0.275016 (0.14891) [-1.84689]	-1.180009 (0.41017) [-2.87687]	-0.146888 (0.14890) [-0.98645]	-0.166327 (0.18560) [-0.89615]

Source: Researcher's computation from data using Eviews7.0.

The signs in Table 4.15 meet a proiri expectations but the speed of long run adjustment is slow.

a) Impulse Response Function Table for Health Related Human Capital Development

The responses of GDP to changes in government expenditure on health in Nigeria in the short run are indicated on Table 4.11 and Figure 4.4. Since the consideration in this study is the response of GDP only to the other variables, only panel 1 forms the basis of discussion here. From Table 4.16 and Figure 6, GDP responses positively and significantly to stock of physical capital all through the short run, medium term and long term periods with values ranging between 0.007 and 0.023. GDP responses negatively to government expenditure on health (HEXPL) throughout the period under consideration. Its values lie between -0.001 and -0.0003. This may be based on the fact that government allocation to the sector is low and most of the government expenditure on the sector goes to the recurrent aspect of it, which is not directly productive. On the other hand, GDP has a negative relationship with financial deepening in the short term and beginning of medium term, but a positive one in the later part of the medium term and long run. This also indicates that it takes time for policies to be implemented and it also takes time for the implementation to materialize into concrete results. Also the response of GDP to labour force participation is positive throughout the period with values ranging between 0.02 and 0.04. This is indicating that as more hands are employed, economic growth increases.

Table 4.16: Impulse Response Function of health development and GDP

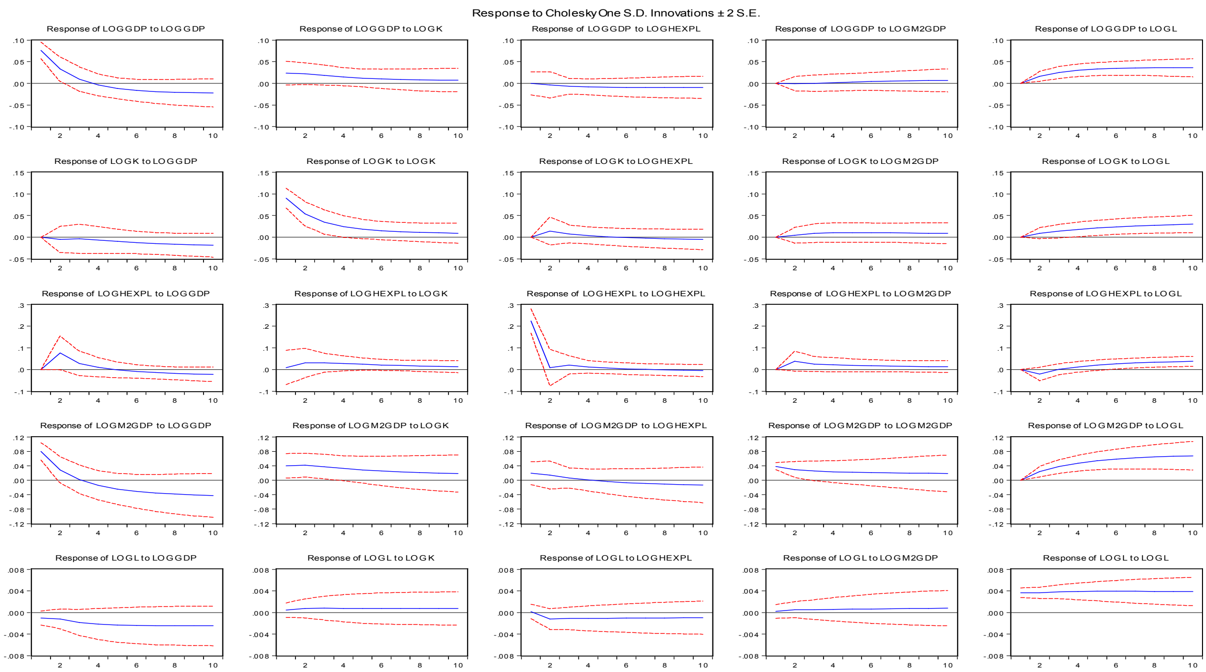
Response of LOGGDP:

Period	LOGGDP	LOGK	LOGHEXPL	LOGM2GDP	LOGL
1	0.075756	0.023224	-0.000337	0.000000	0.000000
	(0.00947)	(0.01370)	(0.01339)	(0.00000)	(0.00000)
2	0.032650	0.022249	-0.003707	-0.001185	0.016047
	(0.01400)	(0.01256)	(0.01527)	(0.00834)	(0.00580)
3	0.009386	0.018591	-0.006823	-1.76E-05	0.024865
	(0.01411)	(0.01164)	(0.00906)	(0.00952)	(0.00685)
4	-0.004014	0.014941	-0.008406	0.001487	0.029920
	(0.01267)	(0.01043)	(0.00917)	(0.00971)	(0.00722)
5	-0.011818	0.012082	-0.009220	0.002881	0.032776
	(0.01214)	(0.01038)	(0.00999)	(0.00983)	(0.00748)
6	-0.016423	0.010068	-0.009570	0.004023	0.034358
	(0.01280)	(0.01112)	(0.01074)	(0.01027)	(0.00788)
7	-0.019153	0.008739	-0.009656	0.004912	0.035195
	(0.01389)	(0.01201)	(0.01137)	(0.01098)	(0.00844)
8	-0.020767	0.007905	-0.009601	0.005590	0.035600
	(0.01490)	(0.01274)	(0.01194)	(0.01181)	(0.00910)
9	-0.021711	0.007408	-0.009477	0.006105	0.035761
	(0.01566)	(0.01327)	(0.01247)	(0.01263)	(0.00979)
10	-0.022251	0.007130	-0.009325	0.006495	0.035787
	(0.01618)	(0.01363)	(0.01297)	(0.01337)	(0.01047)

Source: Researcher's computation from data using Eviews7.0.

Impulse Response Function (IRF) Graph

Figure 4.8: Impulse response function on impact of government health expenditure on GDP



Source: Plotted from research data using Eviews7.0

b) Variance Decomposition for government Expenditure on Health

In terms of future variations in GDP as it relates to government expenditure and controlled variables used, the results are presented on Table 4.17 and Figure 4.9. From the Table 4.17 and Figure 4.9, in the short run (1st and 2nd periods), future variations in GDP arising from changes in health expenditure is between 0.002 and 3.12%, with the long term accounting for the higher values. Stock of physical capital accounts for about 8.6% to 15.4% of future variation in GDP for the entire time horizon. Also, financial depth variable captured by M2GDP accounts for about 0.02% to 0.77%. Clearly stock of physical capital accounts for future variations in GDP than public expenditure on health and financial depth respectively. GDP, on the other hand, accounts for most of its future variation with values ranging between 43.04 and 91.4, decreasing continuously over time.

Table 4.17: Variance Decomposition of Health Development and GGP

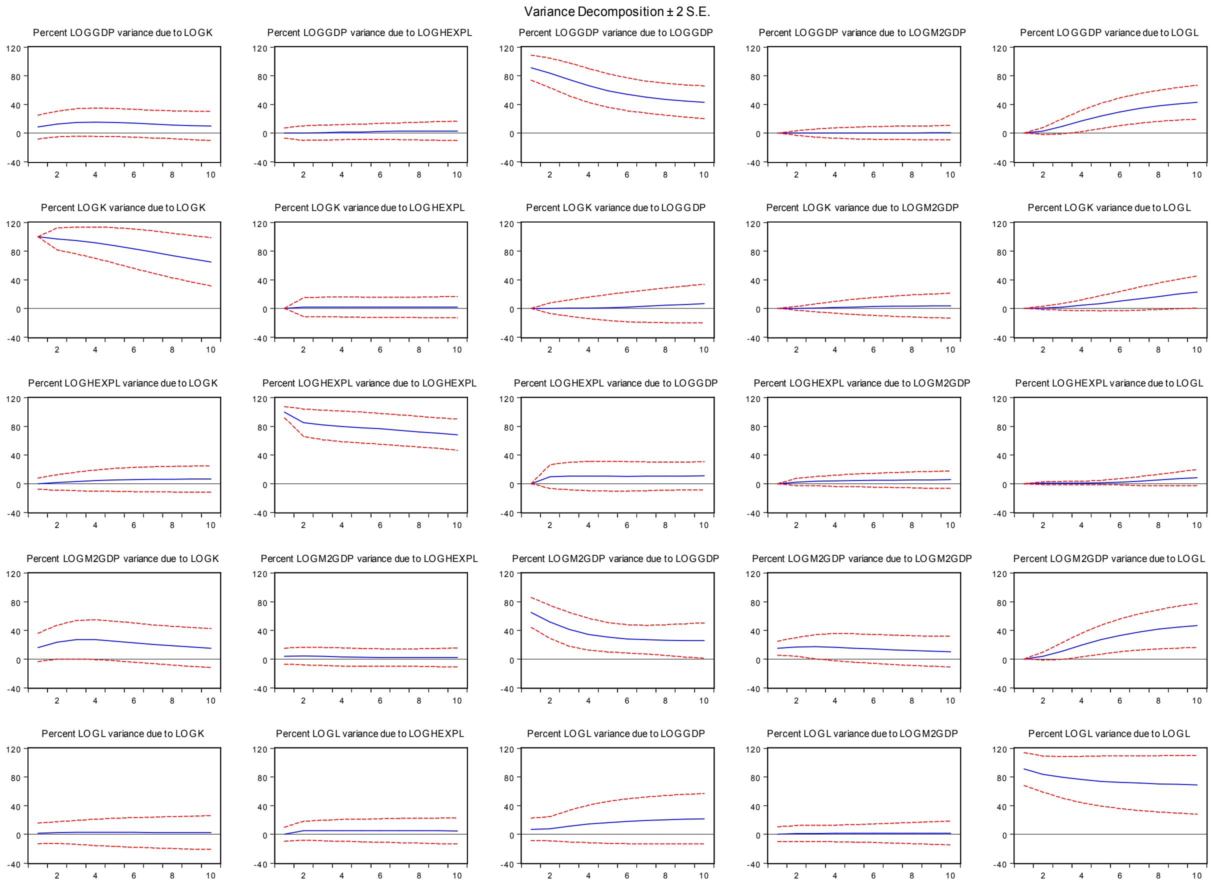
Variance Decomposition of LOGGDP:

Period	S.E.	LOGK	LOGHEXPL	LOGGDP	LOGM2GDP
1	0.090300	8.590687	0.001811	91.40750	0.000000
2	0.106612	12.75102	0.170794	83.88669	0.017309
3	0.113698	14.98273	0.655788	74.83805	0.015248
4	0.118457	15.38907	1.257978	66.31937	0.034714
5	0.122713	14.73489	1.820073	59.37734	0.100400
6	0.127053	13.67710	2.273673	54.08918	0.207678
7	0.131623	12.56999	2.615068	50.13382	0.340683
8	0.136414	11.55684	2.864286	47.15066	0.484927
9	0.141369	10.67720	3.044309	44.85443	0.630621
10	0.146424	9.928542	3.174250	43.04355	0.772061

Source: Researcher's computation from data using Eviews7.0.

Variance Decomposition Graph

Figure 4.9: Variance Decomposition of government health expenditure impact on GDP



Source: Plotted from research data using Eviews7.0

It can be said here that expenditure on the health sector as revealed by the analysis significantly affects economic growth in Nigeria. However, the impact is in the negative direction which does not meet our apriori expectations.

In the long run, technological progress, human capital indices with expenditure on education and expenditure on health as proxies show co-movements with economic growth. The speed to which equilibrium is restored in the long run differs from 0.19 for technological progress and 0.15 for government expenditure on education and government expenditure on education. This indicates that GDP will response differently to progress in technology as well as to government expenditure on the sectors, in which case the response rate to technological progress is the best.

Clearly, in the short run in Nigeria, technological progress (TERK) has a positive impact on GDP throughout all the time horizons. Government expenditure on education leads to economic growth as it has positively impacts on the economy. Government expenditure on health does not lead to economic growth as it has negative impacts on the economy. Also, stock of physical capital, labour force participation have positive impacts on economic growth However, financial deepening within the first 6 periods show negative impacts on GDP, but this is reversed with time as a positive impact sets in for the rest of the period.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY

Acknowledging the importance of human capital development in every facet of the nation's development drive, this study has attempted to examine the impact of government expenditure on human capital on its output. The aim of this study is to establish the impact of government expenditure on health and education as a measure of human capital development on economic growth in Nigeria for the period of 1981 to 2013. Based on Lucas (1988), Romer (1996), modification of the Cobb Douglas production function to capture spill over effects of technological progress and measures of human capital, the following variables were captured in the study: Economic growth (GDP); Capital formation (K); tertiary enrolment (TER) as embedded in technologically improved private capital (TERK); Total number of employed people (L); Exchange rate (ER), Consumer price index measuring price stability (CPI); financial depth as measured by M2GDP; Human capital per worker brought about by government expenditure in education and health - (EDUXPL and HEXPL) respectively. With data collected predominantly from CBN and World Bank sources, Augmented Dickey Fuller unit root test is used, the Johansen cointegration approach is used to establish the presence or otherwise of a long run relationship and the vector error correction mechanism (VECM), including impulse response function and variance decomposition used for short run relationships. The descriptive statistics indicates that the variables comply with requirements for econometric estimations. The unit root results hold that all variables used are stationary at first differencing, and the models are all stable going by the AR polynomial VAR stability test. From the Johasen Cointegration approach, all three relationships examined exhibit cointegration suggesting that a long run relation exists between technological progress (TERK) and output (GDP), Federal government of Nigeria expenditure on education

(EDUXPL) and output (GDP) and Federal government of Nigeria expenditure on education (EDUXPL) and economic growth (GDP).

With respect to the results on technological progress and economic growth, the results show that technological progress negatively impacts economic growth in the short run but positively impacts it in the long run. Also, capital formation negatively affects GDP in the long run but positively impacts it in the short run. Exchange rate negatively impacts GDP all through the periods and labour force participation drives economic growth in the medium and long term. From the variance decomposition of this relationship, it indicates that technological progress (TERK) will actually cause significant future variations in GDP.

Secondly, that is with respect to the impact of federal government education expenditure on economic growth, the results reveal that the variables have long run cointegration. The impulse response function shows that while GDP responds positively and significantly to stock of physical capital all through the short run, medium term and long term periods, its response to education expenditure (EDUXPL) is negative in the short run but positive in the medium and long term. From the variance decomposition table, education expenditure is important in determining future variations in GDP. The variations in GDP, arising from changes in educational indices in the model is between 8.4% and 14% for the entire time horizon. Clearly, educational development significantly affects economic growth in Nigeria. This relationship is positive, which means that if there is an improvement in educational indices in the country, it will consequently be transmitted into economic growth.

The last relationship analysed is that of public health expenditure (as captured by health expenditure in relation to labour force participation) on economic growth. From the analysis, the relationship cointegrates in the long run. In the short run, government expenditure on health (HEXPL) in Nigeria negatively impacts on GDP throughout the period under consideration. This may be based on the fact that government allocation to the sector is low and most of government expenditure on the sector goes to the recurrent aspect of it, which is not directly productive. From the variance decomposition, it is seen that government expenditure on the health sector as revealed by the analysis significantly affects economic growth in Nigeria. However, the impact is in the negative direction which does not meet our a-priori expectations.

5.2 CONCLUSION

From the foregone analysis, the following conclusions which form the basis of the recommendations that follow can be drawn.Technological progress; human capital development and economic growth cointegrates in the long run. This suggests that if macroeconomic policies are taken to influence one of the variables, the results will spill over to the other variables. This means that in order to achieve the desired long run economic growth rate, technological progress or human capital development could be used.

This analysis brings clearly to light the fact that technological progress in Nigeria has a significant contribution to the country's economic growth both in the long and short run. This means improving the state of technology will also improve the results of economic growth.

Clearly, educational development significantly affects economic growth in Nigeria. This relationship is positive, which means that if there is an improvement in educational indices in the country, it will consequently be transmitted into economic growth.

On the other hand, government expenditure on the health sector as revealed by the analysis, negatively and significantly affects economic growth in Nigeria. This is obvious as the federal allocation to the sector is still very low for the sector's development. The implication is that little in terms of economic growth given, this situation can come from the health sector.

In a nutshell, technological progress and public expenditure on education (one side of human capital development) have positive impacts on GDP in Nigeria, while public expenditure on health (the other side of human capital development) have positive impacts on GDP in Nigeria.

5.3 RECOMMENDATIONS

Based on the findings of this study, the following recommendations can be drawn:

i. Government should seriously increase and monitor its allocation to the health sector, and most importantly to the capital aspect of it. It is only when the infrastructure in the sector is fully developed made accessible to all, that the sector can contribute meaningfully to citizens' lives and consequently to economic growth.

ii. Leakages emanating from the bites of corruption resulting to improper funds allocating should be blocked. The government's recent fight through Anti- graft commission should seriously be supported at all levels. This will go a long way in ensuring the necessary equipments in the health sector and unnecessary fund mismanagement

iii. There is need to also drive physical capital formation further so that the impacts on economic growth could be far reaching. The savings and investment culture among Nigerians should be encouraged, so as to meet this recommendation.

iv. Though education positively affects economic growth in Nigeria, the impacts are really weak. This could be improved by reviving the educational sector through adequate allocations for infrastructural developments and also ensuring that the system is tailored towards producing competitive and self-reliant products.

v. The government should try and improve on the survey carried out by the National Commission for Mass Literacy, Adult and Non-Formal Education (NCMLANE), where over 47.50% of Nigeria's population or 60 million Nigerians are still illiterate in the 21st century to ensure high percentage of its population is entitled to quality education by ensuring qualified teachers have been deployed to those areas (villages) where education is inadequate and not qualitative. To compliment this, the government should provide incentives to qualified teachers.

vi. A collective effort should be made between the government and private sector to ensure qualitative education

vii. The government can also take pre-emptive measures to reduce the amount of brain drain from the country by awarding scholarship and training grants to students studying in the country and students studying abroad should also be given grants only for programmes that are not taught in our schools/universities due to lack of manpower.

viii. There should be review of school curriculum from primary to tertiary level to incorporate vocational and entrepreneurial skills which will largely reduce the overdependence on government for employment provision. This will help produce a population with highly entrepreneurial skills and ability. This will ensure capacity building which reduces unemployment while creating direct employment and consequently driving economic growth.

The above recommendations if well implemented could ensure that government expenditure on human capital goes a long way in promoting economic growth.

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APPENDICES

UNIT ROOT RESULTS

EDUXPL

Null Hypothesis: EDUXPL has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.809376	0.8009
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EDUXPL)
Method: Least Squares
Date: 12/10/15 Time: 17:27
Sample (adjusted): 1986 2013
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EDUXPL(-1)	-0.040938	0.050580	-0.809376	0.4270
D(EDUXPL(-1))	-0.440702	0.197731	-2.228796	0.0364
D(EDUXPL(-2))	-0.423895	0.192229	-2.205156	0.0382
D(EDUXPL(-3))	-0.365363	0.191747	-1.905441	0.0699
D(EDUXPL(-4))	-0.305781	0.183909	-1.662676	0.1106
C	1.079147	0.994507	1.085108	0.2896

R-squared	0.295517	Mean dependent var	0.108174
Adjusted R-squared	0.135407	S.D. dependent var	0.278973
S.E. of regression	0.259399	Akaike info criterion	0.326510
Sum squared resid	1.480331	Schwarz criterion	0.611982
Log likelihood	1.428860	Hannan-Quinn criter.	0.413782
F-statistic	1.845716	Durbin-Watson stat	1.863009
Prob(F-statistic)	0.145372		

EDUXPL FIRST DIFFERENCING

Null Hypothesis: D(EDUXPL) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.758680	0.0007
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EDUXPL,2)
Method: Least Squares
Date: 12/10/15 Time: 17:28
Sample (adjusted): 1986 2013
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EDUXPL(-1))	-2.575874	0.541300	-4.758680	0.0001
D(EDUXPL(-1),2)	1.125407	0.422232	2.665375	0.0138
D(EDUXPL(-2),2)	0.686438	0.305384	2.247786	0.0345
D(EDUXPL(-3),2)	0.313171	0.182300	1.717893	0.0993
C	0.276563	0.075292	3.673218	0.0013

R-squared	0.707337	Mean dependent var	-0.012745
Adjusted R-squared	0.656439	S.D. dependent var	0.439223
S.E. of regression	0.257447	Akaike info criterion	0.284423
Sum squared resid	1.524411	Schwarz criterion	0.522317
Log likelihood	1.018071	Hannan-Quinn criter.	0.357150
F-statistic	13.89717	Durbin-Watson stat	1.861108
Prob(F-statistic)	0.000007		

HEXPL LEVEL

Null Hypothesis: HEXPL has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.293730	0.9139
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(HEXPL)
Method: Least Squares
Date: 12/10/15 Time: 17:30
Sample (adjusted): 1986 2013
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
HEXPL(-1)	-0.014509	0.049395	-0.293730	0.7717
D(HEXPL(-1))	-0.677110	0.210800	-3.212090	0.0040
D(HEXPL(-2))	-0.421217	0.239760	-1.756830	0.0929
D(HEXPL(-3))	-0.208231	0.232581	-0.895303	0.3803
D(HEXPL(-4))	-0.218528	0.193344	-1.130258	0.2705
C	0.559898	0.941487	0.594695	0.5581

R-squared	0.359223	Mean dependent var	0.106591
Adjusted R-squared	0.213592	S.D. dependent var	0.306441
S.E. of regression	0.271751	Akaike info criterion	0.419548
Sum squared resid	1.624669	Schwarz criterion	0.705020
Log likelihood	0.126328	Hannan-Quinn criter.	0.506820
F-statistic	2.466667	Durbin-Watson stat	1.839095
Prob(F-statistic)	0.064222		

HEXPL FIRST DIFFERENCING

Null Hypothesis: D(HEXPL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.947137	0.0000
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(HEXPL,2)
Method: Least Squares
Date: 12/10/15 Time: 17:30
Sample (adjusted): 1983 2013
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HEXPL(-1))	-1.464666	0.163702	-8.947137	0.0000
C	0.145646	0.052350	2.782163	0.0094

R-squared	0.734070	Mean dependent var	0.002308
Adjusted R-squared	0.724900	S.D. dependent var	0.529053
S.E. of regression	0.277488	Akaike info criterion	0.336263
Sum squared resid	2.232990	Schwarz criterion	0.428779
Log likelihood	-3.212083	Hannan-Quinn criter.	0.366421
F-statistic	80.05125	Durbin-Watson stat	2.229987
Prob(F-statistic)	0.000000		

GDP – LEVEL

Null Hypothesis: LOGGDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.313943	0.4149
Test critical values:	1% level	-4.273277	
	5% level	-3.557759	
	10% level	-3.212361	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGGDP)
Method: Least Squares
Date: 12/10/15 Time: 17:35

Sample (adjusted): 1982 2013
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGDP(-1)	-0.293211	0.126715	-2.313943	0.0280
C	3.232598	1.360656	2.375765	0.0243
@TREND("1981")	0.029265	0.012578	2.326605	0.0272

R-squared	0.157365	Mean dependent var	0.091552
Adjusted R-squared	0.099252	S.D. dependent var	0.089229
S.E. of regression	0.084685	Akaike info criterion	-2.010693
Sum squared resid	0.207976	Schwarz criterion	-1.873280
Log likelihood	35.17109	Hannan-Quinn criter.	-1.965145
F-statistic	2.707915	Durbin-Watson stat	1.818902
Prob(F-statistic)	0.083517		

GDP FIRST DIFFERENCING

Null Hypothesis: D(LOGGDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.507187	0.0005
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGGDP,2)
Method: Least Squares
Date: 12/10/15 Time: 17:49
Sample (adjusted): 1983 2013
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGGDP(-1))	-1.037638	0.188415	-5.507187	0.0000
C	0.095853	0.039006	2.457412	0.0204
@TREND("1981")	6.98E-05	0.001873	0.037260	0.9705

R-squared	0.520973	Mean dependent var	0.000715
Adjusted R-squared	0.486757	S.D. dependent var	0.129908
S.E. of regression	0.093067	Akaike info criterion	-1.819226
Sum squared resid	0.242522	Schwarz criterion	-1.680453
Log likelihood	31.19800	Hannan-Quinn criter.	-1.773989
F-statistic	15.22590	Durbin-Watson stat	2.020470
Prob(F-statistic)	0.000033		

K – LEVEL

Null Hypothesis: LOGK has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.207991	0.9271
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGK)
Method: Least Squares
Date: 12/10/15 Time: 17:54
Sample (adjusted): 1984 2013
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGK(-1)	-0.004607	0.022150	-0.207991	0.8369
D(LOGK(-1))	0.282421	0.183137	1.542131	0.1351
D(LOGK(-2))	-0.192428	0.193094	-0.996550	0.3282
C	0.127106	0.246403	0.515846	0.6103

R-squared	0.099621	Mean dependent var	0.081634
Adjusted R-squared	-0.004269	S.D. dependent var	0.097260
S.E. of regression	0.097467	Akaike info criterion	-1.695040
Sum squared resid	0.246995	Schwarz criterion	-1.508213
Log likelihood	29.42560	Hannan-Quinn criter.	-1.635272
F-statistic	0.958906	Durbin-Watson stat	1.942140
Prob(F-statistic)	0.426869		

K- FIRST DIFFERENCING

Null Hypothesis: D(LOGK) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.233649	0.0281
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGK,2)
Method: Least Squares

Date: 12/10/15 Time: 17:55
Sample (adjusted): 1985 2013
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGK(-1))	-0.772466	0.238884	-3.233649	0.0034
D(LOGK(-1),2)	-0.007144	0.187238	-0.038155	0.9699
D(LOGK(-2),2)	-0.368931	0.155296	-2.375661	0.0255
C	0.071453	0.024459	2.921376	0.0073

R-squared	0.643280	Mean dependent var	0.007298
Adjusted R-squared	0.600474	S.D. dependent var	0.125522
S.E. of regression	0.079340	Akaike info criterion	-2.102710
Sum squared resid	0.157370	Schwarz criterion	-1.914118
Log likelihood	34.48930	Hannan-Quinn criter.	-2.043646
F-statistic	15.02766	Durbin-Watson stat	1.891349
Prob(F-statistic)	0.000009		

L – LEVEL

Null Hypothesis: LOGL has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.413690	0.3656
Test critical values:	1% level	-4.296729	
	5% level	-3.568379	
	10% level	-3.218382	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGL)
Method: Least Squares
Date: 12/10/15 Time: 18:34
Sample (adjusted): 1984 2013
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGL(-1)	-0.193040	0.079977	-2.413690	0.0234
D(LOGL(-1))	0.090366	0.156221	0.578446	0.5681
D(LOGL(-2))	0.655576	0.155251	4.222698	0.0003
C	1.762617	0.728395	2.419865	0.0231
@TREND("1981")	0.002108	0.000863	2.443117	0.0220

R-squared	0.446959	Mean dependent var	0.011251
Adjusted R-squared	0.358472	S.D. dependent var	0.003942
S.E. of regression	0.003157	Akaike info criterion	-8.527385
Sum squared resid	0.000249	Schwarz criterion	-8.293852
Log likelihood	132.9108	Hannan-Quinn criter.	-8.452676
F-statistic	5.051147	Durbin-Watson stat	2.200775
Prob(F-statistic)	0.004010		

L – FIRST DIFFERENCING

Null Hypothesis: D(LOGL) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.465715	0.0005
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGL,2)
Method: Least Squares
Date: 12/10/15 Time: 18:34
Sample (adjusted): 1983 2013
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGL(-1))	-1.041047	0.190469	-5.465715	0.0000
C	0.011380	0.002630	4.327017	0.0002
@TREND("1981")	2.02E-05	8.04E-05	0.250736	0.8038

R-squared	0.516714	Mean dependent var	8.75E-05
Adjusted R-squared	0.482193	S.D. dependent var	0.005564
S.E. of regression	0.004004	Akaike info criterion	-8.111210
Sum squared resid	0.000449	Schwarz criterion	-7.972437
Log likelihood	128.7238	Hannan-Quinn criter.	-8.065973
F-statistic	14.96834	Durbin-Watson stat	1.939032
Prob(F-statistic)	0.000038		

M2GDP – LEVEL

Null Hypothesis: LOGM2GDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.433635	0.3566
Test critical values:	1% level	-4.273277	
	5% level	-3.557759	
	10% level	-3.212361	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGM2GDP)
Method: Least Squares
Date: 12/10/15 Time: 18:55
Sample (adjusted): 1982 2013
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGM2GDP(-1)	-0.271044	0.111374	-2.433635	0.0213
C	5.744758	2.291176	2.507340	0.0180
@TREND("1981")	0.056246	0.022798	2.467176	0.0198

R-squared	0.175137	Mean dependent var	0.185932
Adjusted R-squared	0.118250	S.D. dependent var	0.113211
S.E. of regression	0.106307	Akaike info criterion	-1.555906
Sum squared resid	0.327736	Schwarz criterion	-1.418493
Log likelihood	27.89450	Hannan-Quinn criter.	-1.510358
F-statistic	3.078679	Durbin-Watson stat	1.598116
Prob(F-statistic)	0.061311		

M2GDP – FIRST DIFFERENCE

Null Hypothesis: D(LOGM2GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.702051	0.0037
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGM2GDP,2)
Method: Least Squares
Date: 12/10/15 Time: 18:56
Sample (adjusted): 1983 2013
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGM2GDP(-1))	-0.885130	0.188243	-4.702051	0.0001
C	0.165911	0.053981	3.073492	0.0047
@TREND("1981")	0.000125	0.002354	0.053114	0.9580

R-squared	0.445127	Mean dependent var	0.000715
Adjusted R-squared	0.405493	S.D. dependent var	0.150606
S.E. of regression	0.116124	Akaike info criterion	-1.376550
Sum squared resid	0.377574	Schwarz criterion	-1.237777
Log likelihood	24.33653	Hannan-Quinn criter.	-1.331314
F-statistic	11.23099	Durbin-Watson stat	2.009755
Prob(F-statistic)	0.000262		

TERK – LEVEL

Null Hypothesis: LOGTERK has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.153348	0.4980
Test critical values:	1% level	-4.273277	
	5% level	-3.557759	
	10% level	-3.212361	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGTERK)
Method: Least Squares
Date: 12/10/15 Time: 18:56
Sample (adjusted): 1982 2013
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGTERK(-1)	-0.255192	0.118509	-2.153348	0.0397
C	3.829163	1.727467	2.216634	0.0346
@TREND("1981")	0.036505	0.016987	2.148944	0.0401

R-squared	0.138217	Mean dependent var	0.115250
Adjusted R-squared	0.078784	S.D. dependent var	0.129012
S.E. of regression	0.123825	Akaike info criterion	-1.250831
Sum squared resid	0.444648	Schwarz criterion	-1.113418
Log likelihood	23.01329	Hannan-Quinn criter.	-1.205282
F-statistic	2.325587	Durbin-Watson stat	1.666420
Prob(F-statistic)	0.115682		

TERK – FIRST DIFFERENCING

Null Hypothesis: D(LOGTERK) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.840028	0.0281
Test critical values:	1% level	-4.296729	
	5% level	-3.568379	
	10% level	-3.218382	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGTERK,2)
Method: Least Squares
Date: 12/10/15 Time: 18:57

Sample (adjusted): 1984 2013
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGTERK(-1))	-1.022012	0.266147	-3.840028	0.0007
D(LOGTERK(-1),2)	0.073947	0.196485	0.376349	0.7097
C	0.146851	0.062025	2.367602	0.0256
@TREND("1981")	-0.001191	0.002875	-0.414318	0.6820

R-squared	0.495887	Mean dependent var	0.003545
Adjusted R-squared	0.437720	S.D. dependent var	0.180173
S.E. of regression	0.135103	Akaike info criterion	-1.041991
Sum squared resid	0.474574	Schwarz criterion	-0.855164
Log likelihood	19.62986	Hannan-Quinn criter.	-0.982223
F-statistic	8.525230	Durbin-Watson stat	2.032140
Prob(F-statistic)	0.000414		

CPI - LEVEL

Null Hypothesis: CPI has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on Modified AIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.405722	0.5645
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CPI)
Method: Least Squares
Date: 12/10/15 Time: 09:02
Sample (adjusted): 1987 2013
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI(-1)	-0.372129	0.264725	-1.405722	0.1752
D(CPI(-1))	0.319090	0.285849	1.116289	0.2775
D(CPI(-2))	-0.341208	0.269021	-1.268333	0.2192
D(CPI(-3))	0.113403	0.271124	0.418270	0.6802
D(CPI(-4))	-0.177867	0.217447	-0.817975	0.4230
D(CPI(-5))	-0.004283	0.216649	-0.019772	0.9844
C	8.118181	6.586531	1.232543	0.2320

R-squared	0.361864	Mean dependent var	0.102173
Adjusted R-squared	0.170423	S.D. dependent var	17.44129
S.E. of regression	15.88573	Akaike info criterion	8.587133
Sum squared resid	5047.128	Schwarz criterion	8.923091
Log likelihood	-108.9263	Hannan-Quinn criter.	8.687031
F-statistic	1.890209	Durbin-Watson stat	1.983096
Prob(F-statistic)	0.132366		

FIRST DIFFERINCING

Null Hypothesis: D(CPI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on Modified AIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.171517	0.0002
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CPI,2)
Method: Least Squares
Date: 12/10/15 Time: 17:23
Sample (adjusted): 1983 2013
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CPI(-1))	-0.950235	0.183744	-5.171517	0.0000
C	0.038898	3.033265	0.012824	0.9899

R-squared	0.479770	Mean dependent var	0.302384
Adjusted R-squared	0.461831	S.D. dependent var	23.01816
S.E. of regression	16.88612	Akaike info criterion	8.553202
Sum squared resid	8269.091	Schwarz criterion	8.645717
Log likelihood	-130.5746	Hannan-Quinn criter.	8.583360
F-statistic	26.74458	Durbin-Watson stat	1.871701
Prob(F-statistic)	0.000016		

EX – LEVEL

Null Hypothesis: EX has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.045161	0.5553
Test critical values:	1% level	-4.273277	
	5% level	-3.557759	
	10% level	-3.212361	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EX)
Method: Least Squares
Date: 12/10/15 Time: 17:26
Sample (adjusted): 1982 2013

Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EX(-1)	-0.210640	0.102994	-2.045161	0.0500
C	-5.614301	6.118289	-0.917626	0.3664
@TREND("1981")	1.440159	0.678886	2.121357	0.0426

R-squared	0.135302	Mean dependent var	4.846972
Adjusted R-squared	0.075667	S.D. dependent var	13.49469
S.E. of regression	12.97409	Akaike info criterion	8.052846
Sum squared resid	4881.483	Schwarz criterion	8.190258
Log likelihood	-125.8455	Hannan-Quinn criter.	8.098394
F-statistic	2.268856	Durbin-Watson stat	1.599689
Prob(F-statistic)	0.121489		

EX FIRST DIFFERENCING

Null Hypothesis: D(EX) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.575085	0.0050
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EX,2)
Method: Least Squares
Date: 12/10/15 Time: 17:25
Sample (adjusted): 1983 2013
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EX(-1))	-0.860369	0.188055	-4.575085	0.0001
C	2.526469	5.401070	0.467772	0.6436
@TREND("1981")	0.104491	0.283073	0.369133	0.7148

R-squared	0.428368	Mean dependent var	-0.006881
Adjusted R-squared	0.387537	S.D. dependent var	17.86074
S.E. of regression	13.97781	Akaike info criterion	8.204586
Sum squared resid	5470.620	Schwarz criterion	8.343358
Log likelihood	-124.1711	Hannan-Quinn criter.	8.249822
F-statistic	10.49128	Durbin-Watson stat	1.968696
Prob(F-statistic)	0.000398		

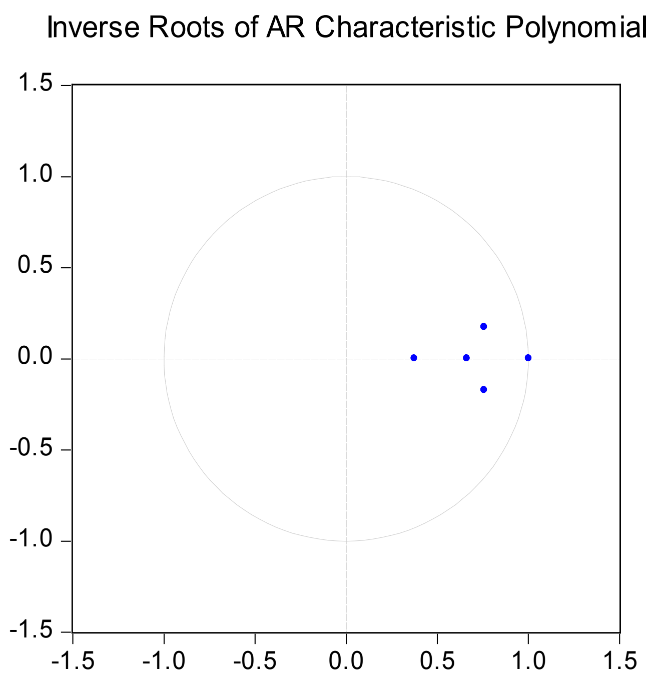
LAG LENGTH

VAR Lag Order Selection Criteria
Endogenous variables: LOGGDP LOGK LOGL LOGTERK EX
Exogenous variables: C
Date: 12/19/15 Time: 13:00
Sample: 1981 2013
Included observations: 30

Lag	LogL	LR	FPE	AIC	SC
0	-32.18945	NA	8.21e-06	2.479297	2.712830
1	120.7393	244.6860	1.67e-09	-6.049285	-4.648087*
2	157.8003	46.94392*	8.69e-10	-6.853351	-4.284489
3	193.6087	33.42125	6.53e-10*	-7.573916*	-3.837390

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR STABILITY TEST



COINTEGRATION

Date: 12/19/15 Time: 12:58
Sample (adjusted): 1985 2013
Included observations: 29 after adjustments
Trend assumption: Linear deterministic trend
Series: LOGGDP LOGK LOGL LOGTERK EX

Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.916877	184.6129	69.81889	0.0000
At most 1 *	0.857765	112.4773	47.85613	0.0000
At most 2 *	0.706015	55.91940	29.79707	0.0000
At most 3 *	0.480538	20.41683	15.49471	0.0083
At most 4	0.047883	1.422958	3.841466	0.2329

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.916877	72.13561	33.87687	0.0000
At most 1 *	0.857765	56.55792	27.58434	0.0000
At most 2 *	0.706015	35.50257	21.13162	0.0003
At most 3 *	0.480538	18.99387	14.26460	0.0083
At most 4	0.047883	1.422958	3.841466	0.2329

Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

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

LOGGDP	LOGK	LOGL	LOGTERK	EX
13.12612	43.11590	-49.52290	-36.23262	0.060866
8.242950	-3.867254	5.988719	0.581363	-0.081512
-6.815693	-4.798316	53.63683	6.446653	-0.078468
34.51367	16.20668	-301.1071	-16.71366	0.089638
18.26349	-3.278277	107.3493	-20.66843	0.071981

Unrestricted Adjustment Coefficients (alpha):

D(LOGGDP)	0.047232	-0.001577	0.029261	-0.029777	0.000267
D(LOGK)	-0.021366	0.003802	0.039020	-0.001715	-0.000414
D(LOGL)	-0.000924	-0.000242	-0.000443	-0.000839	0.000506
D(LOGTERK)	-0.006738	0.027221	0.068592	0.030666	0.004811
D(EX)	-2.694581	2.967461	0.164274	0.323058	-0.095043

1 Cointegrating Equation(s): Log likelihood 208.3497

Normalized cointegrating coefficients (standard error in parentheses)

LOGGDP	LOGK	LOGL	LOGTERK	EX
1.000000	3.284742	-3.772852	-2.760346	0.004637
	(0.26009)	(1.60566)	(0.19530)	(0.00083)

Adjustment coefficients (standard error in parentheses)

D(LOGGDP)	0.619971
	(0.21650)
D(LOGK)	-0.280449

	(0.17871)
D(LOGL)	-0.012130
	(0.01020)
D(LOGTERK)	-0.088443
	(0.37839)
D(EX)	-35.36938
	(12.7760)

2 Cointegrating Equation(s): Log likelihood 236.6287

Normalized cointegrating coefficients (standard error in parentheses)

LOGGDP	LOGK	LOGL	LOGTERK	EX
1.000000	0.000000	0.164198	-0.283272	-0.008073
		(2.95668)	(0.21828)	(0.00148)
0.000000	1.000000	-1.198587	-0.754115	0.003869
		(0.99025)	(0.07311)	(0.00050)

Adjustment coefficients (standard error in parentheses)

D(LOGGDP)	0.606976	2.042543
	(0.25555)	(0.71372)
D(LOGK)	-0.249107	-0.935908
	(0.21034)	(0.58747)
D(LOGL)	-0.014122	-0.038911
	(0.01199)	(0.03349)
D(LOGTERK)	0.135938	-0.395783
	(0.42989)	(1.20065)
D(EX)	-10.90875	-127.6552
	(7.16251)	(20.0041)

3 Cointegrating Equation(s): Log likelihood 254.3800

Normalized cointegrating coefficients (standard error in parentheses)

LOGGDP	LOGK	LOGL	LOGTERK	EX
1.000000	0.000000	0.000000	-0.286279	-0.007688
			(0.06297)	(0.00145)
0.000000	1.000000	0.000000	-0.732164	0.001059
			(0.02800)	(0.00065)
0.000000	0.000000	1.000000	0.018314	-0.002345
			(0.02073)	(0.00048)

Adjustment coefficients (standard error in parentheses)

D(LOGGDP)	0.407542	1.902140	-0.779040
	(0.23975)	(0.61669)	(1.03714)
D(LOGK)	-0.515055	-1.123138	3.173768
	(0.12816)	(0.32966)	(0.55441)
D(LOGL)	-0.011103	-0.036785	0.020559
	(0.01292)	(0.03323)	(0.05589)
D(LOGTERK)	-0.331561	-0.724908	4.175741
	(0.32885)	(0.84589)	(1.42260)
D(EX)	-12.02839	-128.4435	160.0259
	(7.78310)	(20.0204)	(33.6697)

4 Cointegrating Equation(s): Log likelihood 263.8769

Normalized cointegrating coefficients (standard error in parentheses)

LOGGDP	LOGK	LOGL	LOGTERK	EX
1.000000	0.000000	0.000000	0.000000	-0.017686
				(0.00076)
0.000000	1.000000	0.000000	0.000000	-0.024510

				(0.00193)
0.000000	0.000000	1.000000	0.000000	-0.001706
				(5.6E-05)
0.000000	0.000000	0.000000	1.000000	-0.034922
				(0.00250)

Adjustment coefficients (standard error in parentheses)

D(LOGGDP)	-0.620169	1.419555	8.187010	-1.025936
	(0.43255)	(0.52288)	(3.48671)	(0.45482)
D(LOGK)	-0.574229	-1.150924	3.690021	1.056551
	(0.29035)	(0.35099)	(2.34052)	(0.30531)
D(LOGL)	-0.040051	-0.050379	0.273108	0.044506
	(0.02782)	(0.03363)	(0.22423)	(0.02925)
D(LOGTERK)	0.726845	-0.227909	-5.058098	0.189599
	(0.66456)	(0.80334)	(5.35696)	(0.69879)
D(EX)	-0.878463	-123.2077	62.75072	95.01644
	(17.3036)	(20.9172)	(139.483)	(18.1948)

VECM RESULTS

Vector Error Correction Estimates
Date: 12/19/15 Time: 12:48
Sample (adjusted): 1983 2013
Included observations: 31 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LOGGDP(-1)	1.000000
LOGK(-1)	0.852662
	(0.16196)
	[5.26479]
LOGL(-1)	-5.414217
	(0.93211)
	[-5.80853]
LOGTERK(-1)	-1.120459
	(0.13099)
	[-8.55388]
EX(-1)	0.006238
	(0.00063)
	[9.88277]
C	46.95065

Error Correction:	D(LOGGDP)	D(LOGK)	D(LOGL)	D(LOGTERK)	D(EX)
CointEq1	-0.186753	-0.167333	-0.003300	-0.004898	-87.07379
	(0.13208)	(0.14633)	(0.00583)	(0.19564)	(11.7288)
	[-1.41390]	[-1.14352]	[-0.56628]	[-0.02504]	[-7.42395]
D(LOGGDP(-1))	0.052251	0.324137	0.014018	0.140655	29.84085
	(0.21104)	(0.23381)	(0.00931)	(0.31259)	(18.7403)
	[0.24758]	[1.38634]	[1.50567]	[0.44996]	[1.59234]

D(LOGK(-1))	0.319148	0.367471	0.002361	0.604683	30.75087
	(0.25380)	(0.28117)	(0.01120)	(0.37592)	(22.5368)
	[1.25748]	[1.30692]	[0.21083]	[1.60854]	[1.36447]
D(LOGL(-1))	4.783686	2.696987	-0.064672	2.364164	-913.0710
	(4.41895)	(4.89559)	(0.19495)	(6.54523)	(392.393)
	[1.08254]	[0.55090]	[-0.33174]	[0.36120]	[-2.32693]
D(LOGTERK(-1))	-0.305900	-0.226923	-0.004419	-0.282781	-85.44669
	(0.21716)	(0.24059)	(0.00958)	(0.32166)	(19.2836)
	[-1.40862]	[-0.94320]	[-0.46130]	[-0.87914]	[-4.43104]
D(EX(-1))	0.000846	0.001518	-7.44E-05	0.001087	0.038874
	(0.00122)	(0.00135)	(5.4E-05)	(0.00181)	(0.10834)
	[0.69379]	[1.12310]	[-1.38214]	[0.60157]	[0.35883]
C	0.043472	0.007349	0.011403	0.061644	19.99605
	(0.05926)	(0.06565)	(0.00261)	(0.08777)	(5.26205)
	[0.73360]	[0.11194]	[4.36173]	[0.70231]	[3.80005]
R-squared	0.197968	0.227656	0.158814	0.162389	0.726769
Adj. R-squared	-0.002540	0.034570	-0.051483	-0.047014	0.658462
Sum sq. resids	0.194791	0.239079	0.000379	0.427348	1535.935
S.E. equation	0.090090	0.099808	0.003974	0.133440	7.999830
F-statistic	0.987334	1.179042	0.755190	0.775484	10.63964
Log likelihood	34.59504	31.41962	131.3440	22.41714	-104.4822
Akaike AIC	-1.780325	-1.575459	-8.022191	-0.994654	7.192397
Schwarz SC	-1.456521	-1.251656	-7.698388	-0.670850	7.516201
Mean dependent	0.093546	0.075480	0.011264	0.117660	5.002252
S.D. dependent	0.089976	0.101579	0.003876	0.130409	13.68866

Determinant resid covariance (dof adj.)	4.32E-10
Determinant resid covariance	1.20E-10
Log likelihood	134.1048
Akaike information criterion	-6.071278
Schwarz criterion	-4.220972

IMPULSE RESPONSE TABLE

Response of LOGGDP: Period	LOGGDP	LOGK	LOGL	LOGTERK	EX
1	0.082604	0.000000	0.000000	0.000000	0.000000
	(0.01066)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	0.042550	0.004541	-0.001839	-0.019340	-0.009921
	(0.01973)	(0.01849)	(0.01911)	(0.01876)	(0.01513)
3	-0.002054	0.018360	-0.022569	-0.013211	-0.020792
	(0.02274)	(0.02207)	(0.02162)	(0.01840)	(0.01671)
4	-0.003462	-0.003322	0.029043	-0.002788	-0.022897
	(0.02252)	(0.02379)	(0.01868)	(0.01752)	(0.01716)
5	0.010388	-0.018048	0.037405	-0.003984	-0.022241
	(0.02337)	(0.02281)	(0.02009)	(0.01779)	(0.01882)
6	0.011809	-0.024758	0.054354	-0.006527	-0.020994
	(0.02719)	(0.02246)	(0.02244)	(0.01769)	(0.02076)
7	-0.001460	-0.017934	0.050209	0.001047	-0.018303

	(0.03033)	(0.02470)	(0.02663)	(0.01865)	(0.02334)
8	-0.012167	-0.021459	0.061597	0.001960	-0.015764
	(0.02953)	(0.02798)	(0.03094)	(0.01918)	(0.02491)
9	-0.014749	-0.020661	0.066496	0.012924	-0.012381
	(0.03083)	(0.02997)	(0.03456)	(0.02129)	(0.02983)
10	-0.013267	-0.024540	0.073660	0.015065	-0.008719
	(0.03515)	(0.03213)	(0.03853)	(0.02287)	(0.03540)

Response of LOGK: Period	LOGGDP	LOGK	LOGL	LOGTERK	EX
1	0.022106	0.069234	0.000000	0.000000	0.000000
	(0.01296)	(0.00894)	(0.00000)	(0.00000)	(0.00000)
2	0.037145	0.044056	0.015203	-6.54E-05	-0.024178
	(0.01950)	(0.01765)	(0.01714)	(0.01687)	(0.01363)
3	0.011032	-0.004685	0.017532	-0.008854	-0.051591
	(0.02419)	(0.02366)	(0.02367)	(0.02098)	(0.01891)
4	-0.003511	-0.006318	0.031879	0.013302	-0.039835
	(0.02606)	(0.02711)	(0.02292)	(0.02054)	(0.02022)
5	0.014832	-0.015037	0.038785	-0.001226	-0.019116
	(0.02689)	(0.02694)	(0.02418)	(0.01965)	(0.02312)
6	0.016907	-0.010864	0.038284	0.007391	-0.014191
	(0.02761)	(0.02557)	(0.02550)	(0.01862)	(0.02501)
7	-0.003960	-0.000672	0.033825	0.020243	-0.012924
	(0.02934)	(0.02378)	(0.02698)	(0.01885)	(0.02695)
8	-0.005033	0.002598	0.032453	0.016350	-0.009183
	(0.02855)	(0.02293)	(0.02952)	(0.01745)	(0.02761)
9	0.012319	-0.003255	0.037489	0.016664	-0.008718
	(0.02831)	(0.02361)	(0.03227)	(0.01604)	(0.02786)
10	0.015664	-0.008394	0.032785	0.014013	-0.010779
	(0.02863)	(0.02510)	(0.03506)	(0.01610)	(0.02896)

Response of LOGL: Period	LOGGDP	LOGK	LOGL	LOGTERK	EX
1	-0.000139	-0.001175	0.003807	0.000000	0.000000
	(0.00073)	(0.00071)	(0.00049)	(0.00000)	(0.00000)
2	0.000362	-0.001472	0.003470	0.000403	-0.000623
	(0.00114)	(0.00110)	(0.00102)	(0.00090)	(0.00073)
3	8.81E-05	-0.002061	0.005574	0.000232	-0.000978
	(0.00167)	(0.00162)	(0.00144)	(0.00108)	(0.00105)
4	-0.000140	-0.001842	0.005111	0.000307	-0.001057
	(0.00196)	(0.00204)	(0.00198)	(0.00148)	(0.00171)
5	-0.000418	-0.002683	0.006589	0.000123	-0.001189
	(0.00236)	(0.00246)	(0.00237)	(0.00169)	(0.00221)
6	-0.001142	-0.002508	0.006604	0.000995	-0.001092
	(0.00280)	(0.00276)	(0.00284)	(0.00199)	(0.00296)
7	-0.001506	-0.002757	0.007478	0.001047	-0.000782
	(0.00335)	(0.00317)	(0.00339)	(0.00215)	(0.00356)
8	-0.001434	-0.002478	0.007483	0.001675	-0.000475
	(0.00383)	(0.00360)	(0.00397)	(0.00233)	(0.00418)
9	-0.001399	-0.002573	0.007768	0.001904	-0.000291
	(0.00429)	(0.00411)	(0.00466)	(0.00247)	(0.00466)
10	-0.001413	-0.002213	0.007286	0.002264	-9.46E-05
	(0.00472)	(0.00452)	(0.00532)	(0.00259)	(0.00513)

Response of

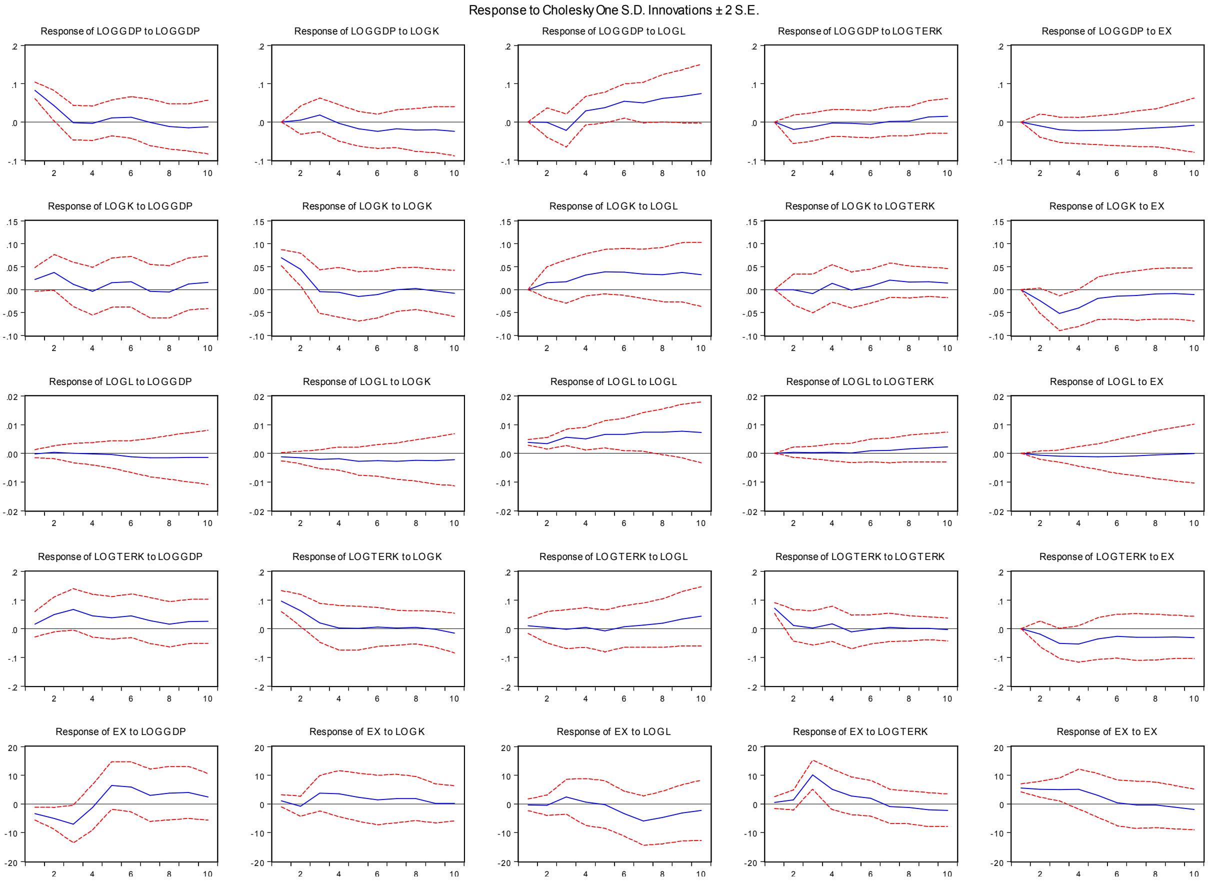
LOGTERK: Period	LOGGDP	LOGK	LOGL	LOGTERK	EX
1	0.015238	0.095787	0.010411	0.072209	0.000000
	(0.02207)	(0.01818)	(0.01325)	(0.00932)	(0.00000)
2	0.049187	0.063309	0.004463	0.011567	-0.018685
	(0.03050)	(0.02804)	(0.02776)	(0.02745)	(0.02229)
3	0.067302	0.020740	-0.002236	0.002354	-0.051911
	(0.03592)	(0.03391)	(0.03372)	(0.02966)	(0.02645)
4	0.045002	0.002625	0.004026	0.016742	-0.053256
	(0.03741)	(0.03887)	(0.03475)	(0.03078)	(0.03167)
5	0.037270	0.001616	-0.008337	-0.011731	-0.034801
	(0.03717)	(0.03804)	(0.03637)	(0.02949)	(0.03644)
6	0.044937	0.005473	0.007554	-0.002393	-0.026359
	(0.03818)	(0.03396)	(0.03614)	(0.02528)	(0.03823)
7	0.027836	0.002856	0.012197	0.004031	-0.029307
	(0.04023)	(0.03066)	(0.03831)	(0.02451)	(0.04078)
8	0.015201	0.004527	0.019014	0.000708	-0.029727
	(0.03943)	(0.02901)	(0.04241)	(0.02205)	(0.03987)
9	0.024415	-0.002270	0.033923	0.001208	-0.028801
	(0.03840)	(0.03133)	(0.04709)	(0.01987)	(0.03757)
10	0.025286	-0.015539	0.043151	-0.003171	-0.031112
	(0.03842)	(0.03475)	(0.05166)	(0.02015)	(0.03670)

Response of EX: Period	LOGGDP	LOGK	LOGL	LOGTERK	EX
1	-3.370584	1.099995	-0.337701	0.512200	5.585366
	(1.13230)	(1.03566)	(1.02495)	(1.02189)	(0.72107)
2	-5.019253	-0.819350	-0.448942	1.366571	5.086992
	(1.89492)	(1.74602)	(1.78549)	(1.76351)	(1.37919)
3	-7.029171	3.723373	2.463962	10.18044	4.999441
	(3.28050)	(3.08009)	(3.04866)	(2.50257)	(1.98741)
4	-1.194941	3.581868	0.648844	5.107104	5.159570
	(3.96092)	(4.02905)	(4.08133)	(3.52414)	(3.47710)
5	6.432663	2.332801	-0.238370	2.804381	2.942785
	(4.15432)	(4.20731)	(4.15138)	(3.28562)	(3.81270)
6	5.905411	1.352087	-3.365912	1.975390	0.369936
	(4.34841)	(4.31703)	(3.90439)	(3.11706)	(3.99075)
7	2.984254	1.857225	-5.879183	-0.908773	-0.322924
	(4.55434)	(4.21031)	(4.30976)	(2.97774)	(4.14827)
8	3.752151	1.885075	-4.749064	-1.237902	-0.320502
	(4.66746)	(3.83725)	(4.56807)	(2.87331)	(3.95119)
9	4.023587	0.207427	-3.111283	-2.012583	-1.182350
	(4.53525)	(3.43032)	(4.90668)	(2.96051)	(3.77392)
10	2.483733	0.163500	-2.255355	-2.191764	-1.920699
	(4.04839)	(3.07986)	(5.24248)	(2.80605)	(3.54917)

Cholesky Ordering: LOGGDP LOGK LOGL LOGTERK EX Standard

Errors: Analytic

IMPULSE RESPONSE GRAPH



VARIANCE DECOMPOSITION TABLE

Variance Decomposition of LOGGDP: Period	S.E.	LOGGDP	LOGK	LOGL	LOGTERK	EX
1	0.082604	100.0000	0.000000	0.000000	0.000000	0.000000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	0.095553	94.56243	0.225869	0.037054	4.096618	1.078033
		(9.32634)	(4.04128)	(4.52282)	(7.14338)	(5.48807)
3	0.102897	81.58531	3.378403	4.842549	5.181057	5.012676
		(13.1080)	(6.63612)	(6.35760)	(9.15759)	(9.10644)
4	0.109483	72.16615	3.076308	11.31445	4.641394	8.801694
		(13.6497)	(8.42660)	(9.18095)	(8.67011)	(9.12153)
5	0.119707	61.11792	4.846349	19.22818	3.993131	10.81442
		(13.6094)	(7.77619)	(11.0761)	(8.70825)	(9.86578)
6	0.136088	48.04281	7.059626	30.83027	3.319734	10.74756
		(12.2830)	(7.60851)	(14.7353)	(8.74563)	(10.3197)
7	0.147312	41.01074	7.507012	37.92811	2.838190	10.71595

		(13.1241)	(8.40288)	(16.0562)	(8.10718)	(10.7361)
8	0.162345	34.32894	7.928324	45.62510	2.351472	9.766162
		(14.0191)	(8.62997)	(17.6951)	(7.76829)	(10.9159)
9	0.178164	29.18893	7.927767	51.81285	2.478626	8.591835
		(13.6254)	(9.36020)	(17.5200)	(8.22370)	(11.8456)
10	0.195574	24.68341	8.153519	57.18379	2.650347	7.328929
		(13.4272)	(9.68684)	(18.2727)	(8.86424)	(12.1494)

Variance Decomposition of LOGK: Period	S.E.	LOGGDP	LOGK	LOGL	LOGTERK	EX
1	0.072678	9.251606	90.74839	0.000000	0.000000	0.000000
		(10.8238)	(10.8238)	(0.00000)	(0.00000)	(0.00000)
2	0.097048	19.83790	71.50138	2.454017	4.54E-05	6.206652
		(14.0099)	(16.0072)	(5.33885)	(3.37626)	(7.38133)
3	0.112292	15.78271	53.58056	4.270562	0.621793	25.74437
		(12.0825)	(15.4051)	(7.89595)	(5.14847)	(13.3563)
4	0.124265	12.96774	44.01153	10.06862	1.653595	31.29851
		(12.0782)	(13.3527)	(10.7158)	(5.54183)	(14.1415)
5	0.133263	12.51440	39.54195	17.22528	1.446290	29.27207
		(12.3209)	(12.2541)	(12.8930)	(5.44725)	(14.0154)
6	0.141013	12.61414	35.90869	22.75497	1.566405	27.15580
		(12.1477)	(12.1089)	(14.3678)	(6.00867)	(14.3116)
7	0.147043	11.67326	33.02595	26.21842	3.335752	25.74662
		(12.5441)	(12.0491)	(15.0090)	(7.10736)	(14.4558)
8	0.151850	11.05568	30.99721	29.15202	4.287201	24.50789
		(12.7221)	(11.7470)	(15.4682)	(8.64462)	(14.5834)
9	0.158050	10.81281	28.65531	32.53578	5.069110	22.92699
		(13.4825)	(11.3176)	(15.7605)	(9.57472)	(15.0286)
10	0.163350	11.04219	27.09027	34.48717	5.481463	21.89891
		(14.5060)	(11.1101)	(16.1485)	(10.7580)	(14.8382)

Variance Decomposition of LOGL: Period	S.E.	LOGGDP	LOGK	LOGL	LOGTERK	EX
1	0.003987	0.121061	8.693256	91.18568	0.000000	0.000000
		(3.74407)	(9.54426)	(11.0635)	(0.00000)	(0.00000)
2	0.005548	0.487303	11.52791	86.19454	0.528759	1.261489
		(5.83506)	(9.98491)	(12.6934)	(3.63352)	(3.99073)
3	0.008192	0.235051	11.61349	85.82449	0.322545	2.004418
		(6.72488)	(10.5362)	(13.2677)	(2.86047)	(4.83924)
4	0.009892	0.181184	11.43161	85.55323	0.317215	2.516763
		(7.69241)	(11.2407)	(14.8837)	(5.50045)	(7.57152)
5	0.012251	0.234436	12.25009	84.71594	0.216957	2.582574
		(8.51695)	(11.9772)	(15.4245)	(5.16309)	(8.53772)
6	0.014264	0.814254	12.12621	83.92239	0.646380	2.490769
		(9.52652)	(12.1025)	(16.6606)	(7.13269)	(9.99573)
7	0.016461	1.448029	11.91166	83.65435	0.890092	2.095873
		(10.6866)	(12.2114)	(17.5473)	(7.64313)	(10.9375)
8	0.018390	1.768581	11.35899	83.58389	1.542515	1.746023
		(12.2203)	(11.9395)	(18.5256)	(9.19718)	(12.1236)
9	0.020268	1.932496	10.96195	83.49537	2.152187	1.457992

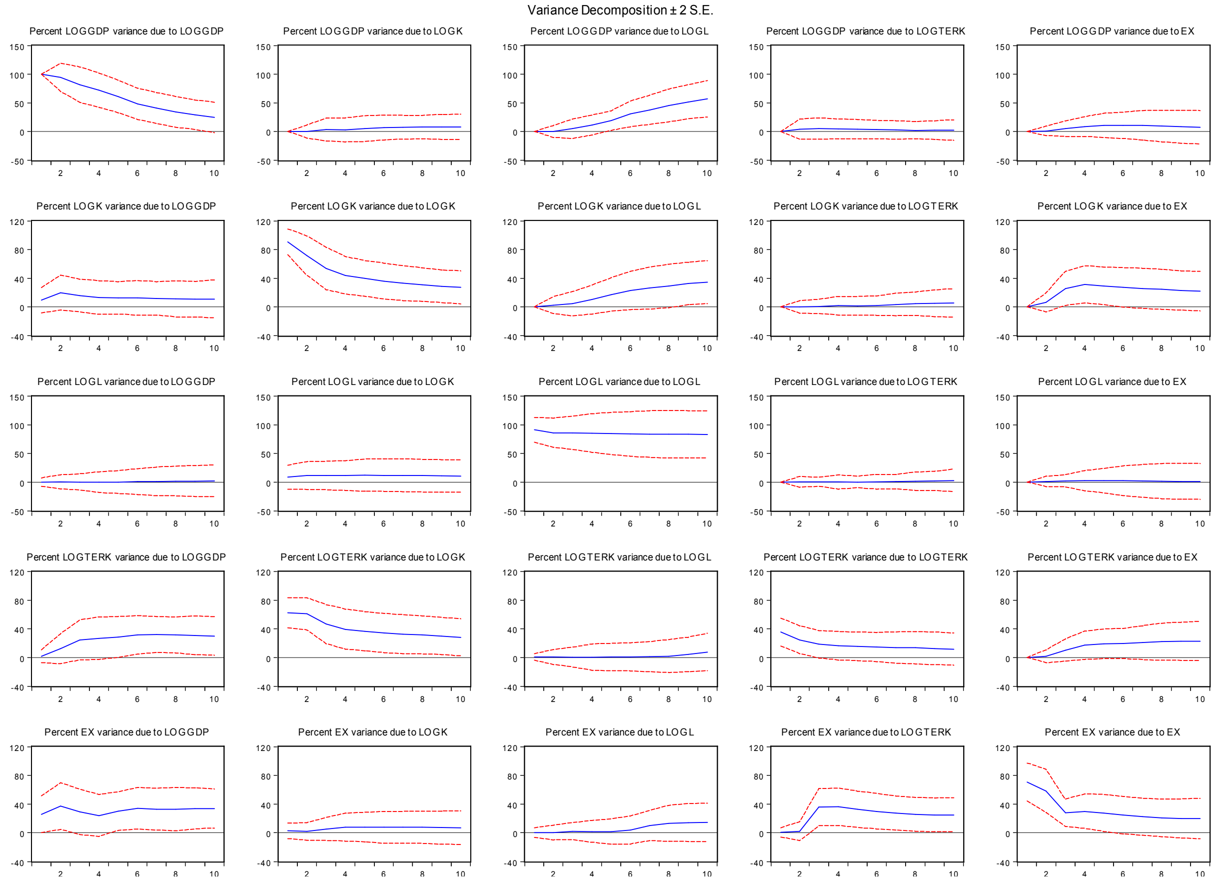
		(13.3284)	(11.4976)	(19.1008)	(9.51620)	(13.0274)
10	0.021816	2.087369	10.49141	83.22593	2.934891	1.260400
		(13.9041)	(11.1592)	(19.6997)	(10.6356)	(13.8065)

Variance Decomposition of LOGTERK: Period	S.E.	LOGGDP	LOGK	LOGL	LOGTERK	EX
1	0.121367	1.576435	62.28930	0.735835	35.39843	0.000000
		(7.35574)	(12.2010)	(2.67578)	(10.0347)	(0.00000)
2	0.147174	12.24150	60.86389	0.592364	24.69035	1.611898
		(11.7492)	(12.9398)	(3.72158)	(9.19106)	(4.96075)
3	0.171246	24.48788	46.42221	0.454586	18.25570	10.37962
		(14.1999)	(14.4362)	(4.83338)	(8.85237)	(9.88155)
4	0.185715	26.69279	39.49062	0.433507	16.33463	17.04846
		(14.8876)	(14.6894)	(6.16205)	(9.24213)	(12.3037)
5	0.193132	28.40591	36.52272	0.587188	15.47307	19.01111
		(15.0219)	(14.3880)	(7.69674)	(9.55111)	(12.3776)
6	0.200267	31.45283	34.04136	0.688376	14.40447	19.41297
		(14.6554)	(14.0012)	(8.46044)	(9.65991)	(12.6515)
7	0.204728	31.94560	32.59328	1.013641	13.82224	20.62523
		(15.0093)	(13.7534)	(9.86543)	(10.6254)	(13.1053)
8	0.208353	31.37604	31.51630	1.811495	13.34665	21.94951
		(15.5317)	(13.1382)	(11.4536)	(10.5206)	(13.6500)
9	0.214462	30.91002	29.75757	4.211834	12.60029	22.52029
		(15.3690)	(12.7124)	(13.0248)	(11.2656)	(14.1941)
10	0.222968	29.88270	28.01609	7.641934	11.67747	22.78180
		(15.2289)	(12.4548)	(14.9018)	(11.1140)	(14.3943)

Variance Decomposition of EX: Period	S.E.	LOGGDP	LOGK	LOGL	LOGTERK	EX
1	6.644060	25.73613	2.741036	0.258343	0.594310	70.67018
		(14.2012)	(5.03442)	(3.33067)	(4.04800)	(12.9954)
2	9.897188	37.31713	1.920614	0.322182	2.174346	58.26573
		(17.3203)	(5.09152)	(4.45622)	(6.05053)	(15.1638)
3	17.20273	29.04803	5.320386	2.158151	35.74150	27.73194
		(15.8645)	(7.71502)	(4.70439)	(13.2955)	(11.7058)
4	19.06086	24.05366	7.864939	1.873767	36.29172	29.91591
		(14.4172)	(9.66690)	(5.91448)	(13.2837)	(12.7801)
5	20.65717	30.17679	7.971659	1.608676	32.74248	27.50040
		(13.9540)	(9.68695)	(6.84392)	(12.6333)	(12.9646)
6	21.88125	34.17870	7.486532	3.799979	29.99660	24.53819
		(14.4800)	(9.62113)	(8.69410)	(12.0257)	(12.1685)
7	22.94862	32.76431	7.461273	10.01799	27.42795	22.32847
		(13.9942)	(9.93396)	(9.79738)	(11.8433)	(11.5713)
8	23.84240	32.83051	7.537468	13.24848	25.67968	20.70387
		(13.9698)	(10.6431)	(11.7362)	(11.9501)	(11.6727)
9	24.49124	33.81302	7.150555	14.16963	25.01234	19.85446
		(14.1493)	(10.5257)	(11.7747)	(11.8824)	(11.8596)
10	24.89169	33.72947	6.926650	14.53834	24.98935	19.81618
		(13.6640)	(10.2738)	(11.9468)	(11.5331)	(11.6954)

Cholesky Ordering: LOGGDP LOGK LOGL LOGTERK EX Standard Errors: Monte Carlo (100 repetitions)

VARIANCE DECOMPOSITION GRAPH



MODEL 2 EDUCATION EXP

LA

COINTEGRATION

Date: 12/19/15 Time: 11:57
Sample (adjusted): 1983 2013
Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend
Series: LOGEDUXPL LOGGDP LOGK LOGM2GDP LOGL
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.646643	75.05360	69.81889	0.0180
At most 1	0.549215	42.80499	47.85613	0.1374
At most 2	0.344246	18.10528	29.79707	0.5583
At most 3	0.148694	5.024203	15.49471	0.8062
At most 4	0.001087	0.033715	3.841466	0.8543

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.646643	32.24861	33.87687	0.0772
At most 1	0.549215	24.69972	27.58434	0.1121
At most 2	0.344246	13.08107	21.13162	0.4448
At most 3	0.148694	4.990488	14.26460	0.7430
At most 4	0.001087	0.033715	3.841466	0.8543

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

4.5 ANALYSIS OF IMPACT HUMAN CAPITAL ON ECONOMIC GROWTH

LOGGDP = C0 + K + EDUXPL +HEXPL + L + EX + M2GDP + CPI

- Lag length selection criteria
- Cointegration analysis
- Vector error correction mechanism

MODEL 2 : EDUCATION
logk logeduxpl loggdp logm2gdp logl
Lag length selection criteria

VAR Lag Order Selection Criteria
Endogenous variables: LOGK LOGEDUXPL LOGGDP LOGM2GDP LOGL
Exogenous variables: C

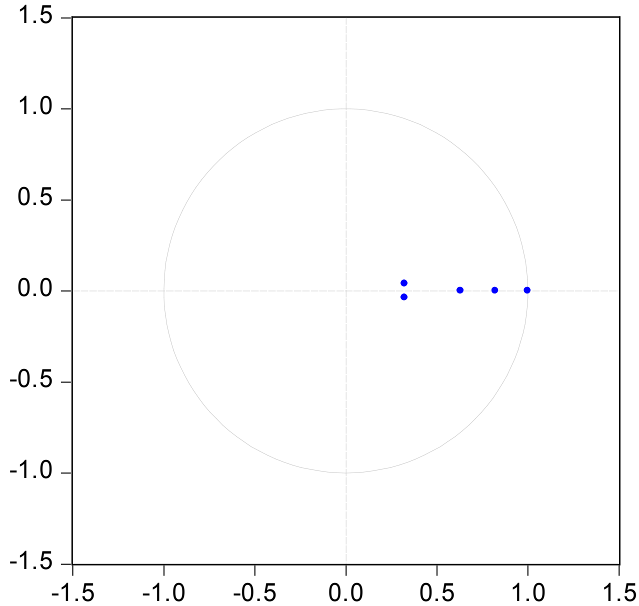
Date: 12/19/15 Time: 12:30
Sample: 1981 2013
Included observations: 30

Lag	LogL	LR	FPE	AIC	SC
0	116.5233	NA	4.06e-10	-7.434885	-7.201352
1	256.5900	224.1068*	1.95e-13*	-15.10600	-13.70480*
2	280.6144	30.43084	2.42e-13	-15.04096	-12.47209
3	307.8426	25.41307	3.22e-13	-15.18951*	-11.45298

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

- **VAR STABILITY TEST**

Inverse Roots of AR Characteristic Polynomial



COINTEGRATION ANALYSIS

Date: 12/19/15 Time: 12:33
Sample (adjusted): 1984 2013
Included observations: 30 after adjustments
Trend assumption: Linear deterministic trend
Series: LOGK LOGEDUXPL LOGGDP LOGM2GDP LOGL
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**

None *	0.612382	79.55837	69.81889	0.0068
At most 1 *	0.554550	51.12630	47.85613	0.0239
At most 2	0.413093	26.86619	29.79707	0.1050
At most 3	0.303443	10.87950	15.49471	0.2190
At most 4	0.001044	0.031327	3.841466	0.8595

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.612382	28.43207	33.87687	0.1943
At most 1	0.554550	24.26011	27.58434	0.1259
At most 2	0.413093	15.98669	21.13162	0.2256
At most 3	0.303443	10.84818	14.26460	0.1620
At most 4	0.001044	0.031327	3.841466	0.8595

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

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

LOGK	LOGEDUXPL	LOGGDP	LOGM2GDP	LOGL
-12.60574	-6.017777	4.357885	6.812652	3.904919
-14.69275	4.187649	0.223251	7.064999	-52.13900
-6.169427	-2.317983	-14.58076	15.56066	-81.47321
-0.182675	3.894130	-19.66338	-0.286403	146.7482
2.254697	-0.267053	3.287803	-5.395931	67.24447

Unrestricted Adjustment Coefficients (alpha):

D(LOGK)	0.028362	0.038726	-0.006534	0.021940
D(LOGEDUXPL)	0.151773	-0.063362	0.021051	-0.040366
D(LOGGDP)	0.011723	-0.029493	-0.010935	0.028556
D(LOGM2GDP)	0.013052	-0.030398	-0.027982	0.029995
D(LOGL)	0.000521	3.60E-05	0.000978	0.000419

1 Cointegrating Equation(s): Log likelihood 282.2795

Normalized cointegrating coefficients (standard error in parentheses)

LOGK	LOGEDUXPL	LOGGDP	LOGM2GDP	LOGL
1.000000	0.477384	-0.345706	-0.540440	-0.309773
	(0.12673)	(0.37182)	(0.18549)	(2.62361)

Adjustment coefficients (standard error in parentheses)

D(LOGK)	-0.357523
	(0.21040)
D(LOGEDUXPL)	-1.913211
	(0.55591)
D(LOGGDP)	-0.147777
	(0.20224)
D(LOGM2GDP)	-0.164528
	(0.25623)
D(LOGL)	-0.006572
	(0.00842)

2 Cointegrating Equation(s):		Log likelihood	294.4095	

Normalized cointegrating coefficients (standard error in parentheses)

LOGK	LOGEDUXPL	LOGGDP	LOGM2GDP	LOGL
1.000000	0.000000	-0.138753	-0.503127	2.106201
		(0.24903)	(0.12738)	(1.79451)
0.000000	1.000000	-0.433516	-0.078163	-5.060863
		(0.63860)	(0.32666)	(4.60182)

Adjustment coefficients (standard error in parentheses)

D(LOGK)	-0.926520	-0.008503
	(0.27053)	(0.10245)
D(LOGEDUXPL)	-0.982250	-1.178674
	(0.80330)	(0.30421)
D(LOGGDP)	0.285559	-0.194053
	(0.27992)	(0.10601)
D(LOGM2GDP)	0.282100	-0.205839
	(0.36824)	(0.13946)
D(LOGL)	-0.007101	-0.002987
	(0.01293)	(0.00490)

3 Cointegrating Equation(s):		Log likelihood	302.4029	

Normalized cointegrating coefficients (standard error in parentheses)

LOGK	LOGEDUXPL	LOGGDP	LOGM2GDP	LOGL
1.000000	0.000000	0.000000	-0.606721	2.783103
			(0.08683)	(1.68688)
0.000000	1.000000	0.000000	-0.401829	-2.945969
			(0.22424)	(4.35656)
0.000000	0.000000	1.000000	-0.746608	4.878469
			(0.14795)	(2.87445)

Adjustment coefficients (standard error in parentheses)

D(LOGK)	-0.886210	0.006642	0.227512
	(0.28220)	(0.10679)	(0.21139)
D(LOGEDUXPL)	-1.112122	-1.227469	0.340326
	(0.83705)	(0.31677)	(0.62700)
D(LOGGDP)	0.353024	-0.168705	0.203949
	(0.28909)	(0.10940)	(0.21654)
D(LOGM2GDP)	0.454732	-0.140977	0.458090
	(0.36251)	(0.13719)	(0.27154)
D(LOGL)	-0.013136	-0.005254	-0.011982
	(0.01274)	(0.00482)	(0.00954)

4 Cointegrating Equation(s):		Log likelihood	307.8270	

Normalized cointegrating coefficients (standard error in parentheses)

LOGK	LOGEDUXPL	LOGGDP	LOGM2GDP	LOGL
1.000000	0.000000	0.000000	0.000000	-8.650442
				(0.27463)
0.000000	1.000000	0.000000	0.000000	-10.51836
				(0.37199)
0.000000	0.000000	1.000000	0.000000	-9.191225
				(0.23603)
0.000000	0.000000	0.000000	1.000000	-18.84482
				(0.42630)

Adjustment coefficients (standard error in parentheses)

D(LOGK)	-0.890217	0.092078	-0.203894	0.358867
	(0.26192)	(0.11110)	(0.32052)	(0.23718)
D(LOGEDUXPL)	-1.104748	-1.384661	1.134065	0.925452
	(0.81446)	(0.34547)	(0.99668)	(0.73751)
D(LOGGDP)	0.347807	-0.057505	-0.357558	-0.306845
	(0.25471)	(0.10804)	(0.31169)	(0.23064)
D(LOGM2GDP)	0.449253	-0.024171	-0.131719	-0.569852
	(0.33285)	(0.14119)	(0.40732)	(0.30140)
D(LOGL)	-0.013213	-0.003623	-0.020220	0.018907
	(0.01258)	(0.00534)	(0.01539)	(0.01139)

Vector Error Correction Mechanism

-

Vector Error Correction Estimates
Date: 12/19/15 Time: 12:28
Sample (adjusted): 1984 2013
Included observations: 30 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LOGK(-1)	1.000000
LOGEDUXPL(-1)	0.477384
	(0.12673)
	[3.76698]
LOGGDP(-1)	-0.345706
	(0.37182)
	[-0.92977]
LOGM2GDP(-1)	-0.540440
	(0.18549)
	[-2.91358]
LOGL(-1)	-0.309773
	(2.62361)
	[-0.11807]
C	-0.435804

Error Correction:	D(LOGK)	D(LOGEDUXPL)	D(LOGGDP)	D(LOGM2GDP)	D(LOGL)
CointEq1	-0.357523	-1.913211	-0.147777	-0.164528	-0.006572
	(0.21040)	(0.55591)	(0.20224)	(0.25623)	(0.00842)
	[-1.69922]	[-3.44156]	[-0.73069]	[-0.64212]	[-0.78059]
D(LOGK(-1))	0.309319	0.898943	0.089252	0.183663	0.004488
	(0.22075)	(0.58326)	(0.21219)	(0.26883)	(0.00883)
	[1.40120]	[1.54124]	[0.42062]	[0.68319]	[0.50806]
D(LOGK(-2))	-0.094301	0.502559	0.218647	0.345078	0.009391
	(0.21102)	(0.55755)	(0.20284)	(0.25698)	(0.00844)
	[-0.44687]	[0.90136]	[1.07793]	[1.34281]	[1.11213]
D(LOGEDUXPL(-1))	0.069447	0.027733	-0.021027	-0.031058	0.002652
	(0.07666)	(0.20254)	(0.07369)	(0.09335)	(0.00307)
	[0.90591]	[0.13692]	[-0.28536]	[-0.33269]	[0.86453]

D(LOGEDUXPL(-2))	0.075788	-0.042082	0.051417	0.023059	-0.001424
	(0.06592)	(0.17417)	(0.06337)	(0.08028)	(0.00264)
	[1.14965]	[-0.24161]	[0.81143]	[0.28724]	[-0.53997]
D(LOGGDP(-1))	-0.402506	-0.814848	0.405795	-0.094794	0.021623
	(0.53667)	(1.41795)	(0.51585)	(0.65355)	(0.02148)
	[-0.75001]	[-0.57467]	[0.78665]	[-0.14505]	[1.00686]
D(LOGGDP(-2))	-1.138963	-1.320535	-1.495202	-1.565844	0.007352
	(0.59964)	(1.58432)	(0.57638)	(0.73023)	(0.02400)
	[-1.89942]	[-0.83350]	[-2.59413]	[-2.14432]	[0.30637]
D(LOGM2GDP(-1))	0.357213	0.202105	-0.467626	-0.054192	-0.019240
	(0.45063)	(1.19062)	(0.43315)	(0.54877)	(0.01803)
	[0.79270]	[0.16975]	[-1.07960]	[-0.09875]	[-1.06696]
D(LOGM2GDP(-2))	0.655385	1.192315	0.955164	0.922805	-0.009883
	(0.47913)	(1.26593)	(0.46055)	(0.58348)	(0.01917)
	[1.36786]	[0.94185]	[2.07397]	[1.58155]	[-0.51545]
D(LOGL(-1))	7.556291	2.599908	11.79393	12.74305	0.009604
	(5.01988)	(13.2632)	(4.82518)	(6.11314)	(0.20088)
	[1.50527]	[0.19602]	[2.44425]	[2.08454]	[0.04781]
D(LOGL(-2))	-3.175857	-9.755110	-4.749548	-4.686781	0.606154
	(4.74013)	(12.5241)	(4.55629)	(5.77247)	(0.18969)
	[-0.66999]	[-0.77891]	[-1.04242]	[-0.81192]	[3.19556]
C	-0.047391	0.011651	-0.000672	0.053133	0.006066
	(0.08364)	(0.22099)	(0.08040)	(0.10186)	(0.00335)
	[-0.56659]	[0.05272]	[-0.00835]	[0.52164]	[1.81218]
R-squared	0.451598	0.564622	0.419882	0.400051	0.465283
Adj. R-squared	0.116463	0.298558	0.065365	0.033416	0.138512
Sum sq. resids	0.150440	1.050201	0.138996	0.223102	0.000241
S.E. equation	0.091421	0.241546	0.087875	0.111331	0.003658
F-statistic	1.347511	2.122128	1.184379	1.091141	1.423880
Log likelihood	36.86270	7.715076	38.04942	30.95168	133.4162
Akaike AIC	-1.657514	0.285662	-1.736628	-1.263445	-8.094414
Schwarz SC	-1.097035	0.846141	-1.176149	-0.702966	-7.533935
Mean dependent	0.081634	0.104465	0.095422	0.193188	0.011251
S.D. dependent	0.097260	0.288406	0.090896	0.113239	0.003942
Determinant resid covariance (dof adj.)		5.94E-14			
Determinant resid covariance		4.62E-15			
Log likelihood		282.2795			
Akaike information criterion		-14.48530			
Schwarz criterion		-11.44937			

IMPULSE RESPONSE FUNCTION TABLE

Response of LOGGDP: Period	LOGGDP	LOGK	LOGEDUXPL	LOGM2GDP	LOGL
1	0.075597	0.023023	0.006386	0.000000	0.000000
	(0.00945)	(0.01372)	(0.01339)	(0.00000)	(0.00000)

2	0.032664	0.021433	0.002831	-0.002386	0.017464
	(0.01422)	(0.01259)	(0.01499)	(0.00812)	(0.00597)
3	0.009620	0.017440	0.000418	-0.002429	0.027231
	(0.01415)	(0.01191)	(0.01152)	(0.01023)	(0.00754)
4	-0.003118	0.013761	-0.001282	-0.001795	0.032786
	(0.01320)	(0.01074)	(0.00988)	(0.01068)	(0.00799)
5	-0.010394	0.011032	-0.002424	-0.001083	0.035990
	(0.01286)	(0.01072)	(0.01044)	(0.01098)	(0.00833)
6	-0.014662	0.009190	-0.003151	-0.000470	0.037849
	(0.01345)	(0.01149)	(0.01138)	(0.01157)	(0.00885)
7	-0.017211	0.008011	-0.003588	1.65E-05	0.038924
	(0.01446)	(0.01238)	(0.01212)	(0.01243)	(0.00954)
8	-0.018749	0.007282	-0.003837	0.000392	0.039538
	(0.01543)	(0.01311)	(0.01265)	(0.01343)	(0.01033)
9	-0.019681	0.006846	-0.003967	0.000682	0.039880
	(0.01619)	(0.01364)	(0.01302)	(0.01446)	(0.01116)
10	-0.020244	0.006595	-0.004026	0.000906	0.040063
	(0.01672)	(0.01400)	(0.01329)	(0.01543)	(0.01196)

Response of LOGK: Period	LOGGDP	LOGK	LOGEDUXPL	LOGM2GDP	LOGL
1	0.000000	0.090323	0.000000	0.000000	0.000000
	(0.00000)	(0.01129)	(0.00000)	(0.00000)	(0.00000)
2	-0.005944	0.054469	0.013019	0.006987	0.009016
	(0.01526)	(0.01403)	(0.01561)	(0.00874)	(0.00643)
3	-0.004916	0.033777	0.011326	0.010198	0.014468
	(0.01693)	(0.01447)	(0.01383)	(0.01161)	(0.00856)
4	-0.005859	0.022821	0.007828	0.010728	0.019046
	(0.01588)	(0.01277)	(0.01096)	(0.01236)	(0.00929)
5	-0.008130	0.016963	0.004982	0.010044	0.022930
	(0.01421)	(0.01121)	(0.00969)	(0.01246)	(0.00957)
6	-0.010593	0.013642	0.002932	0.008967	0.026099
	(0.01305)	(0.01050)	(0.00957)	(0.01248)	(0.00978)
7	-0.012731	0.011611	0.001460	0.007857	0.028619
	(0.01267)	(0.01047)	(0.00992)	(0.01263)	(0.01003)
8	-0.014426	0.010275	0.000377	0.006850	0.030603
	(0.01286)	(0.01080)	(0.01040)	(0.01294)	(0.01035)
9	-0.015724	0.009345	-0.000443	0.005980	0.032167
	(0.01331)	(0.01125)	(0.01086)	(0.01339)	(0.01073)
10	-0.016709	0.008670	-0.001078	0.005245	0.033408
	(0.01384)	(0.01171)	(0.01129)	(0.01393)	(0.01116)

Response of LOGEDUXPL: Period	LOGGDP	LOGK	LOGEDUXPL	LOGM2GDP	LOGL
1	0.000000	0.033014	0.225320	0.000000	0.000000
	(0.00000)	(0.04004)	(0.02817)	(0.00000)	(0.00000)
2	0.084370	0.003408	0.059254	0.013132	-0.005841
	(0.03961)	(0.03506)	(0.04222)	(0.02165)	(0.01599)
3	0.056362	0.009038	0.015553	0.008135	0.010749
	(0.03367)	(0.02770)	(0.02664)	(0.02236)	(0.01676)
4	0.024504	0.013240	0.003713	0.003938	0.024584
	(0.02690)	(0.02021)	(0.01740)	(0.02088)	(0.01612)
5	0.003858	0.013737	-5.77E-05	0.002036	0.033336
	(0.02028)	(0.01485)	(0.01280)	(0.01871)	(0.01496)
6	-0.008012	0.012593	-0.001710	0.001437	0.038515

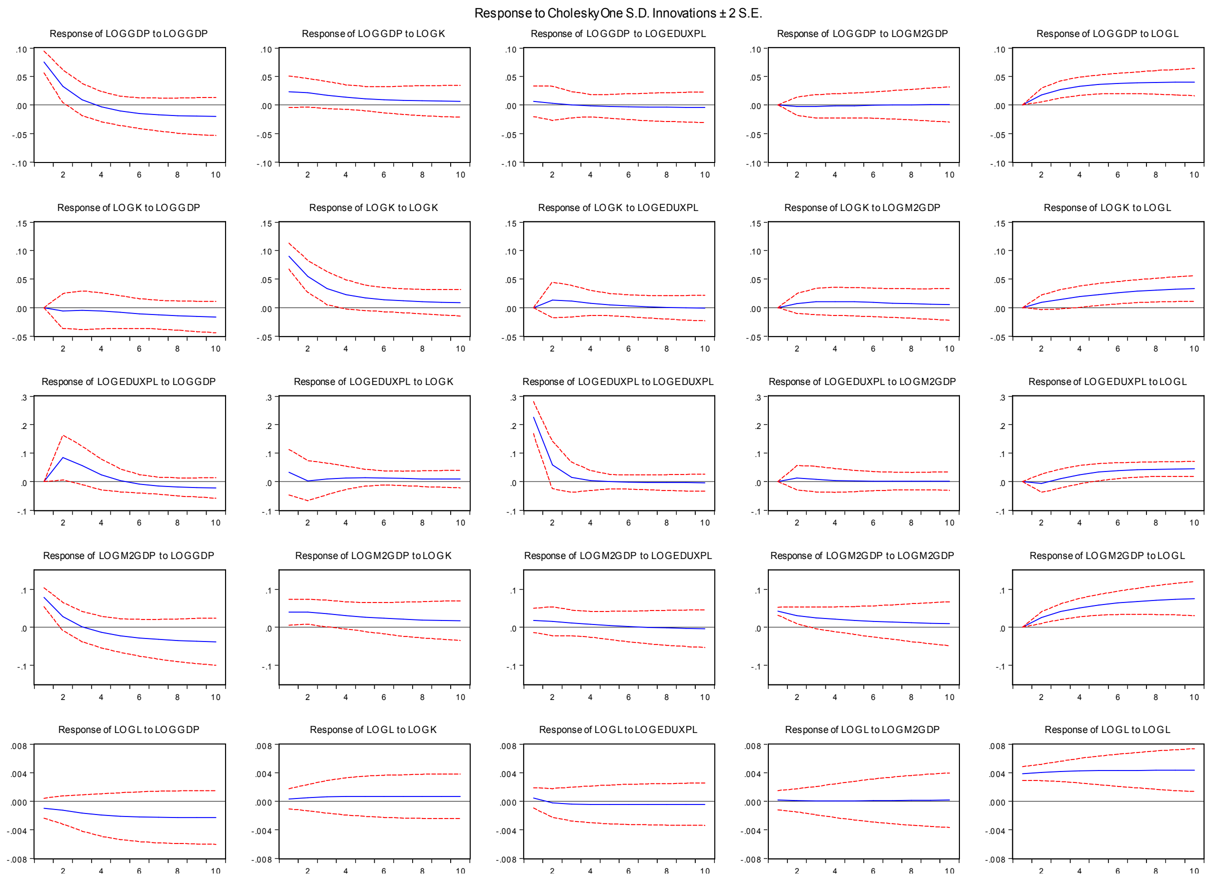
	(0.01616)	(0.01254)	(0.01223)	(0.01672)	(0.01384)
7	-0.014695	0.011163	-0.002671	0.001375	0.041560
	(0.01507)	(0.01268)	(0.01308)	(0.01547)	(0.01306)
8	-0.018512	0.009962	-0.003300	0.001482	0.043378
	(0.01581)	(0.01366)	(0.01391)	(0.01507)	(0.01270)
9	-0.020751	0.009091	-0.003718	0.001615	0.044486
	(0.01702)	(0.01463)	(0.01448)	(0.01537)	(0.01273)
10	-0.022098	0.008503	-0.003992	0.001730	0.045178
	(0.01809)	(0.01536)	(0.01487)	(0.01609)	(0.01308)

Response of LOGM2GDP: Period	LOGGDP	LOGK	LOGEDUXPL	LOGM2GDP	LOGL
1	0.078756	0.039378	0.017928	0.041870	0.000000
	(0.01232)	(0.01682)	(0.01593)	(0.00523)	(0.00000)
2	0.027705	0.040280	0.015261	0.030838	0.025378
	(0.01835)	(0.01659)	(0.01901)	(0.01109)	(0.00764)
3	0.001466	0.035718	0.011185	0.024762	0.041002
	(0.01996)	(0.01741)	(0.01697)	(0.01448)	(0.01039)
4	-0.013272	0.030715	0.007336	0.020746	0.051371
	(0.02091)	(0.01782)	(0.01689)	(0.01648)	(0.01208)
5	-0.022243	0.026574	0.004151	0.017727	0.058650
	(0.02228)	(0.01906)	(0.01845)	(0.01837)	(0.01366)
6	-0.028062	0.023425	0.001636	0.015306	0.063969
	(0.02419)	(0.02077)	(0.02020)	(0.02044)	(0.01535)
7	-0.032020	0.021091	-0.000324	0.013311	0.067970
	(0.02626)	(0.02246)	(0.02171)	(0.02264)	(0.01714)
8	-0.034809	0.019368	-0.001850	0.011656	0.071045
	(0.02816)	(0.02394)	(0.02297)	(0.02487)	(0.01895)
9	-0.036831	0.018086	-0.003046	0.010280	0.073450
	(0.02978)	(0.02517)	(0.02403)	(0.02703)	(0.02074)
10	-0.038332	0.017122	-0.003992	0.009138	0.075360
	(0.03109)	(0.02618)	(0.02492)	(0.02906)	(0.02246)

Response of LOGL: Period	LOGGDP	LOGK	LOGEDUXPL	LOGM2GDP	LOGL
1	-0.000974	0.000338	0.000468	0.000151	0.003879
	(0.00070)	(0.00071)	(0.00071)	(0.00069)	(0.00048)
2	-0.001244	0.000500	-0.000243	0.000111	0.004034
	(0.00100)	(0.00092)	(0.00102)	(0.00081)	(0.00058)
3	-0.001670	0.000628	-0.000409	7.17E-05	0.004185
	(0.00127)	(0.00115)	(0.00119)	(0.00100)	(0.00072)
4	-0.001950	0.000679	-0.000444	6.52E-05	0.004275
	(0.00149)	(0.00131)	(0.00130)	(0.00118)	(0.00086)
5	-0.002105	0.000690	-0.000450	7.65E-05	0.004322
	(0.00165)	(0.00141)	(0.00136)	(0.00136)	(0.00100)
6	-0.002187	0.000689	-0.000449	9.36E-05	0.004344
	(0.00175)	(0.00148)	(0.00140)	(0.00151)	(0.00113)
7	-0.002230	0.000685	-0.000446	0.000111	0.004352
	(0.00181)	(0.00152)	(0.00144)	(0.00164)	(0.00125)
8	-0.002253	0.000683	-0.000443	0.000126	0.004355
	(0.00185)	(0.00155)	(0.00146)	(0.00175)	(0.00135)
9	-0.002266	0.000682	-0.000440	0.000138	0.004356
	(0.00188)	(0.00156)	(0.00148)	(0.00184)	(0.00143)
10	-0.002273	0.000683	-0.000436	0.000149	0.004355
	(0.00189)	(0.00158)	(0.00149)	(0.00192)	(0.00151)

Cholesky Ordering: LOGK LOGEDUXPL LOGGDP LOGM2GDP LOGL
Standard Errors: Analytic

IMPULSE RESPONSE FUNCTION GRAPH



VARIANCE DECOMPOSITION TABLE

Variance Decomposition of LOGGDP:

Period	S.E.	LOGK	LOGEDUXPL	LOGGDP	LOGM2GDP

1	0.090323	8.432968	0.648842	90.91819	0.000000
2	0.107052	12.16919	0.600213	83.40962	0.070043
3	0.114310	13.94695	0.528044	74.11717	0.125011
4	0.119000	14.05114	0.479621	65.22808	0.140379
5	0.123152	13.27698	0.467435	57.85325	0.132284
6	0.127416	12.21508	0.480324	52.11914	0.117215
7	0.131965	11.15572	0.504541	47.74173	0.103133
8	0.136792	10.20567	0.531204	44.37987	0.092450
9	0.141835	9.388021	0.556010	41.75389	0.085246
10	0.147025	8.694274	0.577401	39.66020	0.080898

Variance Decomposition of LOGK: Period	S.E.	LOGK	LOGEDUXPL	LOGGDP	LOGM2GDP
1	0.227726	100.0000	0.000000	0.000000	0.000000
2	0.250413	97.07719	1.479095	0.308338	0.426005
3	0.257660	93.87211	2.278953	0.455342	1.169529
4	0.260381	90.29627	2.535604	0.662536	1.891899
5	0.262901	86.20803	2.531181	1.054422	2.431699
6	0.266136	81.68067	2.417540	1.676207	2.766920
7	0.270009	76.92120	2.266007	2.493279	2.933997
8	0.274302	72.15244	2.109664	3.432611	2.981321
9	0.278838	67.54642	1.963274	4.421875	2.950796
10	0.283498	63.20979	1.832500	5.406763	2.873432

Variance Decomposition of LOGEDUXPL: Period	S.E.	LOGK	LOGEDUXPL	LOGGDP	LOGM2GDP
1	0.079283	2.101644	97.89836	0.000000	0.000000
2	0.090171	1.756603	86.56228	11.35171	0.274993
3	0.096307	1.782227	82.12582	15.50711	0.359422
4	0.102732	2.003739	80.43888	16.07038	0.374828
5	0.109937	2.238504	78.90381	15.78523	0.373672
6	0.117593	2.408320	77.00167	15.49450	0.367558
7	0.125366	2.510644	74.81794	15.34930	0.359679
8	0.133039	2.564582	72.50889	15.32810	0.351428
9	0.140499	2.588132	70.18708	15.38735	0.343445
10	0.147701	2.593708	67.91838	15.49323	0.335972

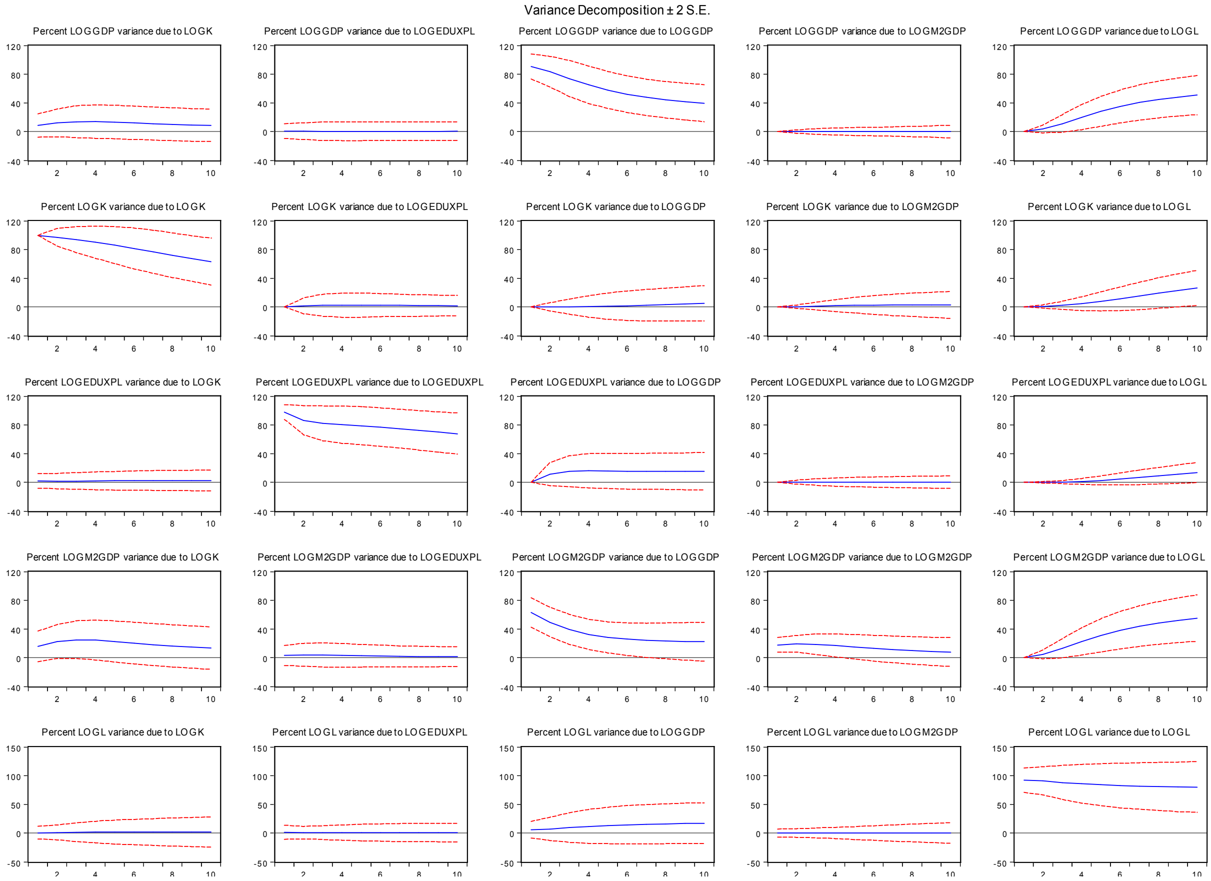
Variance Decomposition of LOGM2GDP: Period	S.E.	LOGK	LOGEDUXPL	LOGGDP	LOGM2GDP
1	0.099135	15.77840	3.270347	63.11316	17.83810
2	0.118514	22.59140	3.946335	49.62496	19.25179
3	0.133203	25.07398	3.829052	39.29610	18.69588

4	0.148276	24.52625	3.334909	32.51404	17.04560
5	0.164189	22.62204	2.783709	28.35221	15.06734
6	0.180619	20.37552	2.308499	25.84258	13.16890
7	0.197207	18.23577	1.936748	24.31431	11.50233
8	0.213691	16.35227	1.656960	23.36116	10.09368
9	0.229907	14.74567	1.449016	22.74821	8.919922
10	0.245761	13.38998	1.294483	22.34072	7.944487

Variance Decomposition of LOGL: Period	S.E.	LOGK	LOGEDUXPL	LOGGDP	LOGM2GDP
1	0.004044	0.698118	1.339106	5.800312	0.138738
2	0.005873	1.055666	0.805751	7.238528	0.101411
3	0.007440	1.370068	0.804575	9.550004	0.072465
4	0.008838	1.561241	0.823100	11.63765	0.056802
5	0.010095	1.664437	0.829466	13.26888	0.049287
6	0.011235	1.719260	0.829134	14.50037	0.046728
7	0.012281	1.749885	0.825883	15.43340	0.047225
8	0.013250	1.768908	0.821330	16.15196	0.049567
9	0.014154	1.782494	0.816178	16.71631	0.052973
10	0.015005	1.793546	0.810784	17.16814	0.056941

Cholesky Ordering: LOGK LOGEDUXPL LOGGDP LOGM2GDP LOGL

VARIANCE DECOMPOSITION GRAPH



MODEL 3: HEALTH ANALYSIS

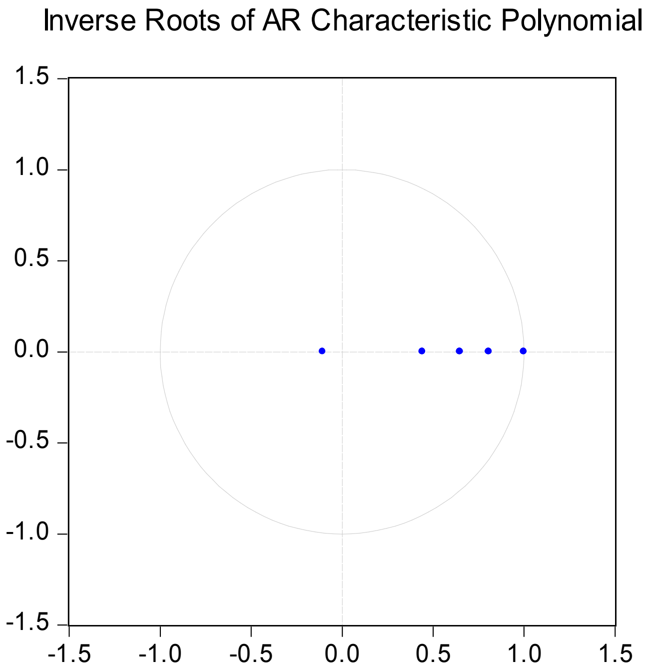
COINTEGRATION

VAR Lag Order Selection Criteria
Endogenous variables: LOGK LOGHEXPL LOGGDP LOGM2GDP LOGL
Exogenous variables: C
Date: 12/19/15 Time: 12:19
Sample: 1981 2013
Included observations: 30

Lag	LogL	LR	FPE	AIC	SC
0	120.8180	NA	3.05e-10	-7.721203	-7.487670
1	262.5181	226.7201*	1.31e-13*	-15.50121*	-14.10001*
2	283.2906	26.31189	2.02e-13	-15.21938	-12.65051
3	309.9629	24.89409	2.80e-13	-15.33086	-11.59433

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

STABILITY



COINTEGRATION

Date: 12/19/15 Time: 12:21
Sample (adjusted): 1983 2013
Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend
Series: LOGK LOGHEXPL LOGGDP LOGM2GDP LOGL
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.597640	73.40323	69.81889	0.0251
At most 1	0.523230	45.18061	47.85613	0.0873
At most 2	0.415210	22.21825	29.79707	0.2866
At most 3	0.164698	5.586673	15.49471	0.7437
At most 4	0.000253	0.007855	3.841466	0.9289

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.597640	28.22262	33.87687	0.2034
At most 1	0.523230	22.96236	27.58434	0.1751
At most 2	0.415210	16.63157	21.13162	0.1901
At most 3	0.164698	5.578818	14.26460	0.6676
At most 4	0.000253	0.007855	3.841466	0.9289

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

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

LOGK	LOGHEXPL	LOGGDP	LOGM2GDP	LOGL
-11.45556	3.051544	2.530608	3.033274	-16.28379
4.058627	6.727306	0.129140	-10.61701	88.74815
-3.753590	-2.719959	-17.21229	8.749620	56.47525
-1.466152	-0.267774	-11.27551	11.32542	-95.09389
-0.491748	-0.546307	-3.372137	2.797460	-22.31187

Unrestricted Adjustment Coefficients (alpha):

D(LOGK)	0.054512	0.010316	0.028589	-0.009498	-0.000124
D(LOGHEXPL)	-0.043476	-0.158953	0.022405	-0.044100	0.000131
D(LOGGDP)	-0.010661	0.024815	0.033398	-0.011551	0.000746
D(LOGM2GDP)	-0.015189	0.030145	0.031651	-0.026955	0.000603
D(LOGL)	-0.000954	-0.000349	0.001233	-5.87E-05	-4.26E-05

1 Cointegrating Equation(s): Log likelihood 269.1645

Normalized cointegrating coefficients (standard error in parentheses)

LOGK	LOGHEXPL	LOGGDP	LOGM2GDP	LOGL
1.000000	-0.266381	-0.220907	-0.264786	1.421475
	(0.11538)	(0.30078)	(0.22353)	(2.03841)

Adjustment coefficients (standard error in parentheses)

D(LOGK)	-0.624465
	(0.16168)
D(LOGHEXPL)	0.498039
	(0.58528)
D(LOGGDP)	0.122131
	(0.19487)
D(LOGM2GDP)	0.174004
	(0.23560)
D(LOGL)	0.010923
	(0.00800)

2 Cointegrating Equation(s): Log likelihood 280.6457

Normalized cointegrating coefficients (standard error in parentheses)

LOGK	LOGHEXPL	LOGGDP	LOGM2GDP	LOGL
1.000000	0.000000	-0.185915	-0.590318	4.252257
		(0.27282)	(0.14895)	(1.83392)
0.000000	1.000000	0.131360	-1.222054	10.62681
		(0.49967)	(0.27280)	(3.35883)

Adjustment coefficients (standard error in parentheses)

D(LOGK)	-0.582596	0.235744
	(0.16960)	(0.10309)
D(LOGHEXPL)	-0.147093	-1.201997
	(0.47964)	(0.29153)
D(LOGGDP)	0.222847	0.134408
	(0.19736)	(0.11996)
D(LOGM2GDP)	0.296350	0.156442
	(0.23850)	(0.14497)

D(LOGL)	0.009506	-0.005258
	(0.00844)	(0.00513)

3 Cointegrating Equation(s):	Log likelihood	288.9614

Normalized cointegrating coefficients (standard error in parentheses)

LOGK	LOGHEXPL	LOGGDP	LOGM2GDP	LOGL
1.000000	0.000000	0.000000	-0.624316	3.178882
			(0.09124)	(1.75088)
0.000000	1.000000	0.000000	-1.198032	11.38522
			(0.17696)	(3.39586)
0.000000	0.000000	1.000000	-0.182869	-5.773479
			(0.09826)	(1.88564)

Adjustment coefficients (standard error in parentheses)

D(LOGK)	-0.689908	0.157983	-0.352801
	(0.16124)	(0.09979)	(0.22055)
D(LOGHEXPL)	-0.231192	-1.262937	-0.516187
	(0.49861)	(0.30858)	(0.68199)
D(LOGGDP)	0.097483	0.043566	-0.598638
	(0.18747)	(0.11602)	(0.25642)
D(LOGM2GDP)	0.177547	0.070353	-0.579325
	(0.23570)	(0.14587)	(0.32239)
D(LOGL)	0.004879	-0.008611	-0.023675
	(0.00823)	(0.00510)	(0.01126)

4 Cointegrating Equation(s):	Log likelihood	291.7509

Normalized cointegrating coefficients (standard error in parentheses)

LOGK	LOGHEXPL	LOGGDP	LOGM2GDP	LOGL
1.000000	0.000000	0.000000	0.000000	-8.680339
				(0.43382)
0.000000	1.000000	0.000000	0.000000	-11.37204
				(0.79824)
0.000000	0.000000	1.000000	0.000000	-9.247174
				(0.22748)
0.000000	0.000000	0.000000	1.000000	-18.99554
				(0.64871)

Adjustment coefficients (standard error in parentheses)

D(LOGK)	-0.675982	0.160527	-0.245704	0.198398
	(0.16040)	(0.09867)	(0.25972)	(0.22645)
D(LOGHEXPL)	-0.166535	-1.251128	-0.018941	1.252324
	(0.48850)	(0.30050)	(0.79097)	(0.68964)
D(LOGGDP)	0.114418	0.046659	-0.468397	-0.134398
	(0.18628)	(0.11459)	(0.30163)	(0.26298)
D(LOGM2GDP)	0.217067	0.077571	-0.275390	-0.394470
	(0.22656)	(0.13937)	(0.36685)	(0.31985)
D(LOGL)	0.004965	-0.008595	-0.023013	0.010935
	(0.00829)	(0.00510)	(0.01342)	(0.01170)

VECM

Vector Error Correction Estimates
Date: 12/19/15 Time: 12:17
Sample (adjusted): 1984 2013
Included observations: 30 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LOGK(-1)	1.000000
LOGHEXPL(-1)	0.702645 (0.22734) [3.09075]
LOGGDP(-1)	0.546917 (0.52245) [1.04684]
LOGM2GDP(-1)	-1.005003 (0.41013) [-2.45046]
LOGL(-1)	-2.691769 (3.82951) [-0.70290]
C	17.67674

Error Correction:	D(LOGK)	D(LOGHEXPL)	D(LOGGDP)	D(LOGM2GDP)
CointEq1	-0.275016 (0.14891) [-1.84689]	-1.180009 (0.41017) [-2.87687]	-0.146888 (0.14890) [-0.98645]	-0.166327 (0.18560) [-0.89615]
D(LOGK(-1))	0.240879 (0.19934) [1.20839]	0.287329 (0.54908) [0.52329]	0.040214 (0.19933) [0.20174]	0.124682 (0.24846) [0.50182]
D(LOGK(-2))	-0.165996 (0.18460) [-0.89921]	0.299386 (0.50849) [0.58877]	0.203166 (0.18460) [1.10058]	0.321098 (0.23009) [1.39553]
D(LOGHEXPL(-1))	0.160073 (0.08707) [1.83835]	-0.318066 (0.23985) [-1.32612]	0.004368 (0.08707) [0.05017]	-0.010053 (0.10853) [-0.09263]
D(LOGHEXPL(-2))	0.113667 (0.06957) [1.63393]	-0.189419 (0.19162) [-0.98850]	0.025698 (0.06956) [0.36941]	0.014247 (0.08671) [0.16431]
D(LOGGDP(-1))	-0.231182 (0.52800) [-0.43785]	-1.505781 (1.45438) [-1.03534]	0.358844 (0.52799) [0.67965]	-0.160508 (0.65810) [-0.24389]
D(LOGGDP(-2))	-0.870815 (0.56777) [-1.53375]	-0.651182 (1.56394) [-0.41637]	-1.484815 (0.56776) [-2.61523]	-1.544566 (0.70768) [-2.18259]
D(LOGM2GDP(-1))	0.287318 (0.44563) [0.64475]	1.242175 (1.22749) [1.01196]	-0.427416 (0.44562) [-0.95915]	0.013649 (0.55544) [0.02457]
D(LOGM2GDP(-2))	0.447398 (0.47172) [0.94844]	0.922798 (1.29936) [0.71019]	0.950474 (0.47171) [2.01496]	0.911371 (0.58796) [1.55007]

D(LOGL(-1))	4.370692	-11.93214	11.19677	11.99394
	(4.82998)	(13.3043)	(4.82988)	(6.02016)
	[0.90491]	[-0.89686]	[2.31823]	[1.99230]
D(LOGL(-2))	-5.394112	-15.96788	-5.487775	-5.885113
	(4.71210)	(12.9796)	(4.71200)	(5.87323)
	[-1.14474]	[-1.23023]	[-1.16464]	[-1.00202]
C	0.021755	0.208561	0.015590	0.073195
	(0.08232)	(0.22674)	(0.08231)	(0.10260)
	[0.26429]	[0.91982]	[0.18940]	[0.71340]
R-squared	0.488651	0.626028	0.414571	0.413976
Adj. R-squared	0.176159	0.397489	0.056808	0.055850
Sum sq. resids	0.140275	1.064326	0.140269	0.217924
S.E. equation	0.088278	0.243165	0.088276	0.110031
F-statistic	1.563726	2.739264	1.158787	1.155951
Log likelihood	37.91204	7.514673	37.91271	31.30393
Akaike AIC	-1.727470	0.299022	-1.727514	-1.286929
Schwarz SC	-1.166991	0.859501	-1.167035	-0.726450
Mean dependent	0.081634	0.102987	0.095422	0.193188
S.D. dependent	0.097260	0.313270	0.090896	0.113239

Determinant resid covariance (dof adj.)	4.62E-14
Determinant resid covariance	3.59E-15
Log likelihood	286.0656
Akaike information criterion	-14.73770
Schwarz criterion	-11.70178

IRP TABLE

Response of LOGGDP: Period	LOGGDP	LOGK	LOGHEXPL	LOGM2GDP	LOGL
1	0.075756	0.023224	-0.000337	0.000000	0.000000
	(0.00947)	(0.01370)	(0.01339)	(0.00000)	(0.00000)
2	0.032650	0.022249	-0.003707	-0.001185	0.016047
	(0.01400)	(0.01256)	(0.01527)	(0.00834)	(0.00580)
3	0.009386	0.018591	-0.006823	-1.76E-05	0.024865
	(0.01411)	(0.01164)	(0.00906)	(0.00952)	(0.00685)
4	-0.004014	0.014941	-0.008406	0.001487	0.029920
	(0.01267)	(0.01043)	(0.00917)	(0.00971)	(0.00722)
5	-0.011818	0.012082	-0.009220	0.002881	0.032776
	(0.01214)	(0.01038)	(0.00999)	(0.00983)	(0.00748)
6	-0.016423	0.010068	-0.009570	0.004023	0.034358
	(0.01280)	(0.01112)	(0.01074)	(0.01027)	(0.00788)
7	-0.019153	0.008739	-0.009656	0.004912	0.035195
	(0.01389)	(0.01201)	(0.01137)	(0.01098)	(0.00844)
8	-0.020767	0.007905	-0.009601	0.005590	0.035600
	(0.01490)	(0.01274)	(0.01194)	(0.01181)	(0.00910)
9	-0.021711	0.007408	-0.009477	0.006105	0.035761
	(0.01566)	(0.01327)	(0.01247)	(0.01263)	(0.00979)
10	-0.022251	0.007130	-0.009325	0.006495	0.035787
	(0.01618)	(0.01363)	(0.01297)	(0.01337)	(0.01047)

Response of LOGK: Period	LOGGDP	LOGK	LOGHEXPL	LOGM2GDP	LOGL
1	0.000000	0.090300	0.000000	0.000000	0.000000
	(0.00000)	(0.01129)	(0.00000)	(0.00000)	(0.00000)
2	-0.005192	0.053605	0.014243	0.004518	0.009397
	(0.01504)	(0.01400)	(0.01601)	(0.00910)	(0.00631)
3	-0.003700	0.034942	0.007356	0.009109	0.013756
	(0.01688)	(0.01407)	(0.01040)	(0.01085)	(0.00775)
4	-0.006565	0.024672	0.004027	0.010462	0.018093
	(0.01560)	(0.01249)	(0.00979)	(0.01130)	(0.00839)
5	-0.009662	0.018742	0.001320	0.010748	0.021556
	(0.01393)	(0.01116)	(0.00998)	(0.01123)	(0.00868)
6	-0.012407	0.015125	-0.000714	0.010562	0.024272
	(0.01291)	(0.01056)	(0.01033)	(0.01114)	(0.00888)
7	-0.014607	0.012808	-0.002273	0.010212	0.026368
	(0.01263)	(0.01055)	(0.01070)	(0.01119)	(0.00910)
8	-0.016301	0.011258	-0.003473	0.009827	0.027983
	(0.01283)	(0.01084)	(0.01107)	(0.01141)	(0.00936)
9	-0.017586	0.010184	-0.004405	0.009464	0.029230
	(0.01326)	(0.01124)	(0.01144)	(0.01175)	(0.00966)
10	-0.018556	0.009420	-0.005133	0.009144	0.030199
	(0.01372)	(0.01164)	(0.01181)	(0.01217)	(0.01001)

Response of LOGHEXPL: Period	LOGGDP	LOGK	LOGHEXPL	LOGM2GDP	LOGL

1	0.000000	0.009203	0.224054	0.000000	0.000000
	(0.00000)	(0.03962)	(0.02801)	(0.00000)	(0.00000)
2	0.076703	0.030305	0.009164	0.038422	-0.021105
	(0.03903)	(0.03357)	(0.04220)	(0.02300)	(0.01563)
3	0.028409	0.031005	0.021213	0.025382	0.001286
	(0.02852)	(0.02171)	(0.02088)	(0.01730)	(0.01272)
4	0.010386	0.028398	0.012194	0.021789	0.012201
	(0.02219)	(0.01746)	(0.01430)	(0.01637)	(0.01244)
5	-0.001717	0.024809	0.007356	0.019094	0.020179
	(0.01817)	(0.01429)	(0.01348)	(0.01508)	(0.01208)
6	-0.009358	0.021490	0.003485	0.017258	0.025841
	(0.01563)	(0.01270)	(0.01325)	(0.01396)	(0.01167)
7	-0.014484	0.018747	0.000538	0.015866	0.030006
	(0.01475)	(0.01242)	(0.01325)	(0.01326)	(0.01132)
8	-0.018036	0.016588	-0.001745	0.014767	0.033130
	(0.01502)	(0.01285)	(0.01337)	(0.01306)	(0.01114)
9	-0.020571	0.014923	-0.003526	0.013878	0.035512
	(0.01580)	(0.01352)	(0.01363)	(0.01328)	(0.01118)
10	-0.022423	0.013650	-0.004924	0.013153	0.037351
	(0.01669)	(0.01422)	(0.01399)	(0.01381)	(0.01143)

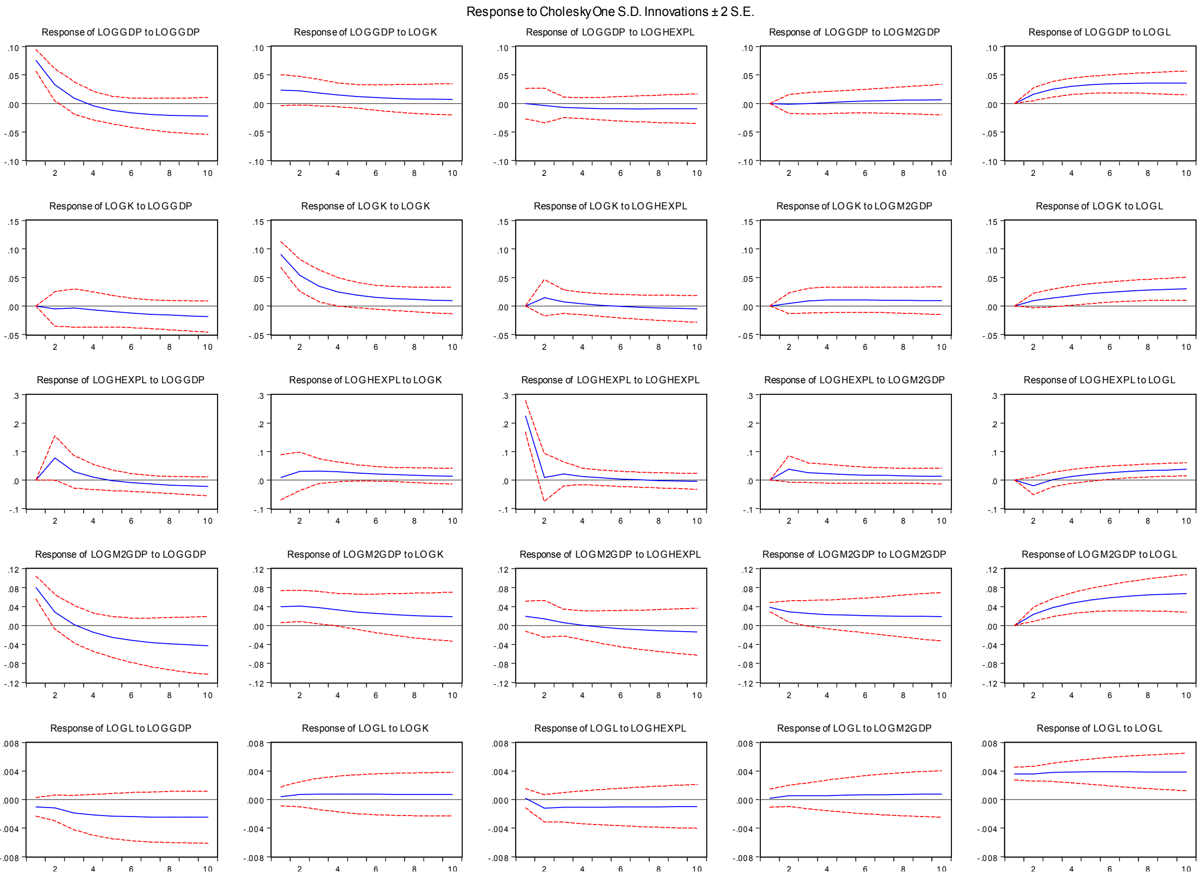
Response of LOGM2GDP: Period	LOGGDP	LOGK	LOGHEXPL	LOGM2GDP	LOGL
1	0.079883	0.039746	0.019643	0.038485	0.000000
	(0.01208)	(0.01681)	(0.01587)	(0.00481)	(0.00000)
2	0.028796	0.041204	0.014134	0.029282	0.023574
	(0.01803)	(0.01649)	(0.01932)	(0.01127)	(0.00742)
3	0.002029	0.037603	0.005906	0.025562	0.037718
	(0.01985)	(0.01696)	(0.01394)	(0.01362)	(0.00948)
4	-0.014267	0.032979	0.000417	0.023390	0.047249
	(0.02029)	(0.01729)	(0.01532)	(0.01521)	(0.01094)
5	-0.024421	0.028816	-0.003666	0.022002	0.053812
	(0.02151)	(0.01855)	(0.01724)	(0.01673)	(0.01230)
6	-0.031013	0.025472	-0.006704	0.020988	0.058469
	(0.02350)	(0.02030)	(0.01902)	(0.01846)	(0.01376)
7	-0.035431	0.022917	-0.008997	0.020186	0.061854
	(0.02564)	(0.02203)	(0.02063)	(0.02031)	(0.01531)
8	-0.038478	0.021007	-0.010748	0.019527	0.064362
	(0.02757)	(0.02352)	(0.02210)	(0.02216)	(0.01688)
9	-0.040630	0.019591	-0.012097	0.018978	0.066255
	(0.02917)	(0.02473)	(0.02345)	(0.02391)	(0.01843)
10	-0.042183	0.018541	-0.013146	0.018520	0.067704
	(0.03043)	(0.02570)	(0.02470)	(0.02551)	(0.01990)

Response of LOGL: Period	LOGGDP	LOGK	LOGHEXPL	LOGM2GDP	LOGL
1	-0.001014	0.000444	0.000173	0.000209	0.003630
	(0.00066)	(0.00067)	(0.00067)	(0.00064)	(0.00045)
2	-0.001190	0.000731	-0.001231	0.000519	0.003628
	(0.00091)	(0.00088)	(0.00096)	(0.00075)	(0.00052)
3	-0.001863	0.000778	-0.001096	0.000513	0.003818
	(0.00120)	(0.00110)	(0.00104)	(0.00091)	(0.00064)
4	-0.002157	0.000772	-0.001099	0.000569	0.003884
	(0.00143)	(0.00126)	(0.00115)	(0.00107)	(0.00077)
5	-0.002320	0.000754	-0.001076	0.000622	0.003909

	(0.00159)	(0.00137)	(0.00124)	(0.00122)	(0.00089)
6	-0.002405	0.000740	-0.001052	0.000668	0.003912
	(0.00170)	(0.00144)	(0.00132)	(0.00134)	(0.00100)
7	-0.002449	0.000733	-0.001029	0.000705	0.003903
	(0.00176)	(0.00148)	(0.00139)	(0.00144)	(0.00110)
8	-0.002470	0.000732	-0.001007	0.000735	0.003891
	(0.00179)	(0.00151)	(0.00145)	(0.00152)	(0.00118)
9	-0.002478	0.000734	-0.000987	0.000759	0.003877
	(0.00182)	(0.00152)	(0.00150)	(0.00158)	(0.00126)
10	-0.002480	0.000739	-0.000971	0.000778	0.003864
	(0.00183)	(0.00153)	(0.00154)	(0.00163)	(0.00132)

Cholesky Ordering: LOGK LOGHEXPL LOGGDP LOGM2GDP LOGL
Standard Errors: Analytic

IRF GRAPH



VARIANCE DECOMPOSITION

Variance Decomposition of LOGGDP: Period	S.E.	LOGK	LOGHEXPL	LOGGDP	LOGM2GDP
1	0.090300	8.590687	0.001811	91.40750	0.000000
2	0.106612	12.75102	0.170794	83.88669	0.017309
3	0.113698	14.98273	0.655788	74.83805	0.015248
4	0.118457	15.38907	1.257978	66.31937	0.034714
5	0.122713	14.73489	1.820073	59.37734	0.100400
6	0.127053	13.67710	2.273673	54.08918	0.207678
7	0.131623	12.56999	2.615068	50.13382	0.340683
8	0.136414	11.55684	2.864286	47.15066	0.484927
9	0.141369	10.67720	3.044309	44.85443	0.630621
10	0.146424	9.928542	3.174250	43.04355	0.772061

Variance Decomposition of LOGK: Period	S.E.	LOGK	LOGHEXPL	LOGGDP	LOGM2GDP
1	0.224243	100.0000	0.000000	0.000000	0.000000
2	0.243089	97.02160	1.784750	0.237156	0.179617
3	0.248911	94.75108	1.987786	0.314434	0.799735
4	0.252276	91.62863	1.946865	0.596821	1.516721
5	0.255123	87.71489	1.825722	1.176092	2.180461
6	0.258098	83.24241	1.706295	2.050718	2.725170
7	0.261397	78.50928	1.619683	3.142301	3.141136
8	0.265042	73.77253	1.572737	4.353458	3.443349
9	0.268997	69.21087	1.561520	5.601088	3.654423
10	0.273205	64.92795	1.578460	6.826901	3.796390

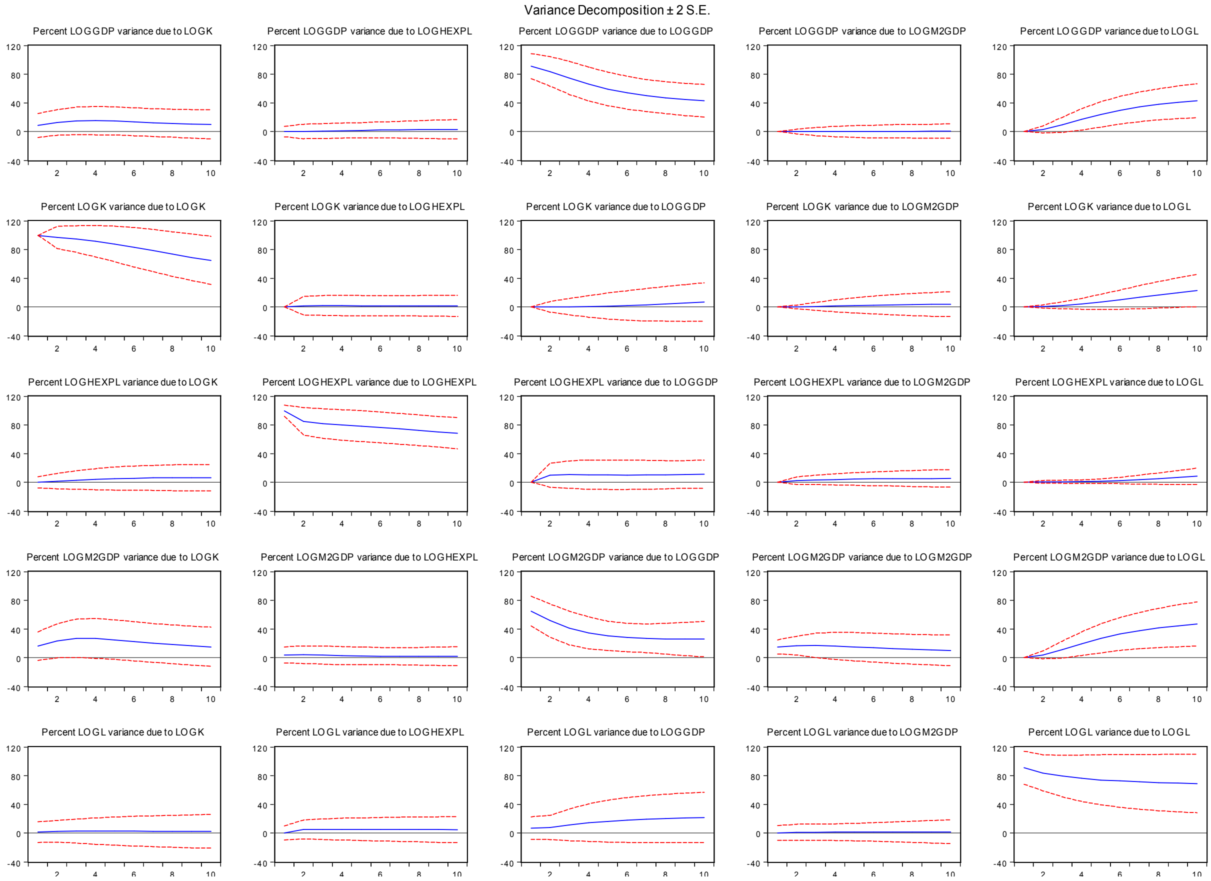
Variance Decomposition of LOGHEXPL: Period	S.E.	LOGK	LOGHEXPL	LOGGDP	LOGM2GDP
1	0.079237	0.168426	99.83157	0.000000	0.000000
2	0.090068	1.697452	85.09438	9.956217	2.498195
3	0.095973	3.170549	81.88673	10.79857	3.422566
4	0.102069	4.353644	79.95025	10.68188	4.077859
5	0.108956	5.202681	78.25922	10.44936	4.547534
6	0.116321	5.776700	76.48334	10.34127	4.890405
7	0.123814	6.146189	74.56562	10.38894	5.136175
8	0.131204	6.369971	72.53285	10.56819	5.306266
9	0.138372	6.491818	70.43300	10.84454	5.417559
10	0.145267	6.542998	68.31262	11.18670	5.483736

Variance Decomposition of LOGM2GDP: Period	S.E.	LOGK	LOGHEXPL	LOGGDP	LOGM2GDP
1	0.099136	16.07396	3.926036	64.92985	15.07015
2	0.118186	23.46442	4.192660	51.62201	16.74225
3	0.132276	26.81307	3.546402	41.23359	17.09998
4	0.146860	26.79484	2.877828	34.39456	16.40901
5	0.162443	25.04725	2.403096	30.37212	15.24632
6	0.178613	22.75136	2.128566	28.13667	13.99155
7	0.194929	20.48417	2.000185	26.92735	12.81967
8	0.211089	18.45827	1.964897	26.28506	11.78774
9	0.226913	16.71906	1.984610	25.95305	10.90053
10	0.242306	15.24778	2.034806	25.79104	10.14371

Variance Decomposition of LOGL: Period	S.E.	LOGK	LOGHEXPL	LOGGDP	LOGM2GDP
1	0.003805	1.358825	0.205593	7.099696	0.303071
2	0.005601	2.330645	4.926586	7.790382	0.998178
3	0.007176	2.595596	5.333748	11.48703	1.118735
4	0.008565	2.634333	5.389676	14.40532	1.227372
5	0.009805	2.601858	5.317459	16.59067	1.338736
6	0.010924	2.555602	5.212427	18.21523	1.452062
7	0.011944	2.514568	5.101937	19.44117	1.563079
8	0.012883	2.483807	4.995632	20.38418	1.668919
9	0.013756	2.463357	4.896750	21.12377	1.768062
10	0.014574	2.451642	4.806111	21.71452	1.859915

Cholesky Ordering: LOGK LOGHEXPL LOGGDP LOGM2GDP LOGL

VARIANCE DECOPOISITION GRAPH


Variance Decomposition ± 2 S.E.
Percent LOGGDP variance due to LOGK
Percent LOGGDP variance due to LOGHEXPL
Percent LOGGDP variance due to LOGGDP
Percent LOGGDP variance due to LOGM2GDP
Percent LOGGDP variance due to LOGL
Percent LOGK variance due to LOGK
Percent LOGK variance due to LOGHEXPL
Percent LOGK variance due to LOGGDP
Percent LOGK variance due to LOGM2GDP
Percent LOGK variance due to LOGL
Percent LOGHEXPL variance due to LOGK
Percent LOGHEXPL variance due to LOGHEXPL
Percent LOGHEXPL variance due to LOGGDP
Percent LOGHEXPL variance due to LOGM2GDP
Percent LOGHEXPL variance due to LOGL
Percent LOGM2GDP variance due to LOGK
Percent LOGM2GDP variance due to LOGHEXPL
Percent LOGM2GDP variance due to LOGGDP
Percent LOGM2GDP variance due to LOGM2GDP
Percent LOGM2GDP variance due to LOGL
Percent LOGL variance due to LOGK
Percent LOGL variance due to LOGHEXPL
Percent LOGL variance due to LOGGDP
Percent LOGL variance due to LOGM2GDP
Percent LOGL variance due to LOGL