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The Effect of Foreign Aid on Public Spending in Ethiopia

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The Effect of Foreign Aid On Public Spending in Ethiopia

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DECLARATION

This is to certify that the thesis prepared by Semira Shemesu, entitled: *The effect of foreign aid on public spending in Ethiopia* submitted in partial fulfillment of the requirements for the degree of master development economics fulfills with the regulations of the university and meets the accepted standards with respect to originality and quality.

Signed by the Examining Committee:

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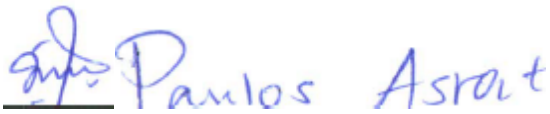
ENDORSEMENT

This thesis has been submitted to St. Mary's University, School of Graduate Studies for examination with my approval as a university advisor.

Paulos Asrat (PHD) 

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ACRONYM

MOFED- MINISTRY OF FINANCE AND ECONOMIC DEVELOPMENT

NBE- NATIONAL BANK OF ETHIOPIA

GDP – GROSS DOMESTIC PRODUCT

VAR - VECTOR AUTO REGRESSION

VECM - VECTOR ERROR CORRELATION MODEL

UNDP- UNITED NATION DEVELOPMENT PROGRAM

WB- WORLD BANK

Abstract

The motivation behind this study is to investigate the effect of foreign aid on public spending in Ethiopia secondary time series data from MOFED and world bank official website is used and from 1981-2018 was used. The Johansen co-integration analysis, VECM was conducted in addition to that impulse response and variance decomposition was conducted. Based on VECM result the response of public spending for the change positive change of foreign aid is negative and the result of short run for VECM shows that the percentage change in forging aid associated with 0.6 present decline in public spending and it is significant. According to the impose response result the response of public spending for the positive change of foreign aid is negative it shows continues negative response from the beginning up to the last forecasting period in the other hand the variance decomposition result shows that the greater variance in the public spending came from the foreign aid next to its own change. In the short run the 89 present variation in public spending came from its own change and 5.7 present of variation is sourced by the foreign aid. Based on the result the researcher recommended that the country should not be depend on different source of foreign aid because the foreign aid affect negatively the public spending and the decrease of foreign aid negatively affect the economic growth of the country. This is caused by most of the foreign aid are directly used in the consumption such as military purpose and projects which has not any significant effect for the long run economic growth of the country Rather than the government depend on foreign aid it should be used some alternative domestic source in order to increase public spending like increasing the revenue from tax in addition to this the government should check the check how to use the foreign aid because in most developing countries foreign aid related to different corruption issue.

Key wordsforeign aid ,co-integration public spending, economic growth

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the study

Foreign aid is the international transfer of public funds in the form of loans or grants ether directly from one government to another (bilateral assistance) or indirectly through the vehicle of a multi-lateral assistance agency such as World Bank (Todaro & smith, 2015)

Public spending can be defined as the set of expenditure of the state for the operation of goods and public services. It can also be set as the application of public resource to finance the public services or to invest economic development. (Cited by feyzloglu, 1996)

The history of economic thought on foreign aid is somewhat strange. The phenomenal success of the marshal plan in the late 1940s and 1950s led many to believe that similar transfers to developing countries would permit their comparably spectacular transformation. That belief had two intellectual theories. The first is harrod-domar model which extended the Keynesian emphasis on investment to include its capacity increasing effects. The second was other economists who focus on physical capital and the view that shortage of it was recognized that many other factors would be needed to achieve satisfactory growth. (Krueger ,1986)

In Ethiopia case, foreign aid in terms of external loans and grants started around 1950's during third five-year plan period (1957-1973), 25 percent of the required total investment was financed by external public capital which is not small. It was often argued that the direction of foreign aid was characterized by negligible long run objectives in favor of infrastructure services compared to direct investment activities for agriculture and industry sectors. Similarly, during the post revolution period 37 percent of the total annual campaign of 1979-83 was financed by foreign aid.) (Abas, 214)

As considerable amount of foreign aid received by the country it is important to understand how foreign aid affect the public spending further it can affect the economic growth. Most developing countries first economic motives is to increase the economic growth and it is important to figure out how foreign aid affect the public spending.

1.2. Statement of the problem

Aid has been given as bilateral assistance directly from one country to another donor also provideaid indirectly as multilateral assistance which pools recourse together form money donors. generally speaking, aid is one of the largest components of foreign capital flows to low income countries with more aid its expecting to lead to public spending and faster economic growth however, some country that have received larger amount of aid have recorded rapid growth while other have recorded slow or even negative growth. As the relationship between foreign aid and public spending in particular and economic growth in general cannot be clear up-to-date. (Steven.R, 2006)

A study conducted by Abas Mohammed, (2014) to investigate the effect of forging aid on government expenditure in Ethiopia during 1966-2013 by using vector error correction model. heconsiders the government expenditure as capital and non-developmental expenditure. The result of the analysis shows that capital expenditure of the government expenditure is positively and significantly affected by foreign aid and foreign aid finance non development expenditure.

According to the study Jafar (2002) that tries to identify the impact of foreign aid on public spending with particular reference of aid fungibility with the consideration of four development sector (education ,agriculture ,transport and construction) and three non-development sector (defense, general servicing and debt servicing in Ethiopia by using OLS estimation and the estimation result show that education and agriculture marked by fungibility however transport and construction aid fungibility seems to exist which indicate that there is crowding out effect and for non-developmental expenditure aid significantly affected debt financing but it have insignificant effect on general service and defense.

The theories and research conducted in the same area have varying conclusion towards the impact of foreign aid on the public expenditure of Ethiopia according to the study by Jafar there exists a negative relationship between foreign aid and public spending of the country. Forstudy conducted by Abas there exists a positive relationship between foreign aid andpublic spending therefore, this study attempt to investigate the trade-off which are in one hand a positive relation relationship and in other side a negative relationship between foreign aid and public spending by using different methodology and investigate what kind of relationship exists between the aforementioned two variables in the context Ethiopia.

1.3. Objective of the study

The general objective of the study is to examining the effect of the foreign aid on public spending in Ethiopia

Specific objective

- To assess the factor that affect public spending in Ethiopia and
- To assess the empirical relationship historical trend of foreign aid and public spending in Ethiopia.

1.4. Hypothesis of the study

- Foreign aid has a significant positive effect on public spending of the Ethiopia.

1.5. Research Question

1. Is there any relationship between foreign aid and public spending?
2. What is the level of effect of foreign aid and public spending?
3. What are other factors that affect public spending of Ethiopia?

1.6. Significant of the study

This study has two main significant first this study show how foreign aid can affect the public spending and explain some direction for the overall importance of foreign aid this study further assists other researchers for additional studies in the area foreign aid

1.7. Limitation of the study

The research is limited to investigating the effect of foreign aid on public spending of Ethiopia Bank based on secondary data for period covering from 1981-2018 The study takes only the effect on public spending and it did not include in economic growth. As a result, the limitation of the study is the effect of foreign aid on public spending was consider and the dynamics effect which public spending affect economic growth not investigate.

CHAPTER TWO

2. LITRATURE REVIEW

2.1. Theoretical reviews

Foreign aid is the international transfer of public funds in the form of loans or grants ether directly from one government to another (bilateral assistance) or indirectly through the vehicle of a multi-lateral assistance agency such as World Bank (Todaro & smith, 2015)

Types of foreign aid

Assistance given by a government directly to the government of another country is Bilateral Aid. It is when the capital flows from a developed nation to a developing country. Strategic political considerations and humanitarian ones often direct Bilateral Aid. These are to assist in long-term projects to promote democracy, economic growth, stability, and development. Foreign aid is financial or technical help given by one country government to another country to assist social and economic development (Jenny,1996)

According to Rogerson,2004 Multilateral Aid is assistance provided by many governments who pool funds to international organizations like the World Bank, United Nations, and the International Monetary Fund. These funds are then used to reduce poverty in developing nations. Though this sector constitutes a minority of the US's foreign aid, the nation's contributions make up a significant percentage of the donor funds received by the organization tied Aid is one of the types of foreign aid that must be spent in the country providing support (the donor country) or in a group of selected countries. A developed country provides a bilateral loan or grant to a developing country, but mandate that the government spends the money on goods or services produced in the selected country.

Project aid is when the funds are used to finance a particular project, such as a school or a hospital, it is considered to be Project Aid. In the other hand military aid is never charitable. The U.S. gave about $15 billion in Military Aid in 2011. Military aid usually requires the receiving nation to either buy arms or defense contracts directly from the USA. In other cases, it just simplifies the process by having the federal government only purchase the arms itself and ship

them over on military transport.The aid system here mainly includes the organizations their political owners and civil servant manager. Voluntary aid is aid usually in the form of charity.

Foreign aid and the big push theory

AccordingtoKiiza ,2015the big push argument holds that a large inflow of aggregate aid in social and productive sectors result in growth across all sectors of society. The big push argument is compelling, especially in countries where governments have failed to invest in needed public investment and private alternatives have not been ready to invest sufficiently.

The theory conclusions were that while large aid inflows create micro-level increases to the consumption patterns for poor households this had no impact on financing investment and growth. This had no impact on financing investment and growth. The study fives a snap shot of the correlation between aid and growth

Realizing the shortfalls of the big push approach a second paradigm emerged which argues that aid works in countries where institutional and macroeconomic frameworks are conducive, namely with good fiscal, monetary and trade policies.Increased to follow up studies increased aid has had the growth enhancing and poverty reducing impact for the government of developing country. the combination of increased aid coupled with specific progressive domestic reforms namely tax administration reform, consistent cash budgeting through the poverty action fund and the poverty action fund and a medium term consultative budget process produced beneficial results for growth and poverty reduction.(kiiza, 2015)

In the other side Public spending can be defined as the set of expenditure of the state for the operation of goods and public services. It can also be set as the application of public resource to finance the public services or to invest economic development.

Public spending

Public spending enables governments to produce and purchase goods and services, in order to fulfil their objectives – such as the provision of public goods or the redistribution of resources. In this entry we study public spending through the lens of aggregate cross-country data on

government expenditures. We begin with an analysis of historical trends, and then move on to analyze recent developments in public spending patterns around the world.

The available long-run data shows that the role and size of governments around the world has changed drastically in the last couple of centuries. In early-industrialized countries, specifically, the historical data shows that public spending increased remarkably in the 20th century, as governments started spending more resources on social protection, education and healthcare.(Rogerson,2004)

Recent data on public spending reveals substantial cross-country heterogeneity. Relative to low-income countries, government expenditure in high-income countries tends to be much larger (both in per capita terms, and as share of GDP), and it also tends to be more focused on social protection.

Recent data on public spending also shows that governments around the world often rely on the private sector to produce and manage goods and services. And public-private partnerships (PPP), in particular, have become an increasingly popular mechanism for governments to finance, design, build and operate infrastructure projects. In the period 2005-2010 alone, the total value of PPP projects in low and middle-income countries more than doubled.

Historical trend of foreign aid

Rich counties started giving money to poorer countries in the 19th century and by the 1920s and 30s countries like Germany France and Britain were providing regular aid to their colonial power s used their money to build infrastructure ports, roads railways and wealthy American industrialists were also involved in development aid through the ford and Rockefeller foundation. Developing countries have received increasingly Signiant flows of ODA over five decades with more than half of them being disbursed during the last 18 years (Aime, 2010)

Even after the colonies gained their independence foreign support continued to focus on economic development says. Within a few years the world had split into what were called three worlds the first world western democratic countries the second world which was the Soviet Union and its communist satellites and then what become known as the third world which were

the former colonies and countries that had come under imperial influence in the post war decades the United States become the world's biggest aid donor starting with the Marshall plan to help Europe rebuild. It was really through the 1960s that the aid programs started to formulate and take shape and become a more definite commitment (UNDP, 1997)

The relation between aid and efficiency must be regarded as inconclusive there is no clear patter to be found (veiderpass,2007)

The visualization shows the evolution of government expenditure as a share of national income, for a selection of countries over the last century. The source of the data is Mauro et al. (2015)

The long-run series in this dataset cover mainly, but not exclusively OECD countries. Non-OECD countries with available long-run data include Russia, India, Argentina, Brazil, Peru and Colombia.

The above-mentioned long-run series are complemented in this dataset by comparable recent estimates for most countries in the world. You can plot other countries in this visualization by selecting but bear in mind that the series for most non-OECD countries are much shorter.

If we focus on early-industrialized countries, we can see that there are four broad periods in this chart. In the first period, until the First World War, spending was generally low. In the US, for example, total government expenditure accounted for less than 2% of national income until 1916. These low levels of public spending were just enough for governments to be concerned with basic functions, such as maintaining order and enforcing property rights.

In the second period, between 1915-1945, public spending was generally volatile, particularly for countries that were more heavily involved in the First and Second World Wars. Government expenditures as a share of national output went sharply up and down in these countries, mainly because of changes in defense spending and national incomes. In the US, public spending as a share of GDP was 10.5% in 1941, then went up to 44.1% in 1945, and then went back down to 12.2% in 1948.

In the third period, between 1945-1980, public spending grew particularly fast. As we show in more detail later, this was the result of growth in social spending; and was largely made possible by historical increases in government revenues over the same period.

Since 1980 the growth of government expenditure has been slowing down in early-industrialized countries – and in some cases, it has gone down in relative terms. However, in spite of differences in levels, in all these countries public spending as a share of GDP is higher today than before the Second World War.

Although the increase in public spending has not been equal in all countries, it is still remarkable that growth has been a general phenomenon, despite large underlying institutional differences.

The map uses the same data, for all countries, to show global patterns. You can switch between the 'Map' and 'Chart' views by selecting the corresponding tabs in the interactive visualization. By using the slider at the bottom you can get a sense of the long-run trend in global government expenditures.

At the end of the 19th century European countries spent less than 10% of GDP via the government. In the 21st century this figure exceeds 50% in many European countries. The increase in absolute terms – rather than the shown relative terms – is much larger since the level of GDP per capita increased very substantially over this period

2.2. Empirical reviews

Muse,2015 studied the relationship between government expenditure and foreign aid in Nigeria using co integration analysis and vector error correction model by Appling data for 43years from 1970-2012 and the results of Johansen and Enger-granger co integration test suggest that there is positive and long run relationship between foreign aid and government expenditure. Coefficient estimate of the foreign aid is not significant in the long run but, in the short run effect of increase in foreign aid is more insignificant both in magnitude and level of significance. According to the study result foreign direct investment and real gross domestic product have positive impact on the government expenditures.

According to Tagem 2017 the amount of aid to developing countries have an impact on government fiscal behavior (particularly on government spending.He test by using a sample of 69 developing countries over 1980-2013 taking account of dynamics characterizing fiscal data , cross-country heterogeneity and the distorting impact of cross- section dependence, by appling the pesaran(CCE mean group estimator and the result show that net aid (grants and loans) and taxes comprise an equilibrium (cointegrated) relation and the result show that a positive long run as well as short run association between aid and spending.

According to the study on impact of foreign aid on public spending by Njeru,(2003) specifically on keneya the empirical results indicate that the flow of foreign aid does influence government spending patterns there is a positive and statistically significant relationship between the share of overseas development assistance .there are strong indications that the government renders aid fungible by financing recurrent expenditures.

The question that is relevant for the debate on the efficacy of development assistance is not so much as an issue of how much, but rather for what. In view of the growing awareness of ODA's inefficiency in achieving intended aims, the paper proposes an alternative approach to development assistance policies – economic integration and subsidiarity provides the conditions necessary for ODA to produce higher rates of economic growth on a sustainable basis. Europe is an excellent case in point, in this context. Europe has in the last decades experienced a number of success stories in moving out of poverty and onto sustainable economic growth. The secret of success has been the push towards economic integration, and the adoption of economic reforms at the local, national, and regional level conducive to economic growth. The recipient countries of development assistance have much to learn from the European experience. (Chowdhury ,2007)

Elizabeth & Nandwa 2007 try to investigate the impact of foreign aid in education on growth how relevant is the heterogeneity of aid flows and the heterogeneity of aid receipts which examine whether foreign aid in education has a significant effect on growth for low income and middle income countries and the result shows that the effect of aid varies by income as well as by the type of aid.

Related empirical study in Ethiopia

Fentaye, 2015 tries to study the impact of foreign aid on economic growth of Ethiopia over the period 1974 to 2013 using multivariate co integration analysis the empirical result from the growth model shows that aid has a significant positive impact on growth in the long run. The aid would have been higher if it was supported by a sound macroeconomic policy environment.

A study conducted by Abas Mohammed, (2014) to investigate the effect of forging aid on government expenditure in Ethiopia during 1966-2013 by using vector error correction model. heconsiders the government expenditure as capital and non-developmental expenditure. The result of the analysis shows that capital expenditure of the government expenditure is positively and significantly affected by foreign aid and foreign aid finance non development expenditure.

According to (Faran, Ayhan, onder2018) Foreign aid has been an essential tool for the socio-economic development of developing countries since 1960s. It is described by OECD as the financial, technical assistance and commodity flow to the countries that are in the list of DAC (Development Assistance Committee). US's Marshall Plan is a well-known development assistance program, which was established between 1948 and 1951 under the European Recovery Program to support Europe in economic crisis after a war became successful in reducing poverty while increasing economic growth. By taking the Marshall plan as a model, developed countries have been supporting the developing countries since then. Recently, the Millennium Development Goals was also launched in New York in 2000 to finance economic growth of poor countries. New actors from other parts of the world took their places in providing development assistance. Despite receiving more than 600 billion USD in the context of foreign aid, large part of Africa has still remained underdeveloped and in an extreme poverty. In this paper, we study the impacts of foreign aid to socio-economic development to Ethiopia.

After reviewing the development and foreign aid literature from primary and secondary sources, this study benefited from data gathered from World Bank Database, Transparency International and Freedom House, and then time series data were evaluated by regression analysis. Our findings indicate that foreign aids do not have a major influence on GDP growth; but it has a considerable influence on FDI (foreign direct investment) and unemployment rate in Ethiopia. However, it is observed that foreign aid has negatively correlated with democracy and corruption

levels in the country. Although, the amount of foreign aid has been continuously increasing, Ethiopia has remained one of the most corrupt and authoritarian African countries according to related indices. Consequently, our study concludes that foreign aid should be redesigned to encourage and reward receiving countries to advance their democracy and eliminate corruption within the context of recent philosophy and principle of collaborative governance for long term development.

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According to the study Jafar, (2002) that tries to identify the impact of foreign aid on public spending with particular reference of aid fungibility with the consideration of four development sector (education ,agriculture ,transport and construction) and three non-development sector (defense, general servicing and debt servicing in Ethiopia by using OLS estimation and the estimation result show that education and agriculture marked by fungibility however transport and construction aid fungibility seems to exist which indicate that there is crowding out effect and for non-developmental expenditure aid significantly affected debt financing but it have insignificant effect on general service and defense.

However, the issue of the relationship between foreign aid and public spending is not much investigated as the result of different empirical study are varies conclusion and result about the relationship between the foreign aid and public spending therefore in order to fill the knowledge gap this research try to investigate the relationship between the two variable by taking the methodology that are distinct the one identified by the above mentioned studies.

CHAPTER THREE

METHODOLOGY

In this section the researcher demonstrates the methodology which it usesfor this paper. The section presents the research design,data type, source and data analysis methods that be used in conducting the study.

3.1 . Research design

The general objective of this study be to investigate the relationship between foreign aid and public expenditure in Ethiopia case. To conduct the research, a quantitative approach be employed. The use of such quantitative approach would know the correct relationship which occurs between foreign aid and public expenditure. The researcher uses secondary sources of data. In line with this, the study use regression to analyze the secondary data using Eview software by using VAR and VECM for short run and long run relationship.

3.2 Data type and source

The study investigates the relationship between foreign aid and public expenditure by using secondary time series data from 1981-2018on amount of foreign aid Ethiopia received government spending, Growth domestic product, inflation rate,external debt andpopulation growth. The data sourcebe theMOFED, NBE andWorld Bank official website.

3.3 Data analysis method

To meet the objective of investigating the relationship between foreign aid and public spending the researcher use VAR model and VECM (vector error correlation model) if there is any long run relationship between the variable.

3.4 Theoretical framework and Model specification

To applicable the one of the multivariate model which is VEM it is a pre required to test the stationery of each variable since the majority of economic theory is built up on the assumption of stationary which directly mean that regressing a non-stationary variable Yt upon a non-stationary variable Xt may lead to a spurious regression in which estimators and test statistics are mis-leading with the exception when two or more I (1) variable are co integrated. If there exists a particular linear combination of these non-stationary variables that is stationary which can be a

cases a long run relationship between these variables exists. The existence of long run relationship also has its implications for the short run behavior of the variables because there has to be some mechanism that derives the variables to their long run equilibrium relationship and such mechanism are modeled by an error correction mechanism.

public spending which measure by amount of government spending is the dependent variable which affect by different independent variable including the foreign aid (measure by amount of foreign aid received), inflation, growth domestic product, External debt and population growth

$$y = \alpha + BX1 + \beta\ 2X\ 2 + \ \beta 3X3\ + \ \beta 4X4 + \beta 5X5 + \varepsilon 1$$

$$PS\ = \alpha + \beta 1FA\ + \ \beta\ 2IF\ + \ \beta 3GDP\ + \ \beta 4ED + \beta 5PG + \ \varepsilon \mathbf{1}$$

Where PS public spending

FA foreign aid

GDP Growth domestic product

IF Inflation rate

ED external debt

PG population growth

Econometric model and analysis

In this research two type of model be conducted vector (autoregressive) VAR and vector error correlation (VECM) besides granger casually test and different diagnostic testhave conducted moreover the impose response test and variance decomposition result discussed

3.4.1. VAR model

The vector auto regression (VAR) is commonly used for forecasting systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of the variable. The reduced form VAR approach side steps the need for structural modeling by treating every endogenous variable in the system as a function of p-lagged values of the entire endogenous variable in the system. For k dimensional, VAR (P) process the VAR model can express as

$$Yt = A1Yt - 1 + \cdots \ldots . + Apyt - p + QXt + \varepsilon t$$

Where $Yt = (y1t, y2t \ldots \ldots . ykt)\ is\ a\ k * 1$ vector of endogenous variables

$Xt = (x1t, x2t, \ldots \ldots . . xdt)'$ is a $d * 1$ vector of exogenous variable

$A1 \ldots\ AP\ \ are\ k * k$ matrices of lag coefficients to be estimated.

$Qis\ a\ k * d$ matrix of exogenous variable coefficients to be estimated

$\varepsilon t = (\varepsilon 1t, \varepsilon 2t, \ldots \ldots \ldots \varepsilon kt)$, is a k*1 white noise innovation process with $E(\varepsilon t) = 0, E(\varepsilon t\ \varepsilon t') = 0$ for t≠0

3.3.1.1 Test of VAR model

Stationery test

To applicable the one of the multivariate model which is VEM it is a pre required to test the stationery of each variable since the majority of economic theory is built up on the assumption of stationary which directly mean that regressing a non stationary variable Yt upon a non stationary variable Xt may lead to a spurious regression in which estimators and test statistics are mis-leading with the exception when two or more I (1) variable are co integrated. If there exists a particular linear combination of these non-stationary variables that is stationary which can be a cases a long run relationship between these variables exists. The existence of long run relationship also has its implications for the short run behavior of the variables because there has to be some mechanism that derives the variables to their long run equilibrium relationship and such mechanism are modeled by an error correction mechanism.

One of the mechanism to test stationary of a unit root test is augmented Dukey fuller test (ADF test) which proposed by dickey and fuller (1979) .This test is valid only if the series is an AR (I) process. If the series is correlated at higher order lags the assumption of white noise disturbance is violated the augmented dickey fuller (ADF) test constructs a parametric correction for higher order correlation by assuming that the y series follows an AR (P) process.

3.4.1.2. Choosing the optimal $_{lag}$ length

Following the approach of hall 1994 and ng and perron 1995 k^* chosen to minimize the specified information criterion amongst models with 0 to k_{max} lags. There are varies method to do that such as Akaike ,Schwarz ,hannan Quinn, modified Akaike, modified schqarz and modified hannan-quinn . It is note that the sample used for model selection excludes data using full set of lag differences up to k_{max}

Granger causality test

One of the first and undeniable maxims that every econometrician is taught is that correlation does not imply causality correlation or covariance is a symmetric relationship cov (x,y) = cov (y,x) . We cannot in general infer anything about the existence or direction of causality between x and y by observing non zero covariance even if our statistical analysis is successful in establishing that the covariance is highly unlikely to have occurred by chance such a relationship could occur because x causes y because y causes x, because each causes the other, or because x and y are responding to some third variable without any causal relationship between them.

Clive granger defined the concept of granger causality, which under some controversial assumptions can be used to shed light on the direction of possible causality between pairs of variables. The formal definition of granger causality asks whether past values of x aid in the prediction of yt, conditional on having already accounted for the effects on yt of past values of y

Co-integration test

The most common tests to determine the number of co integrating relationships among the sires in a VAR / VEC are due to johansen (1995) if we have N*I(1)* variable that are modeled jointly in a dynamic system, there can be up targeting relationship as a common trend as synonymous. The co-integrating rank of the system is the number of such common trends or the number of co integrating relationships.

To determine the co integrating rank r, we perform a sequence of tests. First it is better to test the null hypothesis of r=0 against r>1 to determine if there is at least one co integrating relationship. If we fail to reject r=0, then we conclude that there are no co-integrating relationships or common trends among the series. In this case we do not need a VEC model and can simply use a VAR in the differences of the series.

If r=0 is rejected at the initial stage then at least some of the series are co-integrated and it is possible to determine the number of co integrating relationships by second steep which is by testing the null hypothesis that r<1against r> 2 if it is not possible to reject the hypothesis of no more than one common trend, then it is possible to estimate a VEC system with one co integrating relationship.

If r< 1 is rejected the it is possible to test r< 2 against r>3 and so on and it is better to choose r to be the smallest value at which it fail to reject the null hypothesis that there are no additional co integrating relationships

3.4.2 Vector error correlation model specification VECM

A vector error correction models is a restricted VAR designed for use with non-stationary series that are known to be co-integrated. The VEC has co-integration relations built into the specification so that it restricts the long run behavior of the endogenous variables to converge to their co-integrating relationships while allowing for short run adjustment dynamics. The co integration term is known as the error correction term since the deviation from long run equilibrium is corrected gradually through a series of partial short run adjustments.

3.4.2.1 Impulse response

The impulse-response functions are n*n set of dynamic marginal effects of a onetime shock to variable j on itself or another variable i

$$\delta y^{i}_{1+z}/\delta \varepsilon_t^{j} \quad S=0, 1, 2.....$$

There is no limit on how far into the future these dynamic impulse responses can extend if the VAR is stable then the IRF_S should converge to zero as the time from the shock s gets large – onetime shocks should not have permanent effects. IRF_S are usually presented graphically with the time $_{with}$ the time lag s running from zero up to some user set limit s on the horizontal axis and the impact at the s-order lag on the vertical. Each of n^2 IRF_S graphs tells us how a chock to one variable affects another or the same variable

3.4.2.2 Forecast variance decomposition

Forecast error variance decomposition can measure the extent to which each shock contributes to unexplained movement (forecast errors) in each variable all variance decompositions start at zero

CHAPTER FOUR

Result and discussion

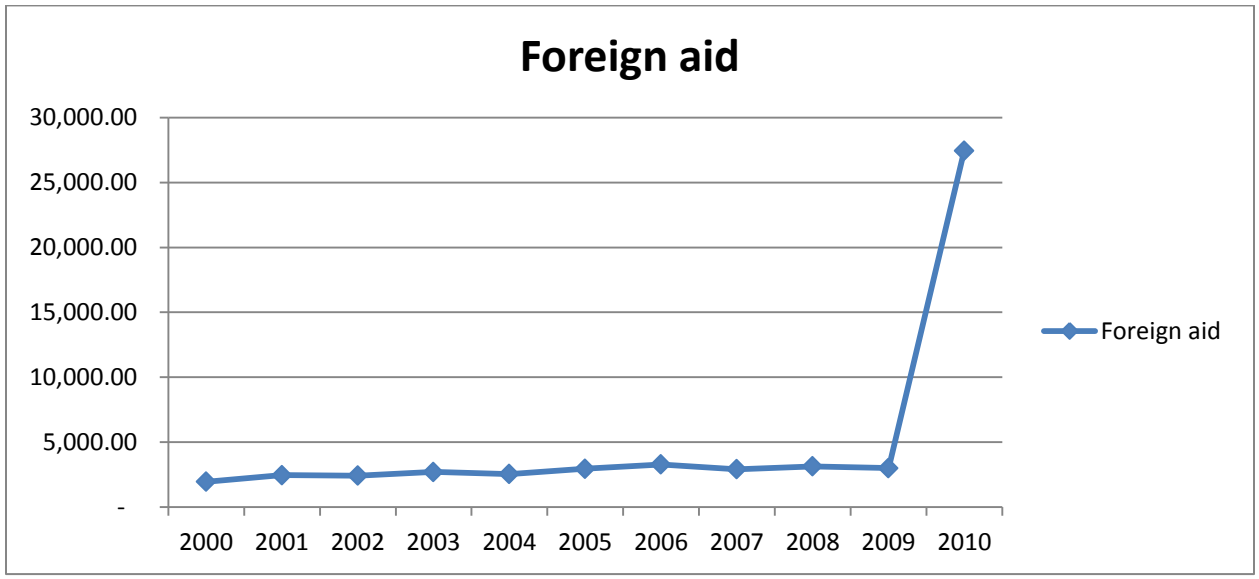
4.1Descriptive result

This part of the research describes the performance of Ethiopia economy with giving special attention in the issue of foreign aid and public spending

4.1.1. Foreign aid in Ethiopia

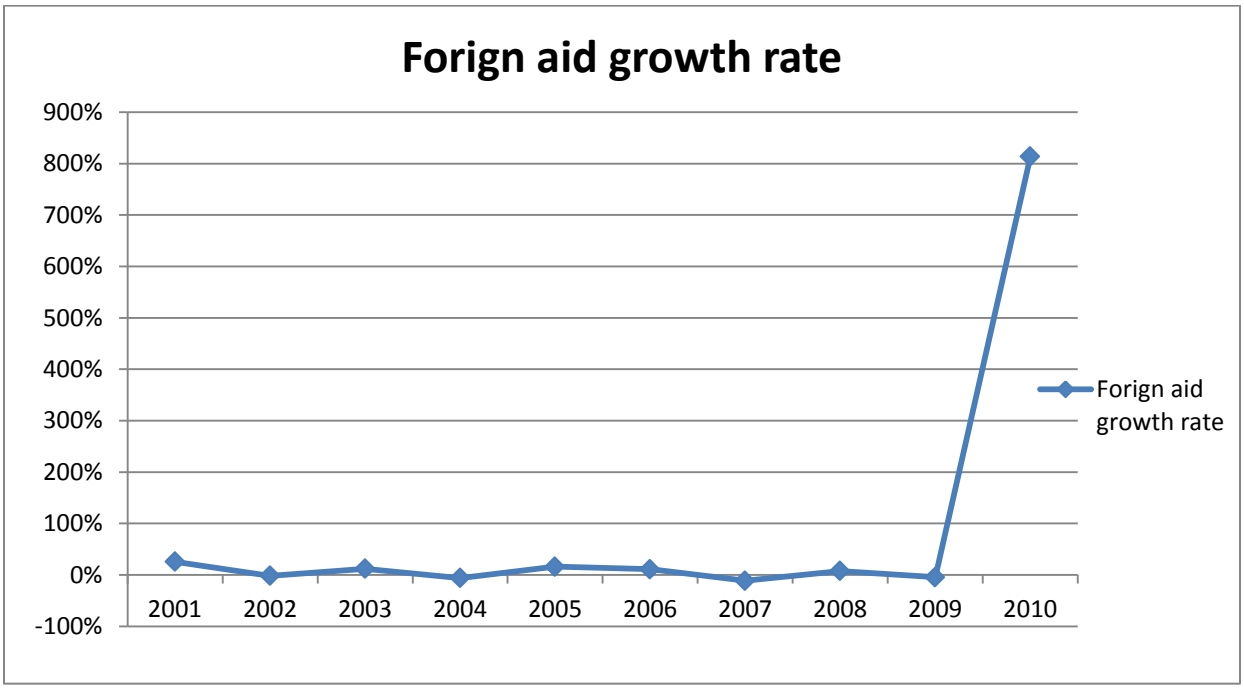
Foreign aid in Ethiopia shows sustained figure between the years 2000 -2009 which have the value of below 5000min USD. As it shows in figure in 4.1 the foreign aid shows dramatically increase in the year 2009

Figure 1 foreign aid trends in Ethiopia(G.C) *In million (USD)and (E.C)*



Source MOFED and own computation

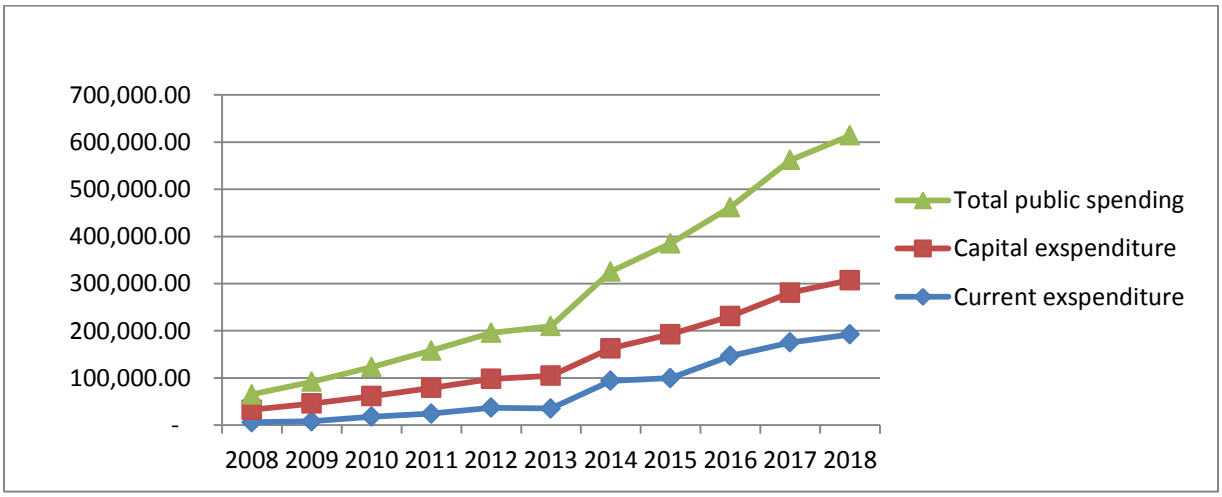
Figure 2 foreign aid growth rates in Ethiopia



4.1.2 Public spending trends in Ethiopia

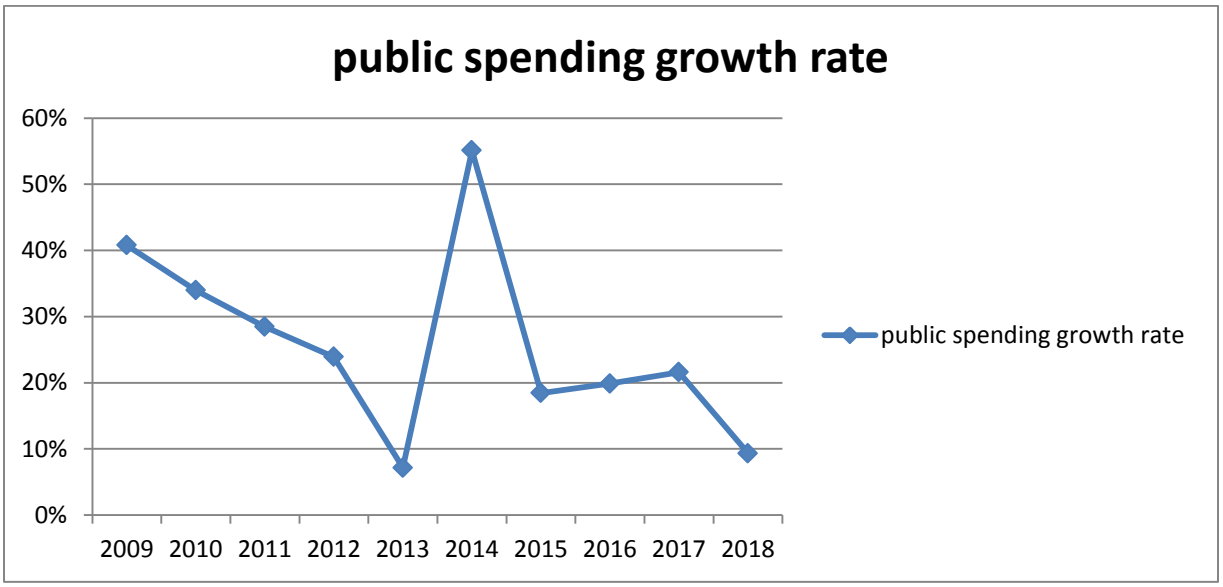
As figure 4.2 clearly shows total growth of total public spending of Ethiopia shows the decreasing trend between the periods 2009 up to 2013 and it is dramatically increase in 2014 which shows a half double when it compares to 2013 recently in 2018 it growth by 10 present comparing the last year figure.

Figure 3 public spending trends in Ethiopia



Source MOFED and own computation

Figure 4 public spending growth rates in Ethiopia



Source MOFED and own computation

4.2 Econometric result and discussion

4.2.1 stationery test

As the time series analysis allowed for only stationery variable in which the mean and the variance should be constant over time it found important to test the stationarity of each variable in the model. Among the methods to test the stationary of the variable augmented dickey fuller test According to the result of augmented dickey fuller test with the assumption of trend and intercept all variable is become stationery at first difference with one present significant level. The result was further indicating that all variable should be used in the model after first difference.

Table 1 Augmented dickey fuller test

At level			At first difference		Order of integration
Variable	t-stat	Critical value	t-stat	Critical value	
Gdp	-5.97	-4.22	-9.24	-4.24	I(1)
Lps	-5.17	-4.23	-4.91	-3.62	I(1)
Lfa	-2.18	-4.22	-7.32	-4.23	I(1)
Lpg	-0.47	-4.24	-5.17	-4.25	I(1)
Ed	-2.50	-4.22	-5.65	-4.23	I(1)
If	-5.78	-4.22	-6.09	-4.24	I(1)

Source own computation from Eview 9

4.2.2 Optimal lag selection criteria

The next step after stationary test is identification of optimal lag length by using Akaike information criterion and according to the process in Akaike information criterion the optimal lag length is two with 5 present level of significant.

Table 2 VAR lag order selection criteria

VAR Lag Order Selection Criteria
Endogenous variables: GDP LFA LPS IF ED LPG
Exogenous variables: C
Date: 06/14/20 Time: 09:14
Sample: 1981 2018
Included observations: 36

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-242.3318	NA	0.039519	13.79621	14.06013	13.88832
1	44.39520	461.9490	3.63e-08	-0.133067	1.714372	0.511739
2	112.5056	87.02993*	7.27e-09*	-1.916977*	1.513981*	-0.719481*

* 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

Source own computation from eview 9

4.2.3 Co-integration test

Co-integration of the variable which can tell as whether the long run relationship between the variable is exist or not. In order to compute the co-integration test Johansens co-integration tests is used and table 3 shows the result of Johansens co-integration tests. According to the result there are four co-integration equation which directly show the presences of long run relationship between the variable. So as to include the long run relationship which presences among the variable in addition to VAR model VEC model has computed.

Table .3 Johansens co-integration tests

Sample (adjusted): 1984 2018
Included observations: 35 after adjustments
Trend assumption: Linear deterministic trend
Series: ED GDP IF LFA LPG LPS
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 *	0.875873	184.2164	95.75366	0.0000
At most 1 *	0.697751	111.1905	69.81889	0.0000
At most 2 *	0.617420	69.31290	47.85613	0.0002
At most 3 *	0.470327	35.68427	29.79707	0.0093
At most 4	0.253179	13.44196	15.49471	0.0996
At most 5	0.088010	3.224410	3.841466	0.0725

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 *	0.875873	73.02586	40.07757	0.0000
At most 1 *	0.697751	41.87761	33.87687	0.0045
At most 2 *	0.617420	33.62863	27.58434	0.0074
At most 3 *	0.470327	22.24231	21.13162	0.0348
At most 4	0.253179	10.21755	14.26460	0.1980
At most 5	0.088010	3.224410	3.841466	0.0725

Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level

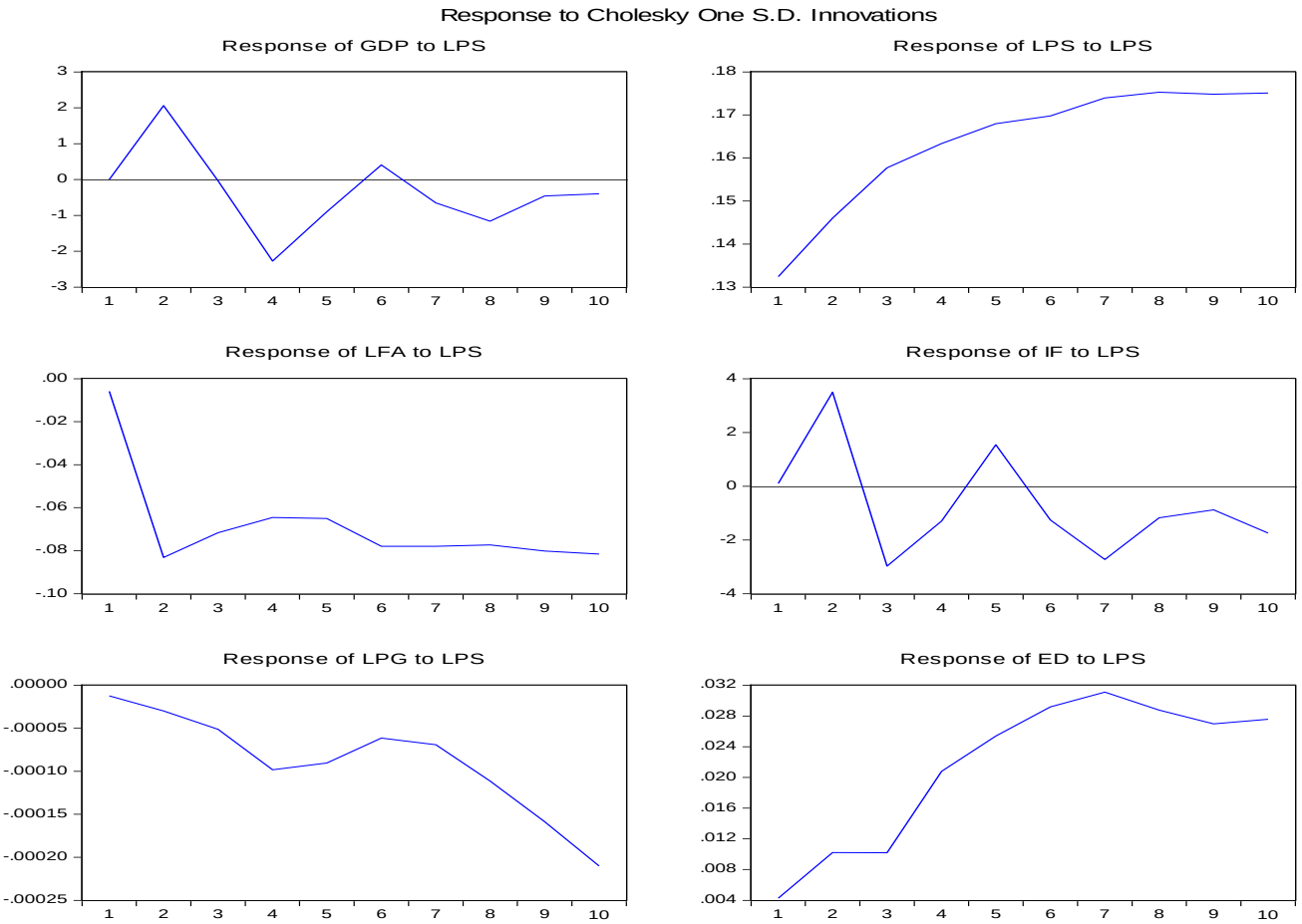
4.2.4 Test of impose response result

The response of other variable for the change in public spending

The response of GDP for the change in public spending is increasing until the second year and then start decline up to the fourth year again it increases up to the sixth year. In the long run it almost sustained within negative regime and the response of foreign aid for the change in public spending is sharply decline until second year and then almost constant within the for casing period

In the other hand the inflation rate response for the change of public spending is increasing and positive until the second year and start decline become negative between second year and third year and then it shows up and down trend for the rest of forecasting period.

Figure 5 the response of other variable to the change in public spending



The response of other variable for the change in foreign aid

As figure 7 shows The response of GDP for the positive change in foreign aid in increasing until the fourth year and it shows decreasing trend up to the sixth year and then increase up to the eight year and end with declining with the forecasting year. The response of public spending for the positive change of foreign aid is negative it shows continues negative response from the beginning up to the last forecasting period.in the other hand the response of inflation rate for the positive change of foreign aid is up and down trade in all forecasting period in the positive regime. In addition to this the population growth shows positive response for the change of foreign aid. The response of external debt is negative for the change of foreign aid.

Figure 6 the response of other variable for the change in foreign aid

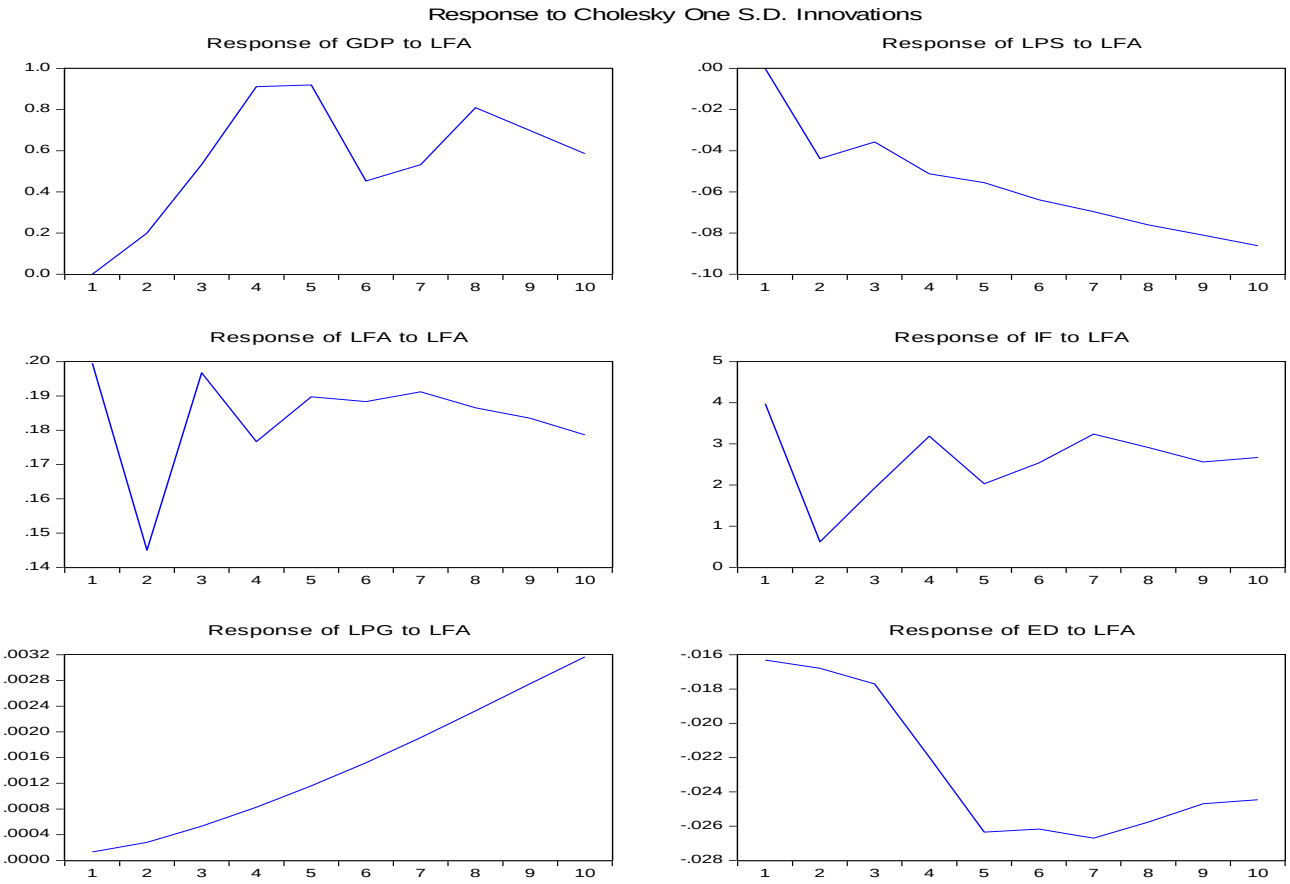


Figure 7 the response of other variable to the change of LPG

The response of other variable for the change of population growth

The response of GDP for the positive innovations of public spending is decline up to the second year and start increasing up to the fourth year and start decline and somehow show sustain positive response up to the forecasting period. The response of public spending for the change in population growth is negative up to the seven year however after the seven year it show positive and increasing trend. In the other hand the response of foreign aid for the positive change in population growth is decreasing and negative within the forecasting period. The response of inflation is negative and decreasing. The response of the external debt is positive and increasing up the fourth year however it starts decline after the fourth year within the forecasting period.

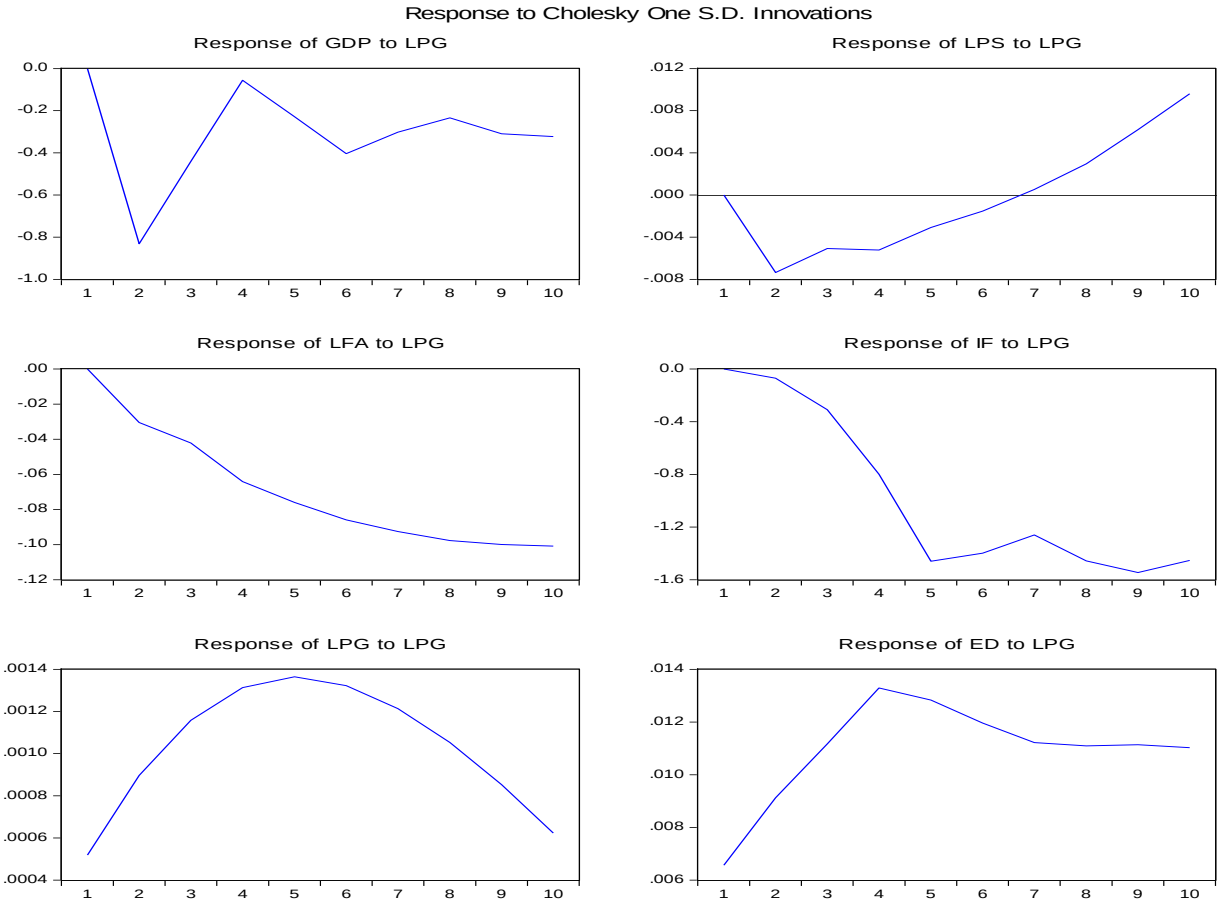


Figure 8 the response of other variable to the change in inflation

The response of other variable for the change of inflation rate

The response of GDP for the positive change of inflation is positive up to the second year however it starts decline up to the fourth year and then it shows up and down trend within the forecasting period in the other hand the response of public spending for the positive change in inflation is increasing and up to the third year then it is constant and remain positive for the forecasting period the response of foreign aid for the change of inflation rate is up and down until the fifth year and the and somehow stable with the positive regime. The response of population growth for the change of inflation is somehow decreasing with negative regime in the other hand the response of external debt increasing up to the third year it is almost constant within the forecasting period.

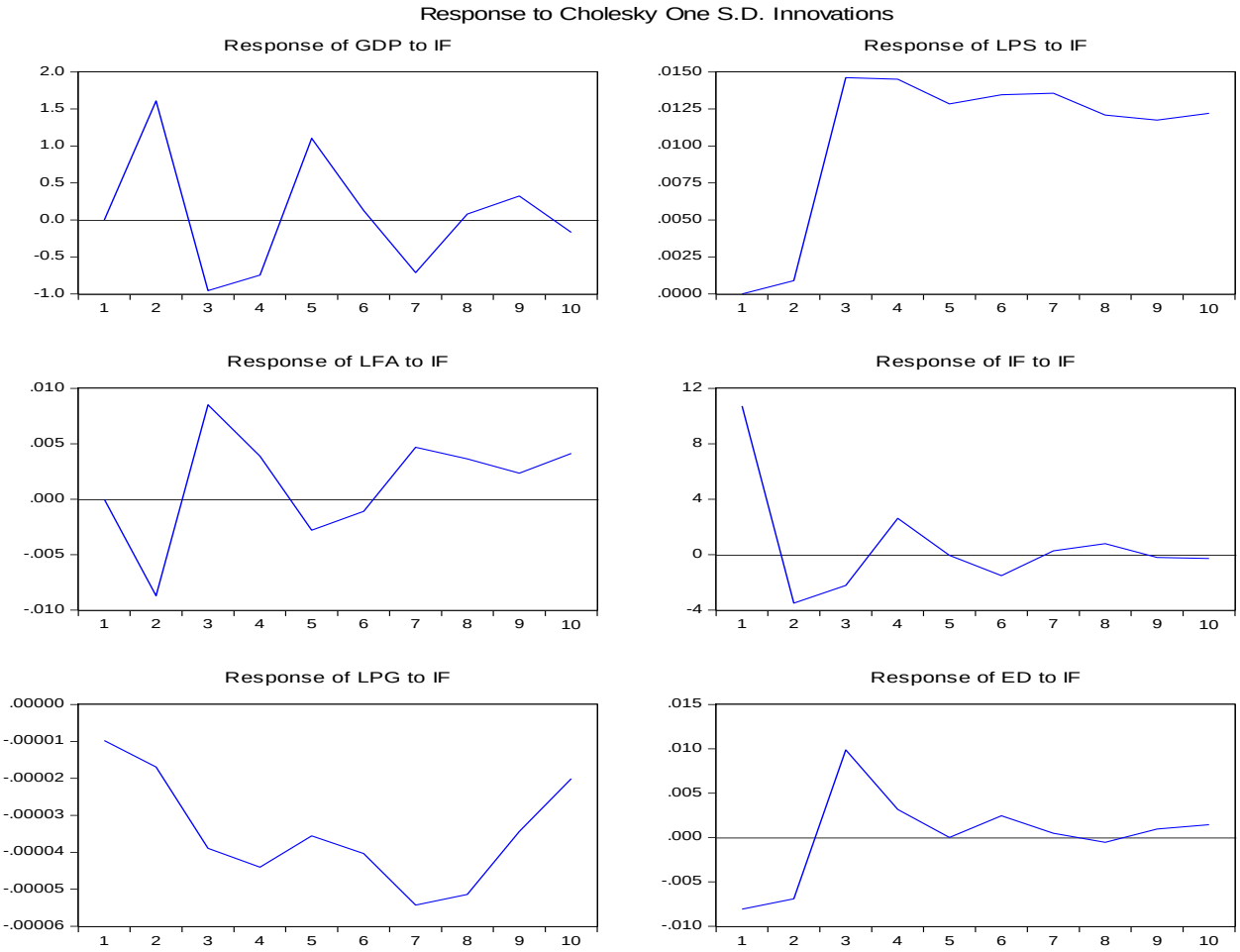
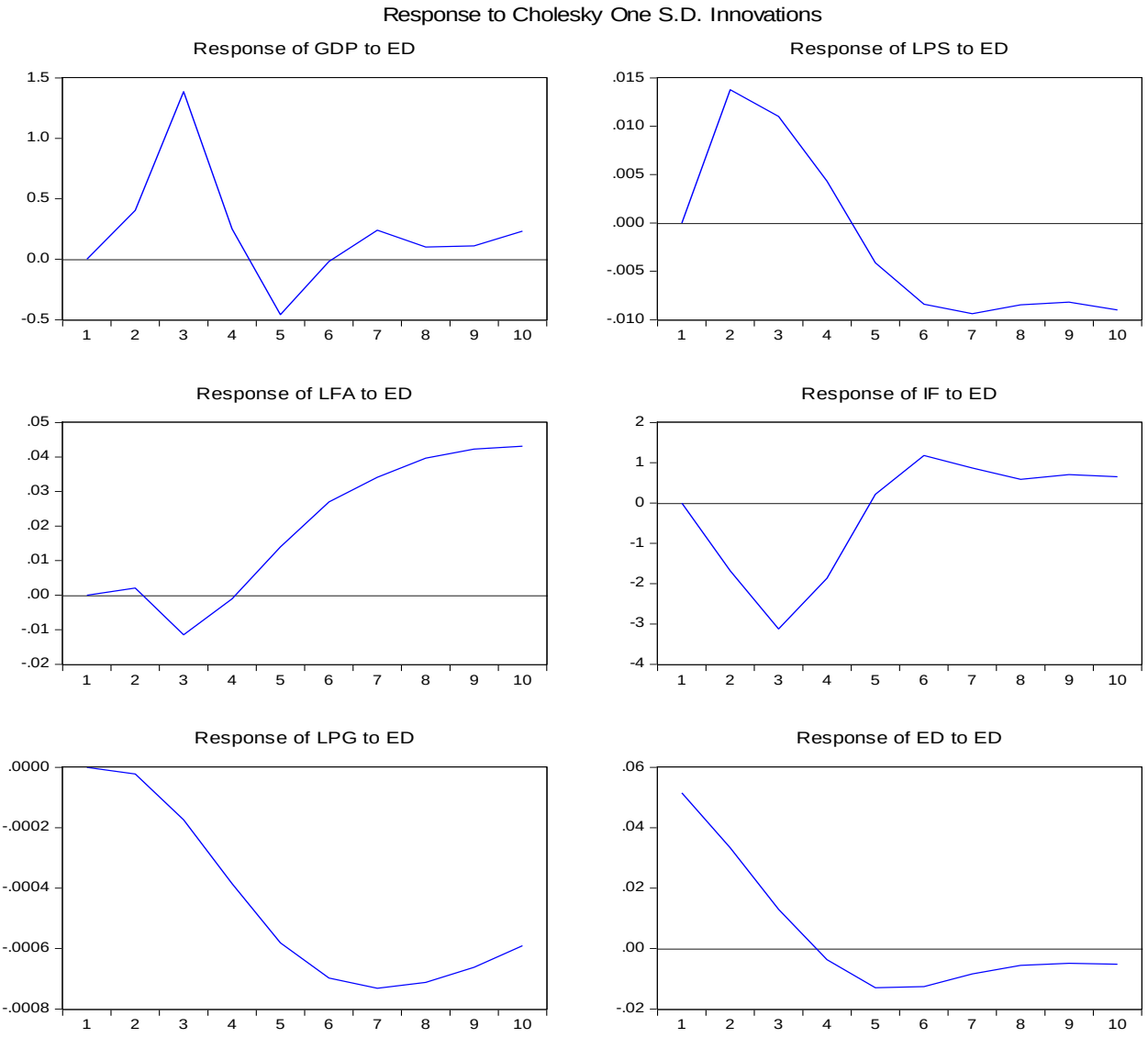


Figure 9 the response of other variable to the change in ED

The response of other variable for the change in external debt

The response of GDP for the change of external debt is increasing up to the third year and start decline after the third year after that it is almost stable in positive regime. In the other hand the response of public spending for the positive change in external debt is increasing until the second year and decline with the negative regime for the forecasting period. The response of population growth for the change of external debt is negative and decline for the forecasting period.



4.2.5 Variance decomposition

As annex B3 clearly shows according to the variance decomposition results the greater variance in the public spending came from the foreign aid next to its own change. In the short run the 89 present came from its own shock and 5.7 present of shock is sourced by the foreign aid. In the other hand in the long run the largest source of 11 present variations in public spending came from foreign aid next to its own shock

The greater variation in GDP came from the change in public spending which contain 26.17 present next to the source of variation from its own shock which take 44.9 present and the second variation 12.37 present sourced explain by the inflation rate.in the other hand the greater variation in the foreign aid explain by the population growth and public spending next to the its own shock which contain 12.6 and 11.24 present.

The greater variation in inflation rate came from or explain by its own shock by 46 present in the long run. The next great variation in the inflation rate came from the public spending which contain 13 present. Which have very important implication that the public spending has significant influence in inflation rate of Ethiopia. The 60 present of the variation in population growth explain by the foreign aid. 32 present of External debt variation explain by public spending in the long run.

4.2.6 Vector Error Correlation Model Result and Analysis

The long run model

$$GDP = -353 + 20.2LPG - 22.86ED$$

$$LPS = -72 + 6.2ED + 4.49\,LPG$$

$$LFA = -79 + 5.61LPG - 2.17ED$$

$$IF = -1034 + 58LPG - 40.91ED$$

According the long run vector error correlation model result the public spending is positively affected by external debt and population growth the percentage change in external debt can lead to 6.2 present increase in public spending in the other hand the percentage change in population growth lead to 4.49 increase in the public spending.

In the long run Public spending positively affected by external debt and population growth which directly mean that the percentage change in external debt can lead to 6.2 present increase in public spending in the other hand the percentage change in population growth lead to 4.49 present increase in public spending.

Population growth positively affected foreign aid while external debt negatively affects the foreign aid link to this the percentage change in population growth can lead to 5.61 present increase in foreign aid in the other hand the percentage changeexternal debt lead to 2.17 present decrease in the foreign aid.

Population growth negatively affect inflation rate and external debt positively affect inflation rate the present change in the population growth lead to 58 present increase in inflation rate in the other hand the percentage change in external debt lead to 40.9 present decrease in inflation.

Table 4 Vector error correction estimates

Vector Error Correction Estimates
Date: 06/14/20 Time: 09:22
Sample (adjusted): 1983 2018

Included observations: 36 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	CointEq2	CointEq3	CointEq4
GDP(-1)	1.000000	0.000000	0.000000	0.000000
LPS(-1)	0.000000	1.000000	0.000000	0.000000
LFA(-1)	0.000000	0.000000	1.000000	0.000000
IF(-1)	0.000000	0.000000	0.000000	1.000000
LPG(-1)	-20.20701	-4.492506	-5.617279	-58.42620
	(4.71258)	(0.88465)	(0.63675)	(9.17780)
	[-4.28789]	[-5.07830]	[-8.82179]	[-6.36604]
ED(-1)	22.86076	-6.924859	2.172588	40.91293
	(10.6621)	(2.00150)	(1.44064)	(20.7646)
	[2.14411]	[-3.45984]	[1.50808]	[1.97032]
C	353.4348	72.15680	79.60613	1034.144

Short run for VECM

According to the short run result for VECM (Annex B2) the adjustment coefficient towards long run equilibrium public spending and foreign aid is 0.06 and 0.08 present respectively in short run foreign aid negatively affect the public spending and public spending positively affect economic growth. And both variable are statically significant.

CHAPTER FIVE

CONCULTION AND RECOMMENDATION

5.1 conclusion

The study is try to investigate the relationship between public spending and foreign aid in Ethiopia by using VAR and VECM model for test the short run and long run relationship respectively time series data which cover from 1981-2018 of gross domestic product, public spending, inflation rate, external debt and population growth is used to analysis the model.

According to the result there are four co-integration equation which directly show the presences of long run relationship between the variable. Based on the long run result the public spending is positively affected by external debt and population growth the percentage change in external debt can lead to 6.2 present increase in public spending in the other hand the percentage change in population growth lead to 4.49 increase in the public spending.

The impose response result shows that the response of GDP for the positive change in foreign aid in increasing until the fourth year and it shows decreasing trend up to the sixth year and then increase up to the eight year and end with declining with the forecasting year. The response of public spending for the positive change of foreign aid is negative it shows continues negative response from the beginning up to the last forecasting period.in the other hand the response of inflation rate for the positive change of foreign aid is up and down trade in all forecasting period in the positive regime. In addition to this the population growth shows positive response for the change of foreign aid. The response of external debt is negative for the change of foreign aid.

In the other hand,the response of GDP for the change in public spending is increasing until the second year and then start decline up to the fourth year again it increases up to the sixth year. In the long run it almost sustained within negative regime and the response of foreign aid for the change in public spending is sharply decline until second year and then almost constant within the for casing period

In the other hand the inflation rate response for the change of public spending is increasing and positive until the second year and start decline become negative between second year and third year and then it shows up and down trend for the rest of forecasting period.

According to the short run result for VECM theadjustment coefficient towards long run equilibrium public spending and foreign aid is 0.06 and 0.08 present respectively in short run foreign aid negatively affect the public spending and public spending positively affect economic growth. And both variable are statically significant.

According to the variance decomposition results the greater variance in the public spending came from the foreign aid next to its own change. 11 present variations in public spending came from foreign aidAccording the long run vector error correlation model result the public spending is positively affected by external debt and population growth the percentage change in ED can lead to 6.2 present increase in public spending in the other hand the percentage change in population growth lead to 4.49 increase in the public spending. Based on the result of short run for VECM the percentage change in forging aid associated with decline the public spending by 0.6 present and it is significant.

Generally, the foreign aid significantly and negatively affects public spending and public spending have a positive and statically affect the economic growth so it is possible to conclude that the forging aid can have good implication in public spending and economic growth.

5.2 Recommendation

Based on the result the researcher recommended that the country should not be depend on different source of foreign aid because the foreign aid affect negatively the public spending and the decrease of foreign aid negatively affect the economic growth of the country. This is caused by most of the foreign aid are directly used in the consumption like military purpose and projects which has not any significant effect for the long run economic growth of the country

Rather than the government depend on foreign aid it should be used some alternative domestic source in order to increase public spending like increasing the revenue from tax in addition to this the government should check the check how to use the foreign aid because in most developing countries foreign aid related to different corruption issue.

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Appendix

Annex A

Annex A1 Augmented Duky fuller test

Null Hypothesis: D(LPG) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 2 (Automatic - based on AIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.176859	0.0010
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LPG,2)

Method: Least Squares

Date: 01/30/20 Time: 06:43

Sample (adjusted): 1985 2018

Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LPG(-1))	-0.072811	0.014065	-5.176859	0.0000
D(LPG(-1),2)	1.413964	0.065759	21.50229	0.0000
D(LPG(-2),2)	-0.595308	0.054785	-10.86619	0.0000
C	0.002639	0.000490	5.387318	0.0000
@TREND("1981")	-2.22E-05	3.94E-06	-5.629091	0.0000

R-squared	0.961572	Mean dependent var	-0.000164
Adjusted R-squared	0.956272	S.D. dependent var	0.000619
S.E. of regression	0.000129	Akaike info criterion	-14.93296
Sum squared resid	4.85E-07	Schwarz criterion	-14.70850
Log likelihood	258.8604	Hannan-Quinn criter.	-14.85641
F-statistic	181.4166	Durbin-Watson stat	1.083507
Prob(F-statistic)	0.000000		

Null Hypothesis: D(RGDP) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Automatic - based on AIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.245485	0.0000
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(GDP,2)

Method: Least Squares

Date: 01/30/20 Time: 06:49

Sample (adjusted): 1984 2018

Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RGDP(-1))	-2.016777	0.218136	-9.245485	0.0000
D(RGDP(-1),2)	0.619691	0.138284	4.481299	0.0001
C	0.060612	2.337823	0.025927	0.9795
@TREND("1981")	0.008148	0.104281	0.078134	0.9382

R-squared	0.774415	Mean dependent var	-0.286077
Adjusted R-squared	0.752584	S.D. dependent var	12.52494
S.E. of regression	6.230023	Akaike info criterion	6.603848
Sum squared resid	1203.209	Schwarz criterion	6.781602
Log likelihood	-111.5673	Hannan-Quinn criter.	6.665208
F-statistic	35.47343	Durbin-Watson stat	1.864964
Prob(F-statistic)	0.000000		

Null Hypothesis: D(ED) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on AIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.654753	0.0002
Test critical values:	1% level	-4.234972	
	5% level	-3.540328	
	10% level	-3.202445	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ED,2)

Method: Least Squares

Date: 01/30/20 Time: 06:49

Sample (adjusted): 1983 2018

Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ED(-1))	-0.994989	0.175956	-5.654753	0.0000
C	0.005415	0.022045	0.245656	0.8075
@TREND("1981")	0.000247	0.000996	0.248524	0.8053

R-squared	0.492531	Mean dependent var	0.001661
Adjusted R-squared	0.461775	S.D. dependent var	0.084586
S.E. of regression	0.062055	Akaike info criterion	-2.641929
Sum squared resid	0.127078	Schwarz criterion	-2.509969
Log likelihood	50.55472	Hannan-Quinn criter.	-2.595872
F-statistic	16.01428	Durbin-Watson stat	1.980239
Prob(F-statistic)	0.000014		

Null Hypothesis: D(IF) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 2 (Automatic - based on AIC, maxlag=2)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-6.096468	0.0001
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(IF,2)

Method: Least Squares

Date: 01/30/20 Time: 06:51

Sample (adjusted): 1985 2018

Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IF(-1))	-2.816173	0.461935	-6.096468	0.0000
D(IF(-1),2)	1.005172	0.330220	3.043948	0.0049
D(IF(-2),2)	0.298204	0.176816	1.686525	0.1024
C	2.384714	6.103549	0.390709	0.6989
@TREND("1981")	-0.094273	0.268508	-0.351100	0.7281

R-squared	0.810992	Mean dependent var	0.185294
Adjusted R-squared	0.784922	S.D. dependent var	33.09553
S.E. of regression	15.34855	Akaike info criterion	8.434972
Sum squared resid	6831.764	Schwarz criterion	8.659437
Log likelihood	-138.3945	Hannan-Quinn criter.	8.511521
F-statistic	31.10816	Durbin-Watson stat	2.030396
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LPS) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.915255	0.0003
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LPS,2)

Method: Least Squares

Date: 06/19/20 Time: 21:48

Sample (adjusted): 1983 2018

Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LPS(-1))	-0.834404	0.169758	-4.915255	0.0000
C	0.108665	0.031797	3.417460	0.0017

R-squared	0.415403	Mean dependent var	-0.004337
Adjusted R-squared	0.398209	S.D. dependent var	0.169895
S.E. of regression	0.131796	Akaike info criterion	-1.161166
Sum squared resid	0.590589	Schwarz criterion	-1.073193
Log likelihood	22.90099	Hannan-Quinn criter.	-1.130461
F-statistic	24.15973	Durbin-Watson stat	1.955442
Prob(F-statistic)	0.000022		

Null Hypothesis: D(LFA) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.326828	0.0000
Test critical values:	1% level	-4.234972	
	5% level	-3.540328	
	10% level	-3.202445	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LFA,2)

Method: Least Squares

Date: 06/13/20 Time: 13:41

Sample (adjusted): 1983 2018

Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFA(-1))	-1.204667	0.164419	-7.326828	0.0000
C	0.180202	0.079263	2.273470	0.0296
@TREND("1981")	-0.004066	0.003494	-1.163686	0.2529

R-squared	0.620207	Mean dependent var	0.006479
Adjusted R-squared	0.597189	S.D. dependent var	0.341485
S.E. of regression	0.216732	Akaike info criterion	-0.140657
Sum squared resid	1.550097	Schwarz criterion	-0.008697
Log likelihood	5.531833	Hannan-Quinn criter.	-0.094600
F-statistic	26.94467	Durbin-Watson stat	1.691151
Prob(F-statistic)	0.000000		

Annex A2 VAR Lag Exclusion Wald Tests

VAR Lag Exclusion Wald Tests
Date: 06/14/20 Time: 09:34
Sample: 1981 2018
Included observations: 36

Chi-squared test statistics for lag exclusion:
Numbers in [ ] are p-values

	GDP	LPS	LFA	IF	LPG	ED	Joint
Lag 1	24.32341	41.37846	21.15512	8.771455	624.5911	21.59631	852.8650
	[0.000455]	[2.44e-07]	[0.001721]	[0.186845]	[0.000000]	[0.001433]	[0.000000]
Lag 2	25.90344	9.274487	8.698748	6.545574	122.8198	8.011639	208.4748
	[0.000232]	[0.158719]	[0.191242]	[0.364921]	[0.000000]	[0.237252]	[0.000000]
df	6	6	6	6	6	6	36

Annex A3 VAR Residual

SerialCorrelation LM

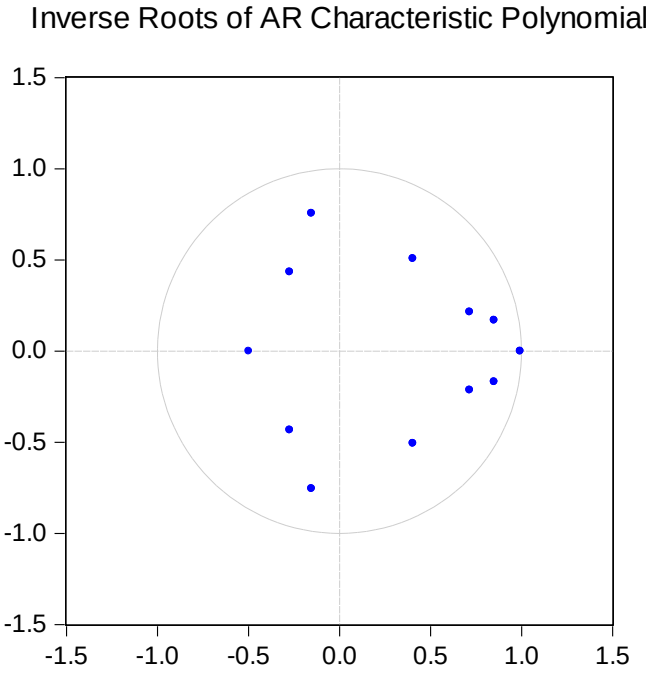
VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag
order h
Date: 06/14/20 Time: 09:35
Sample: 1981 2018

Included observations: 36

Lags	LM-Stat	Prob
1	52.15390	0.0399
2	70.18343	0.0006

Probs from chi-square with 36 df.

Annex A4 Stability test



ANNEX B

Annex B1 CO integration test

date: 06/14/20 Time: 09:16						
Sample (adjusted): 1984 2018						
Included observations: 35 after adjustments						
Trend assumption: Linear deterministic trend						
Series: ED GDP IF LFA LPG LPS						
Lags interval (in first differences): 1 to 2						
Unrestricted Cointegration Rank Test (Trace)						
Hypothesized		Trace	0.05			
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**		
None *	0.875873	184.2164	95.75366	0.0000		
At most 1 *	0.697751	111.1905	69.81889	0.0000		
At most 2 *	0.617420	69.31290	47.85613	0.0002		
At most 3 *	0.470327	35.68427	29.79707	0.0093		
At most 4	0.253179	13.44196	15.49471	0.0996		
At most 5	0.088010	3.224410	3.841466	0.0725		
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		Max-Eigen	0.05			
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**		
None *	0.875873	73.02586	40.07757	0.0000		
At most 1 *	0.697751	41.87761	33.87687	0.0045		
At most 2 *	0.617420	33.62863	27.58434	0.0074		
At most 3 *	0.470327	22.24231	21.13162	0.0348		
At most 4	0.253179	10.21755	14.26460	0.1980		
At most 5	0.088010	3.224410	3.841466	0.0725		
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):						
ED	GDP	IF	LFA	LPG	LPS	
22.75238	-0.111794	0.208274	-0.077612	-1.793001	-1.861217	
-0.207524	-0.165981	0.060970	4.218583	-7.559526	-1.294126	
2.362861	-0.538940	-0.093945	3.955610	-4.820347	-0.775010	
18.32500	0.134790	-0.017085	3.838243	-12.91993	-1.673181	
-3.747676	-0.101486	0.066957	-0.735727	-8.459516	1.243628	
-4.705965	-0.009054	-0.052364	0.267413	-10.88933	3.386351	
Unrestricted Adjustment Coefficients (alpha):						
D(ED)	-0.002262	0.007504	-0.006521	-0.036001	0.003575	0.004942
D(GDP)	1.828185	1.802537	2.373232	-0.575501	0.656740	-0.167076
D(IF)	-5.681870	-2.050437	5.365999	0.338159	-3.879857	-0.798070
D(LFA)	-0.041031	-0.056647	0.033774	0.013144	0.022727	-0.033600
D(LPG)	-0.000236	6.21E-05	1.46E-05	4.63E-05	4.64E-05	3.32E-05
D(LPS)	-0.004493	0.053790	-0.037147	-0.018199	-0.006927	-0.018947
1 Cointegrating Equation(s):		Log likelihood	133.3248			
Normalized cointegrating coefficients (standard error in parentheses)						
ED	GDP	IF	LFA	LPG	LPS	
1.000000	-0.004914	0.009154	-0.003411	-0.078805	-0.081803	
	(0.00216)	(0.00076)	(0.02337)	(0.07167)	(0.01221)	
Adjustment coefficients (standard error in parentheses)						
D(ED)	-0.051469					
	(0.28235)					
D(GDP)	41.59554					
	(20.4575)					
D(IF)	-129.2760					
	(55.3263)					
D(LFA)	-0.933562					
	(0.73508)					
D(LPG)	-0.005359					
	(0.00098)					
D(LPS)	-0.102224					
	(0.52912)					

2 Cointegrating Equation(s):		Log likelihood	154.2636			
Normalized cointegrating coefficients (standard error in parentheses)						
ED	GDP	IF	LFA	LPG	LPS	
1.000000	0.000000	0.007304	-0.127510	0.144094	-0.043228	
		(0.00116)	(0.02982)	(0.10631)	(0.01844)	
0.000000	1.000000	-0.376463	-25.25669	45.36447	7.850896	
		(0.17918)	(4.62576)	(16.4925)	(2.86117)	
Adjustment coefficients (standard error in parentheses)						
D(ED)	-0.053026	-0.000993				
	(0.27989)	(0.00246)				
D(GDP)	41.22147	-0.503566				
	(18.3968)	(0.16180)				
D(IF)	-128.8505	0.975532				
	(54.3839)	(0.47831)				
D(LFA)	-0.921807	0.013989				
	(0.67918)	(0.00597)				
D(LPG)	-0.005372	1.60E-05				
	(0.00094)	(8.2E-06)				
D(LPS)	-0.113386	-0.008426				
	(0.45680)	(0.00402)				
3 Cointegrating Equation(s):		Log likelihood	171.0779			
Normalized cointegrating coefficients (standard error in parentheses)						
ED	GDP	IF	LFA	LPG	LPS	
1.000000	0.000000	0.000000	-0.345056	0.592627	0.039519	
			(0.07340)	(0.29583)	(0.05206)	
0.000000	1.000000	0.000000	-14.04418	22.24666	3.586051	
			(1.76980)	(7.13296)	(1.25534)	
0.000000	0.000000	1.000000	29.78380	-61.40787	-11.32872	
			(7.23782)	(29.1711)	(5.13389)	
Adjustment coefficients (standard error in parentheses)						
D(ED)	-0.068433	0.002522	0.000599			
	(0.27951)	(0.00702)	(0.00289)			
D(GDP)	46.82909	-1.782596	0.267709			

	(14.2036)	(0.35696)	(0.14683)			
D(IF)	-116.1714	-1.916418	-1.812507			
	(47.6654)	(1.19789)	(0.49274)			
D(LFA)	-0.842004	-0.004213	-0.015172			
	(0.66169)	(0.01663)	(0.00684)			
D(LPG)	-0.005338	8.16E-06	-4.66E-05			
	(0.00094)	(2.4E-05)	(9.7E-06)			
D(LPS)	-0.201160	0.011594	0.005834			
	(0.42015)	(0.01056)	(0.00434)			
4 Cointegrating Equation(s):		Log likelihood	182.1991			
Normalized cointegrating coefficients (standard error in parentheses)						
ED	GDP	IF	LFA	LPG	LPS	
1.000000	0.000000	0.000000	0.000000	-0.171671	-0.044918	
				(0.13630)	(0.02830)	
0.000000	1.000000	0.000000	0.000000	-8.861169	0.149380	
				(5.83831)	(1.21224)	
0.000000	0.000000	1.000000	0.000000	4.563157	-4.040495	
				(14.6728)	(3.04660)	
0.000000	0.000000	0.000000	1.000000	-2.214997	-0.244704	
				(0.50869)	(0.10562)	
Adjustment coefficients (standard error in parentheses)						
D(ED)	-0.728155	-0.002331	0.001214	-0.132144		
	(0.27429)	(0.00553)	(0.00222)	(0.06496)		
D(GDP)	36.28304	-1.860168	0.277542	14.64093		
	(17.8229)	(0.35906)	(0.14417)	(4.22081)		
D(IF)	-109.9747	-1.870838	-1.818285	14.31478		
	(61.0350)	(1.22960)	(0.49371)	(14.4543)		
D(LFA)	-0.601147	-0.002441	-0.015397	-0.051742		
	(0.84364)	(0.01700)	(0.00682)	(0.19979)		
D(LPG)	-0.004489	1.44E-05	-4.74E-05	0.000516		
	(0.00116)	(2.3E-05)	(9.4E-06)	(0.00028)		
D(LPS)	-0.534650	0.009141	0.006145	0.010474		
	(0.52560)	(0.01059)	(0.00425)	(0.12447)		
5 Cointegrating Equation(s):		Log likelihood	187.3079			

Normalized cointegrating coefficients (standard error in parentheses)						
ED	GDP	IF	LFA	LPG	LPS	
1.000000	0.000000	0.000000	0.000000	0.000000	-0.061901	
					(0.01215)	
0.000000	1.000000	0.000000	0.000000	0.000000	-0.727250	
					(0.57694)	
0.000000	0.000000	1.000000	0.000000	0.000000	-3.589065	
					(1.22163)	
0.000000	0.000000	0.000000	1.000000	0.000000	-0.463833	
					(0.10115)	
0.000000	0.000000	0.000000	0.000000	1.000000	-0.098929	
					(0.04261)	
Adjustment coefficients (standard error in parentheses)						
D(ED)	-0.741553	-0.002694	0.001453	-0.134774	0.413653	
	(0.27556)	(0.00559)	(0.00230)	(0.06509)	(0.16736)	
D(GDP)	33.82180	-1.926818	0.321515	14.15775	-26.46433	
	(17.4618)	(0.35406)	(0.14559)	(4.12488)	(10.6055)	
D(IF)	-95.43421	-1.477087	-2.078067	17.16929	28.27467	
	(56.2164)	(1.13985)	(0.46870)	(13.2796)	(34.1432)	
D(LFA)	-0.686322	-0.004748	-0.013875	-0.068463	-0.023083	
	(0.83778)	(0.01699)	(0.00699)	(0.19790)	(0.50883)	
D(LPG)	-0.004663	9.69E-06	-4.43E-05	0.000481	-0.001108	
	(0.00114)	(2.3E-05)	(9.5E-06)	(0.00027)	(0.00069)	
D(LPS)	-0.508688	0.009844	0.005681	0.015570	0.074222	
	(0.52799)	(0.01071)	(0.00440)	(0.12472)	(0.32068)	

Annex B2 short run VECM result

Error Correction:	D(GDP)	D(LPS)	D(LFA)	D(IF)	D(LPG)	D(ED)
CointEq1	-1.479136	-0.002649	0.003155	-0.906595	-2.77E-05	-0.003918
	(0.19888)	(0.00650)	(0.00970)	(0.55570)	(2.8E-05)	(0.00265)
	[-7.43726]	[-0.40740]	[0.32520]	[-1.63146]	[-0.99022]	[-1.47956]
CointEq2	-5.499958	-0.006789	0.056817	5.328152	0.000472	0.044642
	(1.45982)	(0.04773)	(0.07121)	(4.07888)	(0.00021)	(0.01944)

	[-3.76757]	[-0.14224]	[0.79791]	[1.30628]	[2.29672]	[2.29652]
CointEq3	9.379699	-0.006521	0.083043	17.68116	0.000596	-0.078945
	(2.35584)	(0.07703)	(0.11491)	(6.58247)	(0.00033)	(0.03137)
	[3.98146]	[-0.08466]	[0.72266]	[2.68610]	[1.79698]	[-2.51657]
CointEq4	0.152578	0.001955	0.000374	-1.616393	-1.35E-06	0.001357
	(0.10670)	(0.00349)	(0.00520)	(0.29813)	(1.5E-05)	(0.00142)
	[1.43000]	[0.56044]	[0.07181]	[-5.42184]	[-0.08953]	[0.95516]
D(GDP(-1))	0.365306	-0.000567	-0.004099	0.139829	1.16E-05	0.001503
	(0.13800)	(0.00451)	(0.00673)	(0.38559)	(1.9E-05)	(0.00184)
	[2.64710]	[-0.12577]	[-0.60894]	[0.36263]	[0.59804]	[0.81817]
D(LPS(-1))	20.52457	0.090504	-0.656621	22.76847	-0.000511	0.011158
	(6.18134)	(0.20210)	(0.30151)	(17.2713)	(0.00087)	(0.08231)
	[3.32041]	[0.44782]	[-2.17774]	[1.31828]	[-0.58760]	[0.13557]
D(LFA(-1))	-9.701555	-0.185229	-0.297843	-10.43674	-0.000355	0.044610
	(3.77985)	(0.12358)	(0.18437)	(10.5613)	(0.00053)	(0.05033)
	[-2.56665]	[-1.49882]	[-1.61543]	[-0.98821]	[-0.66749]	[0.88632]
D(IF(-1))	0.001753	-0.001687	-0.001210	0.264811	1.02E-06	-0.001506
	(0.06940)	(0.00227)	(0.00339)	(0.19391)	(9.8E-06)	(0.00092)
	[0.02527]	[-0.74340]	[-0.35739]	[1.36565]	[0.10450]	[-1.62918]
D(LPG(-1))	-1694.391	-17.56924	-58.44664	288.7496	0.738007	9.145915
	(504.271)	(16.4873)	(24.5974)	(1408.99)	(0.07101)	(6.71481)
	[-3.36008]	[-1.06562]	[-2.37613]	[0.20493]	[10.3935]	[1.36205]
D(ED(-1))	-23.04495	0.215315	0.165759	52.64219	0.002231	0.162648
	(14.3773)	(0.47007)	(0.70130)	(40.1718)	(0.00202)	(0.19145)
	[-1.60287]	[0.45805]	[0.23636]	[1.31043]	[1.10211]	[0.84957]
C	49.27242	0.660904	1.957009	-11.39473	0.007923	-0.271797
	(15.3444)	(0.50169)	(0.74847)	(42.8738)	(0.00216)	(0.20432)
	[3.21110]	[1.31735]	[2.61467]	[-0.26577]	[3.66684]	[-1.33022]
R-squared	0.800453	0.238762	0.385675	0.732114	0.969432	0.397902
Adj. R-squared	0.720634	-0.065734	0.139944	0.624960	0.957205	0.157063
Sum sq. resids	432.3355	0.462161	1.028662	3375.252	8.57E-06	0.076659

S.E. equation	4.158536	0.135965	0.202846	11.61938	0.000586	0.055375
F-statistic	10.02838	0.784122	1.569504	6.832334	79.28487	1.652151
Log likelihood	-95.82408	27.31470	12.91290	-132.8145	223.4273	59.65264
Akaike AIC	5.934671	-0.906372	-0.106272	7.989694	-11.80152	-2.702924
Schwarz SC	6.418524	-0.422519	0.377581	8.473547	-11.31766	-2.219071
Mean dependent	0.163727	0.131091	0.084878	0.083333	0.030073	0.010284
S.D. dependent	7.867811	0.131705	0.218727	18.97336	0.002831	0.060313

Determinant resid covariance (dof adj.)	9.90E-10
Determinant resid covariance	1.11E-10
Log likelihood	106.0919
Akaike information criterion	-0.893996
Schwarz criterion	3.064802

Annex B3 variance decomposition

Period	S.E.	GDP	LPS	LFA	IF	LPG	ED
1	4.158536	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	5.003721	69.13359	16.97229	0.159975	10.32230	2.759717	0.652126
3	5.636191	65.23678	13.38195	1.021820	11.00720	2.784894	6.567352
4	6.197487	54.01437	24.51860	3.007189	10.55299	2.311327	5.595524
5	6.484372	50.53802	24.32400	4.760157	12.52927	2.235918	5.612632
6	6.528086	49.91249	24.38375	5.177145	12.39943	2.588733	5.538451
7	6.643383	48.54540	24.50584	5.640158	13.12390	2.705810	5.478890
8	6.800347	46.38847	26.32006	6.801017	12.53840	2.701016	5.251038
9	6.868356	45.51501	26.24768	7.701515	12.51150	2.850847	5.173448
10	6.921798	44.91830	26.17108	8.300562	12.37916	3.024044	5.206861

Period	S.E.	GDP	LPS	LFA	IF	LPG	ED
1	4.158536	5.163900	94.83610	0.000000	0.000000	0.000000	0.000000
2	5.003721	4.588430	90.37002	4.472263	0.001831	0.125883	0.441577
3	5.636191	4.206212	90.39679	4.538217	0.304103	0.113264	0.441413
4	6.197487	3.883029	89.49900	5.764860	0.420541	0.105992	0.326581
5	6.484372	3.740839	88.80695	6.663836	0.441464	0.087281	0.259631
6	6.528086	3.757135	87.74125	7.723666	0.458683	0.070765	0.248503
7	6.643383	3.774077	86.75552	8.699283	0.466087	0.058191	0.246844
8	6.800347	3.729608	85.80819	9.718761	0.453160	0.052675	0.237603
9	6.868356	3.662367	84.89355	10.71619	0.440002	0.059062	0.228831
10	6.921798	3.582763	83.97083	11.70794	0.432159	0.080568	0.225736

Period	S.E.	GDP	LPS	LFA	IF	LPG	ED
1	4.158536	3.144344	0.082878	96.77278	0.000000	0.000000	0.000000
2	5.003721	3.502788	9.752752	85.32923	0.106336	1.302901	0.005990
3	5.636191	2.167486	10.31897	84.95911	0.126440	2.311632	0.116360
4	6.197487	1.622997	10.37826	83.45372	0.104137	4.353156	0.087728
5	6.484372	1.255851	10.09911	82.18794	0.084281	6.209267	0.163552
6	6.528086	1.029486	10.51574	80.05828	0.068173	7.908358	0.419961
7	6.643383	0.891846	10.69610	78.26052	0.063610	9.358202	0.729722
8	6.800347	0.790217	10.81268	76.60460	0.058053	10.67077	1.063678
9	6.868356	0.717234	11.00996	75.09724	0.052022	11.75797	1.365569
10	6.921798	0.675822	11.24070	73.74152	0.049974	12.67278	1.619201

Period	S.E.	GDP	LPS	LFA	IF	LPG	ED
1	4.158536	3.165226	0.007584	11.71618	85.11101	0.000000	0.000000
2	5.003721	5.138502	7.334390	9.694513	76.13343	0.002949	1.696220
3	5.636191	4.415723	10.86119	10.23539	67.96253	0.051809	6.473355
4	6.197487	6.294575	10.23840	13.49676	62.42266	0.332302	7.215312
5	6.484372	6.128937	10.87743	14.76170	60.03193	1.240478	6.959527
6	6.528086	6.048451	10.88566	16.51786	57.46861	1.962758	7.116669
7	6.643383	5.617557	12.84951	19.18446	53.08414	2.408811	6.855524
8	6.800347	5.425997	12.73789	21.31631	50.80797	3.054751	6.657081
9	6.868356	5.250883	12.55052	22.81967	49.01617	3.770917	6.591835
10	6.921798	5.029295	13.02288	24.21007	46.97300	4.309810	6.454939

Period	S.E.	GDP	LPS	LFA	IF	LPG	ED
1	4.158536	16.48269	0.044497	4.940041	0.027813	78.50496	0.000000
2	5.003721	20.24582	0.071370	6.477634	0.026003	73.14544	0.033731
3	5.636191	22.88354	0.100081	10.30112	0.051730	65.82618	0.837346
4	6.197487	22.72643	0.190694	15.19066	0.054906	59.27879	2.558524
5	6.484372	20.98917	0.189634	21.25841	0.044998	52.96203	4.555754
6	6.528086	19.01792	0.151603	28.27650	0.040356	46.49692	6.016694
7	6.643383	17.06966	0.129973	36.19108	0.041864	39.91293	6.654488
8	6.800347	15.11572	0.137408	44.61578	0.039893	33.46732	6.623876
9	6.868356	13.20682	0.167721	52.96704	0.033513	27.45950	6.165403
10	6.921798	11.41554	0.216129	60.70135	0.026908	22.15851	5.481567

Period	S.E.	GDP	LPS	LFA	IF	LPG	ED
1	4.158536	0.744330	0.594817	8.676976	2.126163	1.404228	86.45349
2	5.003721	1.221187	2.595056	11.57998	2.388376	2.668912	79.54649
3	5.636191	3.616905	3.988532	15.14229	3.705528	4.412336	69.13441
4	6.197487	3.384172	9.651716	19.68502	3.232934	6.261663	57.78450
5	6.484372	2.755543	15.32883	23.96997	2.596277	6.964023	48.38536
6	6.528086	2.483677	20.78548	26.25796	2.186654	7.088810	41.19742
7	6.643383	2.228339	25.46559	28.02363	1.851179	7.020825	35.41044
8	6.800347	2.009969	28.38654	29.46647	1.633612	7.072063	31.43134
9	6.868356	1.853306	30.36307	30.56980	1.481114	7.191975	28.54074
10	6.921798	1.716979	32.13611	31.37267	1.360963	7.267298	26.14598

ED