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IMPACT OF MACROECONOMIC INSTABILITY ON ECONOMIC GROWTH AND PRIVATE CAPITAL ACCUMULATION IN ETHIOPIA

BY: BELAY TILAHUN

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IMPACT OF MACROECONOMIC INSTABIITY ON ECONOMIC GROWTH AND PRIVATE CAPITAL ACCUMULATION IN ETHIOPIA

BELAY TILAHUN

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This is to certify that the thesis prepared by Belay Tilahun, entitled: *Impact of macroeconomic instability on Economic Growth and Private Capital Accumulation in Ethiopia* and submitted in partial fulfillment of the requirements for the Degree of Master of science (Economic Policy Analysis) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Abstract

Impact of Macroeconomic Instability on Economic Growth and Private capital accumulation in Ethiopia

Belay Tilahun

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Analyzing impact of macroeconomic instability on economic growth and private capital accumulation from the year 1974 to 2013 is the main objective of the study. Rather than using one variable as a proxy for macroeconomic instability, the researcher attempts to calculate macroeconomic instability index by using four variables: budget deficit, public debt, exchange rate variability and inflation by utilizing UNDP HDI methodology. In specification of regression equations, endogenous growth model and accelerator model are used for growth and capital accumulation equation respectively. Empirical analysis has been performed by using Johansson maximum likelihood method, the result shows that there is a long run relationship among the variables entered in both models. Both the long run and short run result shows that, macroeconomic instability has a detrimental effect on both economic growth and private capital accumulation. Based on the finding, the major policy implication of this study is that, poor management of macroeconomic with the adoption of incorrect and illogical fiscal and monetary policies and passive reaction against shocks will intensify the macroeconomic instability. Due to this, the way of reaction to the shocks is very important.

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Words are powerless to express my praise and adoration to the **Almighty God** and his **Blessed mom Saint Mary**, for their love, comfort, kindness, strength and mercy. How could I express my praise? I don't know. JUST THANK YOU!! May your name praise forever!!!!!!!!!

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Acronyms

ADF: Augmented Dickey Fuller

AIC: Akike Information Criterion

ARCH: Auto Regressive Conditional Hetroscedasticity

CBE: Commercial Bank of Ethiopia

CSA: Central Statistical Agency

DF: Dickey Fuller

ECT_{-1}: Lagged Error Correction Term

EEA: Ethiopian Economic Association

E-G: Engel – Granger

ETB: Ethiopian Birr

EU: European Union

FDI: Foreign Direct Investment

FPE: Final Prediction Error

GDP: Gross Domestic Product

GOE: Government of Ethiopia

GTP: Gross Transformation Plan

HDI: Human Development Index

HIPC: Highly Indebted Poor Countries

HQ: Hannan-Quinn Information Criteria

Ibid: from the same source

ILO: International Labor Organization

IMF: International Monetary Fund

MDG: Millennium Development Goal

MDRI: Multilateral Debt Relief Initiative

MII: Macroeconomic Instability Index

MOFED: Ministry Of Finance and Economic Development

NBE: National Bank of Ethiopia

OLS: Ordinary Least Square

PP: Phillip Perron

RGDP: Real Gross Domestic Product

R&D: Research and Development

SIC: Schwarz (Bayesian) Information Criteria

UNDP: United Nation Development Program

USD: US dollar

VAR: Vector Autoregressive

VECM: Vector Error Correction Model

This Thesis is dedicated for MY MOM!

Chapter1: introduction

1.1. Back ground of the study

Achieving sustainable economic growth and macroeconomic stability is the centerpiece of every nation. Dhonte and Kapur (1997) points out that sustainable economic growth requires free and competitive function market and setting up a safe economic environment for promoting private sector investment and hence capital accumulation. In this regard, macroeconomic stability can have very effective role. According to IMF and EU (1991) macroeconomic stability is measured by using five variables: low and stable inflation rate which is capped to be around 3percent, low long-term interest rate which should be on the range of 9percent, low national debt relative to GDP which should be around 60percent, low fiscal deficit which should be capped around 3percent of GDP and at the last currency stability which is permitted fluctuation of at most 2.5percent. If the values of these variables fluctuate and increase every time, this will make the domestic macroeconomic environment less predictable and it is of course concern because its unpredictability hampers resource allocation decisions, investment and growth.

Macroeconomic instability is a series issue in Ethiopia. Even if the country has achieved a single digit inflation (which is around 5.4percent in October 2014 according to CSA estimate) and a double digit economic growth (around 11.0-11.4percent according optimistic authorities and 8.0-8.5percent according to IMF in the year 2013/14 and 2014/15), this is not in the presence of negative real interest rates, an overvalued and fluctuation exchange rate and low reserve coverage. Growth has also fluctuated in the context of global and domestic shocks. Thus, the country remains vulnerable to terms of trade shocks. Export diversification and competitiveness lag behind those of other African countries according to IMF (2014). In addition, the budget

deficit has increased from 2.8% of GDP in 2012 to 3.3% of GDP in 2013 (MOFED, 2014) and also debt-to-exports ratios has reached about 29 percent (World Bank, 2014).

Government's desire to achieve double digit economic growth can harm macroeconomic stability through creating macroeconomic shocks. For instance trade and financial openness may increase the vulnerability of the economy to global shocks (the risk of sudden stop of capital flows) and contribute to greater shocks amplification and possibly it could be persistent (Mougani, 2012). In addition to this, an increase in public investment may lead to a reduction in private investment due to the unfavorable effects of government financing (e.g. borrowing) on the existing financial resources and/or on the interest rates. Therefore, this effect of public capital spending on private investment should be considered for a meaningful national policy making.

The Ethiopian government external debt has stood USD 14 billion at the end of June 2014 (MOFED, 2014).This debt portfolio entails significant exposure to exchange rate fluctuations as USD 14 billion is denominated in foreign currency. This represents potential risk given the historical trend of Ethiopian birr (ETB) depreciation against major foreign currencies. In addition, any adverse shocks in the terms of trade and foreign capital inflow will aggravate the exposure to exchange rate risks. Similarly, total domestic debt has reached about 16.9 percent of GDP at the end of 2012/13, 60 percent of which was accounted by direct advances from NBE, 28 percent by treasury bills, and 13 percent by government bonds held mostly by NBE and Commercial Bank of Ethiopia (CBE) (IMF, 2014). This huge amount of public debt from domestic sources may prohibit private sector to borrow from domestic creditors and this will hinder the private capital accumulation.

In addition, since January 2011, the National Bank of Ethiopia requires banks to purchase five-year central bank bills, at three percent interest, in an amount equal to 27% of all new loans (MOFED, 2013). As a result, commercial bank liquidity and capacity to supply credit has been seriously threatened so lack of access to finance is a major constraint for local businesses.

In general the financing mode of the continuing large-scale investment through public enterprise could undermine macroeconomic stability. Since part of it is financed domestically it can squeezes the availability of credit for the private sector. In addition the desire of the GOE to increase the tax revenue which is the tax-to-GDP ratio in 2013/14 is 13.0% to 13.3% in 2014/15 may undermine stability of price and hence macroeconomic stability.

1.2. Statement of the problem

Many economists argued that macroeconomic instability has detrimental effect on both private capital accumulation and economic growth (Fischer, 1993; Agenor, 2000; Ismihan, 2003). In addition to this, chronic macroeconomic instability may lead to a low level of foreign direct investment, worsening of income distribution and poverty (Ismihan et al 2003). Hausman and Gavin (1996) have shown that economies with larger and significant fluctuations (more unstable) have very unequal income distribution than other economies.

Ismihan (2003) points out that macroeconomic instability can affect capital formation and economic growth through creating uncertainty on current and future macroeconomic environment. Uncertainty can affect economic growth through reducing the efficiency of the price system, which will in turn reduce both the level and the rate of productivity (Ibid). Temporary uncertainty can also reduce the rate of private investment by generating option value

of waiting and reducing expected profit (Fischer 1993, Agenor 2000). In addition, uncertainty may increase capital flight and this lowers capital accumulation and hence economic growth.

Macroeconomic instability may also have negative effects on public investment (Ismihan et al 2003). For example, high inflation rate and/or excessive debt accumulation lowers the overall public resources through the following channels. A rise in inflation rate usually raises the degree of dollarization hence reducing the demand for domestic currency and results in a loss of seigniorage revenue. High indebtedness also leads to a high debt burden (principal plus interest payment) and lowers the overall public resources available for other public expenditures, including public investment. It may also make investors to expect high tax in the future and reduce private investment. In addition to this, fluctuation of exchange rate variability may also induce uncertainty and risk in investment decision which may lead to either a capital gain or loss.

Macroeconomic instability can affect economic growth through the level of saving. Alemayehu (2007) points out that saving and macroeconomic instability are negatively related. Since there is a strong correlation between investment and saving, the negative impact of instability on saving will lead to reduce investment and hence economic growth.

Even if Ethiopian progress for growth is visible, there is a room for improvement. For instance foreign investors are restricted in certain sectors[1], Excessive public expenditure, even if it is better for economic growth, may have crowding- out effect on private capital accumulation[2] and shortage of foreign exchange (the perennial shortage of foreign currency makes the process

[1] as an example financial services, telecommunication, air transport, mass media, legal consultancy, advertisement and promotion as well as importation and retail business are restricted to either the government or Ethiopian nationals

[2] if public sector finances its investment through distortionary taxes or through borrowing on domestic financial markets

of making any foreign currency payments out of Ethiopia a nightmare) are the constraint that should be examined in order to sustain the desired double digit economic growth.

Fisher (1993); Bleaney (1996); Ismihan (2003); Haghighi, Sameti and Isfahan (2012) and others tried to show impact of macroeconomic instability on economic growth. Fisher (1993) and Bleaney (1996) try to show the impact without calculating macroeconomic instability index. That means they regress macroeconomic instability variables individually without calculating macroeconomic instability index. In addition, their study did not show impact of macroeconomic instability on capital accumulation. Whereas Ismihan (2003) tries to calculate macroeconomic instability index and show its impact on economic growth and investment. Even if he used the latest integration technique (Johansen multivariate technique), he fails to correctly model the growth equation: He specified growth as a function of real private investment, real public investment and macroeconomic instability index only. Since we know that economic growth rate can also be affected by technology, population growth rate (labor force) and also human capital (see Mankiw, 1992; Barro and Sala – i -Martine, 2004).

Here in Ethiopia, Zelalem (2008) examines impact of capital accumulation and macroeconomic instability on economic growth of Ethiopia for the period 1971 to 2006. His proxy for macro instability was inflation rate and the ratio of budget deficit to real GDP. He found that real GDP positively and strongly associated with physical capital but with budget deficit. In addition to this, He got positive impact of inflation on economic growth. At the end, He concludes that "there is no evidence which supports the existence of macroeconomic instability in the long run other than short run impact." Ways of representing macroeconomic instability may lead him to say such kind of conclusion. He also fails to show impact of instability on capital accumulation and failed to calculate macroeconomic index.

Due to the aforementioned weakness of each research, the researcher tries to pick the strong part of each research and fill the gap which they fail to do so.

In this paper, the researcher has tried to answer the following question;

- Is macroeconomic instability has an impact on economic growth and private capital accumulation in Ethiopia?
- What look like the trend of macroeconomic instability and economic growth in Ethiopia?
- Does macroeconomic instability prohibit capital accumulation in Ethiopia?

This and other question has been attempted to answer in this paper.

1.3. Objective of the study

The general objective of this study is to examine the impact of macroeconomic instability on private capital accumulation and economic growth.

To achieve the above broad objective, the study has the following specific objectives:-

- To examine the short run and long run impact of macroeconomic instability on economic growth.
- To analyze the trend of macroeconomic instability variables and economic growth in Ethiopia.
- To check whether macroeconomic instability affect private capital accumulation or not.
- At the end to give some concluding remarks and policy types.

1.4. *Data sources and method of data analysis*

For the purpose of analyzing the impact of macroeconomic instability on private capital accumulation and economic growth in Ethiopia, secondary data source from 1974/75 to 2013/14, is used. The major data sources for the problem under investigation is publications of National

Bank of Ethiopia (NBE), Ministry of Finance and Economic Development (MOFED), Ethiopian investment commission (EIC), Ethiopian revenue and custom authority and Central statistics Authority (CSA) of Ethiopia. Besides, IMF CD-ROM and WB CD-ROM have been used. In order to achieve the objectives mentioned above, two equations (namely private capital accumulation and growth equation) have been specified and estimated by using VAR model and also the researcher has used endogenous growth model and the accelerator model. In addition macroeconomic instability index has been calculated by using UNDP method of calculating human development index (HDI).

1.5. *Scope and limitation of the study*

The study explored the possible ways through which macroeconomic instability affect private capital accumulation and economic growth. To achieve this objective, the period range from 1974/75 to2013/14 has been chosen. This period is chosen based on availability of data.

Although this study attempts to shed on the impact of macroeconomic instability on private capital accumulation and economic growth in Ethiopia, yet it suffers from certain limitations. The first problem arises from the problem of inconsistent in data by different institutions. Even data arises from the annual reports of the National bank of Ethiopia shows different figures for the same year.

1.6. Organization of the paper

The paper is structured as follows. Chapter two summarizes theoretical and empirical literature. Macro economic performance of Ethiopia is presented in chapter three. Chapter four would discussed model and methodology where as chapter five presents estimation result. The last chapter which is chapter six concludes and provides policy recommendations.

Chapter2: - Literature Review

2.1 Theoretical literature review

2.1.1. Theory of macroeconomic instability

There are four perspectives that attempt to show impact of macroeconomic instability on economic growth.

The traditional perspective

Doronbush & Fischer (1999) showed economic fluctuations by using the demand and supply side of the economy. Great vulnerability of the economy for the given shock can be measured by using the "increasing coefficient" of that shock. As an example, in a model of a demand side, the government expenditure can be extracted as follows (Doronbush & Fischer, 1999).

$$\frac{\Delta Yo}{\Delta G} = \frac{h\alpha}{h+bk\alpha} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \textit{(2.1)}$$

Wherein,

"b" is marginal propensity to invest, "h" and "k" are the sensitivity of money demand to the interest rates and income respectively.

" α " is defined as follows:

$$\alpha = \frac{1}{1-c\,(1-t)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \textit{(2.2)}$$

Wherein,

"c" is marginal propensity to consume and "t" is income tax rate.

Equation (2.1) shows the amount in which a certain amount of confusion in the government expenditure will create on the national income or level of economic activity. As it is observed, its amount is determined by the exogenous variables like money demand equation coefficients, capital investment, and/or consumption function. In addition to this, the coefficient also includes both structure of behavior of individuals within the economy and policy-setting variables like income tax rate. Therefore some structural features of the economy determine the range of instability in the economic activities caused by the emergence of a disturbance and/or certain shock (Doronbush & Fischer, 1999). From this we can say that structure of the economy plays an important role in the determination of vulnerability degree of an economy against shocks. And also policy variable which is the tax rate is effective on the increasing coefficient. Increase in income tax rates will decrease the increasing coefficient and will led to the reduction of economic vulnerability against shocks (Ibid).

Unemployment compensation benefits are of the other variables which are not entered in the abovementioned simple model but they are allowed to operate as an automatic stabilizer (Doronbush & Fischer, 1999). When worker are unemployed and reduce their consumption, this reduction in consumption demand will have increasing impact on the national production. The outcomes of increasing coefficients will be more limited when workers receive unemployment compensation benefits and when their disposable income is reduced by less than the lost gain (Haghighi, Sameti and Isfahan, 2012).

Except economic structure and also automatic stabilizers, the government as an economic institution plays an important role in the economic stability (Doronbush & Fischer, 1999).

With implementing different policies especially economic stabilization policies, the government tries to confront with the economic fluctuations and affects the economic instability as well. But the way of implementation of these policies, which is more dependent on the structural and institutional features of the government, is of paramount importance as much as selection of an accurate policy. If there are some structural barriers for the accurate selection of the policies, identification of accurate policy and also precise implementation of that policy will be impossible. The policies are in three stages so that accurate and timely implementation of each stage will have an important role in their effectiveness. These three stages include: identification stage, decision-making stage and action stage (Ibid).

At first, the need to adopt a certain policy (e.g. anti-recession policy or policy to reduce inflation) should be recognized. This stage is dependent on the existence of accurate and timely information and is considered as the most sensitive stages of a policy, because, if the need of a policy is not recognized accurately, the next stages, even in the best conditions, will not produce favorable result (Haghighi, Sameti and Isfahan, 2012). Monetarists argued that government should never be executor of monetary policies with the objective of economic stability, because, due to the impossibility of accurate and on-time recognition of policies, implementing them will lead to its instability instead of economic stability.

Decision making is put forward at the next stage. For example, when the government identifies necessity of adopting an anti-recession policy, it should decide how to implement this policy. For instance, government may face high budget deficit and identify that an anti-recession policy should be adopted, under such circumstances, the government decides to increase its expenses. Thereupon, if rate of its expenses is increased and also if budget deficit rate is increased, forcing the government to receive foreign loans and/or publishing money, under such

circumstances, the government policy will led to the increased inflation and consequently, macroeconomic instability. Therefore, accurate and on-time decision is of paramount importance. At the end, policy action stage is put forwarded.

Keynesian View

According to Keynesian view, instability in the economy arises from two sources (Greenwald and Stiglitz, 1987; pp, 122; Skott and Dutt, 2005)**:**

i) Demand side; say for example significant change in investment will increase aggregate demand.

ii) Adverse aggregate supply shocks, which change aggregate supply.

Keynesian macroeconomics focuses on aggregate spending and its components. In the Keynesian frame work, basic equation underlying aggregate expenditures is $Ca+ Ig+ Xn+ G = GDP$. That is, the aggregate amount of after-tax consumption, gross investment, net exports, and government spending determines the total amount of the goods and services produced and sold (Dispute over macro theory and policy, 2005 as cited on Majid Sameti, 2012). In equilibrium, $Ca+ Ig+ Xn+ G$ (aggregate expenditures) is equal to GDP (real output). Any change in one of the spending components in the aggregate expenditures equation shifts the aggregate demand curve. This in turn, changes equilibrium real output, the price level, or both and this will lead to demand pull inflation (Ibid).But, Blinder (1991) said that, changes in aggregate demand, whether anticipated or unanticipated, have an impact on real output and employment, not on prices.

The second source of macroeconomic instability arises from the supply side (unexpected drought, war or lack of rain fall will create a supply restriction). This can boost resources prices

and significantly raise per unit production costs. The result will be a sizable decline in a nation's aggregate supply, which destabilizes the economy by simultaneously causing cost-push inflation and hence macroeconomic instability (Majid Sameti, 2012).

Monetarist View

According to monetarist, a change in the money supply is the main cause of instability in the economy (Dispute over macro theory and policy, 2005; Majid Sameti, 2012). The Great Depression occurred largely because the central bank allowed the money supply to fall by nearly 40 percent during that period (Majid Sameti, 2012).

Like rational expectation, monetarists believe that the economy has automatic internal mechanisms for self correction. So the price and wage flexibility provided by competitive markets would cause fluctuations in aggregate demand to alter product and resource prices rather than output and employment. Thus the market system would provide substantial macroeconomic stability were it not for government interference in the economy. The problem of instability will be occur when the government has promoted downward wage inflexibility through the minimum-wage law, pro-union legislation, guaranteed prices for certain farm products, pro-business monopoly legislation, and so forth (Ibid). Monetarists argued that government has contributed to the economy's macroeconomic instability through its clumsy and mistaken attempts to achieve greater stability through its monetary policies (Palley, 1992).

The fundamental equation of monetarism can be expressed as follows (Meltez, 1977; Fisher, 1936 as cited on Palley, 1992);

$$MV = PQ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2.3)$$

Where: -

The left side, *MV*, represents the total amount spent [*M*, the money supply *x V*, the velocity of money[3]].

The right side *PQ*, represent the nation's nominal GDP [P is the price level or more specifically, the average price at which each unit of output is sold *x Q* is the physical volume of all goods and services produced (real output)].

According to monetarist, velocity, V, is stable, meaning that the factors altering velocity change gradually and predictably. People and firms have a stable pattern to holding money. So if the velocity is stable the equation of exchange suggests there is a predictable relationship between the money supply and nominal GDP (PxQ) (Palley, 1992).

The problem of instability will be occurred when inappropriate monetary policy is under taken by the government. A fluctuation in M (an increase in money supply) will directly increase aggregate demand, causing inflation during full employment (Ibid).

The assumption of Monetarist linked with stable money demand, implied that the private sector was stable, and not subject to regular macroeconomic crisis. Of course there could still be periodic disturbances to money demand, but by definition a stable money demand function means that these are few and far between (Ibid).

[3] Velocity can be defined as the number of times per year the average dollar is spent on final goods and services

Real-Business-Cycle View

Real business cycle theory is built on the assumption that there are large random fluctuations in the rate of technological progress. These supply-side shocks to the production function generate fluctuations in aggregate output and employment as rational individuals respond to the altered structure of relative prices by changing their labor supply and consumption decisions (Snowdon and Vane, 2005; pp 316).

Kydland and Prescott, 1982 as cited on Rebelo, 2005; Majid Sameti, 2012 confirmed the above idea by saying macroeconomic instability can be caused by real factors that affect aggregate supply rather than by monetary or spending factors that cause fluctuations in aggregate demand. In the real business-cycle theory, business fluctuations has resulted from significant changes in technology and resource availability and those changes can affect both productivity and long-run growth trend of aggregate supply (Rebelo, 2005).

To sum up, real-business-cycle theory believed that, macroeconomic instability arises on the aggregate supply side of the economy, not on the aggregate demand side, as Keynesian, classic economists and monetarists usually claim (Ibid).

2.1.2) macroeconomic instability and capital accumulation

Macroeconomic instability generally thought of as fueling social unrest, which in turn disrupts productive activities and increases uncertainty in the economy (Pindyck & Solimano, 1993). By doing so, it undermines the incentives for the accumulation of physical capital and reduces the rate of economic growth (Nauro, 2000). The impact of instability may be large on capital accumulation. This may be due to the fact that most capital accumulation expenditures are at

least in part irreversible (sunk costs that cannot be recovered if market conditions turn out to be worse than expected) (Andres 1993). According to Levine & Rennet (1992), Pindyck & Solimano, (1993), if a goal of macroeconomic policy is to stimulate capital accumulation over the short- to intermediate term, stability and credibility may be much more important than particular levels of tax rates or interest rates. Put another way, the authors suggested that if uncertainty over the evolution of the economic environment is high, tax and related incentives may have to be very large to have any significant impact on investment spending (accumulation of capital). So, if their view is correct, a major cost of political and economic instability may be its depressing effect on capital accumulation.

According to Frank & Xia (2005), investment decision and hence capital accumulation is greatly affected by three factors: (i) uncertainty over the future economic environment, (ii) cost irreversibility in the sense that the investment expenditure can be only partially or not at all recovered and (iii) some degree of flexibility required in the timing of investment. Uncertainty can affect capital accumulation through different channel. From this risk aversion and adjustment costs to investment are the principal one (Kottardi & Monika, 2012). In addition, it is also assumed that investors are risk averse as opposed to risk neutral then the overall effect of uncertainty on investment may be negative (Zeira, 1990 as cited on Kottardi & Monika, 2012). Therefore at a higher level of uncertainty, risk averse firms are less likely to accumulate their capital in response to a positive demand shock (Bond and Söderbom, 2011).

High government debt also has an adverse effect on investment (Sachs, 1989, Salotti, 2012). Salotti (2012), analyze the effect of government debt on investment and productivity by estimating reduced-form regressions, and adopting a panel-data perspective. He found that high debt levels are associated with significant and sizeable declines of aggregate private spending on

investment and of productivity growth. In addition to this, if the government borrows from domestic sources, it will reduce the credit which would otherwise be available to the private sector and also putting pressure on domestic interest rates. Even if interest rates are controlled, domestic borrowing still leads to credit rationing and crowding out of private sector investment (Apere, 2014).

Developing economies suffer from a high degree of macroeconomic uncertainty. Growth, inflation, real exchange rates and other key macroeconomic variables are much more volatile than in industrial economies (Serven et al, 1996, Kottardi & Monika, 2012). Such volatility creates uncertainty for investors, both in terms of profitability and cost of investment. Volatile real exchange rates lead to erratic swings in the relative profitability of investment in traded as well as non-traded goods in an economy. These fluctuations, in turn, render the cost of new capital uncertain. This uncertainty increases with the import content of investment (Serven, 1998, 2003).

In Africa, poor governance, institutional failures, macroeconomic policy imperfections, inadequate infrastructure, rampant corruption, bureaucratic red tape, weak legal systems and lack of transparency in government departments are the main detriment for capital accumulation (Nnadozie, Katjomuise & Krüger, 2007).

To conclude, Macro economic instability can deter capital accumulation in an economy. According to Serven (1966), instability raises the value of waiting, treating property right and makes prediction of investment difficult; so they are going to affect capital accumulation negatively. In addition, adding macroeconomic instability as a determinant factor of capital accumulation can have the following advantage. A variable of public debt can represents the

evolution of external credit in capital accumulation financing. A higher external debt level could be an indicator of over-indebtness, signaling the lack of viability and sustainability of current macroeconomic policies in the long term, and most likely negatively impacting investors' expectations due to the increase in the degree of uncertainty on future policies (Pablo Acosta, 2003). And also inflation rate can capture the effectiveness of monetary policy in the economy.

2.1.3) macroeconomic instability variables and economic growth

In this section, I will try to show the effect of macroeconomic instability variables: such as public debt, inflation rate, exchange rate variability and public deficit on economic growth.

Public debt and economic growth

The theoretical literature on the relationship between public debt and economic growth tends to points out a negative relationship (Claessens *et al*., 1996, Checherita and Rother, 2010). Growth models augmented with public agents issuing debt to finance consumption or capital goods tend to exhibit a negative relationship between public debt and economic growth, particularly in a neoclassical setting (Elmendorf and Mankiw, 1999, Manmohan, 2010, Checherita and Rother ,2010).

Meade (1958) and Buchanan (1958) were drawing attention to the fact that the removal of the "deadweight debt" would; (i) raise the incentive of households to save; (ii) improve the incentives for work and enterprise; (iii) possibly allow for a decrease in income taxation at a later stage as a result of saving interest payments on the budget (improving even more the incentives for work and enterprise). Whereas, Modigliani (1961) by refining the theoretical contributions of Buchanan (1958) and Meade (1958) argued that the national debt is a burden for next

generations, which comes in the form of a reduced flow of income from a lower stock of private capital. Apart from a direct crowding-out effect, he also pointed out to the impact on long-term interest rates, possibly in a non-linear form "if the government operation is of sizable proportions it may significantly drive up[long-term] interest rates since the reduction of private capital will tend to increase its marginal product".

According to Elmendorf and Mankiw, (1999), Manmohan (2010), even if debt (reflecting deficit financing) can stimulate aggregate demand and output in the short run (assuming no "non-Keynesian effects"[4]) , but crowds out capital and reduces output in the long run. Iyoha (1999) also added that heavy debt burden payments have inevitably put great pressure on budgets leading to rising fiscal deficits in the heavily indebted countries, the implication of this impact are: it has to increase tax to service the debt and reduce the deficit, it equally has the effect of depressing investment on the "debt overhang"[5] effect. In addition to this, a country suffering from debt overhang will invest less than it would in the absence of such an overhang and consequently may forego projects with positive net present value; this is because of high debt stock acts as an implicit tax on investment. To make it brief, potential investor will fear that the more there is production, the more they will be taxed by the creditors to service the external debt, and thus they will be less willing to incur investment cost today for the sake of increased output in the future (Sachs, 1984, Krugman, 1988).

Theory of debt overhang and policy discussions indicates that the effect of debt on growth could occur through all the main sources of growth; high public debt can adversely affect capital

[4] Non-Keynesian effects of expansionary fiscal policy lead to low consumption due to expectations of a one-time tax distortion in the future.

[5] a situation where a country's debt service burden is so heavy that a large portion of output accrues to foreign lenders and consequently creates disincentives to invest

accumulation and growth via higher long-term interest rates (Gale and Orzag, 2003; Baldacci and Kumar, 2010), higher future distortionary taxation (Barro, 1979, Dotsey, 1994), inflation (Sargent and Wallace 1981, Barro 1995, Cochrane 2010), and greater uncertainty about prospects and policies. From these, the capital-accumulation channel is supported, in particular, by two arguments (Pattillo, Poirson and Ricci 2004, Checherita and Rother, 2010). First, the debt-overhang concept implies that when external debt grows large, investors lower their expectations of returns in anticipation of higher and progressively more distortionary taxes needed to repay debt, so that new domestic and foreign investment is discouraged, which, in turn, slows capital-stock accumulation. And the second one, in heavily indebted countries, investors hold back, given the uncertainties about what portion of the debt will actually be serviced with the countries' own resources. To make it brief, in the face of stagnating exports, rising debt service payments have entailed either payment defaults or a drain on scarce foreign exchange needed to import machinery and inputs of production. Both arguments suggest that nonlinear effects of debt on growth are likely to occur through lower capital accumulation (Pattillo, Poirson and Ricci 2004).

Here in Africa, scholars confirms that external debt is the highest in the world.

According to the ILO (1995)

Africa's external debt is the highest in the world as a proportion of GDP; some countries in the region are spending more than half of their export earnings to service foreign debts. The debts of many African countries are so large in relation to their foreign exchange earnings potential that it would be impossible to pay them off even if growth resumed and was sustained

at unrealistically high levels. Largely as a consequence of debt servicing, flow of capital from Africa is significantly more than flow of new capital to the region.

Many reasons can be mentioned in which external indebtedness become acute in Africa. Ajay & Khan (2000) points the following reasons: - First, the external debt is enormous relative to the size of the economy and has led, in many cases, to capital flight and the discouragement of capital accumulation, especially private capital accumulation. Second, debt servicing payments absorb a major proportion of export earnings and eat significantly into the funds that could be used to provide essential facilities to improve the welfare of a country's citizens. Third, debt burden threatens not only the execution but also the prospects of success of adjustment programs. Fourth, given the time spent on external debt negotiations and its management, debt has a negative impact on an economy's overall growth and growth prospects.

When we come to in Ethiopia, Melese (2005), points out that Ethiopia's external debt is not simply unsustainable; even the most generous debt relief would not bring the country in meeting its responsibility within the context of global poverty-reduction goals. In line with this, according to the World Bank classification of Highly Indebted Economies, the country is one of the severely indebted low-income countries. Alemayheu and Befekadu (1999) also point out that the country's dependence on external resource inflow in the form of credit and grant aid has now reached the stage where it cannot survive without it. In fact, much more than complete debt relief would be necessary for any credible attempt at reducing poverty by half over 20 years. Complete debt forgiveness would need to be accompanied by additional resource inflows, as well as a viable policy framework (Befikadu, 2001).

Budget deficit and economic growth

Budget deficit arises when the demand for government expenditure far exceeds government revenue that needs to be financed by net lending (Ball and Mankiw, 1995). A change in budget deficit is attributed to changes in government spending or tax revenue or both (Ibid).

Budget deficits have many effects. According to Mankiw (1995), deficits reduce national saving. National saving is the sum of private saving (the after-tax income that households save rather than consume) and public saving (the tax revenue that the government saves rather than spends). When the government runs a budget deficit, public saving is negative, which reduces national saving below private saving (Ibid).

Mankiw (1995) shows the effect of reduction in national saving on economy as follows: -

Letting Y denote gross domestic product, T taxes, C consumption, and G government purchases, then private saving is $Y-T-C$, and public saving is $T-G$. Adding these yields national saving, S:

$$S = Y - C - G \quad \text{(2.4)}$$

National saving is current income not used immediately to finance consumption by households or purchases by the government.

GDP have four components.

$$Y = C + I + G + NX \quad \text{(2.5)}$$

Substituting equation (2.5) in equation (2.4) this will yield national saving.

$$S = I + NX \quad (2.6)$$

The last equation sheds considerable light on the effects of budget deficits. From this we observe that national saving equals the sum of investment and net export. When budget deficits reduce national saving, they must reduce investment and/or reduce net exports, or both (Ball and Mankiw, 1995).

To the extent that budget deficits increase the trade deficit (that is, reduce net exports), another effect follows immediately: budget deficits create a flow of assets abroad. That means when a country imports more than it exports, it does not receive these extra goods and services for free; instead, it gives up assets in return. This asset may be local currency but foreigners use this money to buy corporate or government bonds, equity, or real estate. In any case, when a budget deficit turns a country into a net importer of goods and services, the country also becomes a net exporter of assets (Mankiw, 1995).

In addition to this, a decline in national saving reduces the supply of loans available to private borrowers, which pushes up the interest rate (the price of a loan) (Ball and Mankiw, 1995, Hubbard, 2011). Faced with higher interest rates, households and firms, choose to reduce investment (Hubbard, 2011). A higher interest rate also attracts investors both at home and abroad, because domestic assets pay higher return (Ball and Mankiw, 1995). The increased demand for domestic asset affect for foreign currency. That means if a foreigner wants to buy a domestic bond, they must first acquire the domestic currency. This will lead to domestic currency to appreciate. The appreciation of domestic currency in turn, affects trade in goods and services. With a stronger currency, domestic goods are more expensive for foreigners, and foreign goods are cheaper for domestic residents. Exports fall, imports rise, and the trade balance moves toward deficit (twin deficit) (Ball and Mankiw, 1995, Hubbard, 2011). This argument can be justified in a Mundell-Fleming framework and The Keynesian absorption theory. For

example, in a Mundell-Fleming framework, it is argued that an increase in the budget deficit would induce upward pressure on interest rates, causing capital inflows and an appreciation of the exchange rate that will increase the current account deficit. The Keynesian absorption theory suggests that an increase in the budget deficit would induce domestic absorption and thus, import expansion, causing a current account deficit.

Mankiw et al conclude that government budget deficit reduce national saving, reduce investment, reduce net exports, create a corresponding flow of assets overseas and at the end deterrent economic growth. These effects occur because deficits also raise interest rates and the value of the currency in the market for foreign exchange.

Large and persistent budget deficits are considered to be the root cause of monetary expansion, persistent inflation and macroeconomic instability (Sargent and Wallace, 1981, Friedman, 1968 as cited on Saleh, 2003, Saleh and Harvie, 2005). According to Sargent and Wallace (1981) inflation is linked to how budget deficits are financed; deficits lead to inflation to the extent that they are monetized. The extent to which monetary policy is used to help balance the government's budget is the key to determining the effect of budget deficits on inflation (Sill, 2005). Deficits monetization not only can lead to inflation and deterrent economic growth, but it can also impose burden for future generations as taxes necessary to finance the budget deficits are shifted to the future (Anoruo, 2003). Empirical evidence also suggests that persistent budget deficits are unambiguously bad for growth (Easterly et al., 1994). Kibrome (2008) also points out that Inflationary ways of deficit financing may end up eating into the growth momentum they have helped generate by reducing stimuli to growth.

Inflation rate and economic growth

It is now widely accepted among economists, policy makers and central bankers that the main objective of macroeconomic policies is to achieve a high economic growth rate while maintaining a low inflation rate; it is also generally believed that high inflation is detrimental to medium and long-run economic growth (Javier, 1999, Fischer, 1993, Khan and Senhadji, 2001).

High inflation impedes efficient resource allocation by obscuring the signaling role of relative price changes, the most important guide to efficient economic decision making (Fischer, 1993). It is also well known that high and unstable prices create high uncertainty which raises the cost of doing business and adversely impact growth rates (Khan and Senhadji, 2001).

A high level of inflation also induces frequent changes in prices that may be costly for firms ***(menu costs)*** and reduces the optimal level of cash holdings by consumers. It also generates larger forecasting errors by distorting the information content of prices, encouraging economic agents to spend more time and resources in gathering information and protecting themselves against the damage caused by price instability, hence endangering the efficient allocation of resources (Javier, 1999).

Inflation can affect economic growth through capital accumulation channel. This may be due to the fact that high and volatile unanticipated inflation has been found one of the main determinants of the rate of return on capital and investment (Bruno, 1993, Pindyck and Solimano, 1993, Andres and Hernando, 1999). And also inflation undermines the confidence of domestic and foreign investors about the future course of monetary policy (Andres and Hernando, 1999). In addition to this, it can also affect the accumulation of other determinants of growth such as human capital or investment in R&D (Ibid).

Inflation may also discourage economic agents from saving, due to the fact that money is worth today than tomorrow. In addition, inflation can be treated as a tax on real balance, reduces real returns to savings which in turn causes an informational friction afflicting the financial system. These financial market frictions results in credit rationing and thus limit the availability of investment. In the long-run, therefore, inflation reduces economic growth because the economy needs a certain level of savings to finance investment projects which stimulate economic growth (Javier, 1999, Nasir and Saima, 2008).

When we come to in Ethiopia, Alemayehu and Kibrome (2008) states that the Ethiopian economy has been characterized by erratic nature of output growth as the economy have been highly dependent on fortune of nature and external shocks. Since agriculture accounted for over 50 percent of GDP for most of the recent past, whenever weather conditions turned to be unfavorable, agricultural production contracted and GDP followed suit. With this systematic relationship between GDP (output) and rainfall there followed a systematic price trend. Prices followed the inverse of output growth trend.

According to Asayehgne (2008), the main determinants of inflation in Ethiopia are imports, depreciation of the Ethiopian birr, and a decline in the domestic lending interest rates or an increase in broad money supply. Asayehgne et al concludes that to successfully jump out of the inflationary trap, the Ethiopian monetary authorities need to tighten the stock of money in the country. A tight monetary policy could serve as an anchor for inflationary pressure in Ethiopia.

Exchange rate variability and economic growth

"Exchange rate" can be defined as the price of one currency in relation to another. In a slightly different perspective, it expresses the national currency's quotation in respect to foreign

ones. Thus, exchange rate is a conversion factor, a multiplier or a ratio, depending on the direction of conversion. It is believed that if exchange rates can freely move, it may turn out to be the fastest moving price in the economy, bringing together all the foreign goods with it (Toseef, 2005).

Variability (Volatility) can be defined as "instability, fickleness or uncertainty" and is a measure of risk, whether in asset pricing, portfolio optimization, option pricing, or risk management, and presents a careful example of risk measurement, which could be the input to a variety of economic decisions (Azid, Jamil and Kousar, 2005).

Variability of exchange rates describes uncertainty in international transactions both in goods and in financial assets. Exchange rates are modeled as forward-looking relative asset prices that reflect unanticipated change in relative demand and supply of domestic and foreign currencies, so exchange rate variability reflects agents' expectations of changes in determinants of money supplies, interest rates and incomes (Tossef, 2005).

There are four main channels through which exchange rate variability affects growth. These are: trade, foreign direct investment (FDI), currency crisis, and debt servicing (Alice, 2014).

Exchange rate variability hinders the flow of international trade as it represents uncertainty and hence imposes costs on risk-averse commodity traders (Ethier, 1973). According to Brodsky, (1984), Exchange rate uncertainty may lead to a reduction in the volume of trade as commodity traders are risk adverse. This is because exchange rate is agreed upon at the time of contract agreement while payment is made at delivery. Therefore, unpredictability in exchange rate creates uncertainty about profits and by implication, reduces the benefits of international trade and the growth potential of an economy (Brodsky, 1984, Sebastian, Sharma and Joshi, 2014).

Real exchange rate uncertainty can also have negative effects on both domestic and foreign investment decisions. It causes reallocation of resources among the sectors and countries, between exports and imports and creates an uncertain environment for investment. Due to this, investors delay their investment decisions to obtain more information about the real exchange rates if investments are irreversible and exerts negatively on economic performance (Sebastian, Sharma and Joshi, 2014). Further, high exchange rate variability that affects foreign direct investment adversely could increase the instability in currencies of small countries causing financial instability (Ibid). In addition, the instability of exchange rate also may lead to weakening of relative price competiveness of smaller currencies, thus contributing to a deterioration of their external accounts and even currency crisis and collapse of growth (Ibid).

In addition to this, change in exchange rate can affect the real cost of servicing debts. A strong appreciation of the dollar, for example, implies a higher cost of servicing dollar denominated external debt which, in turn, affects allocation of funds for development purpose thereby affecting prospects of longer term growth (Alice, 2014).

Here in Ethiopia, the national bank (NBE) conducts regular interventions to reduce exchange rate volatility and ensure stable path of exchange rate depreciation. But the NBE's limited liquidity instruments and reserve cushion make this difficult. That means excess demand for foreign exchange is not sufficiently address. IMf (2014) stressed that better market functioning and price setting mechanisms for the exchange rate, along with greater interest rate and exchange rate flexibility are needed, not only to clear the foreign exchange market, but also to promote the competitiveness of the traded goods sector.

2.2) Empirical literatures

Fisher (1993) conducted case studies in Cote d'Ivoire and Chile to analyze the role of macroeconomic instability in economic growth by using inflation rate, external debt, and government deficit as macroeconomic instability indicators from the year 1970-85. He concludes that, the mechanism through which macroeconomic instability affect economic growth is through its impact on the investment, and also the separate role of macroeconomic instability variables in the growth regression implies the existence of other channels, which needs further investigation. In addition to this, Fisher argued that macroeconomic instability affect economic growth in the short run only. Within this in mind, He added that inflation rate is the best indicator of how well a country manages its economy. It is widely accepted that very high inflation rates inhibit an efficient resource allocation and depress investment rates and economic growth.

Bleaney (1996) estimates impact of macroeconomic instability on economic growth in developing country from 1980-90 by using a cross sectional data. He uses the central government budget surplus, real exchange rate volatility, public debt and inflation rate as an indicator of macroeconomic instability. His results show a negative correlation between budget deficits and growth, and between real exchange rate volatility and growth. He concludes that policy induced macroeconomic instability impedes growth.

Luis Servén (1998) attempted to show the impact of macroeconomic instability on private investment in developing countries. He used: inflation, terms of trade, real exchange rate and price of capital goods as proxy for macroeconomic instability. His result shows that there is a significantly negative association between the constructed uncertainty measures and private investment.

Sanchez-Robles (1998) estimate impact of macroeconomic instability on economic growth using single-equation co integration analysis for Spain from the year 1962-95. He used per capita income growth rate as dependent variable and used each of the proxies of instability separately as a regressor, including constant and investment-to income ratio, in various estimations. By treating these estimation results as empirical regularities, they concluded that macroeconomic stability should be regarded as a prerequisite for economic growth in the Spanish economy.

Elbadawi and Schmidt-Hebbel (1999) try to estimate the impact of macroeconomic and financial instability on economic growth for both developing countries and industrial economies by measuring the performances of macroeconomic and financial instabilities with four indicators: public sector deficit, monetary growth, real exchange rate misalignment, and current account deficit. They conclude that both macroeconomic and financial crises are very harmful for economic growth.

Ismihan (2003) investigated the role of macroeconomic instability on public and private capital accumulation and growth in Turkey over the 1963-1999 by using a time series techniques, such as co integration and generalized impulse response analyses. Ismihan uses budget deficit, exchange rate variability, inflation and public debt as an indicator of macroeconomic instability. In addition to this, He tried to calculate macroeconomic instability by using UNDP HDI calculation methodology. His results summarized as follows: Both the descriptive and econometric evidence suggest that the chronic and increasing macroeconomic instability of the Turkish economy has seriously affected its capital formation and growth. Furthermore, the Turkish experience indicates that chronic macroeconomic instability seems to be a serious impediment to public investment, especially to its infrastructural component, and shatters, or even reverses, the complementarities between public and private investment in the

long-run. The main conclusion of his findings is that macroeconomic instability not only deters economic growth but it may also reverse the complementarities between public and private investment in the long-run.

Christopher J Gerry and Mickiewicz (2008) estimates the impact of Macroeconomic instability (as proxy by inflation) on economic growth by using panel data for the period 1989-2006 of Post-Communist Transition economies: their result show that macroeconomic instability is always statistically significant and with a negative impact on economic growth. Inflation, it seems, is definitively bad for economic growth in transition. In addition to this, they found some evidence that institutions of governance are important for economic growth through their influence on the macroeconomic environment that is, good institutions are conducive to macroeconomic stability which in turn positively impacts upon economic growth.

Zelalem Gebremedhin (2008) attempted to show the impact of capital accumulation and macro stability on economic growth of Ethiopia taking a series of data range from 1971 to 2006. Macro stability is proxy by inflation and budget deficit. The result shows that economic growth is positively and strongly associated with physical capital, but negatively and significantly with budget deficit. In addition inflation affects economic growth positively. He concludes that there is no strong evidence which supports the existence of macro instability in the long run other than short run impact. This may be due the fact that inflation rate yield positive impact on economic growth where as another measurement of macro instability; budget deficit generates negative impact on economic growth.

Sirimaneetham and Temple (2009) examined the relationship between macroeconomic stability and growth in developing countries. This paper introduces a new way of calculating

macroeconomic stability index, based on aggregating five policy indicators using an outlier-robust version of principal components analysis. Using this index, growth is found to be positively associated with macroeconomic stability in a sample of 70 developing countries. The result show that a one-standard-deviation improvement in the index would raise the annual growth rate by somewhere between 0.5 and 0.7 percentage points over a thirty-year period.

Sanchez-Robles and Martinez (2010), attempted to estimate impact of macroeconomic stability on economic growth in Eastern Europe by carry out a panel data analysis of 13 countries over the period 1992-2008. They captured macroeconomic stability by low level of inflation and public deficit; they conclude that, a long term growth framework, deficits are detrimental to growth since they are associated to corruption, rent seeking, an excessive size of government and distortions in the resource allocation. A low rate of inflation suggests an effective degree of market liberalization. Furthermore, in a heavily competitive environment characterized by strong rivalry because of the arrival of foreign firms, price stability in particular and macroeconomic stability in general is the main precondition for economic growth.

Omar Joyav (2011) descriptively analyzes the cause and solution of macroeconomic instability in Afghanistan. He argued that that macroeconomic instability is both a cause and a reflection of underdevelopment. Whilst macroeconomic instability negatively affects the long-term growth and thus development, it is also the result of the co-existence of various 'underdeveloped structures' in the economy. He also added that, dealing with macroeconomic instability should be an important part of development strategies, and only a mix of stabilization and structural policies will be able to effectively overcome instability. His Studies have also shown that macroeconomic instability has significant costs in terms of welfare loss, increase in inequality and poverty, and reduction in long-term growth.

Haghighi, Sameti and Isfahan (2012), investigates the effect of macroeconomic instability on the economic growth in Iran by using time series data and macroeconomic instability index (by using weighted sum of inflation, exchange rate variability, public debt and current budget deficit) from the years 1974 to 2008: the result show that economic growth in Iran has a long-term relationship with the macroeconomic instability. In other words, changes in macroeconomic instability indicators will be associated with the increase (decrease) of economic growth in the long run. They conclude that; a remarkable inhibitory effect of the macroeconomic instability on the real growth rate, it seems that the government should consider macroeconomic instability and use purposeful and controlled policies to reduce macroeconomic instability, because, remarkable decrease of the economic growth is the detrimental outcome of the macroeconomic instability in the long term. In addition, to achieve a sustainable economic growth, setting up and safeguarding an environment with macroeconomic stability is necessary and sustainable growth requires imposition of the policies which are not led to the accelerating and increasing inflation, chronic budget deficit, uncontrollable financial supply current account deficit and apparent change of exchange rate. And also the poor management of macroeconomic with the adoption of incorrect and illogical fiscal and monetary policies and passive reaction against shocks will intensify the macroeconomic instability. Therefore, the way of reaction to the shocks is very important.

Masino (2012) attempted to investigate the impact of macroeconomic instability on private innovative investment in the form of R&D in48 developing countries. The results suggest a negative impact of instability on the share of R&D financed by the business sector. These outcomes highlight the desirability of counter-cyclical policy interventions aiming to prevent the avoidance or abandonment of private R&D undertakings in unstable macroeconomic

environments. He also argued that uncertainty of the macroeconomic environment has been suggested as a potential answer for the lack of private R&D engagement exhibited by most developing countries.

Ulvedal (2013), investigate the impact of macroeconomic instability on economic growth in developing countries; by including budget deficit, inflation rate, exchange rate volatility and public debt as an indicator of macroeconomic instability: Of the four indicators of macroeconomic instability included in this analysis, only the inflation rate and the initial government debt level seem to be significantly associated with economic growth. The results show a statistically significant negative association between initial government debt and growth, and between inflation and growth. In addition to this, He investigates whether a threshold model rather than a linear relationship seems to fit the data better and find evidence that it does. He proposes that the initial government debt level and inflation rate have no effect on growth at moderate levels, but when they reach unsustainable levels, they have a serious negative impact on growth rates. To test this hypothesis, He includes dummy variables for initial government debt above 90 % and average inflation rate above 25 % in the regressions. The results show that the threshold model fits better to the data than the linear model, and that reaching unsustainable levels of government debt and inflation has a strong negative impact on growth rates.

Kolawole (2013) empirically examined the growth effect of inflation, real exchange rate, real interest rate and external debt in Nigeria over the period 1980-2011. The results reveal that real interest rate significantly affects growth positively, while external debt, inflation and real exchange rate impact negatively on growth in the country.

İsmihan, Dinçergök and Cilasun (2013) attempted to analyze the impact of macroeconomic instability on finance-growth nexus in Turkey by using time series econometric techniques from the year 1980 to 2010. The result shows that Macroeconomic instability harms financial development, banks act as lazy banks, and economic growth has a positive effect on financial development. They suggest that macroeconomic stability is a precondition not only for economic growth but also for financial development. And also governments must avoid excessive domestic debt financing since such behavior creates laziness in the banking sector and this, in turn, harms economic growth via decreasing private credits.

Chapter3: - Ethiopian Economic Performance; an overview

3.1) trends of macroeconomic instability variables in Ethiopia

3.1.1) public debt

Since the debt relief granted under the Multilateral Debt Relief and Heavily Indebted Poor Countries initiatives (MDRI and HIPC) in 2006, Ethiopia's external debt stock has grown by more than four-fold, as a result of the surge in public enterprises' external borrowings from non-Paris club (particularly China and India) and commercial banks (UNDP, 2014). In 2013/14 the external debt stock rose to USD 14.0 billion from the previous year's level of 2012/13 of USD 11.1 billion and 2011/12 of USD 8.9 billion (MOFED, 2014). The share of GOE external debt from commercial banks rose to 28% in 2012/13 from under 10% in 2007/08 (UNDP, 2014). On the other hand, the share of Paris-club donors shrank to 3.6% in 2012/13 from 4.6% in 2011/12 (Ibid). This may continue in light of the ambitious GTP investment agenda, which may pose risks to Ethiopia's debt rating and hence requires vigilance in debt management to mitigate the risk of debt distress. Any non-concessional borrowing should be consistent with maintaining a low risk of debt distress (Ibid).

The latest debt sustainability analyses show that Ethiopia would remain at a low risk of external debt stress, despite the growth in external borrowing. Ethiopia will also remain at low risk of debt stress in 2013/14 and in 2014/15. The debt burden indicators are, however, on the rise (IMF, 2014).

Ethiopia's external debt has changed significantly in its magnitude, structure and composition. In the last five years only, external debt has rose by 150%. The following table summarizes public sector external debt outstanding, disbursements, debt service payments & debt relief of the Ethiopian government.

Table 3.1; - public sector external debt outstanding, disbursements, debt service payments & debt relief from the year 2009/10- 2013/14 (In millions of USD)

	2009/10	2010/11	2011/12	2012/13	2013/14
	USD	USD	USD	USD	USD
Total out standing	**5,633.26**	**7,807.60**	**8,888.65**	**11,222.75**	**14,007.02**
Central government	3,695.61	4,724.98	5,469.28	6 ,831.51	8 ,419.24
Government guaranteed	662.02	1,040.31	1,308.14	1 ,767.08	2 ,653.71
Non-government. guaranteed	1,275.63	2,042.31	2,111.23	2 ,624.16	2 ,934.07
Total disbursement	**1,564.49**	**2,080.16**	**1,650.40**	**2,706.68**	**3,150.02**
Central government	1,039.30	898.48	1,017.12	1 ,446.70	1 ,537.66
Government guaranteed	170.01	305.09	360.40	518.87	986.64
Non-government guaranty	355.17	876.59	272.87	7 41.11	6 25.71
Total debt service	**111.28**	**241.88**	**412.07**	**567.30**	**664.00**
Central government	52.88	70.99	99.71	1 19.52	1 48.38
Government guaranty	14.79	35.69	55.12	1 36.51	1 45.23
Non-government guaranteed	43.61	135.19	257.25	3 11.27	3 70.39
Total principal repayment	**69.51**	**180.23**	**309.05**	**429.04**	**510.17**
Central government	26.65	38.04	54.41	6 1.90	7 3.98
Government guaranteed	6.32	32.28	44.94	1 06.99	1 20.39
Non-government guaranteed	36.54	109.91	209.70	2 60.15	3 15.80
Total interest & com.	**41.77**	**61.65**	**103.03**	**138.26**	**153.82**
Central government	26.23	32.95	45.30	5 7.62	7 4.39
Government guaranty	8.47	3.41	10.18	2 9.53	2 4.84
Non-government guaranty	7.07	25.29	47.55	5 1.12	5 4.59
Total debt relief	**11.64**	**9.12**	**17.63**	**9.50**	**2.53**
Central government	11.64	9.12	17.63	9.50	2.53
Government guaranty	_	–	–	–	–
Non-government guaranty	_	–	–	–	–

Source; - MOFED, 2014

The stock of external debt is growing from year to year. In 1974/75, when the Imperial regime was overthrown by the Derg government, the total debt stock stood at 372 million USD. On May 28, 1991, the military government was in turn overthrown by the Ethiopian Peoples' Revolutionary Democratic Front (EPRDF), whose budget was issued on June 30, 1992. At the time the country's external debt was 8.8 billion USD. And now after twenty two years (2014), external debt has reached two fold (USD14.0 billion).

From the year 2005/06-2013/14, the total debt relief is about USD 4,534.2 million. From this the largest relief was obtained during the fiscal year of 2006/07, which was about USD 4,090.4 million. This was mainly due to highly indebted poor country (HIPC) and Multilateral Debt Relief (MDRI) stock relief from international development association (IDA), international monetary fund (IMF) and African development fund (ADF), making up 98.3% of the total relief. The highest stock relief was obtained from IDA and ADF/ADB, USD 3,039.80 million and USD 837.00 million, respectively. In 2005/06, IMF has also cancelled about USD 164.8 million under HIPC and MDRI program (MOFED, 2013). Thanks to these two initiatives, the debt stock reduced to a level of USD 2,314.6 million in 2006/07 and the country was within sustainable debt thresholds.

In addition to external debt, Domestic debt has grown with the financing needs of the general government. According to IMF (2014), Total domestic debt was about 16.9 percent of GDP at the end of 2012/13, 60 percent of which was accounted for by direct advances from national bank of Ethiopia (NBE), 28 percent by treasury bills, and 13 percent by government bonds held mostly by NBE and Commercial Bank of Ethiopia (CBE).

3.1.2) exchange rate variability

Many institutions forced Ethiopia to devalue its currency. For instance World Bank (2014) has been said that reducing the currency's value by 10 percent in real terms may lead to a 5 percent increase in stalled export earnings and a 2 percent increase in growth. World Bank (1992) points out that; an over valuation of exchange rate imposes an implicit tax on export and hence discourages the production of exportable goods. It also sets an implicit subsidy on imports and hence encourages imports worsening the current account. According to the chief economist of World Bank, Ethiopia last devalued its currency by 17 percent (a situation when exchange rate is overshoot from 12.89 to 16.11) against the dollar in September 2010. Since then, the birr has appreciated in real terms by more than 50 percent, leading to a currency that's overvalued by 31 percent.

But, for countries like Ethiopia which is at the juncture of building its infrastructure where most of development attributes are imported, neither theory nor global practice will guarantee us positive results from devaluation. Many economists agree that the economic mathematical calculation that endorses devaluation to boost export is one sided assumption, they do not see how import expenditure will play out, it usually become expensive, i.e. you are going to whole lots of your resources to import and satisfy your needs, and above all most of Ethiopia's imports are none-replaceable at least in short term. In addition to this, the devaluation of the birr is likely to aggravate inflation and it could start a snowball effect of higher inflation as it can build into a cascade of expectations for further devaluation by private citizens. When devaluation is done overnight in secretive and surprising manner as is done to the birr, the action has the potential to irritate the business sector and speculators. As a result, the devaluation measure could be self-defeating and self-fulfilling. Moreover, for those who control the commanding heights of the

Ethiopian economy and the party-controlled conglomerates and their "owners", the action will tempt them to convert their assets into dollars/pounds/Euros and expatriate their assets before their values are eroded. There is also a possibility for potential and future birr holders to shun the currency since holding the birr will be very expensive to them (Seid 2010).

Recently, Ethiopian government wants to avoid exchange rate variability. According to Redwan Hussein, Head of Government Communication Affairs Office (GCAO) in August, 2014, disclosed the Ethiopian government will not make a significant devaluation to birr against the major currencies. In addressing the question relating to devaluation of birr, he said; "The government will not accept all proposals, the government considers all the pros and the cons of the proposal and decided on the issues that will benefit the country more." Redwan added that, the Federal Government has devaluated Birr by 10 percent in 2010 and 20 percent in 2011 in line to the Growth and Transformation Plan (GTP). Nonetheless, he only disclosed the government will not apply a huge devaluation and refrained from stating the exact amount.

When we come to the trends of exchange rate, the Ethiopian birr (ETB) has been declining in its value for the past several years now. During the communist era (1973/74 to 1991/92), the currency was held at a constant exchange rate of $1 USD to 2.07 ETB.

The transitional government devalued the Birr back in 1992/93 to about 1 USD = 4.27 ETB. Since then, the Birr has been falling against the dollar. The most overshooting in the exchange rate has been recorded in 2010/11; it is a time when ETB birr has been lost its value by 19.98% (exchange rate increased from 12.89 to 16.11). Trends of exchange rate can be summarized as follows:

Table 3.2: - exchange rate at Trends

year	Exchange rate	Parallel exchange rate
1974/75-1991/92	2.07	4.57
1992/93	4.27	8.82
1997/98	6.88	7.08
2002/03	8.58	8.70
2007/08	9.24	9.54
2013/14	19.54	22.50

Source; - National Bank of Ethiopia and Ethiopian economic association

During 1945–71, the birr/USD rate remained unchanged at 2.5. It was revalued to 2.3 in December 1971, and then to 2.07 in February 1973, and remained at that level until October 1992. In a desire to solve the problems related to the fixed exchange rate the EPRDF led Ethiopian government devalued the Ethiopian currency by 51.5% during 1992/93 in nominal terms. After this massive devaluation the price of one US dollar raised from Birr 2.07 to Birr 4.27 in nominal terms. From 1992/93 to 2002/03, the Ethiopian currency has lost its value by almost 100%. From 2002/03 till now depreciation of Ethiopian currency has increased drastically; the birr lost its value by almost 150%.

To conclude, the government should avoid continuous devaluation of its currency because it is a source of risk for stakeholders. At times, large commercial firms tend to hoard USD assuming that the government will devalue the birr. This situation leads to foreign currency shortage in the

market. Above all, firms involved in the import and export sector tend to speculate in the market and hold onto their goods, which also exacerbates the aforementioned problem.

3.1.3) budget deficit

The Parliament of Ethiopia has approved a budget of 178.6 billion birr for federal government for 2014/15 fiscal year, 15.3% increase compared to 154.9 billion birr in 2013/14. 46% of the budget goes to capital expenditure of which around one-third (35 %) going to road sector development followed by education sector (17%). 81% of the budget will be financed from domestic sources (68.9 % from tax and non-tax domestic revenue, 11.8% from domestic loan) and 19 % is expected from external sources (9.8% from external loan and 9.4% from external assistance). 16.2% of the total budget will finance the road sector, 13.8% education, 8.4% MDGs support, 4.6% debt service and 2.7% will go to the health sector.

Both the International Monetary Fund (IMF) and the African Development Bank (AFDB) have projected expansion in GDP by 7.5% in 2014/15 – much lower than the 11.2% average growth targeted in the five-year Growth and Transformation Plan (GTP). Macroeconomists fear a boost in the budget without a parallel growth in GDP is a recipe for budget deficit, which may cause inflation in the economy. Although the proposed budget is lower than the 201.1 billion Br projected in the GTP document, and its growth rate is three percentage points down from its average record since 2011, those who follow Ethiopia's macro economy caution that inflating the federal budget deficit from the 3.3pc of GDP registered in 2013/14 fiscal year is inevitable.

For a country whose domestic and external debt is ballooning to over 20 billion dollars, representing over 25.7percent of the GDP, the concerns are that the administration may get compelled to print money to finance its deficit. Doing so would certainly push up the inflation

rate. Or else, when the government runs a budget deficit, it generally enters financial markets and borrows funds to pay for the excess of spending over taxes. Such kind of activity of the government will push the interest rate upward and will have a crowding out effect on investment.

Economists generally agree that persistent budget deficits – as in the case of Ethiopia –generate macroeconomic imbalances. Ethiopia has a history of budget deficit averaging at 0.035% of GDP during the Derg regime (from 1974 to 1991) and 5.06% of the GDP ever since the EPRDF took power in 1991, reaching a record high of 10.54% in 1999/00 (this may be due to Ethio-Ertrea war) and the lowest budget deficit, during the EPRDF was recorded in 1996/97 which is amounted 921 million birr (1.4% of GDP).

Trends of budget deficit since 1974/75 to 2013/14 can be summarized as follows:

Table 3.3: - trends of budget deficit from 1974/75-2013/14

years	Budget deficit	Budget deficit/GDP
1974/75	127	0.0112
1980/81	82.4	0.005
1985/86	1235.3	0.057
1990/01	1811.66	0.0663
1995/06	1541.8	0.0277
2000/01	2556.2	0.0375
2005/06	8352.6	0.0634
2010/11	14,741.8	0.0288
2013/14	16,662.4	0.0162

Source: - own computation based on MOFED data

Note: - budget deficit is stated in million birr and GDP is calculating at current market price

As we have seen from the table, budget deficit has been increased from time to time. From the year 1974-2013, the lowest budget deficit was recorded in 1980/81 which is 82.4 million birr (0.005% of GDP). Beginning from 1980/81, budget deficit began to increase drastically. Even if the trend has shown a reduction from 1990/01 to 1995/96 by 14.9%, the number began to increase since 2000/01. With a five years interval, the most drastic increment of the budget deficit is recorded from 2000/01 to 2005/06: it is a time when budget deficit has increased by almost three fold.

To conclude, budget deficit is increased from time to time, so the government should do some measurement. From different measures which are taken to reduce budget deficit, the best ways for Ethiopia is reducing unproductive expenditure like defense expenditure. According to a study by global fire power, the Ethiopian government has approved a 6.7% increase in defense expenditure as part of the 2014-15 state budgets; which means budget for national defense will rise from ETB7.5 billion (USD380.5 million) to ETB8.0 billion (USD405.9 million). By reducing such kinds of unproductive expenditure and shift the budget for more productive expenditure, the government can achieve both stable budget balance and at the same time boost economic growth.

3.1.4) Inflation

Inflation can be used as a proxy for macroeconomic stability (see fisher, 1996). This may be due to the fact that in a situation where the general price level is continuously raising, it is very difficult to maintain macroeconomic stability.

Here in Ethiopia, rise in prices were mainly associated with fall in output (especially agricultural harvest) and years of high production were accompanied by fall in price. For instance in 2000/01, output was grown by 8.3 percent (mainly due to a 9.6 percent increase in agricultural output) and consumer price index decreased by 5.2 percent (owing mainly to a 10.4 percent decrease in food price). In the following two years there was a significant fall in agricultural production due to unfavorable weather condition. Especially, in 2002/03 agricultural output decreased by 10.5 percent and the consumer price index increased by 15.1 percent (with food price growing by 24.8 percent).

In the early 1990's Ethiopia was characterized as a low inflation country. In the Ethiopian history the lowest inflation rate is recorded in 2001/02, the country experiences a deflation of -7.2% (see EEA, 2012) due to a decline in food price associated with bumper agricultural production following the good weather condition. In contrary to this, the highest rate of inflation is recorded in July of 2008 which is estimated around 64.20% and recently that means in October, 2014 the inflation rate is recorded at 5.4%.

During 2002 inflation has shown a negative sign in all regions of Ethiopia. The decline in price in 2002 peaked up to 15.1% in 2002/03. The inflation rate further increase and reached the highest level of 18.6 in October 2003. Though there was a slight decline in 2003/04 it continues to rise again in 2004/05. The main reason behind the increment of inflation since 2003/04 was basically due to an increase in the house rent, price of construction materials, water, fuel etc.

Inflation is also differing from one region to the other. Inflation rate in different region can be summarized as follows.

Table 3.4: - Inflation by region (2002-2015)

	2002	2004	2006	2008	2010	2012	2014	2015
Addis ababa	-4.3	5.78	9.46	23.61	11.15	25.79	9.3	9.21
Amhara	-4.52	12.59	13.16	29.25	3.13	35.06	4.3	6.35
Oromia	-3.60	8.25	10.74	31.91	3.71	37.83	10.1	9.78
Tigray	-3.68	4.46	11.86	10.01	3.1	28.36	4.4	4.23
National	-5.23	8.5	12.38	26.48	4.15	22.9	7.75	7.4

Source EEA, CSA and own computation

Note; - 2015 inflation rate is estimated by using only four months data.

As we have seen from the table, in the year 2002, negative inflation were recorded in all regions. From the four regions, in Amhara the lowest inflation was recorded (-4.52%). Even if it is the lowest from the four major regions, it is higher than the national inflation rate (- 5.25%). This shows that inflation is higher in the major regions than the least developed regions. The soaring inflation of 2007/08 has hit almost every region of the country. However the magnitude of the rise in price varies across regions. From the major four regions, Oromia and Amhara recorded the highest annual increase in price of 31.91 and 29.25 percent respectively; whereas Tigray has the lowest inflation at 10.01% which is also lower than the national inflation rate of 26.48%.

Different reason has been mentioned about sources of inflation in Ethiopia. According to African development bank (AFDB), 2011, the main driver of short-run inflation in Ethiopia is a surge in money supply, accounting for 40 percent and concludes that an Inflationary pressure in Ethiopia is reflecting monetization of the fiscal deficit. Whereas Alemayehu and Kibrom (2008) points out that the determinants of inflation are differ for food and non-food sectors and in the

short and long run as well. According to them, sharp rise in food demand triggered by an alarming rise in money supply/credit expansion, inflation expectation and international food price hike are the main forces behind food inflation in the long run. And also money supply, interest rate and inflation expectations are the long run determinants of non-food inflation. They added that, in the short run model, wages, international prices, exchange rates and constraints in food supply are found to be prime sources of inflation and also cost marking-up as another possible cause of inflation in the short run. Another researcher, Asayehegne (2008) identify that imports, depreciation of the Ethiopian birr, and a decline in the domestic lending interest rates or an increase in broad money supply are the main determinants of inflation in Ethiopia.

To conclude, the above mentioned researchers share the common determinants of inflation in Ethiopia; which is sharp rise of money supply in the economy. Therefore, in order to be able to curb the upward trend in prices, it is essential to adopt conservative fiscal and monetary policy and also inflation expectations need to be tackled by credible government policies to change public opinion and tackling marketing mal-function (Alemayehu and Kibrome et al, 2008).

It is absolutely vital that economic policymakers design strategies that could curtail the on-going erosion of purchasing power—to curb inflation before it deepens the economic crisis and contributes to political instability (Assayehegne, 2008). Thus I strongly recommend that monetary authorities should continue with tight monetary policies, supported by prudent fiscal management to ensure that the macroeconomic environment remains conducive to continuing growth and poverty reduction.

3.2) current flows of foreign direct investment (FDI) in Ethiopia

The government of Ethiopia follows an integrated 5-year development plan, the Growth and Transformation Plan (GTP), which aims to achieve 11.2 – 14.9% GDP growth annually as well as achieve the Millennium Development Goals and attain middle-class income status by 2025. To achieve these goals, the government is investing heavily in large-scale social, infrastructural and energy projects. The GTP also puts a significant emphasis on developing local production to lessen Ethiopia's dependency on imported goods, and encourage investment in the export-oriented sectors of textiles/garments, leather/leather products, cut flowers, fruits and vegetables, and agro-processing.

Given the scale of public investment needed to meet GTP targets, Ethiopia will need significant inflows of foreign direct investment. According to the United Nations Conference on Trade & Development (UNCTAD) report which is released on June 24, 2014, revealed that Ethiopia was the third largest recipient of foreign direct investment (FDI) in Africa in 2013, with a 240% increase from the amount in 2012. The country has also registered a significant increase in their Foreign Direct Investment (FDI) stock[6]. According to the report, the FDI inflow to the country had reached 953 million dollars in 2014, up from the 279 million dollars it was in the previous year. Its foreign direct investments inward stock also reached close to 6.1 billion dollars in 2013, up from 941 million dollars in 2012. The net sales value of cross border merger and acquisition (M & A) in the country has also increased by more than double to 366 million dollar in 2013, from 146 million dollars in 2012. Though the amount of FDI inflow in the form of M & A has increased a considerable amount in the year, the major part of the country's investment inflow comes from green field projects, according to the report. Investment in light manufacturing from

[6] the amount of investment from aboard held within the economy

China, Turkey and India has the major share in the increase of the amount of foreign investment into Ethiopia. Sources of FDI based on their largest share in Ethiopia can be summarized as follows:

Table 3.5: - Sources of FDI (July 9, 2012 – July 5, 2013)

rank	Country of origin	No. of projects	Capital in' 000' USD
1	Turkey	34	1,513,503
2	China	155	358,642
3	Saudi Arabia/ Ethiopia	11	318,189
4	India	47	302,993
5	Sudan	97	125,008
6	Britain	2	114,326
7	South Africa/ Ethiopia	2	112,494
8	Saudi Arabia	19	107,669
9	Germany/ Ethiopia	5	100,693
10	Netherlands/ Ethiopia	4	40,944
Total		376	3,094,461
Others		345	458,235
Grand total		712	3,552,697

Source: - Ethiopian investment agency

Foreign direct investment inflow has increase from time to time. Strong natural resource base, cheap labor, conducive tax environment, importing duty-free capital goods and construction materials, etc may be the reason for the increment of FDI from time to time.

3.3) saving and investment in Ethiopia

Most developing countries in Africa heavily relied on overseas development assistance (ODA) to fund the bulk of investment needed to prop growth and create a sustainable economic development path. Consequently, the domestic and regional financial markets-as sources of funds - were neglected considering that no or few viable policies were actively implemented to shore up domestic savings, especially households' savings. The issue of low levels of domestic savings is a major problem in developing countries due to high levels of unemployment, low wages, and engagement of a large proportion of the population in the informal sector as well as poor performance of the economy (Reddy, 2010).

Here in Ethiopia, the rate of growth of investment and saving are not equal. According to MOFED (2014), Rate of Investment has reached 40.3% of GDP where as Domestic saving has reached 22.5% of GDP. The trend of gross domestic saving as a ratio of GDP and investment as a percentage of GDP is summarized as follows: -

Table 3.6: - trends of saving and investment in Ethiopia

variables	1960/61-73/74	1974/75-90/91	1991/92-2011/12	2012/13	2013/14
Gross domestic saving	17.7%	7.3%	11.2%	19.2%	22.5%
investment	14.7%	13.2%	15.1%	35.8%	40.3%

Source: - author's computation based on MOFED data

During the imperial regime, gross domestic saving was greater than investment. This shows that domestic saving is fully covered domestic investment.

After the down fall of the imperial regime and the reign of DERG regime, saving has begun to decline by almost 58.7% and investment has decline by 10.3%, this shows that great amount of saving-investment gap has created during the DERG regime.

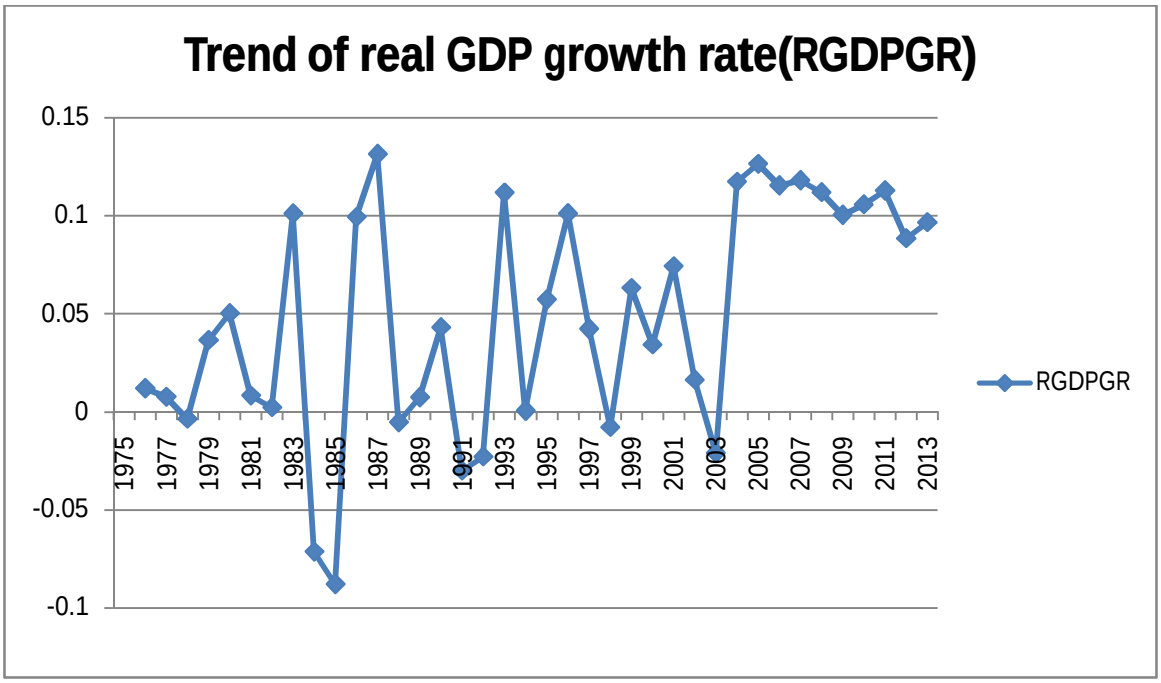
As shown from the table, domestic saving has increases from year to year. This may be due to the policy which is implemented by the government like paying salary in a Bank, housing system (like 40/60, 20/80 etc) and growth of micro financial institution are the main methods which is used by the government to mobilize saving from the citizen.

3.4) Economic growth

As we know, Ethiopia has experienced three policy transitions, (the imperial era (prior to 1973/74), the socialist (Derg) regime (1974/75-1990/91) and the EPRDF regime (1991/92 on wards)) each with unique economic policies with different impact on macro-economic performance of the country. Hence the performance of the country's economy is highly correlated with changing political economy. For instance, During the Imperial period (pre 1974) economic policy was mainly known to be market oriented economic system and the political process was unpredictable and violent; which exert detrimental impact on the macro performance. Due to this, economic performance was not improving. During the derg regime (1974/75-1990/91), the government exercised centralized economic system. Because of intervention of the government in all types of economic activities and nationalization of all types of property, the economy was goes to the worst. After the down fall of the derg regime in 1991/92, the new government (EPRDF) liberalized the economic system. Due to this, relatively good economic performance is recorded though it experienced fluctuations.

Trends of growth rate of real GDP from the year 1974-2013 can be summarized as follows

Figure 3.1: trends of growth rate of real GDP



Source; - own computation based on MOFED data

As shown from the figure, growth rate of GDP show tremendous fluctuation. During the derg regime, Ethiopia has recorded the lowest rate of economic growth which is almost -0.1%. In addition to this, the average growth rate in real GDP was only 1.77% for the seventeenth years. Due to drought, growth was decelerated by 7.14% and 8.79% during 1983/84 and 1984/85 respectively. However the growth rate displayed remarkable recovery from the previous years and reached 9.93% and 13.4% in 1985/86 and 1986/87 respectively as a result of the economic reforms taken as it creates relatively conductive environment for domestic and foreign private investors.

The Ethiopian economy has grown rapidly as the transition from a command to a market based economy takes place. However, the performance of GDP growth rate in the beginning of current

EPRDF regime (1991/1992) was discouraging (-2.29) due to unfavorable economic basis inherited from the previous regime. Furthermore, growth rate of GDP had also very low in 1997/98 (-0.79%) because of unexpected Eritrea's aggression. Ethiopia registered the highest GDP growth (double digit growth rate) in the current EPRDF government for the period 2003/04-2010/11 especially in 2004 (12.6%) and 2006(11.8%).

3.5) sector contribution of real GDP

A basic feature of the Ethiopian economy is the dominance of the agricultural sector in terms of output contribution, market contribution, and employment and export earnings. Agriculture accounts more than 50% of the national output and 85% of the population are employed in this sector. In addition, more than 90% of the total foreign exchange is generated from this sector. The performance of the economy as a whole is greatly influenced by what happened in the agriculture sector. The following table demonstrates the average share of agriculture, industry and service sectors to GDP in the two regimes.

Table3.7: Average percentage sector contribution of GDP in the two regimes

sectors	Sectoral contribution				
	1974/75-1990/91	1991/92-2012/13	Average (1974/75-2012/13	2012/13	2013/14
Agriculture	58.8	51.9	54.9	42.5	40
Industry	9.93	11.4	10.5	12.4	14
Service	31.4	37.83	35.03	45.2	46
Distributive service	19.4	19.78	19.6	24.3	24.8
Other service	12.03	18.04	15.4	20.9	21.2

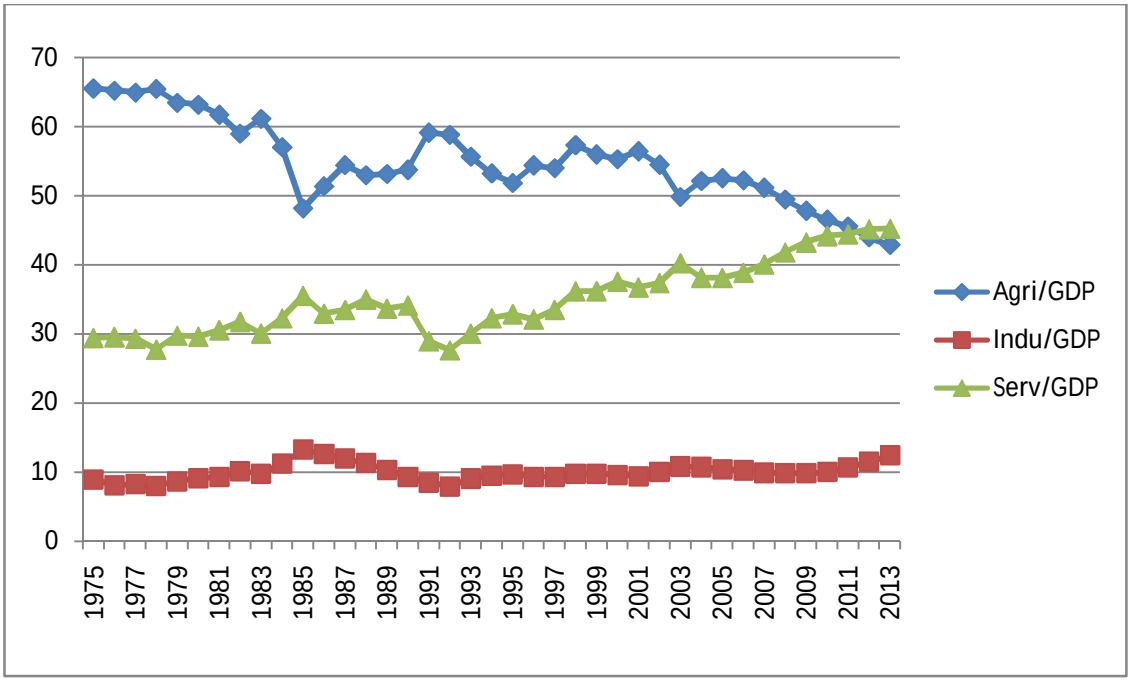
Source; - own computation based on MOFED data

As shown from the table, Agriculture as compared to other sectors, contributed a lion share of real GDP of Ethiopia during the entire period under review 1974/75-2013/14. That is, the share of agriculture was 54.9%, while that of industrial and service sectors were 10.5% and 35.03% respectively.

The structure of the Ethiopian economy is characterized by a decline in the share of value added in the agriculture over the last decade though agriculture still remained to be dominant in employment creation and a major source of foreign exchange earnings. The service sector has overtaken the lead in dominating the economy judged by its contribution to GDP. In the fiscal year 2013/14, the service sector took the upper hand with a 46% share of the total value added of GDP, where as Agriculture stood 40% of GDP.

Trends in the share of Agriculture, Industry and service can be shown graphically as follows.

Figure 3.2: trends of the share of agriculture, service and industry to GDP



Chapter4: - Model Specification and Methodology

4.1) model specification

4.1.1) Measuring macroeconomic instability

In order to determine macroeconomic situation, I used macroeconomic instability index. Macroeconomic stability exists when key economic relationships are in balance (Bleaney, 1996; Ismihan, 2003; Haghighi and Isfahani, 2012). For example, balance between domestic demand and output, fiscal revenues and expenditure, savings and investment, as well as the balance of payments. These relationships, however, need not necessarily be in exact balance. Therefore a change in macroeconomic instability may result from one or more policy-induced macroeconomic instability indicators; such as, public deficit to GDP ratio, real exchange rate fluctuations, external debt to GDP ratio, as well as inflation rate. This definition is in line with Fischer (1993a, 1993b), Bleaney (1996), Ismihan (2003) and to some extent with Haghighi and Isfahani (2012). A combined index is appropriate for this purpose, because, each variable has only partial information separately (Ismihan et al, 2003). For example, inflation is a good index of monetary and financial status but it may be affected by the prices control. When inflation is managed by price controls, uncertainty and lack of confidence in fiscal policies imposes pressure on the exchange rate. The exchange rate pressures may not be revealed under a constant exchange rate regime, but policymakers try to stabilize foreign currency within the framework of changes in the international reserves (Ibid).

Usually, one component of macroeconomic index can be used as an indicator of macroeconomic instability. For instance; Larraine and Schmidt-Hebbel (2006); Gerry and Mickiewicz (2008), shows the impact of Macroeconomic instability by using inflation as an index of macroeconomic instability. But rather than using one variable as an indicator, using a Macroeconomic Instability

Index (MII) is relatively shows the use of more comprehensive criterion of the macroeconomic instability.

Ismihan (2003) and Haghighi and Isfahani (2012) computed macroeconomic instability index (MII) by using the human development index (HDI) methodology (UNDP, 1992).

Ismihan (2003) used four variables as macroeconomic instability indicators, namely, inflation rate, public deficit to GDP ratio, external debt to GDP ratio and change in exchange rate (exchange rate variability), similarly Haghighi and Isfahani (2012) also used four variables but in place of external debt to GDP ratio, they used current account deficit to GDP ratio.

It is obvious that the four indicators are not measured in the same units and more importantly they have different ranges, i.e. they have different minimums and maximums. Therefore, it seems not sensible to sum their values or to take their simple average in order to obtain a composite index. Fortunately, the HDI methodology circumvents these problems.

Thus, the MII is constructed in two steps by utilizing UNDP HDI methodology. In the first step, the mentioned four macroeconomic instability indexes are built based on the following relation:

$$I_t = \frac{(X_{t-X_{min}})}{(X_{\max -X_{min}})} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \textit{(4.1)}$$

Whereas; -

I_t refers to the index value of variable X, i.e. macroeconomic instability indicator X, in year t,

X_t refers to the actual value of indicator X in year t

$X_{min}(X_{max})$ refers to the minimum (maximum) value of indicator X over the whole period under consideration. It should be noted that, the formula at 4.1 implies all sub-indices have a common range that lies between zero and 0 and 1.

In the second step, the Macroeconomic Instability Index (MII) is obtained based on the four simple averages of the above variables.

4.1.2 Growth equation

The growth model which is used in this study is based on endogenous growth model. The endogenous growth model, which is developed by Lucas- Romer extends the old neo classical model by emphasizing the role of endogenous factor (like human capital stock and R&D activities) as the main engine of economic growth. While early neo-classical model assumes that total factor productivity growth (technical progress) as exogenously given, the newer endogenous growth models attributes these components of growth the 'learning by doing ' effect occurring between physical and human capital, which results in increasing return to scale in production technology (Lucas, 1988).

The most distinctive difference between the neo-classical exogenous and endogenous growth theory is that the former assumes constant return to scale with diminishing marginal productivity of capital per capita (MP_k) (Solow, 1956 as cited on Romer, 1990), where as the later generally assumes constant or increasing return to scale with non- diminishing MP_k. The assumption of non-diminishing MP_k provides a possible way to long run sustained economic growth in the endogenous growth theories. Therefore due the above mentioned reason, endogenous growth model is used in this paper.

According to the augmented neo-classical (endogenous growth model), Economy admits a representative firm, with a representative (or aggregate) production function (Barro & Sala – i - Martine 2004). So the model below which is based on Mankiw (1992), Knight (1993), Hadjimichael et al., (1994) and Haghighi and Isfahani (2012), will begin with simple production function where output is a function of labor, human capital and physical capital.

$$Y_t = f\,(Kt, H_t, L_t)\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{ (4.2)}$$

Even if capital (both human and physical) and labor are accumulated, without factors productivity does not matter for one nation economic growth. The productivity of the input is depends on both the degree of technology and efficiency of the economy (Barro & Sala – i - Martine 2004). So by including factors productivity and using Cob-Douglas equation, production function can be represent as follows:

$$Y_t = A_0\,(A_kK)^{\alpha}\,(A_HH)^{\beta}\,(A_LL)^{1-\alpha-\beta}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(4.3)}$$

Where: -

Y = real product, L= labor force, K, H= physical and human capital respectively.

A_0 = is general indicator of technology and efficiency in economy, A_k, A_H, A_L is the increased technology of physical and human capital and labor respectively.

Factors productivity (technology) can be put in one variable as follows: -

$$A = A_L\,(A_0A_k^{\alpha}A_H^{\beta})^{1/1-\alpha-\beta}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{ (4.4)}$$

So equation (4.3) can be rewritten as follows:

$$Y = K^{\alpha} H^{\beta}(AL)^{1-\alpha-\beta} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.5)$$

Where: -

"A" can be interpreted as general level of technology and efficiency. In this formula, "A" can be interpreted as a parameter which merely reflects increasing technology of work.

According to Barro & Sala – i -Martine (2004), if we want to consider models that possess a steady state, we have to assume that technological progress takes the labor-augmenting form, in order to have a sustainable situation. Thus, in the Cobb–Douglas case, we will be safe in assuming that technological progress is labor augmenting (see Barro & Sala – i -Martine, 2004 pp, 612 for proof). It is assumed that accumulation, labor force growth and technology should be according to the following functions:

$$L = L_0 e^{nt} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.6)$$

$$A = A_0 e^{(gt + x\,\varepsilon)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.7)$$

Where: -

"n" represents exogenous rate of labor force growth

"t" represents a time indicator

"g" represents technical progress exogenous

"X" is a vector of policy variables and other factors affecting technology and efficiency level in economy,

"ε" represents a vector of coefficients related to this policy variables and other effective factors

We can express physical and human capital and real product in terms of effective unit of labor.

$$k = \frac{K}{AL} \quad , \quad h = \frac{H}{AL} \, , y = \frac{Y}{AL} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \textit{(4.8)}$$

The production function and physical and human capital accumulation functions are rewritten according to the per capita amounts of effective labor force unit as follows:

$$y = k^{\alpha} h^{\beta} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \textit{(4.9)}$$

Let us pause here for the moment and say something about investment (capital accumulation). As we know gross investment depends on both replacement investment and net addition to the capital stock. i.e

$$It = \delta Kt + \Delta kt \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.10)$$

Where: -

I_t = gross investment, δK_t = replacement investment, Δkt= net addition to capital stock and δ is a constant depreciation rate.

Let us assume that Amount of saving and investment are equal in the economy.

St = I_t which intern $sY_t = \delta K_t + \Delta kt$ ……. *(4.11)*

By following the trend and with some algebraic manipulation, we reached the following equation:

$$\frac{dk}{dt} = S_k y - (n+g+\delta)\,k \quad \text{..... (4.12)}$$

Where: - S_k = saving ratio in the economy, y and k real output and capital per effective labor respectively, n = population growth rate, g= rate of technical progress and δ= depreciation rate in the economy.

By using the same fashion, we can also derive for human capital

$$\frac{dh}{dt} = S_h y - (n+g+\delta)\,h \quad \text{..... (4.13)}$$

In stable condition (at steady state) physical and human capital level will remain constant per effective labor force unit (Barro & Sala – i –Martine et al, 2004). Therefore equation (4.12) and (4.13) set to "zero" and the value of physical and human capital per effective labor will be solved. Balanced values of effective physical and human capital per capita can be solved as follows:

$$k^* = \left[S_k^{1-\beta} S_h^{\beta} / (n+g+\delta) \right]^{1/1-\alpha-\beta} \quad \text{.....(4.14)}$$

$$h^* = \left[S_k^{\alpha} S_h^{1-\alpha} / (n+g+\delta) \right]^{1/1-\alpha-\beta} \quad \text{.....(4.15)}$$

These are the steady state value of human and physical capital. Let us substitute the steady state value of equation 4.14 and 4.15 in equation (4.9) and take natural logarithm and then effective labor force per capita product in a stable condition is achieved:

$$Lny^* = \left[\frac{\alpha}{1-\gamma}\right] lnSk + \left[\frac{\beta}{1-\gamma}\right] ln\, Sh - \left[\frac{\gamma}{1-\gamma}\right] ln\,(n+g+\delta) \quad \ldots\ldots\ldots\ldots \quad (4.16)$$

Where: $-\gamma = (\alpha+\beta)$

Now let us remind equation (4.7): real product per effective unit of labor can be calculated as

$y = \frac{Y}{AL}$, in place of "A" we can use equation (4.7), by taking a natural log output per effective unit of labor can be represent as follows:

$$lny = ln\left[\frac{Y}{L}\right] - lnA = ln\left[\frac{Y}{L}\right] - ln\, A_0 e^{(gt+x\,\varepsilon)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.17)$$

By making some rearrangement, we got the following equation:

$$ln\left[\frac{Y}{L}\right] = lny + lnA_0 + gt + x\,\varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.18)$$

In place of lny we can substitute equation (4.16) then our equation will be as follows:

$$ln\left[\frac{Y}{L}\right] = \left[\frac{\alpha}{1-\gamma}\right] lnSk + \left[\frac{\beta}{1-\gamma}\right] ln\, Sh - \left[\frac{\gamma}{1-\gamma}\right] ln(n+g+\delta) + lnA_0 + gt + x\,\varepsilon \quad \ldots\ldots (4.19)$$

From Equation (4.19), a growth regression equation can be extracted for each economy with considering its economic condition.

The variables $n+g+\delta$ can be proxy by labor force and according to Mankiw (1992) $g+\delta$ take the value of 0.05.

The last variable ($x\ \varepsilon$) represent vector of policy variables and other factors affecting technology and efficiency level in economy. It can be proxy by macroeconomic instability index (MII).

And also, $\left[\frac{\beta}{1-\gamma}\right] ln\ Sh$ can be proxy by human capital. The reason that I include human capital as a determinant factor is that, a wide range of growth models has treated human capital as a critical factor in determining growth rate of output. It is an important source of long-term growth; either because it is a direct input to research or because of its positive externalities (see Lucas, 1988; Romer, 1990; Acemoglu 2007). The inclusion of human capital variables in growth models are intended to capture quality differences in the labor force, as non-physical capital investment increases the productivity of the existing labor force.

Human capital can be proxies by different indexes. For instance Barro and Lee (1993) points out that; human capital can be measured by an index of educational attainment, by mean years of schooling, or by school enrolment. However none of this data are found in the required level. Due to this, expenditure on education is used in order to proxy human capital.

$\left[\frac{\alpha}{1-\gamma}\right] LnSk$ can be proxy by capital accumulation. Acemoglu,(2007) points out that Physical-human capital interactions could potentially be important, since a variety of evidence suggests that physical capital and human capital (capital and skills) are complementary, meaning that greater capital increases the productivity of high human capital workers more than that of low skill workers. This may play an important role in economic growth, for example, by inducing a

"virtuous cycle" of investments in physical and human capital (Acemoglu, 2007). Therefore, capital accumulation is included in this paper for a proxy of physical capital.

Following Barro's (1990) endogenous growth model, there is a possibility that private and public capital stocks affect economic growth differently. Due to this, private and public capital accumulation regressed individually.

Note: - in order to avoid serial correlation between human capital and public capital accumulation, expenditure on education is deducted from public capital accumulation.

Thus, the growth function with their expected sign is given by:

$$RGDP = f(\underset{(-)}{MII},\ \underset{(+)}{HC},\ \underset{(+)}{K_p},\ \underset{(+)}{K_g}\ \ \underset{(+)}{LF},\ )\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (4.20)$$

Where: -

RGDP = real GDP

MII = macroeconomic instability index

HC = human capital which is proxy by education expenditure

LF = labor force

K_p = private capital accumulation

K_g = public capital accumulation which exclude education expenditure.

By taking a natural logarithm, the model to be estimated can be specified as follows:

$$\ln \mathbf{RGDP} = \beta_0 + \beta_1 \ln\mathbf{MII} + \beta_2 \ln\mathbf{HC} + \beta_3 \ln\mathbf{LF} + \beta_4 \ln\mathbf{K_p} + \beta_5 \ln\mathbf{K_g} + \varepsilon_t \quad \text{..... (4.21)}$$

Note; - MII is bounded between 0 and 1; taking logarithm will give as a negative number. So following Ismihan, 2003, I will add 1 in all value of MII (see Ismihan, 2003).

4.1.3 Ways of calculating capital accumulation

For some countries, you can find a capital stock series created by one of the county's governmental agencies or its central bank. Examples of such countries are the U.S., the U.K., Japan, and Germany. However, a capital stock series will not be readily available for a country like Ethiopia. Due to this, I will try to calculate a capital stock series by using a method called *the perpetual inventory method*. Following the work of Beddies (1999), Baier, Dwyer, and Tamura (2006a), the perpetual inventory method uses the following formula;

$$K_{pt}^{*} = Kp_{t-1} + Ip^{*}_{t} - \delta Kp_{t-1} \quad \text{.......................... (4.22a)}$$

This can be rewritten as;

$$Kp_t^{*} = K_{pt-1}(1-\delta) + I^{*}p_t \quad \text{.......................... (4.22b)}$$

Where; - K_{tp}^{*}= private capital stock at period t, Kpt_{-1}= the level of private capital stock one period lag I_{tp}^{*}= is the private investment level at period t and δ is depreciation rate (assumed constant over time) equal to 5%.

Note; - There is the same way to generate public capital accumulation series.

4.1.4 Private Capital accumulation equation

In this part, I will try to use the accelerator model. In the accelerator model, since the capital-output ratio in most economies is larger than one (often three or more); moderate expected changes in output are capable of triggering relatively large changes in capital accumulation in

the accelerator model (Parker,2009). This is one of the reasons that this theory gained great popularity.

The accelerator model begins with an assumption that firms' desired capital-output ratio is roughly constant. This implies that the desired capital stock for any period *t* is proportional to the level of output in period *t*. According to Blejer and Khan, (1984), Branson, (1989), Fry, (1998), Agrawal et al (2000), the accelerator model relate desired capital stock k* to real output, y:

$$k_t^* = \alpha y_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.23)$$

Where: - k_t^* = desired capital stock in period t; α = capital output ratio; y= output at period t

A partial adjustment mechanism allows the actual capital accumulation to adjust to the difference between the desired capital accumulation and the capital accumulation in the previous period (Branson, 1989, Agrawal et al 2000, Pentecost, 2000):

$$k_t - k_{t-1} = \lambda\,(k_t^* - k_{t-1}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.24)$$

Where; - λ refers to the coefficient of adjustment. The flexible accelerator model allows economic conditions to influence the adjustment coefficient λ (Agrawal et al, 2000). Specifically can be shown as follows;

$$\lambda = \beta_0 + (\beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots\ldots\ldots)[\,k_t^* - k_{t-1}\,] \ldots\ldots \quad (4.25)$$

Where; - X_i are variables like macroeconomic instability, capital flight and others that are expected to affect the coefficient of adjustment which is λ. whereas β_i are the coefficients.

Equation (4.24) can be written as follows

$k_t = \lambda k_t^* + (1-\lambda)\, k_{t-1}$ …… *(4.26)*

Substituting (4.23) into (4.26) and simplifying gives:

$k_t = \lambda\alpha y_t + (1-\lambda)\, k_{t-1}$…… *(4.27)*

Equation (4.27) can be rewritten as follows:

$K_t = K_{t-1} + \lambda\,(\alpha y_t - k_{t-1})$…… *(4.28)*

Thus equation (4.28) is a type of capital accumulation equation, augmenting other variables that best capture the behavior of capital accumulation; the model is extracted as follows.

$K_{pt} = f(CFt, SAV_t, MII_t, K_{gt}, open_t)$…… *(4.29)*

(-) (+) (-) (?) (+)

Where; -

Kp_t = private capital accumulation at time t

CF_t = capital flight at time t

SAV_t = level of saving at time t

MII = macroeconomic instability index

K_{gt} = public capital accumulation at time t

OPENt = level of openness at time t

By taking a natural logarithm, the model to be estimated can be specified as follows:

$$Ln\boldsymbol{K_p} = \alpha_0 + \alpha_1 Ln\boldsymbol{MII} + \alpha_2 Ln\ \boldsymbol{K_g} + \alpha_3 Ln\boldsymbol{SAV} + \alpha_4 Ln\boldsymbol{OPEN} + \alpha_5 Ln\ \boldsymbol{CF} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots \textit{(4.30)}$$

4.2 Econometric Approach

Stationarity test

Before estimating a model by using a time series data, it is necessary to identify the time-series properties of the data. From this stationary test is the one.

A stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance depends on the distance between two time periods not on the actual time at which the covariance is computed. This type of a stochastic process is called weak stationarity (Verbeek, 2004:258). On the other hand a stochastic process is said to be strictly stationary if the joint probability distribution is independent of time. This implies that the distribution of Y_1 is the same as Y_t and so on (Verbeek, 2004).

4.2.1 The unit root test

Several tests are usually employed to test whether time series variables are stationary or non stationary; the Dick-Fuller (DF), the Augmented Dick-Fuller (ADF) test, Auto-Correlation Function (ACF) and Phillips-Peron test. In this paper the researcher tried to employ both Augmented Dick- Fuller and Phillips-Perron (PP) test.

Dicky- fuller test

Dick-Fuller (DF) test can be tested in three ways.

$$\Delta y_t = \delta y_{t-1} + u_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.31)$$

$$\Delta y_t = \beta_1 + \delta y_{t-1} + u_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.32)$$

$$\Delta y_t = \beta_1 + \beta_{2t} + \delta y_{t-1} + u_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.33)$$

Where; - $U_t \sim \text{IID}(0, \delta^2)$; t is a time trend; equation (4.40) represent a random walk, (4.41) represent a random walk with drift and (4.42) represent a random walk with drift and time trend. In each of the three cases, the null hypothesis is $\delta=0$ i.e. there is a unit root or non stationarity against the alternative $\delta<0$ i.e the time series is stationary. Dickey-Fuller (DF) test is based on a simple autoregressive of order one, AR (1) process with a white-noise disturbance.

The DF test regression does not include values of variables beyond one lag, the error terms may be serially correlated; results based on such tests may be biased and are not valid (Davidson and Mackinnon, 1999; Gujarati, 2004).the Augmented Dickey- Fuller (ADF) test avoids this problem because it corrects for serial correlation by adding lagged-difference terms (Greene, 2003).

The augmented Dicky- fuller test

The Augmented Dickey-Fuller (ADF) test adjust the DF test to take care of possible serial correlation in the error terms by adding the lagged difference terms of the dependent variable.

The ADF test can be represent as follows:

$$\Delta y_t = \beta_1 + \beta_{2t} + \delta y_{t-1} + \sum_{i=1}^{p} \alpha i \ \Delta y_{t-p} + u_t \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.34)$$

Where: - u_t = a pure white noise error term; $\Delta y_{t-1} = (yt_{-1} - y_{t-2})$; $\Delta y_{t-2} = (y_{t-2} - y_{t-3})$ *etc*

Y_t = any variable in the model to be tested for stationarity.

ADF test uses the same null hypothesis and the same asymptotic critical value as that of DF test (Gujarati, 2004: 815-819). Both of them uses δ=0 as the null hypothesis and δ <0, as an alternative. Where a rejection of this hypothesis indicates that the time series is stationary and it does not contain a unit root (Enders 1995).

Phillips-Perron (PP) test

The other test of stationarity with the same null as ADF is the Phillips-Perron (PP) test, which is argued to be more robust to serial correlation and time-dependent heteroskedasticity and is an improvement over the ADF test with respect to finite sample properties (Deme, 2002).

In contrast to the ADF, the PP test does not add lagged difference terms to account for a potential serial correlation in the error terms; rather, it uses non-parametric statistical methods. This test's statistic follows the same asymptotic distribution as the ADF test statistic *(*Gujarati, 2004).

4.2.2 Lag length selection criteria

Before estimating the VAR, we have to decide the maximum lag length, to generate the white noise error terms. According to Davidson and Mackinnon (1999), the estimation of the VECM requires the determination of the appropriate lag length because the cointegration result may be sensitive to the number of lags included in the VAR. Thus, prior to cointegration testing and

estimation of the VECM, we need to determine the appropriate lag length, which is determined using the well-known model selection criteria, the Akaiki Information Criteria (AIC), the Final Prediction Error (FPE), the Hannan-Quinn Information Criteria (HQ), and the Schwarz (Bayesian) Information Criteria (SIC).

4.2.3 Co integration test

Now a day long run linear relationships among variables in the presence of short-run deviations from the long run equilibrium are checked, using co-integration test. In the face of non-stationary series with a unit root, first differencing appears to provide the appropriate solutions to ensuring series are weakly stationary. First differencing, however, does possess a major limitation in that it tends to ignore the long run properties of the data (Kennedy, 1992). In order to obtain both the short run and long run relationship one can appeal to what is known as co integration. There are two approaches used in testing for Co integration. These are; i) the Engle-Granger (two step algorism) and ii) the Johansen Approach.

A) the Engle-Granger (two step algorism)

The Engle-Granger (E-G) method requires that for co-integration to exist, all the variables must be integrated of the same order. Hence, once the variables are found to have the same order of integration, the next step is testing for co integration. This needs to generate the residual from the estimated static equation and test its stationarity. By doing so we are testing whether the deviation (captured by the error term) from the long run are stationary or not. If the residuals are found to be stationary it implies that the variables are co integrated. This in turn ensures that the deviation from the long run equilibrium relationship dies out with time (Enders, 1996).

Test of The Engle-Granger (E-G) method is simple. If two time series y_t and x_t are both integrated of order *d* (i.e. I (*d*)), then, in general, any linear combination of the two series will also be I (*d*); that is, the residuals obtained on regressing Y_t on x_t are I (*d*). If, however, there exists a vector b, such that the disturbance term from the regression $(e_t = y_t - bx_t)$ is of a lower order of integration I (*d-b*), where $b>0$, then Engle and Granger (1987) define y_t and x_t as co integrated of order (*d,b*).

Even if, the Engle-Granger (EG) has the advantage that it is intuitive and easy to perform, it has encountered the following limitation. First, it has no systematic procedure for separate estimation of the multiple co integrating vectors. The method makes the implicit assumption that the co integrating vector is unique, which means that we are bound to end with a model that is a linear combination of independent co integrating vectors. Second, the co integration test may depend on the variable put in the left side of the co integration. That is, the test is not invariant to the variable used for normalization (Enders, 1995). Finally, the method does not allow the variables in the right hand side to be potentially endogenous (Harris, 1995).

Therefore, to encounter the above mentioned limitations the researcher will use the Johansen maximum Likelihood Procedure (1988) since it addresses the above stated weakness of the E-G method.

B) The Johansen approach

The Johansen (1988) procedure allows testing for the presence of more than one co integration vector. Moreover, it permits to estimate the model without priority restricting the variables as

endogenous and exogenous. It is used to determine how each endogenous variable responds over time to a shock in that variable and in every other endogenous variable.

The starting point in this procedure is formulation of VAR model in the following form. Considering K-lags of Z_t a general P^{th}-order VAR representing the interrelationships among the *n* variables in the model; as given in Johansen and Juselius (1990) is of the form,

$$Z_t = \Omega + \partial_1 Z_{t-1} + \partial_2 Z_{t-2} + \ldots\ldots\ldots\ldots + \partial_p Z_{t-p} + \varepsilon_t = \Omega + \sum_{i=1}^{p} \boldsymbol{\partial i}\, Z_{t-i} + \varepsilon_t \ldots\ldots \textit{(4.35)}$$

Where; - Z_t = is an (n χ 1) vector of stochastic I(1) variables

Ω = a vector of deterministic terms like trends and intercepts

∂_i = is (n χ n) matrix of coefficient.

$\varepsilon_t = iid\ (0, \Sigma)$ vector of error terms with Σ representing the contemporaneous covariance matrix.

Both the growth equation and capital accumulation equation can be expressed as follows;

$ln\ \mathbf{RGDP} = \beta_0 + \beta_1\ ln\mathbf{MII} + \beta_2\ ln\mathbf{HC} + \beta_3\ ln\mathbf{LF} + \beta_4\ ln\mathbf{K_p} + \beta_5\ ln\mathbf{K_g} + \varepsilon_t$ **…**Growth equation

$ln\mathbf{K_p} = \alpha_0 + \alpha_1\ ln\mathbf{MII} + \alpha_2\ ln\ \mathbf{CF} + \alpha_3\ ln\boldsymbol{K_g} + \alpha_4 ln\mathbf{OPEN} + \alpha_5 ln\mathbf{SAV} + \varepsilon_t$ ……. Private capital equation

Developing multivariate models with exogenous variables will allow for comparing their results to those that will be obtained from multivariate models without exogenous variables. These models are also introduced to reduce the problems of possible misspecification and multi co linearity in the data (Lopete, 2004). In VAR model a variable can be described as a function of its past lags and current and past lag values of other endogenous and exogenous variables. From the above equations some variables like RGDP, capital accumulation and domestic saving can be endogenous and others can be exogenous; Multivariate models (VAR) model for the above capital accumulation equation and growth equations with **b- lags** for each exogenous variable and **p- lags** for each endogenous variable can be formulated as follows:

$$LRGDPt = \delta 1 + \sum_{i=1}^{p} \alpha 1 i LRGDPt - i + \sum_{j=1}^{p} \beta 1\, jLKpt - j + \sum_{j=1}^{p} \hbar 1\, jLKgt - j + \sum_{k=0}^{b} \gamma 1 kLHt - k +$$

$$\sum_{n=0}^{b} \phi nLMIIt - n + \sum_{m=0}^{b} \eta mLLFt - m + \varepsilon_{1t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \textit{(4.36)}$$

By following the same fashion, we can also derive for private capital accumulation function.

$$LKpt = \delta 2 + \sum_{j=1}^{p} \beta 2\, jLKpt - j + \sum_{i=1}^{p} \alpha 2 iLCFt - i + \sum_{s=0}^{b} \lambda sLKgt - s + \sum_{n=0}^{b} \phi nLMIIt - n +$$

$$\sum_{w=1}^{p} \sigma 1 wLSt - w + \sum_{c=0}^{b} \mu 1 cOPENt - c + \varepsilon_{2t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \textit{(4.37)}$$

Where; - $\delta 1$ **&** $\boldsymbol{\delta_2}$ are parameters that represent the intercept terms in each equation

$\boldsymbol{\varepsilon_{1t}}$ & $\boldsymbol{\varepsilon_{2t}}$ (assumed to be white noise[7] disturbances and uncorrelated.) are error terms in each equation.

p and **b** are the optimal lag lengths of endogenous and exogenous variables respectively

$\alpha s, \beta s, \phi, \varphi, \gamma s, \eta, \lambda, \theta s, \vartheta, \sigma s$ & $\mu, \hbar$; - are parameter coefficients of the variables.

The next concern in co-integration analysis is the determination of the rank (r) of the long run matrix (Π). This implies the determination of the number of different linear combinations of the variables (or the number of independent co-integrating vectors) that are stationary.

In general, there are three cases that may occur. The first case is when r=0, in which case the short-run dynamics depend only on the lagged changes in the variables and the levels of any of the variables in vector *Z* have no long run relationship (i.e., there is no co-integration relation; all rows are linearly dependent, and the system is non-stationary). *In the* second case, if r=n, all linear combinations would be stationary. Which implies that all the endogenous variables are I(0). In this case, estimating the level VAR and the VECM with unrestricted OLS will yield identical results *(*Davidson and Mackinnon, 1999 pp 630).

In addition to these two extreme cases, one may find the usual intermediate case of 0<r<n, implying a co-integration relationship. In this case, the system is non-stationary, but there are *r* cointegrating relationships that are stationary; Π is said to have reduced rank and contains stationary long-run equilibrium information. However, the rank determination must be

[7] White noise process: a sequence of a variable is said to be white noise if the values in the sequence are serially uncorrelated, have mean zero, and variance σ^2

supplemented by exogeneity and causality tests to obtain an economically interpretable linear relationship among the variables *(*Badawi, 2005*)*.

To determine the rank of the long-run matrix and hence the number of co-integrating vectors, the two likelihood ratio tests (the trace, λ_{trace}), and the maximal eigen value ($\lambda_{maximum}$) statistics are used.

The trace test statistic is given by:

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{n} ln\,(1 - \lambda i) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(4.39 a)}$$

Here we test whether the (n-r) smallest eigen values are jointly zero or not.

The maximal eigen or λ_{max} statistics which is based on estimated $(r+1)^{th}$ largest eigen value is given by;

$$\lambda_{max}(r, r+1) = -T ln(1-\lambda_{r+1}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(4.39b)}$$

Where; - *r* is the number of co-integrating vectors under the null; λ is the estimated characteristic root (eigen values) from the Π matrix; and *T* is the number of observation.

λ_{max} Statistics tests the null hypothesis that there are 'r' co integrating vectors against the alternative of 'r+1'. The trace statistics (λ_{trace}), on the other hand, tests the hypothesis of less than or equal to 'r' co integrating vectors against the alternative of 'r+ 1. The distributions of both test statistics follow Chi-square distributions (Enders, 1995).

4.2.4 Vector error correction model

Economic variables have short run behavior that can be captured through dynamic modeling. If there is long run relationship among the variables, an error correction model can be formulated that portray both the dynamic (short run) and long run interaction between the variables. So The VECM contains information on both the short-run and long-run properties of the model, with disequilibrium as a process of adjustment to the long run model. Following the Granger representation theorem, if some variables are co-integrated, the vector error correction model (VECM) representation can be written as follows:

$\Delta z_t = \psi\Omega + \Pi Z_{t-1} + \theta_1 \Delta Z_{t-1} + \ldots\ldots\ldots\ldots + \theta_p \Delta Z_{t-p-1} + \varepsilon_t = \psi\Omega + \Pi z_{t-1} + \sum_{i=1}^{p-1} \theta_i \Delta Z_{t-i} + \varepsilon t$ …….. …….. (4.38)

Where; -

Δz_t = represents the first differences of the variables; $\theta_i = \sum_{j=i+1}^{p} \alpha j$ is an *(nxn)* coefficient matrix in the error correction term (which contains short-run parameters); $\psi\Omega$ = is a constant; $\Pi = \sum_{i=1}^{p} \alpha j - i$ is (nxn) matrix of long-run responses, which contains information about the long-run relationships. And εt represent the error terms are assumed to be Gaussian or well-behaved.

4.2.5 Impulse response and variance decomposition

Impulse response is a method of assessing the interaction among the variables in the VAR. it can be used either to assess the dynamic behavior of the VAR or to investigate the policy impact of the variables that constitute the VAR (Alemayehu, 2009). The coefficients of VAR/VEC models

only reveal the direct or ceteris paribus effect. They do not take account of the fact that the lagged explanatory variables in each equation are inter linked. That is both with the lag and contemporaneously and therefore does not reflect the full impact of one variable on the other. For this reason, the analysis relies to a great extent on impulse response functions to estimate the total short and long run an increase in macroeconomic instability on both economic growth and investment. Generally impulse response shows how one variable, say economic growth responds over time to a shock in another variable (say macroeconomic instability index) and compares this response to shocks from other variables. Impulse response only traces out the time path of the effects of shocks of other variables contained in the VAR model on a specific variable. In other words, this approach is designed to determine how each variable responds over time to an earlier shock in that variable and to shocks in other variables (Shin, 2006).

The variance decomposition helps in identifying the degree to which one variable influences the other. In this study variance decomposition will be used to break down and ascertain the degree to which macroeconomic instability influence other variable in the system and vice versa. To make it brief, variance decompositions show the portion (or relative importance) of variance in the prediction for each variable in the system that is attributable to its own innovations and to shocks to other variables in the system.

Enders in Shan *et al.* (2006) proposed that the forecast-error variance decomposition permits inferences to be drawn concerning the proportion of the movements in a particular time-series due to its own earlier shocks vis-a–vis shocks arising from other variables in a VAR model. The technique breaks down the variance of the forecast error for each variance following a shock to a particular variable, and in this way, it identifies which variables are strongly affected and those that are not.

Chapter5: Empirical Result and Discussion

This chapter presents and discusses the results of the empirical analysis based on econometric frameworks given in the previous chapter. Which means econometric results and their interpretations along with theoretical and empirical supports is present in this chapter. Specifically, the unit root test, co integration test, long run and short run dynamics and diagnostic tests are present for both private capital accumulation and economic growth equations.

5.1) Unit root test result

The unit root test is a common practice in macro-level data analysis to identify the problem of non-stationarity. If this behavior of macro-variables is left uncorrected, it would lead to the problem of spurious regression. The test examines that whether the data series is stationary or not. To conduct the test, the conventional Augmented Dickey Fuller (ADF) test and Phillips-Perron test are used. The null hypothesis for the test states that the data series under investigation has a unit root (non stationary) with the alternative hypothesis states that the series is stationary. The result of the test for the variables at level and at their first difference is presented in Table 5.1;

Table 5.1: unit root test

	Augmented Dicky-Fuller test (with trend and intercept		Phillips-Perron test (with trend and intercept)		
variables	At level	first difference	At level	first difference	Order of integration
LNRGDP	1.1572	-6.2558***	0.6836	-5.7971 ***	**I(1)**
LNMI	-0.0601	-8.1801***	0.2707	-10.8389***	**I(1)**
LNKp	-1.3917	-8.2216***	-1.0429	-8.3125 ***	**I(1)**
LNKg	-2.1579	-8.6368***	-1.9086	-8.6368 ***	**I(1)**
LNLF	-2.0312	-5.2673***	-2.0312	-5.2673***	**I(1)**
LNHC	-0.4687	-4.1149**	-0.4687	-4.0749 **	**I(1)**
LNOPEN	-1.71615	-5.067301***	-1.929685	-4.989***	**I(1)**
LNSAV	-0.2130	-8.5987***	-0.7708	-10.116***	**I(1)**
LNCF	-1.7019	-7.283***	-1.5778	-10.1026***	**I(1)**

*Note; - ***, ** is rejection of the null hypothesis at 1 and 5% significant level respectively*

The stationary result of intercept and without trend and intercept is presented in appendix 1

The unit root tests conducted revealed all variables have unit root in their level, thus have to be differenced once to achieve stationarity. This result is confirmed using both ADF and PP tests.

Thus I can conclude that all variables included in growth and capital accumulation model are I (1). From now onwards, it is possible to employ Johansen approach to test co integration.

5.2) co integration result

5.2.1) Growth equation

In the Johansen approach, the first step in testing for co integration and estimating a VAR model is to determine the optimal lag length of the VAR (Alemayehu et al, 2009). Johansen co-integration analysis is very sensitive to the number of lags included in the model, the more lags we include, the more initial values we lose. If we include too few lags, the size of the test will be incorrect (Wooldridge, 2000).

The optimal lag order is determined with the sequential modified Likelihood Ratio test statistics [LR], the Final Prediction Error [FPE], the Akaiki Information Criterion [AIC], the SchwarzInformation Criterion [SC] and the Hannan-Quinn Information Criterion [HQ]. As shown in Table 2, LR, FPE, SC, and HQ suggest an optimal lag of one, all at a 5% level of significance.

Table 5.2.1: VAR lag order selection criteria for growth equation

Lag	LogL	LR	FPE	AIC	SC	HQ
0	110.5812	NA	1.41e-10	-5.653035	-5.391805	-5.560940
1	322.8784	344.2657*	1.06e-14*	-15.18261	-13.35400*	-14.53794*
2	360.4698	48.76727	1.14e-14	-15.26864	-11.87265	-14.07139
3	403.4427	41.81147	1.24e-14	-15.64555*	-10.68218	-13.89573

* indicates lag order selected by the criterion

From the stationary test of section 5.1, the result showed that all variables are integrated of order one in the growth as well as capital accumulation equation. The existence of the same

order of integration, therefore, allows us to test for Co integration among the variables. To determine the number of co integrating vectors two test statistics called the maximum Eigen value (λ_{max}) and trace statistics (λ_{trace}) are computed. The trace test tests the null hypothesis of r co integrating vectors against the alternative hypothesis of k co integrating vectors, where k is the number of endogenous variables, for r =0,1,2…,k-1. The maximum Eigen-value test, on the other hand, tests the null hypothesis of r co integrating vectors against the alternative hypothesis of r+1 co integrating vectors.

It can be seen from table 5.2.2 that the unrestricted co-integration rank tests (both trace statistics (λ trace) and maximum Eigen value (λmax)) show the existence of one co-integrating vectors in the system. This means, the null hypothesis of no co-integration is rejected by both the λ max and the λ trace statistics. Thus both λ trace and maximum Eigen value (λ_{max}) conclude that there is one co integrating vector among the variables and there is only one Eigen value significant at 5% level and this outcome determines that the rank of the co integration is unity. This means among the variables there is one long run relationship.

Table 5.2.2: Johansen co integration result for growth equation

Null hypothesis	Alternative hypothesis	Eigen value	Co integration test statistics	5% C V	P value	Hypothesized no. of CE (s)
Trace test (λ_{trace})						
H_0: r=0	H_1 : r≥0	0.734810	113.4585	95.75366	0.0018**	None **
H_0 : r≤1	H_1 : r>1	0.521735	63.02077	69.81889	0.1545	At most 1
H_0 : r≤2	H_1 : r>2	0.431050	34.99235	47.85613	0.4484	At most 2
H_0 : r≤3	H_1 : r>3	0.182989	13.56178	29.79707	0.8643	At most 3
H_0 : r≤4	H_1 : r>4	0.123910	5.881884	15.49471	0.7094	At most 4
H_0 : r≤5	H_1 : r>5	0.022248	0.854984	3.841466	0.3551	At most 5

Maximum Eigen test (λ_{max})						
H_0 : r=0	H_1: r=1	0.734810	50.43770	40.07757	0.0024**	None **
H_0 : r=1	H_1: r=2	0.521735	28.02842	33.87687	0.2122	At most 1
H_0 : r=2	H_1: r=3	0.431050	21.43057	27.58434	0.2510	At most 2
H_0 : r=3	H_1: r=4	0.182989	7.679895	21.13162	0.9222	At most 3
H_0 : r=4	H_1: r=5	0.123910	5.026900	14.26460	0.7384	At most 4
H_0 : r=5	H_1: r=6	0.022248	0.854984	3.841466	0.3551	At most 5

*Note; - ** denote rejection of the null hypothesis at 5% level of significance.*

Table 5.2.2 indicates that there is long run equilibrium relationship among the variables in the growth model. In addition to this, the existence of one co integrating vector suggests that the first row of β coefficient and the first column of α vectors are important for further analysis. Thus, table 5.2.3 and table 5.2.4 below reports β and α vector respectively.

Table 5.2.3: standard beta (β) coefficient for growth equation

coefficient	**LNRGDP**	**LNMII**	**LNLF**	**LNKP**	**LNKG**	**LNHC**
β	1.000000	0.030062	-1.408962	-0.059959	-0.018265	-0.240026

Note; - since the table is not in equation form, the real sign of the coefficient are changed

Table 5.2.4: standard (α) coefficient for growth equation

Variables	Adjustment coefficient	Standard error
LNRGDP	-0.045325	0.12573
LNMI	-0.161765	0.71814
LNLF	0.191051	0.02447
LNKP	-0.113859	0.33824
LNKG	-0.256834	0.35918
LNHC	-0.141244	0.20610

The value of α coefficient obtained from the co integration show the speed of adjustment of the long run parameters towards the equilibrium relationship. For instance adjustment coefficients of real GDP (LNRGDP), macroeconomic instability (LNMI), private capital stock (LNKP), public capital stock (LNKG) and human capital (LNHC) are negative indicating the existence of adjustment towards long run equilibrium. That is, the speed of adjustment of LNRGDP, LNMI, LNKP, LNKG and LNHCA to their long run equilibrium by 4.5%, 16.17%, 11.38% , 25.68% and 14.12% respectively. However, the adjustment coefficients of the labor force (LNLF) is positive which indicate the extent to which this variable may deviate from its long run steady state path after a certain shock.

To identify the variables that are endogenously determined and conditional on other variables in the VAR, the test for weak exogenitey is conducted by putting zero restriction on each of α coefficient. Results of chi^2 with one degree of freedom and with their probability value are given in table 5.2.5. The results, using the likelihood ratio (LR) test as shown in table 5.2.5 confirm that the dependent variable (RGDP) failed to be weakly exogenous at 1% level of significance. In addition to this, LNKP's exogenity is rejected at 10% level of significance. Due to this, Granger causality test is conducted to see whether (RGDP) actually Granger- cause LNKP. The result presented in appendix 3(A) shows that RGDP does not Granger cause LNKP. This implies that there is no a series problem of endogeniety and it is possible to form long run equation.

Table 5.2.5: test of weak exogenity/ (test for zero restriction on α coefficient)

Variables	LR test of restriction: ch^2(1)	Probability value
LNRGDP	8.631303	0.003304***
LNMI	2.330019	0.126900
LNLF	0.195111	0.658697
LNKP	3.490518	0.061721*
LNKG	2.350421	0.125249
LNHC	0.396270	0.529022

**** And * denotes rejection of weak exogenity at 1% and 10% significance level respectively*

Once the long run relationship is defined, the next task is to carry out test of significance on the long run parameters. The test can be obtained by imposing restriction on β coefficients, which is termed as exclusion test. It helps to determine which are relevant or statistically significant in the co integration vector and which are not. As can be seen from the test result presented in table 5.2.6, all variables (Macroeconomic instability (MI), Level of real private capital accumulation (KP), public capital accumulation (KG), active labor force (LF) and human capital (HC)) are significant in affecting real GDP.

Table 5.2.6: - test of zero restriction on the long- run β parameters

Variables	Coefficient	LR –test: chi^2(1)	Probability value
LNMI	-0.030062	9.649766	0.008027***
LNLF	1.408962	6.858633	0.032409**
LNKP	0.059959	23.68628	0.000007***
LNKG	0.018265	9.172495	0.010191**
LNHC	0.240026	10.36083	0.005626 ***

**** And ** denote significance of the variable at 1% and 5% respectively.*

In addition, all explanatory variables are found to have theoretically and expected sign. Thus, the long run growth equation with the corresponding sign and statistical significance could be given as:

$$LNRGDP = 4.11 - 0.03LNMI + 1.41LNLF + 0.06LNKP + 0.0183LNKG + 0.24LNHC$$

$$[0.008]^{***} \quad [0.0324]^{**} \quad [0.000007]^{***} \quad [0.0102]^{**} \quad [0.00563]^{***}$$

Since the model is specified in log-linear form, the coefficient of the independent variables can be interpreted as elasticity.

The long-run impact of Macroeconomic instability on economic growth is found to be negative and significant. The long run elasticity of LNGDP with respect to LNMII is -0.03. Which means, other things remain constant or (citrus paribus), 1 percent increase in macroeconomic instability index reduces the real GDP by 0.03 percent in the long run. This finding is in line with the theoretical prediction of macroeconomic instability theory especially the traditional perspective, which is derived by Doronbush & Fischer (1999). The theory states that a certain amount of confusion by the government either from the demand side (example if the government mistakenly increases government expenditure, it will lead to budget deficit and hence macroeconomic instability) or from the supply side (unnecessary monetary expansion leading to inflation and macroeconomic instability) will reduce the national income or level of economic activity. The result is also consistent with the findings of Ismihan (2003) for Turkey and Haghighi, Sameti and Isfahan (2012) for Iran.

Labor force has positive and statistically significant impact on growth with elasticity of 1.4. Similarly, both private (KP) and public (KG) capital accumulation affect economic growth positively and statistically significant with elasticity of 0.06 and 0.012 respectively. In addition,

human capital (HC) also affects economic growth positively statistically significant with an elasticity of 0.24.

5.2.2 Private Capital accumulation equation

Once the variable as shown in Table 5.1 become stationary, the next step will be determine the optimal lag length.

As shown in Table 5.2.7, the optimal lag order is determined with the sequential modified Likelihood Ratio test statistics [LR], the Final Prediction Error [FPE], the Akaiki Information Criterion [AIC], the Schwarz Information Criterion [SC], and the Hannan-Quinn Information Criterion [HQ]. All the test statistics suggests that the optimal lag length is one.

Table 5.2.7 lag length selection criteria for capital accumulation equation

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-173.0325	NA	0.000643	9.677430	9.938660	9.769526
1	-25.04839	239.9742*	1.55e-06*	3.624237*	5.452847*	4.268908*
2	5.733763	39.93360	2.42e-06	3.906283	7.302272	5.103528
3	43.45310	36.69990	3.49e-06	3.813346	8.776715	5.563166

* indicates lag order selected by the criterion

After the optimal lag length is determined, Johansen co integration test will proceeds. Both the λ trace and maximum Eigen value (λ_{max}) conclude that there is one co integrating vector among the variables.

Table 5.2.8 Johansen co integration result for capital accumulation equation

H_0: - r<=	Eigen value	Trace test	p- value
Trace test (λ_{trace})			
0	0.713013	104.2231	0.0115**
1	0.513788	56.78708	0.3470
2	0.392003	29.38491	0.7498
3	0.137444	10.47666	0.9724
4	0.104743	4.858146	0.8237
5	0.017055	0.653674	0.4188
Maximum Eigen test (λ_{max})			
0	0.713013	47.43606	0.0062**
1	0.513788	27.40217	0.2424
2	0.392003	18.90825	0.4216
3	0.137444	5.618515	0.9893
4	0.104743	4.204472	0.8372
5	0.017055	0.653674	0.4188

*** denote rejection of the null hypothesis at 5% level of significance*

As shown from table 5.2.8, both the λ trace and maximum Eigen value (λ_{max}) suggested that there is long run relationship among the variables in the capital accumulation model. The existence of one co integrating vector suggests that the first row of β coefficient and the first column of α vectors are important for further analysis. Due to this, table 5.2.9 and table 5.2.10 below reports β and α vector respectively.

Table 5.2.9: standard beta (β) coefficient

coefficient	**LNKP**	**LNMI**	**LNKG**	**LNSAV**	**LNOPEN**	**LNCF**
β	1.000000	0.240300	-1.277868	-0.953249	0.140670	0.039879

Note; - since the table is not in equation form, the real sign of the coefficient are changed

Table 5.2.10: standard (α) coefficient

Variables	Adjustment coefficient	Standard error
LNKP	-0.064699	0.06852
LNMI	0.052209	0.13441
LNKG	0.089226	0.06887
LNSAV	-0.386124	0.18744
LNOPEN	-0.215198	0.05266
LNCF	-0.209840	0.605557

As shown from Table 5.2.10, the adjustment coefficient of private capital accumulation (LNKP), saving (LNSAV), openness (LNOPEN) and capital flight (LNCF) are negative indicating their speed of adjustment towards long run equilibrium. That is the speed of adjustment of LNKP, LNSAV, LNOPEN and LNCF adjusts to their long run equilibrium by 6.5%, 38.6%, 21.5% and 20.99% respectively. However, the adjustment coefficients of the rest of variables are positive which indicate the extent to which those variables deviate from their long run steady state path after a certain shock.

Once we identify β and α coefficient, the next step is identifying variables that are endogenously determined and conditional up on the other variables in the VAR, and the test for weak exogeneity is conducted. This requires imposition of zero restriction on the first column of α coefficient. Results of chi$^{\wedge 2}$ with one degree of freedom and with their probability value are summarized in table 5.2.11.

Table 5.2.11: weak exogeneity test for private capital accumulation

Variables	**LR test of restriction: ch$^{\wedge 2}$(1)**	**Probability value**
LNKP	4.722721	0.029767**
LNMI	0.774585	0.378802
LNKG	4.769581	0.028967**
LNSAV	0.621962	0.430319
LNOPEN	0.478408	0.489144
LNCF	0.428444	0.512753

*** denote rejection of the null hypothesis (weak exogenity) at 5% level of significant.*

As shown in Table 5.2.11, both the dependent variable (LNKP) and LNKG rejects the null hypothesis at 5% level of significance. To see whether endogenity problem is existed or not, Granger causality test is conducted. The result presented in appendix 2(B) shows that LNKP does not Granger cause LNKG. This implies that there is no a series problem of endogenity and it is possible to form long run equation. The rest of variables accept the null hypothesis at different level of significance.

A test for significance of the long run parameters is done by imposing restriction on β coefficients. This test helps to determine which variables are relevant or statistically significant

in the co integration vector and which are not. As shown in table 5.2.12, explanatory variables like (macroeconomic instability (MI), public capital accumulation (KG), saving (SAV) and capital flight (CF) except openness (OPEN) affect private capital accumulation.

Table 5.2.12: Test of zero restriction on the long run β parameter

Variables	**Coefficient**	**LR –test: chi^2(1)**	**Probability value**
LNMI	-0.240300	5.847907	0.043721**
LNKG	1.277868	4.049755	0.044178**
LNSAV	0.953249	7.587087	0.022516**
LNOPEN	-0.140670	1.837623	0.175230
LNCF	-0.039879	2.987061	0.083932 *

*** And * denote significance of the variable at 5% and 10% respectively.*

As shown from Table 5.2.12, macroeconomic instability, public capital accumulation and saving are significant at 5% in affecting private capital accumulation where as capital flight affect private capital accumulation at 10% level of significance.

Finally, the structural long run relationship derived from the co -integrating vector normalized with respect to LNKP can be represented as:

LNKP = 7.114 -0.2403LNMI + 1.2779LNKG + 0.9532LNSAV -0.141LNOPEN -0.034LNCF

*(0.043721)** (0.044178) ** (0.022516) ** (0.175) (0.0839)**

As shown from the above, the long run equation suggested that public capital accumulation and saving affect private capital accumulation positively whereas macroeconomic instability,

openness and capital flight have negative influence on private capital accumulation in the long run. Except openness, all explanatory variables are significant.

Like growth equation, private capital accumulation is specified in the log-linear form. Due to this the coefficient of the independent variables can be interpreted as elasticity with respect to private capital accumulation.

The long run impact of macroeconomic instability on private capital accumulation found to be negative and significant with an elasticity of -0.24. The result is consistent with the theoretical prediction of different authors (Levine & Rennet, 1992, Andres 1993, Pindyck & Solimano, 1993). According to Pindyck & Solimano, (1993) and Levine & Rennet, 1992, major cost of political and economic instability may be its depressing effect on capital accumulation. In addition to this, Bond and Söderbom, (2011) added that at a higher level of macroeconomic instability, risk neutral firms are less likely to accumulate their capital in response to a positive demand shock. This result is also consistent with the finding of Luis Servén (1998) and Masino (2012) for Developing countries.

Public capital accumulation has positive and significant effect on private capital accumulation with elasticity of 1.278. This may show that public expenditure may have crowd-in effect on private capital accumulation.

Saving rate has positive and statistically significant impact on private capital accumulation with elasticity of 0.95.

Capital flight and openness affect private capital accumulation negatively. But openness affects private capital accumulation insignificantly where as capital flight affects private capital accumulation negatively and significantly with elasticity of -0.04.

5.3 vector error correction model (Dynamics equation)

5.3.1 Growth equation

Once the long run model and its coefficients are determined, the next step is determination of short run dynamics. In modeling short run dynamics, all weakly exogenous variables from the long run model with their lag are included by differencing once. This differencing is required to reduce the possibility of multi co linearity problem which could result from correlation between current and lag value of a variable (Alemayehu et al, 2009).

A dynamic result for growth function is given in table 5.3.1.

Table: 5.3.1 Short run dynamics for Growth equation

Dependent variable: - DLNRGDP

Variables	Coefficient	Std. error	t-value	p-value
Constant	0.008478	0.018177	0.466396	0.6443
DLNMI(-1)	-0.003864	0.032316	-0.119584	0.9056
DLNLF(-1)	0.268170	0.101850	2.632992	0.0132
DLNKP(-1)	-0.057560	0.195051	-0.295102	0.7699
DLNKG(-1)	-0.074019	0.193326	-0.382873	0.7045
DLNHC(-1)	0.266696	0.554959	0.480568	0.6343
ECM(-1)	-0.45325	0.125730	-3.60497	0.00721
R^2 = 0.56541	*DW = 2.027840*			
	Single equation			
AR1-2 test:	*F(1,30) = 0.03981(0.8432)*			
ARCH1-1 test:	*F (1, 29) = 0. 3893(0.5367)*			
Normality test:	*chi^2(2) = 1.8784(0.3909)*			
Hetero test:	*F(11,18) = 1.825 (0.1298)*			

RESET test: F(1,29) = 0.05124 (0.94)

The estimated error correction model passes all diagnostic tests. Autocorrelation test indicates that the residuals of the estimated error correction model do not suffer from autocorrelation. This can be confirmed by looking model's autocorrelation function (Detail result is presented In Appendix 2(A)). The errors are also normally distributed as Jarque-Bera test of normality fails to reject the null of normally distributed residuals. The result is derived by using Histogram-Normality test (The result is shown graphically in appendix 2(B)). The white test for heterocedasticity also does not reject the null hypothesis of homocedasticity errors (detail result is shown in appendix 2(C)).Similarly, the ARCH test indicates the absence of autoregressive conditional hetrocedasticity errors (Engel, 1982) (Detail result is shown in appendix 2(D)). Finally, the general test for misspecification as provided by Ramsey's (1969) RESET test does not reject the null hypothesis of no functional misspecification in the estimated equation (Detail result is shown in appendix 2 (E)).

As shown from Table 5.3.1, the short run impact of macroeconomic instability (MI) found to be negative but it is insignificant. Insignificancy of the result can be justified as; since macroeconomic instability affect economic growth indirectly through different channel. Say for example by prohibiting capital accumulation due to this, it may take time to see the impact of macroeconomic instability on economic growth. Similarly, both private and public capital accumulation affect economic growth negatively in the short run, but both of them are

insignificant. The sign is contrary with long run result. This may be due to the fact that benefits from capital accumulations (both private and public) are not realized in the short period of time and may have crowding out effect on growth. Human capital affects economic growth positively but it is insignificant. This is due to the fact that, it takes time to see the impact of education investment on economic growth whereas labor force affects growth positively and statistically significant which is consistent with the long run result.

At the end, the above preferred model also confirms that the error correcting term is significant at 1%. It points out that 45.3% of the disequilibrium from the long run path will be corrected in one year.

5.3.2 Private Capital accumulation equation

Following the same fashion with growth equation, a dynamic result for private capital accumulation is given as follows.

Table 5.3.2: Short run dynamics for capital accumulation equation

Dependent variable = DLNKP

Variables	Coefficient	Std. error	t-value	p-value
Constant	0.140986	0.029965	4.705008	0.0001
DLNMI(-1)	-0.226550	0.096370	-2.350835	0.0255
DLNKG(-1)	-0.390053	0.594499	-0.656103	0.5168
DLNSAV(-1)	0.052736	0.086600	0.608967	0.5471
DLNOPEN(-1)	0.267513	0.245997	1.087465	0.2855
DLNCF(-1)	-0.003617	0.002188	-1.652989	0.10
ECM(-1)	-0.17089	0.068524	-2.4944185	0.0235

R^2 =0.595636 DW = 1.961816
AR 1-2 test: F(1,30) = 0.3352 (0.1781)
ARCH1-1 test: F(1,29) = 0.5532 (0.4619)
Normality test: chi^2 (2) =0.3628 (0.834)
Hetero test: F (11,18) =1.3060 (0.3141)

The various diagnostic tests perform well indicating no problem about the regression analysis. The test does not reject the null of white noise error terms suggesting no problem of error autocorrelation (detail result is present in appendix 2 (A)). The Jacque Bera test for normality does not reject the null hypothesis of normality. It points out that the error term is normally distributed (the result is shown graphically in appendix 2(B)). In addition to this, the white test for heterocedasticity also does not reject the null hypothesis of homocedasticity errors (detail result is shown in appendix 2(C)). The test for autoregressive conditional hetroscedasticity (ARCH) also points out that, no ARCH structure in the error term is detected. Failure to reject the null of no ARCH indicates the existence of constant variance (detail result is shown in appendix 2(D)). At the end, the Ramsey RESET test for functional form mis-specification accepts the regression specification of the dynamic model that means the test fail to reject the null hypothesis which is no functional misspecification (detail result is shown in appendix 2(E)).

The regression result indicates that, in the short-run, macroeconomic instability index affect private capital accumulation negatively and significantly. The result is consistent with the view that in the absence of macroeconomic stability, no one is willing to invest and hence accumulate the capital. this is due to the fact that, most capital accumulation expenditures are at least in part irreversible; due to this it is difficult to recover the cost if market conditions turn out to be worse than expected. The short-run impact of public capital accumulation on private capital

accumulation is found to be negative but it is insignificant. This may be due to a "crowding out" effect on private capital accumulation in the short run. This result may be observed because public spending has a long gestation period; we look for the impact after a long period but consume resources in the interim that can be used for private investors. Capital flight also affects accumulation of capital negatively and significantly. The result is consistent with long run result.

Openness and saving also affect capital accumulation positively, but both of them are insignificant.

The lagged error correction term (ECT_{-1}) is also included in the model to capture the long run dynamics between the co integrating serious is correcting signed (negative). It indicates that 17% of the disequilibrium from the long run path will be correcting in one year.

Chapter 6: - Conclusion and policy implication

6.1. Conclusion

This study examines the impact of macroeconomic instability on economic growth and private capital accumulation from the year 1974 to 2013. Rather than using one variable as a proxy for macroeconomic instability, the researcher tried to calculate macroeconomic instability index by using four variables: inflation, budget deficit, exchange rate variability and government debt. With regard to the literature part, different types of macroeconomic instability theory were discussed. Ethiopia's macroeconomic environment was also briefly discussed by giving more emphasis to macroeconomic instability variables trend, saving and investment trend and also trend and sector contribution of real GDP.

In the specification of equations, endogenous growth model and accelerator model is used for growth and private capital accumulation equation respectively. Co-integration and Vector Error Correction approaches have been applied for the identification of impact of macroeconomic instability on economic growth and capital accumulation both in the long and short run. Before looking in to the co integration relationship of each model, the variables were tested for their time series property using ADF and PP test and all variables are identified as I(1). The λ_{max} and λ_{trace} test statistics were employed to assess the number of co-integration vectors in the models. The result shows that the null hypothesis of zero co integration vector is rejected in favor of one co-integration relationship.

Regarding to the result, first impact of macroeconomic instability on economic growth is analyzed. The result showed that all explanatory variables are statistically significant with their

theoretically expected sign. In line with the conventional and modern growth theories labor, physical capital (both private and public) and human capital affect economic growth positively whereas; macroeconomic instability has a significant and negative impact on economic growth in Ethiopia. The vector error correction model (short run impact) showed that human capital accumulation affect economic growth positively but it is insignificant. And also labor force affects positively and significantly. Macroeconomic instability affects economic growth negatively. Unexpected result is observed in the capital accumulation: both private and public capital accumulation affect growth rate negatively but both of them are insignificant. This may be due to the fact that, the return from capital accumulations (both private and public) are not realized in the short period of time and may have crowding out effect on growth in the short run.

The second equation analyzed impact of macroeconomic instability on private capital accumulation. The result confirms that macroeconomic instability and capital flight affect capital accumulation negatively whereas, saving and public capital accumulation have positive impact in the long run. In addition to this, the short run equation shows that macroeconomic instability, capital flight and public capital accumulation affect private capital accumulation negatively. Except public capital accumulation, both variables are statistically significant. Furthermore, saving has positive impact on private capital accumulation. The main reason for the existence of negative relationship between private and public capital accumulation in the short run is that public capital accumulation may have "crowding-out" effect on private capital accumulation. This result may be observed because public spending has a long gestation period; we look for the impact after a long period but consume resources in the interim that can be used for private investors.

6.2. Research implications

The result and discussion part suggested that macroeconomic instability has detrimental effect on both economic growth and private capital accumulation. The Research implications that can be derived from this empirical study are:

- The first and foremost policy recommendation is, the governments should restore —or preserve— macroeconomic stability. This can be done through policies which do not lead to the accelerating of inflation, chronic budget deficit, uncontrollable public debt and apparent change of exchange rate.
- The poor management of macroeconomic with the adoption of incorrect and illogical fiscal and monetary policies and passive reaction against shocks will intensify the macroeconomic instability. Due to this, the way of reaction to the shocks is very important.
- Since budget deficit is one component of macroeconomic instability, the government can reduce budget deficit and stabilize the economy through reducing unproductive expenditures like defense expenditure.
- At the end, since saving has positive impact on private capital accumulation, policies which is used by the government to mobilize saving is the best for rapid private capital accumulation and hence economic growth.

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Appendices

Appendix1: result of stationarity test result

	Augmented dickey fuller (with intercept)		Phillips- perron test (with intercept)		Order of integration
variables	At level	First difference	At level	First difference	**I(1)**
LNRGDP	1.22	-4.33***	1.62	-4.378***	**I(1)**
LNMII	-1.642	-7.4987***	-0.321	-9.772***	**I(1)**
LNKP	2.1189	-7.498***	1.531	-7.4753***	**I(1)**
LNKG	2.3692	-8.0078***	2.123	-8.17***	**I(1)**
LNLF	-1.594	-3.7185***	-1.365	-3.871***	**I(1)**
LNHC	2.112	-3.682**	1.739	-3.8271**	**I(1)**
LNSAV	-0.213	-8.5988***	-0.77	-10.110***	**I(1)**
LNCF	-0.88	-7.138***	-0.881	-11.96***	**I(1)**
LNOPEN	-0.7057	-5.1396***	-0.785	-5.071***	**I(1)**

Appendix 2: Diagnostic tests for error correction model

A) Autocorrelation test

i) Growth equation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.039813	Prob. F(1,30)	0.8432
Obs*R-squared	0.050363	Prob. Chi-Square(1)	0.8224

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/22/15 Time: 21:33
Sample: 1976 2013
Included observations: 38
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.000759	0.102361	-0.007414	0.9941
C(2)	0.058122	0.351996	0.165122	0.8700
C(3)	-0.000141	0.032417	-0.004350	0.9966
C(4)	-0.005723	0.197636	-0.028957	0.9771

C(5)	-0.000304	0.193698	-0.001567	0.9988
C(6)	-0.004773	0.094622	-0.050442	0.9601
C(8)	-0.001296	0.016412	-0.078940	0.9376
RESID(-1)	-0.073241	0.367064	-0.199532	0.8432

R-squared	0.001325	Mean dependent var	-6.57E-18
Adjusted R-squared	-0.231699	S.D. dependent var	0.045775
S.E. of regression	0.050802	Akaike info criterion	-2.937090
Sum squared resid	0.077426	Schwarz criterion	-2.592335
Log likelihood	63.80471	Hannan-Quinn criter.	-2.814429
F-statistic	0.005688	Durbin-Watson stat	2.014050
Prob(F-statistic)	1.000000		

ii) Capital accumulation equation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.335271	Probability	0.178121
Obs*R-squared	.919568	Probability	0.147727

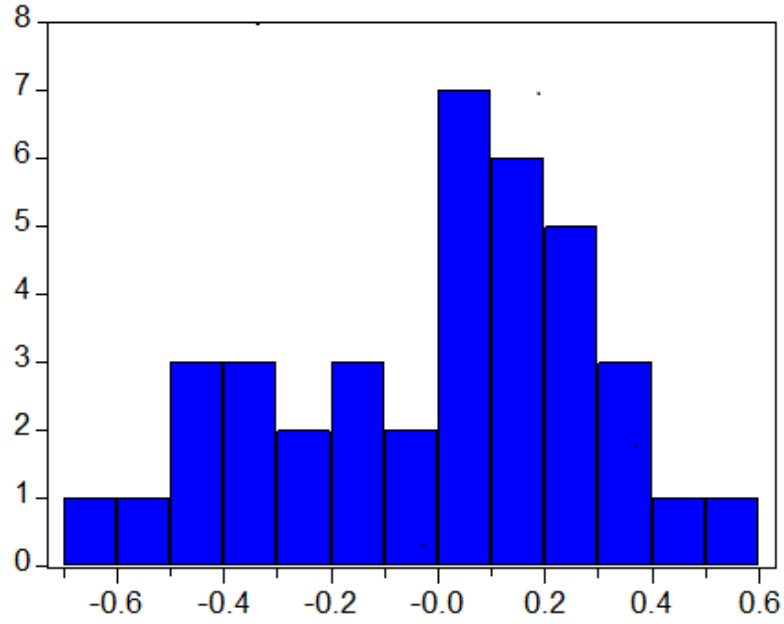
Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/23/15 Time: 14:45
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.051470	0.067675	0.760558	0.4531
C(2)	-0.103520	0.218107	-0.474630	0.6386
C(3)	-0.045093	0.227634	-0.198094	0.8444
C(4)	-0.070380	0.084987	-0.828127	0.4144
C(5)	-0.048140	0.081253	-0.592468	0.5581
C(6)	-0.001351	0.002101	-0.643014	0.5253
C(7)	0.082212	0.131692	0.624272	0.5373
C(8)	0.000392	0.028253	0.013871	0.9890
RESID(-1)	-0.037724	0.219087	-0.172187	0.8645

R-squared	0.103147	Mean dependent var	7.30E-18
Adjusted R-squared	-0.144261	S.D. dependent var	0.135741
S.E. of regression	0.145202	Akaike info criterion	-0.817989
Sum squared resid	0.611424	Schwarz criterion	-0.430140
Log likelihood	24.54180	Durbin-Watson stat	1.775808

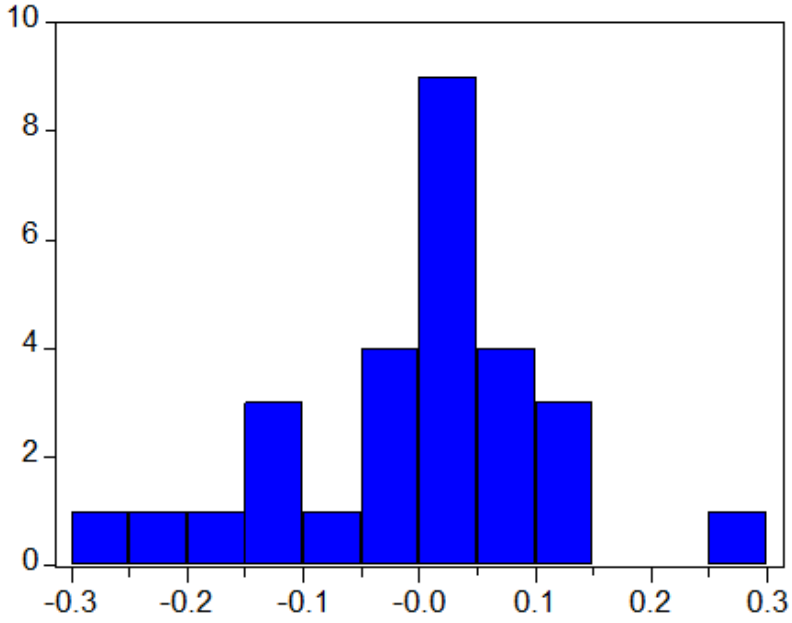
B) Normality test

i) Growth model



Series: Residuals	
Sample 1976 2013	
Observations 38	
Mean	4.12e-15
Median	0.068907
Maximum	0.537164
Minimum	-0.686792
Std. Dev.	0.290390
Skewness	-0.468936
Kurtosis	2.446135
Jarque-Bera	1.878421
Probability	0.390936

ii) Capital accumulation model



Series: Residuals	
Sample 1979 2013	
Observations 28	
Mean	2.38e-17
Median	0.023036
Maximum	0.268728
Minimum	-0.253867
Std. Dev.	0.116433
Skewness	-0.266185
Kurtosis	3.166036
Jarque-Bera	0.362818
Probability	0.834094

C) Test for heteroskedasticity

i) Growth model

White Heteroskedasticity Test:

F-statistic	1.825198	Probability	0.129812
Obs*R-squared	29.30354	Probability	0.208916

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/22/15 Time: 14:59
Sample: 1976 2013
Included observations: 38

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-120.4992	259.9992	-0.463460	0.6507
LNRGDP(-1)	14.41587	16.46996	0.875283	0.3973
LNRGDP(-1)^2	-0.609516	0.698532	-0.872567	0.3987
LNMII(-1)	0.280345	0.413066	0.678693	0.5092
LNMII(-1)^2	0.093277	0.201820	0.462180	0.6516
LNLF(-1)	122.8174	236.4527	0.519417	0.6122
LNLF(-1)^2	-16.66882	30.87697	-0.539846	0.5984
LNKP(-1)	-4.750140	5.999123	-0.791806	0.4427
LNKP(-1)^2	0.216603	0.285546	0.758556	0.4616
LNKG(-1)	1.933539	4.588619	0.421377	0.6804
LNKG(-1)^2	-0.092721	0.236834	-0.391503	0.7018
LNHC(-1)	3.482119	1.920632	1.813007	0.0930
LNHC(-1)^2	-0.224264	0.142638	-1.572262	0.1399
LNRGDP(-2)	-14.42230	18.45116	-0.781647	0.4484
LNRGDP(-2)^2	0.606926	0.782025	0.776095	0.4516
LNMII(-2)	-0.378256	0.458145	-0.825625	0.4239
LNMII(-2)^2	-0.129769	0.211984	-0.612163	0.5510
LNLF(-2)	-51.50615	161.9170	-0.318102	0.7555
LNLF(-2)^2	7.128770	21.23036	0.335782	0.7424
LNKP(-2)	1.973589	9.624786	0.205053	0.8407
LNKP(-2)^2	-0.097891	0.480183	-0.203861	0.8416
LNKG(-2)	-1.260025	7.336787	-0.171741	0.8663
LNKG(-2)^2	0.065344	0.401692	0.162671	0.8733
LNHC(-2)	-3.653144	1.798065	-2.031709	0.0631
LNHC(-2)^2	0.244177	0.129723	1.882286	0.0824

R-squared	0.771146	Mean dependent var	0.082107
Adjusted R-squared	0.348646	S.D. dependent var	0.100064
S.E. of regression	0.080758	Akaike info criterion	-1.951571
Sum squared resid	0.084784	Schwarz criterion	-0.874212
Log likelihood	62.07985	F-statistic	1.825198

Durbin-Watson stat	2.960371	Prob(F-statistic)	0.129812

ii) Capital accumulation model

White Heteroskedasticity Test:

F-statistic	1.306049	Probability	0.314103
Obs*R-squared	26.86012	Probability	0.311016

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/23/15 Time: 15:05
Sample: 1976 2013
Included observations: 38

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-12.19245	4.572702	-2.666356	0.0194
LNKP(-1)	-0.186815	2.306970	-0.080979	0.9367
LNKP(-1)^2	0.014112	0.112979	0.124908	0.9025
LNMII(-1)	-0.076112	0.139207	-0.546756	0.5938
LNMII(-1)^2	-0.048125	0.064013	-0.751799	0.4656
LNOPEN(-1)	0.462968	0.280008	1.653410	0.1222
LNOPEN(-1)^2	0.110078	0.078064	1.410096	0.1820
LNSAV(-1)	-0.124747	0.584693	-0.213354	0.8344
LNSAV(-1)^2	0.007946	0.031506	0.252213	0.8048
LNKG(-1)	0.941670	1.639470	0.574375	0.5755
LNKG(-1)^2	-0.056446	0.087137	-0.647790	0.5284
CF(-1)	-0.000276	0.000901	-0.306707	0.7639
CF(-1)^2	2.24E-05	2.61E-05	0.859371	0.4057
LNKP(-2)	6.850280	3.205154	2.137270	0.0522
LNKP(-2)^2	-0.350832	0.163385	-2.147269	0.0512
LNMII(-2)	-0.080954	0.120696	-0.670727	0.5141
LNMII(-2)^2	-0.051773	0.054223	-0.954812	0.3571
LNOPEN(-2)	-0.198715	0.293851	-0.676245	0.5107
LNOPEN(-2)^2	-0.027631	0.082125	-0.336451	0.7419
LNSAV(-2)	-0.002036	0.474423	-0.004292	0.9966
LNSAV(-2)^2	0.001676	0.025295	0.066258	0.9482
LNKG(-2)	-5.438039	2.289143	-2.375579	0.0336
LNKG(-2)^2	0.305548	0.127366	2.398986	0.0321
CF(-2)	0.000780	0.001169	0.667549	0.5161
CF(-2)^2	3.25E-05	2.71E-05	1.199089	0.2519

R-squared	0.706845	Mean dependent var	0.017941
Adjusted R-squared	0.165637	S.D. dependent var	0.034668

S.E. of regression	0.031667	Akaike info criterion	-3.823934
Sum squared resid	0.013036	Schwarz criterion	-2.746574
Log likelihood	97.65474	F-statistic	1.306049
Durbin-Watson stat	1.876893	Prob(F-statistic)	0.314103

D) Test for ARCH

i) Growth model

F-statistic	0.389314	Probability	0.536706
Obs*R-squared	0.407033	Probability	0.523479

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/22/15 Time: 15:05
Sample (adjusted): 1977 2013
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.070920	0.021376	3.317720	0.0021
RESID^2(-1)	0.110058	0.176390	0.623951	0.5367

R-squared	0.011001	Mean dependent var	0.079342
Adjusted R-squared	-0.017256	S.D. dependent var	0.099962
S.E. of regression	0.100820	Akaike info criterion	-1.698413
Sum squared resid	0.355767	Schwarz criterion	-1.611336
Log likelihood	33.42064	F-statistic	0.389314
Durbin-Watson stat	1.859249	Prob(F-statistic)	0.536706

ii) Capital accumulation model

ARCH Test:

F-statistic	0.553210	Probability	0.461973
Obs*R-squared	0.575722	Probability	0.447994

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares

Date: 05/23/15 Time: 15:11
Sample (adjusted): 1977 2013
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.016158	0.006483	2.492263	0.0176
RESID^2(-1)	0.125887	0.169253	0.743781	0.4620

R-squared	0.015560	Mean dependent var	0.018311
Adjusted R-squared	-0.012567	S.D. dependent var	0.035070
S.E. of regression	0.035290	Akaike info criterion	-3.797916
Sum squared resid	0.043588	Schwarz criterion	-3.710840
Log likelihood	72.26145	F-statistic	0.553210
Durbin-Watson stat	1.930881	Prob(F-statistic)	0.461973

E) Test of Ramsey RESET test (model misspecification test)

i) Growth equation

Ramsey RESET Test:

F-statistic	0.005099	Prob. F(1,29)	0.9436
Log likelihood ratio	0.006504	Prob. Chi-Square(1)	0.9357

Test Equation:
Dependent Variable: DLNRGDP
Method: Least Squares
Date: 05/22/15 Time: 21:28
Sample: 1977 2013
Included observations: 37

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLNRGDP1	0.338958	0.435232	0.778799	0.4424
DLNMII1	-0.005092	0.032696	-0.155749	0.8773
DLNKP1	-0.067655	0.198623	-0.340620	0.7358
DLNKG1	-0.079017	0.205157	-0.385154	0.7029
DLNHC1	0.257274	0.209821	1.226160	0.2300
ECM1	-0.079921	0.384833	-0.207677	0.8369
C	0.012062	0.017326	0.696188	0.4919
FITTED^2	-0.589112	8.250429	-0.071404	0.9436

R-squared	0.346009	Mean dependent var	0.046707
Adjusted R-squared	0.188150	S.D. dependent var	0.057348
S.E. of regression	0.051672	Akaike info criterion	-2.898981
Sum squared resid	0.077431	Schwarz criterion	-2.550674
Log likelihood	61.63115	Hannan-Quinn criter.	-2.776187
F-statistic	2.191877	Durbin-Watson stat	2.008551
Prob(F-statistic)	0.064816		

ii) Capital accumulation model

Ramsey RESET Test:

F-statistic	0.671524	Probability	0.419442
Log likelihood ratio	0.853197	Probability	0.355650

Test Equation:
Dependent Variable: LDKP
Method: Least Squares
Date: 05/23/15 Time: 15:55
Sample: 1978 2013
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LDCF	-5.45E-05	0.000470	-0.115765	0.9087
LDECM	-0.023883	0.056675	-0.421401	0.6767
LDKG	0.895426	0.068854	13.00469	0.0000
LDMII	0.010002	0.030182	0.331372	0.7428
LDOPEN	0.096798	0.068368	1.415832	0.1679
LDSAV	0.022361	0.021541	1.038090	0.3081
C	-0.011879	0.009972	-1.191251	0.2436
FITTED^2	0.146102	0.178289	0.819465	0.4194

R-squared	0.945300	Mean dependent var	0.099914
Adjusted R-squared	0.931625	S.D. dependent var	0.171485
S.E. of regression	0.044841	Akaike info criterion	-3.178249
Sum squared resid	0.056300	Schwarz criterion	-2.826356
Log likelihood	65.20849	F-statistic	69.12578
Durbin-Watson stat	1.467324	Prob(F-statistic)	0.000000

Appendix 3: - Granger causality test

A) LNRGDP VS LNKP

Pairwise Granger Causality Tests
Date: 05/25/15 Time: 19:54
Sample: 1974 2013
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Probability

LNKP does not Granger Cause RGDP	39	0.11825	0.73294
RGDP does not Granger Cause LNKP		4.64530	0.03790

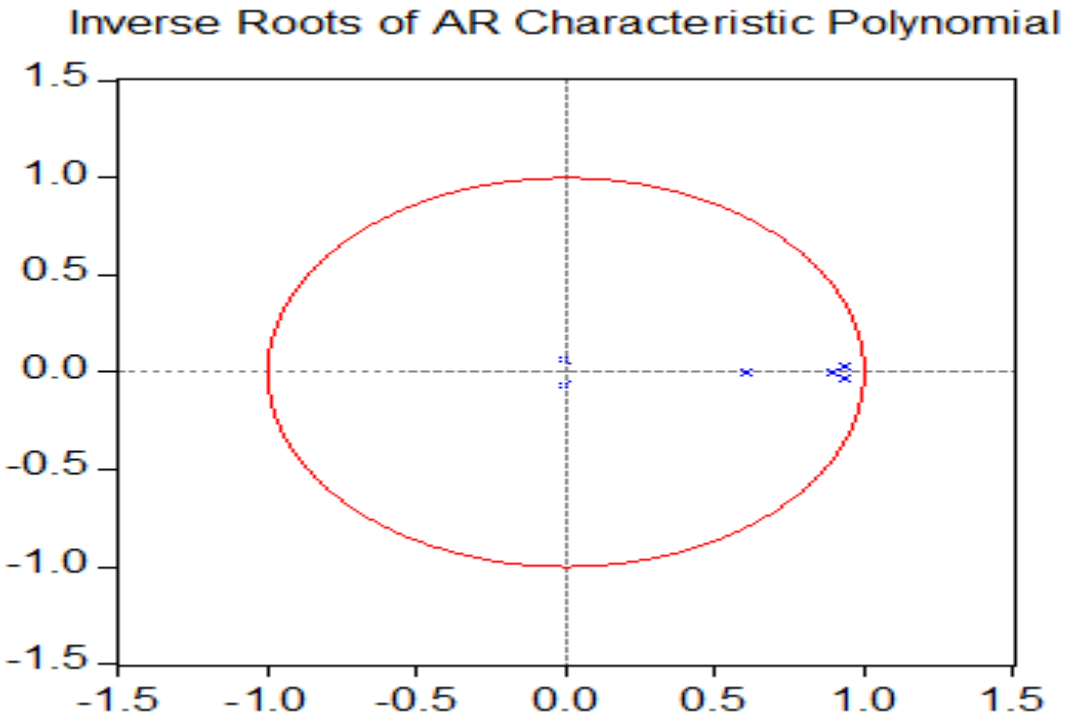
B) LNKP VS LNKG

Pairwise Granger Causality Tests
Date: 05/25/15 Time: 20:28
Sample: 1974 2013
Lags: 1

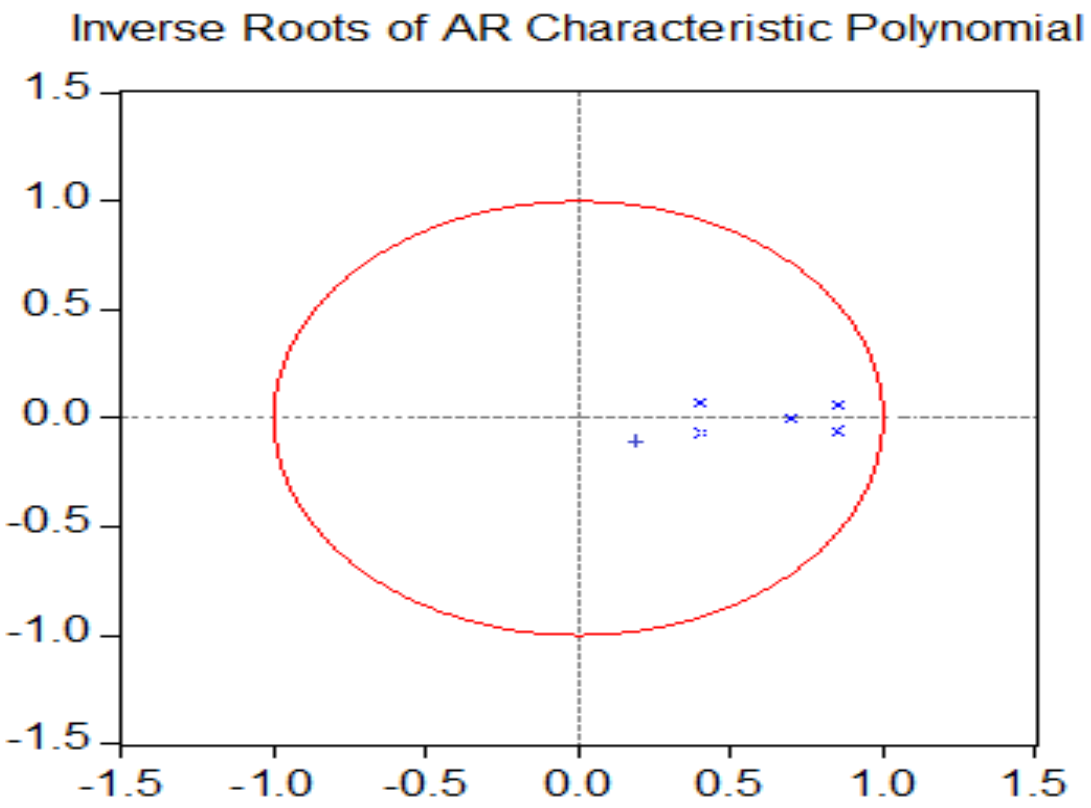
Null Hypothesis:	Obs	F-Statistic	Probability
LNKG does not Granger Cause LNKP	39	0.10047	0.75310
LNKP does not Granger Cause LNKG		0.00019	0.98906

Appendix 4: - VAR stability test

i) Private capital accumulation equation

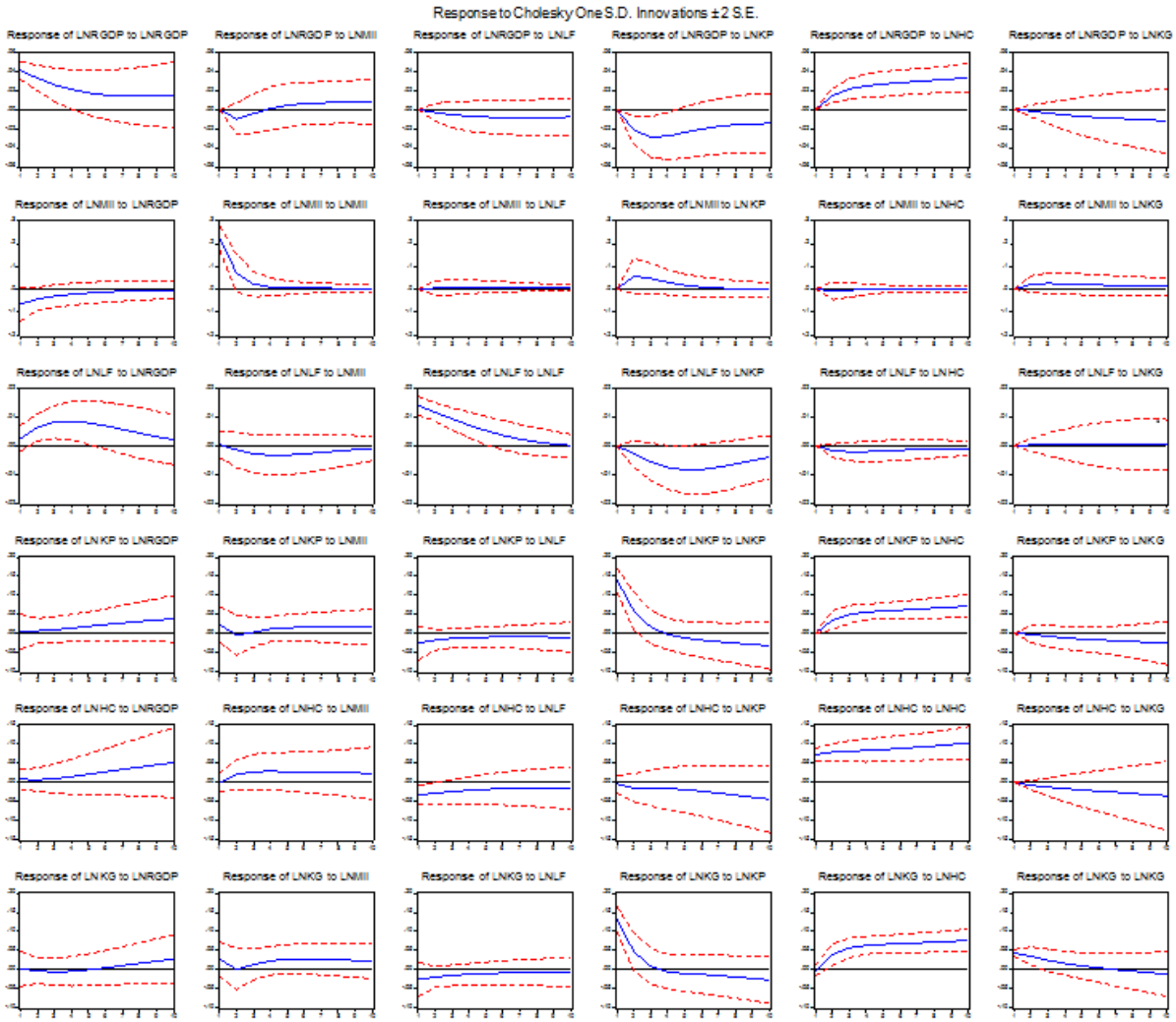


ii) Growth equation

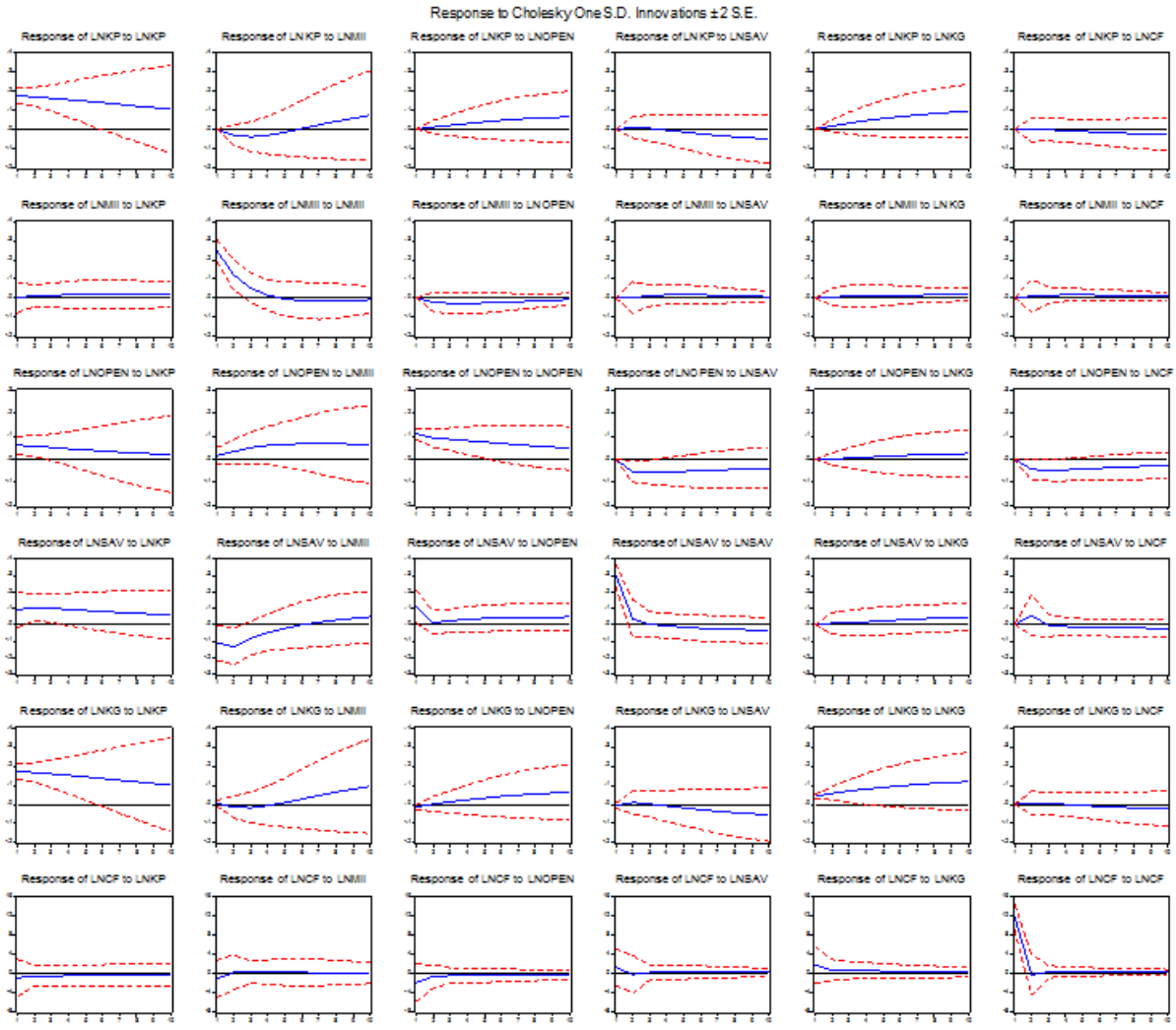

Inverse Roots of AR Characteristic Polynomial
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5

Appendix 5: - Graphical representation of Impulse response Function

i) Growth equation



ii) Private capital accumulation



Appendix 6- Variance decomposition of Variables

i) Growth variables

Periods	**Variance decomposition of LNGDP**:						
	S.E.	LNRGDP	LNMII	LNLF	LNKP	LNKG	LNHC
1	0.041089	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.059647	78.21364	2.528606	0.216211	12.88562	0.101135	6.054785
3	0.074788	61.97704	1.912033	0.616715	22.82444	0.465232	12.20453
4	0.086681	52.03343	1.444837	1.085127	27.15357	0.975141	17.30789
5	0.096231	45.56318	1.396315	1.542364	28.22285	1.553890	21.72140
6	0.104371	40.93531	1.552847	1.936218	27.74144	2.168499	25.66568

7	0.111769	37.36278	1.773531	2.241463	26.60226	2.801597	29.21837
8	0.118843	34.47048	1.992924	2.455107	25.23801	3.440716	32.40277
9	0.125854	32.07040	2.183648	2.587646	23.85388	4.075250	35.22917
10	0.132971	30.05822	2.336030	2.655127	22.54620	4.695809	37.70862

Periods **Variance Decomposition of LNMII**

	S.E.	LNRGDP	LNMII	LNLF	LNKP	LNKG	LNHC
1	0.235352	7.708475	92.29153	0.000000	0.000000	0.000000	0.000000
2	0.257067	9.152852	85.07125	0.041140	4.915192	0.753950	0.065620
3	0.265448	9.868864	80.49831	0.147166	7.781470	1.637113	0.067082
4	0.269499	10.25582	78.22213	0.291796	8.805095	2.357330	0.067834
5	0.271691	10.45664	77.02495	0.444217	9.088821	2.908946	0.076427
6	0.273020	10.54742	76.32033	0.583898	9.129808	3.332373	0.086175
7	0.273902	10.57894	75.86196	0.701028	9.102676	3.661283	0.094112
8	0.274527	10.58226	75.54043	0.793233	9.065213	3.918823	0.100046
9	0.274989	10.57418	75.30295	0.862391	9.034820	4.121171	0.104484
10	0.275342	10.56295	75.12206	0.912319	9.014454	4.280319	0.107897

Periods **Variance Decomposition of LNLF**

	S.E.	LNRGDP	LNMII	LNLF	LNKP	LNKG	LNHC
1	0.014333	3.655263	0.139489	96.20525	0.000000	0.000000	0.000000
2	0.019977	12.59840	0.557775	84.23510	1.895307	0.040580	0.672831
3	0.024519	19.83698	1.678569	70.79348	6.475862	0.085166	1.129946
4	0.028298	24.24597	2.600752	59.74946	11.97575	0.111106	1.316971
5	0.031274	26.57816	3.143796	51.82619	16.95223	0.123652	1.375966
6	0.033454	27.68628	3.419098	46.50975	20.86165	0.130355	1.392860
7	0.034939	28.13382	3.546367	43.10358	23.67771	0.135424	1.403098
8	0.035878	28.24781	3.600514	41.02418	25.56853	0.140642	1.418327
9	0.036425	28.21159	3.621558	39.83120	26.74832	0.146617	1.440716
10	0.036717	28.12524	3.629102	39.20200	27.42106	0.153470	1.469131

Variance Decomposition of LNKP

Period

	S.E.	LNRGDP	LNMII	LNLF	LNKP	LNKG	LNHC
1	0.144602	0.086722	2.643406	3.214296	94.05558	0.000000	0.000000
2	0.161011	0.250005	2.227586	3.827984	89.06884	0.070248	4.555336
3	0.170266	0.540452	2.018615	4.063300	80.51987	0.451827	12.40594
4	0.180831	1.044036	2.154505	3.989658	71.41858	1.109178	20.28404
5	0.192879	1.809699	2.478215	3.772317	63.18384	1.885798	26.87014
6	0.206005	2.818297	2.764266	3.511296	56.13982	2.681901	32.08442
7	0.220075	3.999211	2.942276	3.251233	50.21054	3.452292	36.14445
8	0.235064	5.263859	3.023089	3.011798	45.24428	4.177917	39.27906
9	0.250951	6.532236	3.036184	2.801777	41.09110	4.851697	41.68700
10	0.267696	7.745612	3.007771	2.624182	37.61385	5.472726	43.53586

Periods **Variance decomposition of LNKG**

	S.E.	LNRGDP	LNMII	LNLF	LNKP	LNKG	LNHC
1	0.144015	0.013911	3.634934	3.383061	84.09799	8.870102	0.000000
2	0.161526	0.074643	2.891260	4.138919	75.28209	11.13010	6.482985
3	0.174342	0.200404	2.998732	4.330945	64.81793	11.02504	16.62695
4	0.188138	0.239933	4.042460	4.166695	55.76490	9.906439	25.87958
5	0.201989	0.209890	5.289127	3.883908	48.65611	8.680799	33.28016
6	0.215520	0.228234	6.269239	3.582869	43.11475	7.625790	39.17911
7	0.228976	0.407255	6.889594	3.293361	38.69388	6.787942	43.92797
8	0.242755	0.810458	7.198714	3.023388	35.08617	6.159981	47.72128
9	0.257199	1.446769	7.271680	2.776128	32.10509	5.724338	50.67599
10	0.272535	2.282775	7.177327	2.554209	29.63145	5.460064	52.89417

Periods **Variance decomposition of LNHC**

	S.E.	LNRGDP	LNMII	LNLF	LNKP	LNKG	LNHC
1	0.080476	0.949468	0.006899	16.53003	0.365510	0.225321	81.92277
2	0.119433	0.735036	2.956827	13.03179	1.721814	1.113215	80.44132
3	0.150870	0.864997	5.192493	10.71076	2.149639	1.981192	79.10091
4	0.178264	1.309633	6.305507	9.023196	2.379859	2.804563	78.17724
5	0.203697	2.069322	6.692603	7.704894	2.690472	3.589762	77.25295
6	0.228478	3.101269	6.670202	6.638238	3.167653	4.332731	76.08991
7	0.253399	4.323623	6.430672	5.764326	3.817205	5.024908	74.63927
8	0.278901	5.640640	6.087215	5.047671	4.601328	5.660065	72.96308
9	0.305206	6.965628	5.706428	4.462587	5.463254	6.236802	71.16530
10	0.332407	8.233478	5.326635	3.988017	6.345999	6.757959	69.34791

Cholescky ordering: LNRGDP LNMII LNLF LNKP LNKG LNHC

ii) Private capital accumulation variables

Periods **Variance Decomposition of LNKP**

	S.E.	LNKP	LNMII	LNOPEN	LNSAV	LNKG	LNCF
1	0.143974	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.190808	89.67898	4.445923	1.313016	0.002210	4.488613	0.071260
3	0.230138	79.28864	4.002317	4.215446	0.565549	11.31999	0.608060
4	0.271465	69.34892	3.341943	7.254408	1.884196	16.82897	1.341566
5	0.317477	60.24258	6.053709	9.150189	3.177664	19.57885	1.797013
6	0.365104	53.08062	10.90058	9.836822	3.944346	20.34204	1.895592
7	0.409909	48.06916	15.81539	9.822721	4.217047	20.28618	1.789496
8	0.449051	44.76459	19.80773	9.528672	4.195470	20.08592	1.617612
9	0.481722	42.62595	22.71431	9.172061	4.041231	19.99544	1.451006

10	0.508464	41.22580	24.70719	8.839884	3.847260	20.06568	1.314190

Periods **Variance Decomposition of LNMII**

	S.E.	LNKP	LNMII	LNOPEN	LNSAV	LNKG	LNCF
1	0.247393	9.784045	90.21596	0.000000	0.000000	0.000000	0.000000
2	0.281753	9.519644	86.96753	0.993098	0.467582	0.000771	2.051380
3	0.291652	9.221600	82.30991	2.192379	2.422535	0.008025	3.845551
4	0.298662	8.800835	78.78272	3.053055	4.202411	0.096668	5.064309
5	0.304709	8.467265	76.93006	3.394702	5.283914	0.334253	5.589805
6	0.308667	8.265132	76.08385	3.445308	5.744368	0.714284	5.747058
7	0.310660	8.160011	75.59843	3.415115	5.878899	1.176678	5.770866
8	0.311651	8.118554	75.19010	3.396507	5.887680	1.648788	5.758369
9	0.312470	8.123138	74.80699	3.402135	5.860184	2.074807	5.732750
10	0.313459	8.163276	74.46836	3.417670	5.823942	2.429194	5.697556

Periods **Variance decomposition of LNOPEN**

	S.E.	LNKP	LNMII	LNOPEN	LNSAV	LNKG	LNCF
1	0.143404	47.28592	0.532173	52.18191	0.000000	0.000000	0.000000
2	0.202445	42.44062	3.852763	37.96176	11.21042	0.067464	4.466981
3	0.245616	39.54649	6.767877	31.69289	14.67751	0.045872	7.269367
4	0.277315	37.85862	9.606340	28.27295	16.02640	0.084365	8.151316
5	0.300796	36.91578	12.11858	26.14651	16.32896	0.190676	8.299496
6	0.318196	36.40138	14.18115	24.70105	16.21030	0.347495	8.158633
7	0.331068	36.14454	15.77462	23.67666	15.93014	0.542987	7.931054
8	0.340644	36.03296	16.95910	22.92999	15.60925	0.771143	7.697561
9	0.347894	35.99322	17.82502	22.36990	15.29771	1.027621	7.486527
10	0.353547	35.98004	18.46137	21.93486	15.01257	1.307401	7.303754

Periods **Variance Decomposition of LNSAV**

	S.E.	LNKP	LNMII	LNOPEN	LNSAV	LNKG	LNCF
1	0.381439	9.629378	15.81874	7.407100	67.14478	0.000000	0.000000
2	0.397049	10.76175	18.70670	7.069864	62.47009	0.166015	0.825581
3	0.409935	12.43357	19.14184	7.760519	58.73450	0.599357	1.330213
4	0.422794	13.88954	17.99908	8.643546	56.18262	1.394134	1.891076
5	0.438777	15.20458	17.41968	9.452592	53.25208	2.253736	2.417331
6	0.456852	16.26743	18.02142	9.910750	50.11557	2.991186	2.693642
7	0.474603	17.11152	19.33128	10.05819	47.16240	3.567586	2.769026
8	0.490185	17.79112	20.74862	10.02312	44.67586	4.028985	2.732295
9	0.502918	18.34960	21.94060	9.913776	42.71212	4.429323	2.654577
10	0.512989	18.81147	22.82202	9.789437	41.19956	4.804466	2.573045

Periods **Variance Decomposition of LNKG**

	S.E.	LNKP	LNMII	LNOPEN	LNSAV	LNKG	LNCF
1	0.144317	88.94818	1.143616	0.751394	0.005605	9.151200	0.000000

2	0.200341	75.88292	1.273249	1.254188	0.316026	21.17636	0.097253
3	0.249597	65.33993	0.854288	3.378265	0.257478	30.09061	0.079432
4	0.300794	56.63609	2.714817	5.566748	0.711136	34.14481	0.226395
5	0.355094	49.62249	7.283862	6.916129	1.343689	34.45732	0.376510
6	0.409092	44.49634	12.67941	7.449896	1.794087	33.14518	0.435091
7	0.458942	41.01801	17.45431	7.505847	2.002775	31.59770	0.421358
8	0.502459	38.74403	21.12416	7.354258	2.042404	30.35678	0.378362
9	0.539219	37.26910	23.73757	7.141261	1.993678	29.52452	0.333881
10	0.569901	36.29566	25.52070	6.931256	1.910379	29.04305	0.298956

Periods **Variance Decomposition of LNCF**

	S.E.	LNKP	LNMII	LNOPEN	LNSAV	LNKG	LNCF
1	0.990499	0.350875	8.275342	0.081581	2.603951	0.928372	87.75988
2	1.044505	1.354630	7.486314	0.097055	8.683239	1.091911	81.28685
3	1.063335	1.412040	8.701258	0.408223	9.074719	1.150678	79.25308
4	1.078811	1.389796	10.75326	0.474401	9.174159	1.118648	77.08973
5	1.087335	1.377186	12.04156	0.467477	9.082993	1.142078	75.88870
6	1.090919	1.396290	12.43487	0.497601	9.023925	1.243079	75.40424
7	1.093120	1.460822	12.41449	0.582898	9.023473	1.380621	75.13770
8	1.096033	1.572676	12.39674	0.690250	9.045684	1.513879	74.78078
9	1.099827	1.716199	12.51855	0.785801	9.057690	1.624412	74.29734
10	1.103814	1.868732	12.73527	0.855265	9.049696	1.711598	73.77944

Cholesky ordering	LNKP	LNMII	LNOPEN	LNSAV	LNKG	LNCF

Appendix 7: - Structural breaking test (chow test)

LNRGDP

Chow Breakpoint Test: 1991
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1974 2013

F-statistic	1.819624	Prob. F(5,30)	0.1391
Log likelihood ratio	10.59508	Prob. Chi-Square(5)	0.0600
Wald Statistic	9.098118	Prob. Chi-Square(5)	0.1052

LNMII

Chow Breakpoint Test: 1991
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1974 2013

F-statistic	1.260040	Prob. F(5,30)	0.3067
Log likelihood ratio	7.625037	Prob. Chi-Square(5)	0.1781
Wald Statistic	6.300202	Prob. Chi-Square(5)	0.2781

LNKP

Chow Breakpoint Test: 1991
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1974 2013

F-statistic	0.314010	Prob. F(5,30)	0.9006
Log likelihood ratio	2.040459	Prob. Chi-Square(5)	0.8435
Wald Statistic	1.570049	Prob. Chi-Square(5)	0.9048

LNKG

Chow Breakpoint Test: 1991
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1974 2013

F-statistic	0.440604	Prob. F(5,30)	0.8166
Log likelihood ratio	2.834512	Prob. Chi-Square(5)	0.7255
Wald Statistic	2.203019	Prob. Chi-Square(5)	0.8204

LNHC
Chow Breakpoint Test: 1991
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1974 2013

F-statistic	1.736578	Prob. F(5,30)	0.1567
Log likelihood ratio	10.16800	Prob. Chi-Square(5)	0.0706
Wald Statistic	8.682891	Prob. Chi-Square(5)	0.1224

LNLF

Chow Breakpoint Test: 1991
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1974 2013

F-statistic	2.534344	Prob. F(5,30)	0.0499
Log likelihood ratio	14.09356	Prob. Chi-Square(5)	0.0150
Wald Statistic	12.67172	Prob. Chi-Square(5)	0.0267

LNCF

Chow Breakpoint Test: 1991
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1974 2013

F-statistic	0.943569	Prob. F(5,30)	0.4674
Log likelihood ratio	5.842256	Prob. Chi-Square(5)	0.3219
Wald Statistic	4.717843	Prob. Chi-Square(5)	0.4513

LNOPEN

Chow Breakpoint Test: 1991
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1974 2013

F-statistic	1.810380	Prob. F(5,30)	0.1409
Log likelihood ratio	10.54777	Prob. Chi-Square(5)	0.0611
Wald Statistic	9.051901	Prob. Chi-Square(5)	0.1070

LNSAV

Chow Breakpoint Test: 1991
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1974 2013

F-statistic	0.130401	Prob. F(5,30)	0.9842
Log likelihood ratio	0.860025	Prob. Chi-Square(5)	0.9730
Wald Statistic	0.652003	Prob. Chi-Square(5)	0.9855