Private Investment in Kenya: The Effects of Government Policy and Commodity Price Shocks.

By

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DECLARATION

I declare that this is my original work and that it has not been presented for a degree in any university. Where work of others has been utilized, acknowledgement has been duly given. I am solely responsible for all errors here in.

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CERTIFICATE OF APPROVAL

This thesis is submitted with our approval.

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DEDICATION

I sincerely dedicate this piece of work to my mother Rose Munzi Musengele for her untiring moral support and my brother Julius who has been encouraging me all through my studies without which I would not be who I am today.

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ABSTRACT

This study has examined the effects of Government policy and Commodity price shocks on private investment in Kenya. Due to non-stationarity of the variables in the model and the existence of a cointegrating relation, an error correction mechanism was used. The estimated long-run results indicate that real GDP growth rate, real lending interest rate and export price index have significant influence on private investment in Kenya. In the short run however, real public infrastructural investment and real public non-infrastructural investment, real GDP growth rate and real lending interest rate are significant factors in explaining private investment in Kenya. Political uncertainty through the political regime dummy has also been found to be significant

Given the positive impact of real public infrastructural and public non-infrastructural investment, the study suggests policies such as allocating public sector resources to capital accumulation and with respect to the negative effect of commodity price shocks, there is need to diversify the country's production and export base. Since real lending interest rates have a significant positive effect, it is essential to maintain the financial liberalization status and in order to maintain the important link between GDP and private investment, there is need to expand the agricultural and industrial sectors. Political uncertainty being a major blow to private investment, the Government should set up proper mechanism to curb corruption among its officials, improve on governance and set proper measures and controls over top officials

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

This study investigates the factors that determine private investment in Kenya particularly the interaction between government policy and private investment. The Government policy effects are directly established through government expenditures on public infrastructural investment and indirectly through the lending interest rate. The Kenyan economy is characterized by commodity price volatility especially for goods traded in the international market; hence the paper also established the effects of commodity price shocks on private investment.

Private investment is one of the major contributors to economic growth and development in both developed and developing countries. This is because through investment, new technology can be adopted, employment opportunities can be created, incomes can grow and living conditions of the people can improve thus, ultimately leading to alleviation of poverty. Technology, employment and poverty are among the main problems facing most of developing countries and it is through investment that long-term solutions can be reached.

The Kenyan economy's private sector has been facing macro-economic problems since the early 1970s. In 1973/74 there was the first oil crisis, which translated into balance of payment crisis. The coffee boom of 1978 eased up the situation but was immediately followed by the second oil crisis of 1979/80 that precipitated further balance of payment problems. In the 1980s the debt crisis followed. The 1984 drought severely affected the private sector performance. The 1992 introduction of the multi-party system led to decline of private investment due to political uncertainty (Ronge and Kimuyu, 1997). The U.S embassy bombing of 1998 and another recent terrorist attack in Mombasa have negatively impacted on investor's behaviour. It is crucial to investigate whether statistically these events had a significant impact on private investment.

In the government document; Kenya Investment Climate Action Plan (2005-2007), it has been clearly stated that the private sector is Kenya's hope for creating employment and wealth, arresting the spread of poverty, and putting Kenya on a firm development path. In the national economic recovery strategy the president has called for a national effort to create an enabling business environment that would encourage domestic and foreign private investment, because without investment the desired growth will not take place and without growth there will be no new employment opportunities.

This study focuses on the factors that determine private investment in Kenya. Economic theories enlighten us that unlike public investments, private firms are motivated to innovate in order to remain competitive in a free market mechanism and as such, they spearhead the process of product innovation. Without a clear understanding of the factors that determine private investment, policy making is likely to be difficult. Thus, relevant policy prescriptions will to a large extent depend on knowledge of factors that determine private investment.

1.2 PROBLEM STATEMENT

Private investment as a share of GDP in Kenya has been fluctuating between 9.3% and 15.6% since 1970. The highest level was realised in 1978 due to the favourable investment climate associated with the coffee boom while the lowest level was exhibited in 2002. This was the transition period from the second president's regime. Due to the bitter struggles for his succession, the political uncertainty associated with the general election campaigns, coupled with poor economic governance and freezing of donor aid flow many private investors fled the country. Recent empirical data also reflect that total domestic investment as a share of GDP in Kenya has been falling since 1995. Its contribution has been falling from 13.9% to 9.3% for the seven consecutive years since1995 (Everhart and Sumlinski, 2001)

Private investment is at the helm of economic growth and as such it is vital to understand its determinants. Private investment behaviour has been studied in detail, but the focus has been on industrial countries and on the developing countries at aggregate level. It is equally important for policy makers in Kenya to be able to assess how private investment responds to government policy; not only in designing long-term development strategies, but also in implementing short-term stabilization programs. Even if it can be assumed that an increase in private investment, other things being equal, has an unambiguous positive effect on output, it is still necessary to establish how private investment in Kenya is determined-in particular, what variables systematically affect it-before one can evaluate the influence that government can exercise over private investment decisions that change the current and future growth rate of the economy. The interaction between government policy and private investment is also crucial for any analysis of the effects that stabilization programs involving elements of demand restraint may have on the real sector, a question that is still a subject of considerable controversy (Khan and Knight, 1981, 1982)

The literature on the effects of price variability on macroeconomic performance in developing countries has been primarily concerned with two aspects of variability; namely, discrete ex post price shocks and uncertainty about future prices. There are strong reasons to suspect that both these manifestations of variability should have important implications for investment. The theory of temporary trade shocks show that investment can be expected to respond strongly to discrete ex post commodity price shocks (Bevan, et al, 1990a), (Collier, et al 1999). Similarly, recent theoretical development supports the view that investment decisions may be very sensitive to uncertainty about the future outcomes of key variables affecting investment decisions (Dixit and Pindyck, 1994).

In light of the widely recognised fact that commodity prices are highly volatile, it is surprising that no work has sought to quantify the link between manifestations of commodity price variability and investment decisions in Kenya, seen as particularly vulnerable to commodity price variability. This study therefore focuses on the role of government policy and derives an explicit relationship between government expenditures

(specifically government infrastructural investment) and private capital formation. It also focuses on the effects of commodity price shocks on private investment.

1.3 OBJECTIVES

The main objective of this study is to determine the effects of government policy and commodity price shocks on private investment in Kenya.

Specifically the study seeks to establish the relationship that exists between:

i. Economic growth and private investment
ii. Lending interest rates and private investment
iii. Public infrastructural investment and private investment
iv. Commodity price shocks and private investment.
v. Public non infrastructural investment and private investment
vi. Political uncertainty and private investment
vii. Interest rates liberalization and private investment
viii. Structural adjustment programmes and private investment

1.4 STUDY HYPOTHESES

Guided by economic theory, the study postulates the following null hypotheses.

1. Economic growth does not influence private investment.
2. Lending interest rates do not affect private investment
3 Public infrastructural investment is not complementary to private investment.
4 Export price index has no impact on private investment.
5 Public non-infrastructural investment does not crowd out private investment
6 Political uncertainty does not influence private investment
7 Structural adjustment programmes do not stimulate private investment
8 Interest rates liberalization has no impact on private investment

1.5 SIGNIFICANCE OF THE STUDY

In Kenya today, policy efforts are geared towards creation of an enabling business environment that will encourage domestic private investment so as to attain the desired growth and create new employment opportunities. The attainment of this however will significantly depend on extensive knowledge of private sector development, which is important for economic growth. The study contributes new findings to already existing body of literature on investment and acts as a guide for further research.

1.6 ORGANISATION OF THE THESIS

This study is organized in five chapters; chapter one comprises of background information, problem statement, objectives, study hypotheses, significance and organization of the study. Chapter two presents the conceptual framework and literature review. Chapter three is methodology of the study, chapter four is data analysis and discussion of findings and chapter five consists of summary, conclusions and policy implications.

CHAPTER TWO

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

2.1 THEORETICAL REVIEW.

Investment theory developed around growth models giving rise to the accelerator theory by clerk (1917) as quoted in Fry (1980), which makes investment a linear proportion of changes in output. This classical investment theory is however, limited in appeal because it does not perceive a role for profitability, expectations and the cost of capital.

The next phase of investment theory date back to Keynes (1936) who called attention to the existence of an independent investment function in the economy. A central feature of the Keynesian analysis is the observation that although savings and investment must be identical ex-post, different decision makers in general take savings and investment decisions and there is no reason why ex-ante savings should equal ex-ante investment. Keynes argued that investment is determined by the prospective marginal efficiency of capital relative to the prevailing or market interest rate, which is a reflection of the opportunity cost of money. Keynesians have traditionally favoured the accelerator theory of investment while disregarding the role of factor costs.

A more general form of the accelerator model is the flexible accelerator model. The basic notion behind this model is that the larger the gap between the existing capital stock and the desired capital stock, the greater a firm's rate of investment. The hypothesis is that firms plan to close a fraction of the gap between the desired capital stock, k*, and the actual capital stock, k, in each period. This gives rise to a net investment equation of the form: $I = \delta (k_t^* - k_{t-1})$ where I = net investment, k_t^* = desired capital stock, k_{t-1} = last period's capital stock and δ = partial adjustment coefficient.

The neo-classical theory of investment, popularized by Jorgensen (1967) asserts that the level of investment depends on the volume of output and the user cost of capital which in turn depends on the real interest rate, the price of capital goods and the rate of physical

capital depreciation. An investment equation results from the time lag between the decision to acquire assets and the actual delivery. The neo-classical theory has been criticized on account of inconsistency between its assumptions of perfect competition and exogeneity of output. The static expectations assumptions about the future prices, output and the interest rates overlook the fact that investment is a forward-looking process.

Tobin's Q theory advanced by Tobin (1969) postulated that the main force driving investment is the Q- ratio or the ratio of the market value of existing capital stock to it's replacement value; enterprises will want to invest if the increase in the market value of additional unit exceeds the replacement cost. The delivery lags and installation cost makes the measured Q-ratio to differ from unity. The Q-framework hence, posits that in the absence of capital market imperfections, value-maximizing firms will invest as long as the shadow price of a marginal unit of capital-Q- exceeds unity. Investment will only cease when the value of this capital unit is not more than or less than the cost of replacing it.

However, in empirical implementation of this model, the average Q (the ratio of the market value of the entire existing stock of capital to its replacement cost) is often used since the marginal Q is difficult to measure. There is a significant divergence between the marginal and the average Q in cases where firms enjoy either scale economies or market power or where they cannot sell at leisure. This limits the application of the Q theory

More generally, the application of the neo-classical and Tobin's Q theories of investment is limited in developing countries due to the restrictive assumptions on which these models are based such as perfect capital markets, a perfect flow of information and little or no government investment. Typically these countries do not have functionally efficient equity markets and have for a long time suffered financial repression, debt overhang, a dominant role of imported capital goods, and macroeconomic instability (Ag'enor and Montiel, 1996). Although these factors act as barriers to private investment, they are often not incorporated in traditional models of investment.

Another approach dubbed "neoliberal" (Galbis, 1979) emphasizes the importance of financial deepening and high interest rates in stimulating growth. The proponents of this approach are McKinnon (1973) and Shaw (1973). The core of their arguments rests on the claim that developing countries suffer from financial repression (which is generally equated with controls on interest rates in a downward direction) and that if these countries were liberated from their repressive conditions, this would induce savings, investment and growth. In the neoliberal view, investment is positively related to the real rate of interest in contrast with the neoclassical theory. The reason for this is that a rise in interest rates increases the volume of financial savings through financial intermediaries and thereby raises investible funds, a phenomenon that McKinnon (1973) calls the "conduit effect". Thus, while it may be true that demand for investment declines with the rise in real interest rate, realized investment actually increases because of the greater availability of funds. This conclusion applies only when the capital market is in disequilibrium with the demand for funds exceeding supply.

More recent literature has introduced an element of uncertainty into investment theory due to irreversible investment (Pindyck, 1991). The argument is that since capital goods are often firm specific and have a low resale value; disinvestment is more costly than positive investment. He argues that the net present value rule-invest when the value of a unit of capital is at least as large as its cost-must be modified when there is an irreversible investment because when an investment is made, the firm cannot disinvest should market conditions change adversely. This lost option value is an opportunity cost that must be included as part of the cost. Accordingly, "the value of the unit must exceed the purchase and installation cost, by an amount equal to the value of keeping the investment option active (Pindyck, 1991)

Rondrik (1991) as quoted in Dixit and Pindyck (1994), introduces another element of policy uncertainty as a determinant of private investment. When a policy reform is introduced, it is very unlikely that the private sector will see it as one hundred percent sustainable. A number of reasons may be adduced, among them the expectations that, the political-economic configuration that supported the earlier policies may resurface. There is

also the fear that unexpected consequences may lead to a reversal. Investors must respond to the signals generated by the reform for it to be successful. However, rational behaviour calls for withholding investment until much of the uncertainty regarding the eventual success of the reform is eliminated. Collier and Gunning (1999a) have recently provided a theoretical illustration of the investment response to a temporary trade shock within the context of a Ramsey model. The model assigns importance to the policy stance adopted for the capital account according to the rationale that large windfalls drive down the rate of return to capital within the domestic economy as the most lucrative investment opportunities are gradually exploited. In such circumstances, agents in the domestic economy stand to gain from having access to foreign saving instruments, which allows them to avoid the temporary erosion of investment returns.

When agents have access to foreign saving instruments, the investment dynamic involves four phases. In the first phase, savings are invested domestically to exploit the high rate of return differential with the rest of the world, which exists due to the borrowing constraints. In the second phase, as the rates of return on construction and other domestic investment opportunities approach the return available on international deposits, agents switch any additional windfall savings into foreign assets to ensure a better return to the windfall than is available domestically. In phase three, as the shock dwindles away foreign assets are repatriated, and then in phase four domestic investments is finally reversed. The savings rate, which determines the size of the investment response, is determined by the duration of the shock (Bevan, et al, 1990b)

From this discussion, it is clear that private investment depends on three broad categories of variables: Keynesian, neoclassical and uncertainty variables. Variables that may be included in the Keynesian tradition include growth rate of GDP, internal funds (for example, credit to the private sector) and capacity utilization. The neoclassical determinants of private investment include Tobin's Q, real interest rate, user cost of capital, output growth and public investment ratio. There are three uncertainty variables. The first is variability (variance, standard deviation or moving coefficient of variation) of the user cost of capital, real exchange rate, inflation rate, distortions in the foreign exchange market

(proxied by the black market premium) and real GDP. The second uncertainty variable is the debt/GDP ratio and third is debt service as a ratio of exports and services.

2.2 EMPIRICAL REVIEW

Several studies have been conducted on private investment. This section reviews some of them. Blejer and Khan (1984) carried out a study on the role of government policy on private investment. They derived an explicit relationship between principal instrument variations in the bank credit and in government expenditures and private capital formation using a variant of the flexible accelerator model. They separated long-term or infrastructural and short-term public investment and found that the level of private investment was positively related to the trends in infrastructural investment, the expected real GDP, change in bank credit to the private sector and the amount of foreign capital inflows.

Their study nevertheless concentrated on developing countries excluding Africa and concluded that the findings could only be applicable to the average developing country. As a result there has been a challenge of the same to be explored in Africa and a specific county case.

Ouattara (2004) in modelling the long run determinants of private investment in Senegal found that public investment affects positively and significantly private investment. The impact of the terms of trade variable on private investment was also found to be negative and significant. The size of its estimated coefficient suggested that private investment in Senegal was highly sensitive to external shocks. He looked at the effects of public investment on private investment at aggregate level and used the terms of trade as a proxy for external shocks. There is therefore a need to investigate the impact of the various categories of public investment on private investment and use another proxy for external shocks for terms of trade has been frequently used to capture other factors such as openness and competition policy.

Green and Villanueva (1991) in their study on the adverse effects of double-digit inflation on private investment found that a higher inflation rate had a negative effect on private investment for 23 developing countries in their pooled time series/cross sectional study.

A study by Borenstein (1989) as pointed out in Matin and Wasow(1992) found that large external debt burden contributes to a decline in private investment. The presence of large external debt burden constitutes another source of uncertainty in the macro-economic environment. A high external debt to GDP ratio signifies that part of the future returns on any investment must be used to service the existing stock of debt. Empirical results have confirmed that high debt to GDP ratio has a strong negative impact on the private investment rates in developing countries.

McKinnon (1973) and Shaw (1973) carried out a study on the applicability of neo-classical model of investment. They proposed that financial repression interferes with development in several ways: Financial intermediaries that collect savings do not allocate them efficiently among the competing uses; saving vehicle is not well developed and the returns in saving are negative or unstable; and firms are discouraged due to poor financial policies that reduce the return to investment or make them uncertain; as a result all these retard growth. They found that there is a positive relationship between private investment and real interest rates in LDCs

Porter and Ranny (1982) as quoted in Matin and Wasow (1992) advanced the same study and found interest rates to be a factor affecting investment, especially its impacts on the cost of working capital. They found that there was a strong positive relationship between private investment and the level of real interest rates. They concluded that the impact of interest rates on investment depends on how they affect the level of desired capital stock and its productivity as well as the availability of savings and consequent speed of adjustment of the actual capital stock to the desired level.

Studies have also been done in Kenya on private investment for example Chesang (1991) as cited in Ronge and Kimuyu (1997) did a study on private investment on urban housing in Kenya. He found lagged changes in income and the availability of credit to the urban housing sector to have significant and positive impact on investing in housing. However, his study had a limitation as a true representative of total private investment since it dealt

with one category of investment that constitutes at most 10% of gross investment in the country (Wilson, et al, 1991) as quoted in Ronge and Kimuyu (1997).

Study by Mwau (1984) as quoted in Ronge and Kimuyu (1997) mainly focussed on the impact of foreign capital inflows on the Kenyan economy. He found that capital inflows have significant and positive effect on domestic investment, balance of payment and economic growth. This study was later confirmed by Musinga (1992) as quoted in Ronge and Kimuyu (1997) who also found that net foreign capital inflow to the private sector and rate of growth of GDP had significant and positive effect on private investment. Further, Matin and Wasow (1992) used Kenyan data from 1968-1988 to assess the determinants of private investment. They found that insufficient and uncertain access to imports to be a major factor behind the decline in private investment.

In a study on the interactions between savings, investment and growth, Bwire (1993) estimated a private investment function for Kenya which revealed that private investment was influenced by the rate of GDP growth, the rate of inflation, and the external debt services. Though innovative in introducing the external debt element, Bwire's use of the external debt stock may have tilted the study towards the short-term fluctuations of the former ratio to which investors may not necessarily respond given their long-term focus. The impact of inflation on private investment may also not have been captured correctly.

Matin and Wasow (1992) sought to explain the behaviour of aggregate private investment over the adjustment period in Kenya through policy simulations. A private investment function for Kenya was estimated and the study found that real interest rate had a significant negative impact on private investment. The model used, however, did not examine the effect of public debt on the behaviour of private investment.

Ronge and Kimuyu (1998) in their study on private investment in Kenya found out that at the aggregate level, private investment is determined by key macroeconomic and policy variables such as domestic credit, the exchange rate, foreign exchange reserves, public investment and public debt. The impact of these variables has been shown to differ both in

magnitude and sign. The availability of credit has a positive impact on the level of private investment; the level of public investment impacts positively on private investment, and the level of public debt has a negative impact on private investment.

The literature reveals that public investment plays an important role in capital formation, which depends much on economic theory. Meaningful results are obtained only when a distinction is made on long-term, or infrastructure, and short-term public investment. Apart from Blejer and Khan (1984) who carried out a study on the role of government policy on private investment in developing countries excluding Africa using such distinction, there are very few empirical studies of the same in Africa and Kenya in particular. From the literature too there seems to be very little research on the effects of shocks on private investment. These two influences on private investment using recent data are the core concerns of this paper.

CHAPTER THREE

METHODOLOGY

3.1 Model specification

The model used in this study was developed from the flexible accelerator model by Jorgensen (1967) and adjusted to include other variables that we found important for Kenya as shown in Appendix 1. This was because the flexible accelerator model appears to be the most popular of investment theories used in applied work. However, in the context of developing countries, due to data limitations and structural constraints, a variant of the flexible accelerator model has been used in empirical research, including the literature on the determinants of private investment in these countries. It also included dummy variables for structural adjustment programmes (DSAPs), political regime (Dpr), and interest rate liberalization (Dil). The econometric form of the model estimated was therefore expressed as;

$IP_t = b_0 + b_1GR_t + b_2RLIR_t + b_3PUB_t + b_4NPUB_t + b_5EI_t + b_6D_{Sap} + b_7D_{Pr} + b_8D_{IL} + \mu_t$

Where IP = the ratio of private sector investment to GDP.

GR = the percentage change in real GDP

RLIR = the rate of real lending interest rate

PUB = real public infrastructural investment as a share of GDP

EI = real export price index

NPUB = real public non infrastructural investment as a share of GDP

D_{Sap} = dummy variable for the structural adjustment programmes

D_{Pr} = dummy variable for political regime

D_{IL} = dummy variable for interest rate liberalization

t = time

μ = the random error term

Neoclassical theory suggests that private investment is positively related to the growth of real GDP (Green and Villanueva, 1991; Fielding, 1997). This is because countries with higher income level would tend to dictate more of their wealth to domestic savings, which

would then be used to finance investment (Green and Villanueva, 1991). Public sector investment has also been suggested to affect private investment, although its impact remains ambiguous. Public investment can boost private investment by increasing private returns through the provision of infrastructure (communication, transport, energy etc). Evidence of a complementarity between public and private investment has been found by studies such as Blejer and Khan (1984), Ashauer (1989) and Green and Villanueva (1991). Conversely, public investment may crowd out private investment if the additional investment is financed by a deficit, which leads to an increase in the interest rate, credit rationing, and a tax burden. Empirical studies by Chiliber and Wijnbergen (1998) and Rossiter (2002) report a negative effect of public investment on private investment. Hence both b_3 and b_4 would be either positive or negative.

Interest rates too affect private investment. High fiscal deficits push interest up or reduce the availability of credit to the private sector or both, therefore crowding out private investment. Second as argued by Serven and Solimano (1993) restrictive monetary and credit policies raise the cost of real bank credit and by raising interest rates they raise the opportunity cost of retained earnings. In turn, high interest rates increase the cost of capital, and thus reduce the likelihood of private investment. Conversely Portar and Ranny (1982), McKinnon and Shaw (1973) have argued that interest rates mobilize deposits thus stimulating investment. Therefore the impact of the interest rates on investment depends on how they affect the level of desired capital stock and its productivity as well as the availability of savings and consequent speed of adjustment of the actual capital stock to the desired level.

Finally export price index is suggested to be another important determinant of investment in developing countries. This variable is used to proxy commodity price shocks to the economy. Unfavourable index implies that export prices are declining. This may worsen the current account deficit, which is an indicator of macroeconomic instability, and extent of a negative effect on private investment. If the worsening index is the effect of a reduction in export prices then export earnings will fall, which in turn will tend to reduce investment in that sector.

Guided by economic theory we expect a positive sign between private investment and real GDP growth and export price index. We expect the sign with respect to public investment and real interest rate to be either negative or positive**.** We expect the sign for structural adjustment programmes dummy to be positive because most of the SAPs introduced by IMF in developing countries are in favour of privatization. The dummy for political regime is expected to have a negative sign for it captures the political uncertainty in the Kenyan economy hence the more uncertain the economy is, the more risky it is for private investors. The dummy for interest rate liberalization is expected to have a positive sign because financial liberalization allows the market forces of demand and supply to determine the cost of investable funds. This implies that the more liberal the interest rates are the more motivation there is for private investors.

3.2 DATA USED IN THE ANALYSIS

The annual data covers the period of 1970-2003 and was obtained from international and domestic sources such as International Financial Statistics (IFS), Republic of Kenya's Statistical Abstracts and Economic Surveys, Kenya Central Bureau of Statistics (KCBS) and the Central Bank of Kenya's Annual Economic Reviews.

In the national accounts, investment is recorded in gross terms in both constant and current price figures. The stock of public investment was deflated using the GDP deflator to express it in real terms. Data on real GDP was calculated by deflating GDP at market price by GDP deflator (base 2000). The real lending interest rate was taken as the difference between the nominal lending rate of interest and the rate of inflation. The export price index variable came from the World Bank Global Development Network (macro time series). Assigning the period under president Moi's leadership a value of zero because it is when there was more political uncertainty in the country and assigning the other periods a value of one measured the dummy for political regime (1970-1978, and 2002-2003=1 and 0 otherwise). A value of zero was assigned to the period before 1980 and a value of one after 1980 to capture the impact of structural adjustment programmes in Kenya. For interest rate liberalization dummy variable a value of one was allocated to the period after 1991 and zero otherwise.

3.3 ESTIMATION TECHNIQUE

It has been shown in the literature that in non-stationary series, spurious correlation may arise despite the absence of correlation between the underlying series. As argued by Banerjee et al (1993), if two or more series are each growing they may be correlated even though they are increasing for entirely different reasons and by amounts that are uncorrelated. Thus a correlation between non-stationary series cannot be interpreted in the way that would be interpreted if it arose among stationary series. Before choosing the estimation technique for the private investment equation, it is, therefore, necessary to explore the data characteristics first.

3.3.1 Unit Root test for stationarity.

Dickey-Fuller (DF) and the Phillip Perron (PP) tests of evaluating the time series characteristics were used. The DF test is a test against the null hypothesis that there is a unit root series, integrated of order one and it was employed because serial correlation was absent. As can be depicted in the data trends discussion in chapter four sections 4.1, the graphs of all the variables showed the presence of an intercept and plotting them against time did not indicate the presence of any trend in the variables. We therefore only considered the case where a constant was included in the unit root test.

The PP test is the same as DF test except that there is no requirement that the error term be serially uncorrelated. The restrictive assumptions of independency and homogeneity of the error term under the DF test are relaxed under the PP test. The PP test is however more appropriate if the variable in consideration has some structural breaks, Perron (1989). All the tests were run at 5% significance level. The PP tests were run on three truncations as suggested by Newey-West (1988). Both tests in levels and first differences are as reported below in Table (1).

Table 1: Dickey-Fuller and Philip- Perron Unit Root Test Statistics in Absolute Values

Variable	DF in Levels 5% CV = 2.953	PP in levels 5% CV=2.953	DF in First difference 5% CV = 2.956	PP in first difference 5% CV= 2.956	Order of integration
IP	3.007	3.010	7.697	7.800	1
GR	3.731	3.676	7.692	8.241	1
PUB	2.335	2.301	7.754	7.930	1
NPUB	7.890	8.067	11.553	6.027	1
RLIR	2.335	2.204	4.884	4.749	1
EI	0.090	0.111	6.031	6.027	1

It is evident from Table (1) that all the variables were integrated of order one i.e. I (1) and was found to be I (0) at 5% level of significance after differencing once. Even though IP, GR and NPUB were stationary at levels, due to low power property associated with these tests in small samples, first difference tests for these variables were conducted to ascertain the prerequisites for cointegration. The graphical representation of the variables in their first differences show stochastic movements around zero mean as shown in Appendix 7 confirming that the variables are indeed stationary in first difference. After establishing that all variables are I (1) we proceed to test for cointegration.

3.3.2 Cointegration test

Although economic variables may be individually non-stationary, they may be cointegrated. Non- stationary series are said to be cointegrated if a linear combination of these variables is stationary i.e. I (0). The existence of a cointegrating relationship implies that the regression of non-stationary series in their levels yields meaningful not spurious results. However, for cointegration to exist the non-stationary series must be integrated of the same order. In our case all the variables were integrated of order one I (1).

Cointegration in this study was tested using the Engle- Granger (1987) two-step procedure. The gist in this method is that there is some adjustment process that prevents the errors in the long-run relationship from becoming larger indefinitely (the error correction mechanism-ECM). In this case we first estimated a static (long-run) model using the ordinary least squares method. Secondly, we generated the residuals and evaluated their order of integration using the ADF unit root test. It is vital to note that in this test the usual ADF critical values are not appropriate hence Engle and Granger (1987) calculated the appropriate values against which this test can be resolved. These figures can be found from several sources including Charemza and Deadman (1997). Graph of the error term as shown in Appendix 2 indicate presence of an intercept. The results showed that the residuals were stationary in levels i.e. I (0) which supports the existence of cointegrating relationship in the estimation equation. The results are as shown in Table (2).

Table 2: Engle-Granger Two Step Cointegration Test Statistic in Absolute Values

Residual	ADF stat	5% critical value	Inference
Ect	4.205	3.71	I (0)

In order to derive the short run coefficients of the private investment model, overparametized ECM version of the equation was estimated. The error correction term (ECT (-1)) was derived as the lagged residuals generated from the estimated static long-run cointegrating equation. A general-to- specific model specification was followed. All the variables in the auto-regressive private investment model, except for the error term and dummy variables were set at two lags to economize the degrees of freedom. Using the Akaike information criterion as a guide, some of the variables that were statistically insignificant were systematically eliminated from the model to come up with a more preferred specification. A variable, though statistically insignificant, could be dropped only if dropping it resulted into a smaller Akaike information criterion and if dropping it could not result in misspecification of the model, which was monitored using Ramsey Reset test.

After examining the data characteristics, the private investment equation was estimated using the ordinary least squares (OLS) method on time series annual data for the entire 1970-2003 period. This is because ordinary least squares method is widely used and is simple to apply. Apart from this the data was exposed to various diagnostic tests to confirm the classical assumptions of OLS as shown in section 3.3.3 below. In order to determine both the long run and short-run behaviour of investment with regard to explanatory variables, a private investment function was developed and estimated at levels to determine the log-run behaviour and, then re-estimated on differenced terms. The estimation on differenced terms was to determine the short run behaviour and the adjustment mechanism by which short-run dynamics adjust towards equilibrium. The study involved the use of inferential statistics especially T- statistic to test the hypotheses. The Econometric views package (Eviews 3.1) was used to generate the results of the study.

3.3.3 Diagnostic Tests

In order to use OLS method of estimation, its assumptions must hold for the results to be reliable. We employed the Multicollinearity test, the Histogram normality test, the Breusch Godfrey serial correlation test, Auto regressive conditional heteroskedasticity test, The Ramsey reset test, Cusum test, Recursive estimate test, and Recursive coefficients test with respect to the short run regression results and these tests are presented below. We also did the same tests for the long run model and the results are as attached on Table (8).

3.3.3.1 Multicollinearity of the explanatory variables

Presence of perfect or near perfect linear relationship among some or all explanatory variables of a regression may lead to indeterminate regression coefficients and infinite standard errors, though even if multicollinearity is very high as in the case of near perfect multicollinearity, the OLS estimators still retain the property of BLUE. Explanatory variables correlation matrix was used to test the presence of multicollinearity in the regression equation. As depicted in the results in Table (3) below no presence of perfect

or near perfect linear relationship was observed as argued in Gujarati (2003), multicollinearity is a serious problem if the zero-order correlation coefficient between two regressors is in excess of 0.8.

Table 3: Correlation matrix

	EI	EPUB	GR	PUB	RLIR
EI	1.000	-0.108	-0.463	-0.564	0.670
NPUB	-0.108	1.000	-0.043	-0.383	-0.055
GR	-0.463	-0.043	1.000	0.297	-0.051
PUB	-0.564	-0.383	0.297	1.000	-0.493
RLIR	0.670	-0.055	-0.051	-0.493	1.000

3.3.3.2 Normality of the random variable

OLS assumes that the random variable or error term is normally distributed around a zero mean and constant variance. Absence of this implies that OLS estimates are still BLUE but we cannot assess their statistical reliability by the classical tests of significance. The Jarque-Bera test was employed to test the null hypothesis of normality and the results were as in Table (4) below show that we cannot reject the null hypothesis.

Table 4: Histogram normality test

Jarque-Bera	2.960
Probability	0.228

3.3.3.3 Autocorrelation of the disturbance term

OLS estimates, in the presence of autocorrelation are unbiased but not efficient. They do have minimum variance among all linear unbiased estimators. The Breusch- Godfrey serial correlation LM test was used to test for the null hypothesis of no serial correlation of order one. The order was determined through the Akaike and Schwarz information criterion. Testing a higher order autocorrelation led to a higher penalty with respect to degrees of freedom as per these two criterions. The results in Table (5) show that we cannot reject the null hypothesis of no serial correlation.

Table 5: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.165	Probability	0.689
Obs*R-squared	0.253	Probability	0.615

3.3.3.4 Auto-Regressive conditional heteroscedasticity (ARCH)

ARCH occurs when the error term variance is autocorrelated to the squared error term in the previous period. ARCH in itself does not invalidate standard OLS inference, however ignoring ARCH effects may result in loss of efficiency. The ARCH LM test was utilized to test for the presence of ARCH effects and the results were satisfactory i.e. we cannot reject the null hypothesis of no ARCH effect as Table (6) shows.

Table (6): ARCH Test.

F-statistic	0.607	Probability	0.442
Obs*R-squared	0.637	Probability	0.425

3.3.3.5 Correct model specification.

It is very essential to find out whether the model has omitted certain variables, has incorrect functional form or there is correlation between explanatory variables and the residuals. Fitting two residuals to test for the presence of model misspecification we used the Ramsey reset test. The results in Table (7) indicate that we cannot reject the null hypothesis of no model misspecification.

Table (7): Ramsey Reset Test

F-statistic	0.329	Probability	0.572
Log likelihood ratio	0.506	Probability	0.477

3.3.3.6 Stability of the model

The Cusum Test in general tested stability of the model. Since the Cusum Test is within the 5% significance boundary, as shown in Appendix 4, we argue that our model is stable. We also assessed the stability of our residuals and, as shown in Appendix 3, no structural break was observed. Thus, our residuals are quite stable. We then sought to understand whether coefficients of the variables were stable. The results, as captured by the respective graphs in Appendix 8 show that the coefficients of the constant(C), D(GR), D(EI (-2)), D(NPUB (-2)), D(PUB (-2)), D(RLIR), DIL, DPR, DSAP and ECT (-1) were very stable, since they were between the boundary of the plus or minus standard error.

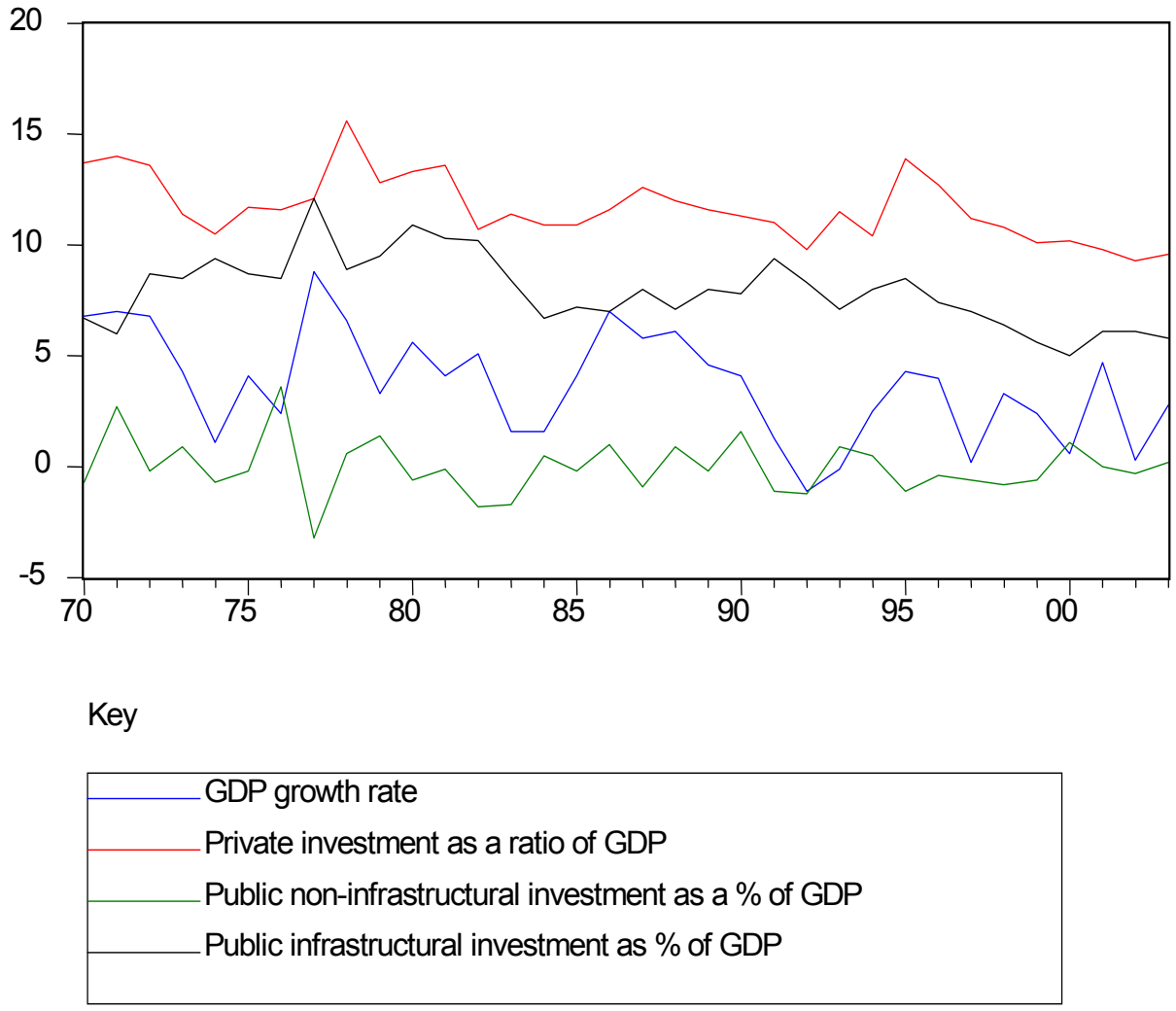
CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION OF FINDINGS

Our data analysis and presentation are in two main parts. First is a discussion of the trends in the economic fundamentals used in the study and second is a report on the regression results.

4.1 Trends in Economic Fundamentals used in the study.

4.1.1 Figure (1): Trends in real private investment, GDP growth rate, public non-infrastructural investment and public infrastructural investment

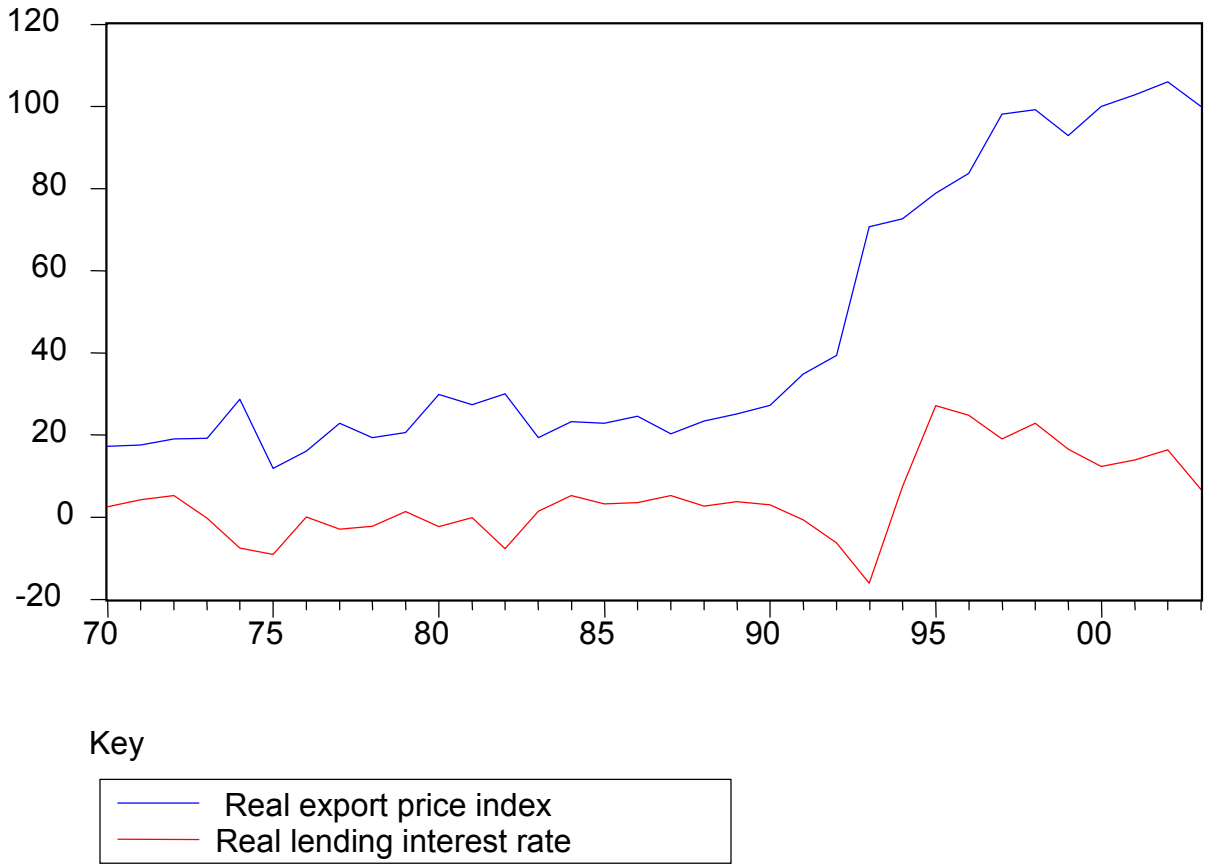


In Figure (1) the graphical representation of private investment as a share of GDP shows that in Kenya it has been fluctuating between 9.3% and 15.6%. The highest level was realised in 1978 due to the favourable investment climate associated with the coffee boom while the lowest level was experienced in 2002. This was a general elections period and, due to political uncertainty associated with change in political regime, many investors fled to neighbouring countries. Secondly, the donors had frozen their aid to the country.

The figure also show that real GDP growth rate in Kenya has been low over the period. It significantly dropped in 1973/74 as a result of the oil shocks that led to high inflation rate of 17%, hence low investments. The country experienced the highest rate in 1977/78 due to the effects of the coffee boom. It was also very low in 1982 and 1984 due to the effects of the 1982 attempted coup and the 1984 drought which led to low agricultural output, which is the backbone of the economy. The lowest value of –1.1% was realized in 1992 due to political uncertainty induced by election campaigns and introduction of multiparty system. Since 1996 the GDP growth rate has been relatively low, fluctuating around 2%.

As depicted in Figure (1) the growth in real public non-infrastructural investment over the period was very low. This was because of the emphasis by the government on tangible investment due to its approval by the public. We can also deduce that real public infrastructural investment was positive throughout the period. The highest being in 1977 as a result of the high GDP growth rate and high government revenue associated with the coffee boom. It has been declining since 1994 due to high corruption rates within the government officials.

4.1.2 Figure (2): Trends in real export price index and real lending interest rate.



From Figure (2) it can be observed that the real export price index has been low especially during the period prior to financial liberalization that took place in 1991. This may be attributed to the effects of the financial controls. After 1991 the export price index increased tremendously and reached its peak in 2002. This was due to reliable rainfall that boosted agricultural output, especially tea and coffee, which are the key exports of the country.

Real lending interest rate has been low prior to 1993 when it was –16.01%. This was due to the high inflation rate of 46%, which was an aftermath of the 1992 general elections. Over this entire period interest rates were low as a result of the financial controls within

the banking sector. After interest rate liberalization in 1991 and especially 1995 when the entire financial sector was fully liberalized, the real lending interest rates rose up to 27.2% and have been fluctuating since then as a result of changes in the inflation rate.

4.2: Regression results and interpretations.

This section reports regression results as well as their interpretations.

4.2.1: Private-investment long run regression results.

Table 8: long run regression results

Dependent Variable: IP
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.776	2.143	5.028	0.000*
EI	-0.032	0.018	-1.788	0.086***
NPUB	0.184	0.189	0.975	0.339
GR	0.256	0.103	2.479	0.020**
PUB	0.195	0.193	1.012	0.321
RLIR	0.053	0.029	1.817	0.081***
DIL	1.538	1.140	1.349	0.189
DPR	-0.533	0.647	-0.825	0.417
DSAP	-1.076	0.788	-1.365	0.184

Adjusted R-squared	0.480	Akaike info criterion	3.185
S.E. of regression	1.065	F-statistic	4.811
Durbin-Watson stat	2.511	Prob(F-statistic)	0.001*

Normality J-B 4.23(0.12) Autocorrelation B-G 2.47(0.13)
Heteroskedasticity ARCH 0.11(0.74) Ramsey RESET 3.59(0.07)

Where *, **, * indicates significance level at 10 percent, 5 percent and 1 percent respectively and the numbers in parenthesis are the F-statistic and their respective probability values for the diagnostic tests.**

Table (8) presents the regression results for existence of a long-run relationship among private investment, real public infrastructural investment, real public non-infrastructural investment, real GDP growth rate, real export price index and real lending interest rate. It can be seen that the computed F-statistic is statistically significant at 1% level, thus implying that these variables are bound together in the long run. This confirms results obtained with the Engle-Granger two-step cointegration test approach. The model passes the standard diagnostic tests for reported results show that: the residuals are normally distributed; there is absence of autocorrelation, and there is no auto-regressive conditional heteroskedasticity. Though the Ramsey reset test statistic is significant, other stability tests as shown in Appendix 5 and 6 show that the model is stable.

The results indicate that real GDP growth rate affects positively and significantly private investment at 5% level, which is in line with the theory. The impact of the export price index on private investment is negative and significant at 10% level. The size of its estimated coefficient suggests that private investment in Kenya is sensitive to commodity price shocks. Moreover, as pointed out earlier, unfavourable export price index can lead to macroeconomic uncertainties and other adverse factors, which will in turn affect the overall investment outlook and thus private investment. Kenya's dependency on energy imports and narrow production base make its economy vulnerable to export price shocks.

Real lending interest rate, also affects positively and significantly private investment at 10% level, which too is in line with economic theory. This concurs with the findings of Porter and Ranny (1982), McKinnon (1973), and Shaw (1973) who found that high interest rates stimulated deposits thus financed investment. The results contradict those of Martin and Wasow (1992) who argued that it scares borrowers hence, impacting investments negatively. Nevertheless Porter and Ranny (1982) argued that, the impact of the interest rates on investment depends on how they affect the level of desired capital stock and its productivity as well as the availability of savings and consequent speed of adjustment of the actual capital stock to the desired level.

To complement this study, it is important to investigate whether the above long run relationship is stable for the entire period of the study. In other words, we have to test for parameter stability. The methodology used here is based on the cumulative sum (cusum) and the cumulative sum of squares (cusumsq) tests proposed by Brown et al (1975). Unlike the Chow test, that requires break point(s) to be specified, the cusum tests can be used even if we do not know the structural break point. The cusum test uses the cumulative sum of recursive residuals based on the first n observations and is updated recursively and plotted against the break point.

The cusumsq makes use of the squared recursive residuals and follows the same procedure. If the plot of the cusum and cusumsq stays within the 5% critical bound the null hypothesis that all coefficients are stable cannot be rejected. If however either of the parallel lines is crossed then the null hypothesis of parameter stability is rejected at 5%

significance level. Appendix 5 and 6 evidently show that the cusum and cusumsq plots lie within the 5% critical bound, thus providing evidence that the parameters of the model do not suffer from any structural break.

4.2.2: Private investment short run regression results.

Table 9: Short Run Regression Results

Dependent Variable: D(IP)
Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.485	0.444	1.092	0.287
D(GR)	0.213	0.062	3.428	0.003*
D(EI(-2))	0.011	0.021	0.501	0.620
D(NPUB(-2))	0.347	0.141	2.458	0.023**
D(PUB(-2))	0.659	0.264	2.498	0.021**
D(RLIR)	0.068	0.022	3.087	0.006*
DIL	0.223	0.364	0.612	0.547
DPR	-1.273	0.539	-2.364	0.028**
DSAP	-0.588	0.492	-1.194	0.246
ECT(-1)	-1.318	0.182	-7.251	0.000*

Adjusted R-squared	0.726	Akaike info criterion	2.513
S.E. of regression	0.748	F-statistic	9.822
Durbin-Watson stat	1.931	Prob(F-statistic)	0.000*

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Where **, * indicates significance level at 5 percent and 1 percent respectively.

Table (9) reports short run private investment regression results. The reported diagnostic tests in section 3.3.3 show that: the residuals are normally distributed; there is absence of autocorrelation, auto-regressive conditional heteroskedasticity, and the Ramsey reset test shows that the functional form of the model is well specified.

The regression performed well in terms of goodness of fit and overall significance with an adjusted R^2 of 73% and F-statistic significant at 1% level. Regression results show that in the short run real GDP, public non- infrastructural investment, public infrastructural investment and lending interest rates exert the respective expected positive influence on private investment in Kenya. Real GDP growth rate is significant at 1% level. These results conform to the findings of (Blejer and Khan, 1982) who found that GDP growth rate affected private investment positively.

Real lending interest rate was positively related to the level of private investment at a significant level of 1%. Although this differs with the neoclassical argument that interest rates should have a negative impact on private investment, it concurs with the " neoliberal conduit effect" argument. McKinnon (973) has argued that a rise in interest rates increases the volume of financial savings through financial intermediaries and thereby raises investible funds. In Kenya following the financial liberalization in 1995, the economy was liberated from financial repression hence high interest rates were meant to induce savings, investment and growth. This also conforms to the findings of Porter and Ranny (1982).

The results also show that previous public infrastructural investment at the second lag exerts a positive significant influence over private investment at 5% level. This concurs with the theory that public infrastructural investment is complementary to private investment. Reduction in government investment expenditure on infrastructure is likely to affect private investment with a lag since it will take time to affect the actual stock of capital. Effort to restrain total public expenditure will thus affect private investment adversely if it reduces public investment in infrastructure and reduces the stock of infrastructure capital. These results are in line with the findings of Matin and Wasow (1992), Blejer and Khan (1982) and Ouattara (2004).

The study as opposed to other studies in developing countries finds a positive significant relationship between public non-infrastructural investment and private investment in two lags at 5% level. This nevertheless conforms to economic theory. Kenya being a developing country it has not achieved adequate investment in this sector therefore investing in it is as important as investing on the infrastructural sector. This is because both investments crowds in private investment. This concurs with the findings of Ronge and Kimuyu (1997) that aggregate public investment has a significant impact on private investment in Kenya.

The dummy variable for political regime has a negative sign and is significant at 5% level. This shows that there was indeed a structural break between the different political

regimes. Political uncertainty which prevailed during the second president's regime especially after the attempted coup of 1982, the transition from single party to multiparty system in 1992 and the struggles for his succession led to macro-economic uncertainty and scared many private investors. This coupled with poor governance has led to poor Kenyan economic performance for the last 10 years.

In the short run as opposed to the long run the export price index, which is a proxy for commodity price shocks, is insignificant even at the lag of two. This implies that the impact of an external shock is not instantaneous on private investment therefore can only be realized over a period of time. The dummy variable for interest rate liberalization and structural adjustment programmes too are statistically insignificant. Though the impact of interest rate liberalization may be captured by the real lending interest rate variable, the structural adjustment programmes seem to have no impact on private investment in Kenya. This concurs with the findings of Matin and Wasow (1992) in their study on adjustment and private investment in Kenya.

The one- period lagged error term is negative and statistically significant at 1 percent level. Its coefficient which is –0.132 implies that about 13.2 percent of the discrepancy between actual and equilibrium value of private investment is corrected each period. Thus there are economic forces in the economy, which operate to restore the long run equilibrium path of the private investment following short run disturbances.

CHAPTER FIVE

CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Summary and conclusion

The study has investigated the effects of government policy and commodity price shocks on private investment in Kenya over the period 1970-2003. The long run and short run private investment functions using a variant of the flexible accelerator model have been estimated. Diagnostic tests have been undertaken and the OLS method of time series data analysis was used

The study has found that in the long run private investment; real GDP growth rate and lending interest rates are bound together. Real GDP growth rate and real lending interest rate are positively related to private investment while export price index has a negative impact. This result conforms to the findings of Ouattara (2004) who in modeling the long run determinants of private investment in Senegal found that external shocks had a negative effect although he proxied the shocks by terms of trade. The results on lending interest rates support the neoliberal theory and the findings of Porter and Ranny (1982), McKinnon (1973) and Shaw (1973) but contradict the classical theory and the findings of Matin and Wasow (1992) who sought to explain the behaviour of aggregate private investment over the adjustment period in Kenya through policy simulations and found that real interest rate had a significant negative impact on private investment. Nevertheless, the neoliberal theory argument in the stimulation of deposits and private investment financing holds in the Kenyan perspective.

In the short run real GDP growth rate, real public infrastructural investment, real public non-infrastructural investment and real lending interest rates have a positive impact on private investment. This result concurs with the findings of Ronge and Kimuyu (1997) though it has gone beyond the estimation of the effects of public investment on private investment and separated it into public infrastructural and non-infrastructural investment where as opposed to Blejer and Khan (1984) it found a positive and significant impact of non-infrastructural public investment at the second lag. The dummy variable for political

regime has a negative sign implying that there was a structural break between the political regimes, which influenced private investment negatively.
This is in line with the recent element of uncertainty in investment theory as argued by Pindyck (1991) and Rondrick (1991). Unlike other studies in Kenya, it has captured the impact of political uncertainty, which has been found to be a key setback to private investment in the country.

5.2 Policy implications

Our analysis has shown that at aggregate level, private investment is determined by key macroeconomic and policy variables such as real lending interest rates, GDP growth rate, public investment and political regimes. Although the impact of these variables both in the long run and short run differ both in magnitude and sign, the overall fit of the equations suggest that taken together, the variables explain a significant amount of the fluctuations in the level of private investment in Kenya. The implication is that these results embody information on the possible future direction of policy in Kenya.

The main policy conclusions that may be inferred from this result are: firstly, in view of the positive impact of public infrastructural investment and public non-infrastructural investment on private investment, allocating public sector resources to capital accumulation helps to boost private sector development in Kenya. In order to increase the level of private investment, the government would have to increase its investment on infrastructure and human capital development. In a bid to achieve this goal, the government will need to reorientate public expenditure so that any budget rationalization does not adversely affect public investment, as has been the case in the past. In addition, public policy should push for an increase in the efficiency of public investment so as to fully complement private investments.

Secondly, the results suggest that with respect to the negative effects of commodity price shocks, the Kenyan government needs to diversify the country's production and export base in order to make it less risky and vulnerable to these external shocks. Thirdly, the

government should maintain the financial liberalization status so as to allow the market forces of demand and supply with respect to loanable funds to determine the interest rate. In order to maintain the important link between GDP growth rate and private investment, the government should undertake policies that will stimulate output especially expanding the agricultural and industrial sector performance. These can be achieved through provision of incentives and marketing assistance. Finally, political uncertainty being a major blow to private investment, the government should set up proper mechanisms to curb corruption among its officials, improve on governance and set proper measures and controls over top officials to facilitate macroeconomic stability which is linked to political certainty hence higher levels of private investment.

5.3 Limitations and directions for further research.

We used annual data that could not carefully capture the impact of the explanatory variables on shorter time periods like on monthly or quarterly basis. Further research should use quarterly data in future in order to capture the real effects of the variables on private investment. In addition there were data problems due to use of proxies. More so other explanatory variables like exchange rates, specific public sector investments and corruption among others were not incorporated in the study. These areas of shortcomings remain future areas of research for the author.

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APPENDICES

Appendix 1: Towards an investment model

The model used in this study was developed from the flexible accelerator model by Jorgensen (1967) and adjusted to include other variables that we found important for Kenya. In the long-run steady state, the private sectors desired capital stock (k*) is assumed to be proportional to expected output (y^e), leading to the relationship.

$K_t^* = a\,(y_t^e)$ ----------1

An investment function can be derived from the above equation in two ways. The first one is to specify coefficient "a" as a function of different variables. A gradual adjustment of actual to desired capital stock is obtained in a standard way by using a local quadratic approximation to adjustment costs, and gradual change in capital stock constitutes the investment function. An alternative method assumes that the parameters of the quadratic adjustment cost function are a function of different variables. This formulation starts with a partial adjustment function derived from a quadratic adjustment cost model as follows:

$\Delta I_t = \alpha(I_t^* - I_{t-1})$ ----------2

Where I_t^* is the desired level of investment in the steady state, which is given by;

$I_t^* = [1 - (1 - \delta) L]\, k_t^*$ ----------3

Where L is a lag operator and δ is the proportional rate of depreciation. The response of private investment to the gap between desired and actual investment, measured by the coefficient α, is assumed to vary systematically with economic factors that influence the ability of private investors to achieve the desired level of investment. As a result the phenomenon of "crowding out" is captured through the speed of adjustment rather than through directly changing the desired level of investment.

A linear representation of the coefficient of adjustment contained in equation 2 can then be considered a function of the variables;

$$\alpha_t = b_0 + \frac{1}{(I_t^* - I_{t-1})}(b_1 GR_t + b_2 RLIR_t + b_3 PUB_t + b_4 EI_t + b_5 D_{Sap} + b_6 D_{Pr} + b_7 D_{IL} + \mu_t \text{---4}$$

Where GR = the percentage change in real GDP

RLIR = the rate of real lending interest rate

PUB = public infrastructural investment

EI = export index

D_{Sap} = dummy variable for the structural adjustment programmes

D_{Pr} = dummy variable for political regime

D_{IL} = dummy variable for interest rate liberalization

t = time

μ = the random error term

Substituting equation (4) into (2) yields;

$$\Delta I_t = b_0 (I_t^* - I_{t-1}) + b_1 GR_t + b_2 RLIR_t + b_3 PUB_t + b_4 EI_t + b_5 D_{Sap} + b_6 D_{Pr} + b_7 D_{IL} + \mu_t \text{----5}$$

From equation 3 and 1 we generate the relationship;

$$I_t^* = [1 - (1 - \delta) L] K_t^* = [1 - (1 - \delta) L] a Y_t^e \text{ ----------6}$$

And can therefore obtain a dynamic reduced form equation for gross private investment that includes the real GDP growth rate, the real lending interest rates, the real public investment and the real export price index as the explanatory variables.

$$I_t = b_0 a [1 - (1 - \delta) L] Y_t^e + b_1 GR_t + b_2 RLIR_t + b_3 PUB_t + b_4 EI_t + b_5 D_{Sap} + b_6 D_{Pr} + b_7 D_{IL} + \mu_t \text{----------7}$$

Given the widespread belief that public sector investment plays a relatively important role in private capital formation in developing countries, the lack of empirical support for the relationship is quite surprising. Our basic contention is that this lack of evidence is not so much an indication of the absence of any statistical relation, but rather a reflection of the offsetting effects those different types of public investment-infrastructural and other-tend to have. Ideally, it would be more meaningful to separate out the infrastructural component of public investment and then to estimate the independent effects of the different categories. Unfortunately, since there is a great deal of overlap between the categories of public investment, it is not possible to make such functional distinctions in the data.

Recognizing that such distinctions are crucial in understanding the role of public sector investment, we will experiment with a proxy for the infrastructural and non-infrastructural components of public sector investment. The central assumption underlying this proxy is that infrastructural investment is an ongoing process that moves in line with the pace of economic development. Because it usually has a long gestation period and reflects decisions made in the past, such investment cannot be rapidly adjusted. In contrast, it will assume that the government can alter other kinds of investment more easily and with relatively greater speed.

In order to make a distinction between these kinds of public investment on the basis of whether the investment is "expected" or not, we argue that the expected public investment is closer to the long-term component and would therefore exert a positive or negative influence on private investment depending on how it is financed, where as the effect of the unexpected or surprise component is uncertain. To calculate expected real public investment we will use an essentially empirical method; that is, fitting a first order-autoregressive process of the form;

$PUB_t = p_0 + p_1 PUB_{t-1}$ ----------8

Where p_0 is the average level of public investment and p_1 is the autoregressive parameter. The predicted values from equation 8 are defined as the expected real public sector investment (EPUB); the residuals are defined as the unexpected component. With these two variables, the basic investment equation then becomes.

$I_t = b_0\, a\, [1 - (1 - \delta)\, L]\, Y_t^e + b_1 GR_t + b_2 RLIR_t + b_3 PUB_t + b_4 NPUB_t + b_5 EI_t + b_6 D_{Sap}$

$+ b_7 D_{Pr} + b_8 D_{IL} + \mu_t$----------9

Where b_3 and b_4 is positive or negative.

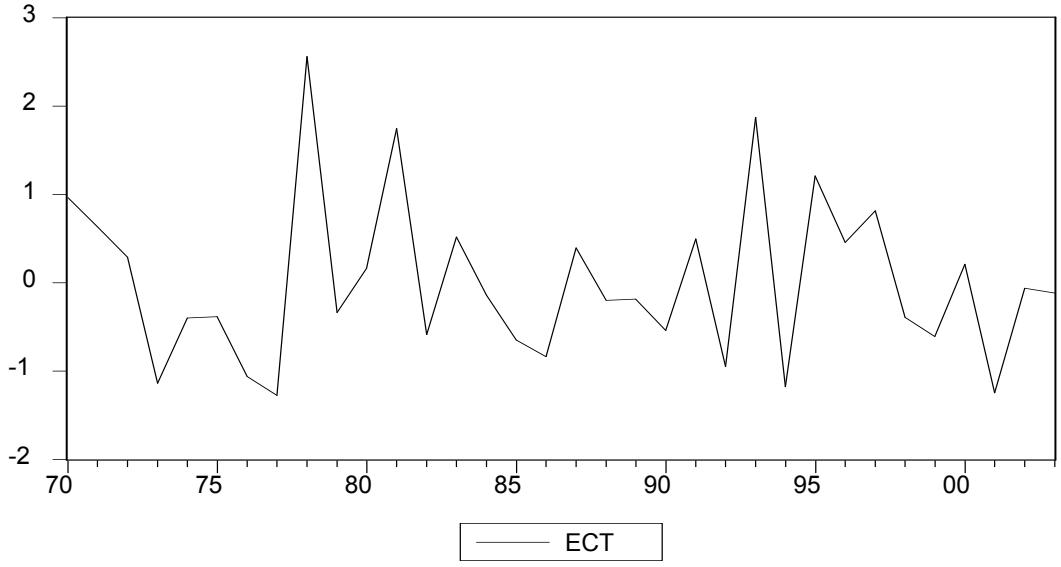
All the monetary variables are normalized on the basis of the GDP, so that under appropriate assumptions, the Y_t^e reduces to unity and the composite coefficient for Y_t^e in the above equation becomes part of the constant term, making the equation estimatable. The econometric form of the model to be estimated can therefore be expressed as;

$IP_t = b_0 + b_1 GR_t + b_2 RIR_t + b_3 PUB_t + b_4 NPUB_t + b_5 EI_t + b_6 D_{Sap} + b_7 D_{Pr} + b_8 D_{IL} + \mu_t$-----10

Where the other variables are as defined and IP_t becomes the ratio of private sector investment to GDP

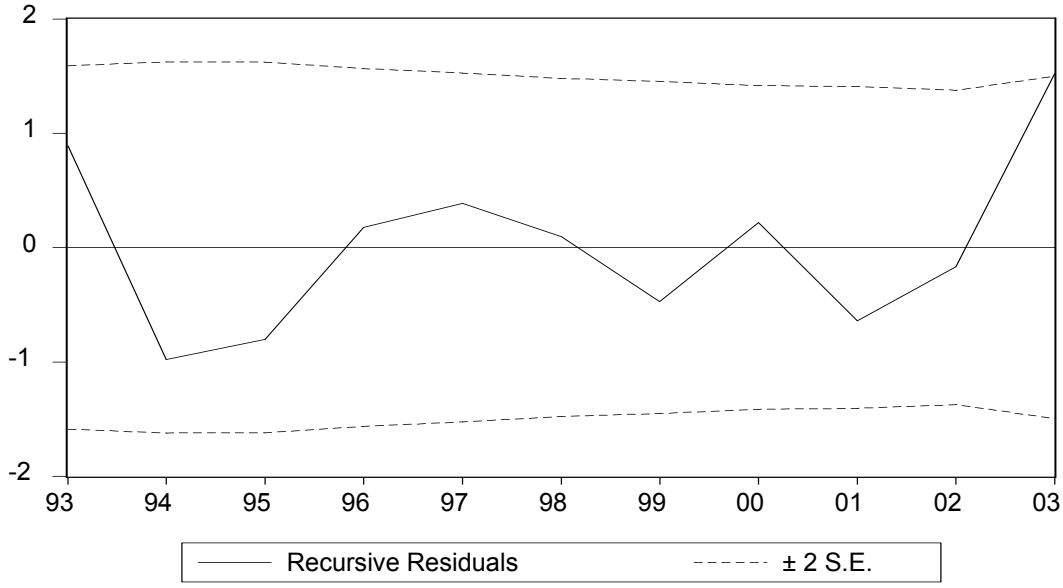
Appendix 2

Residuals graph



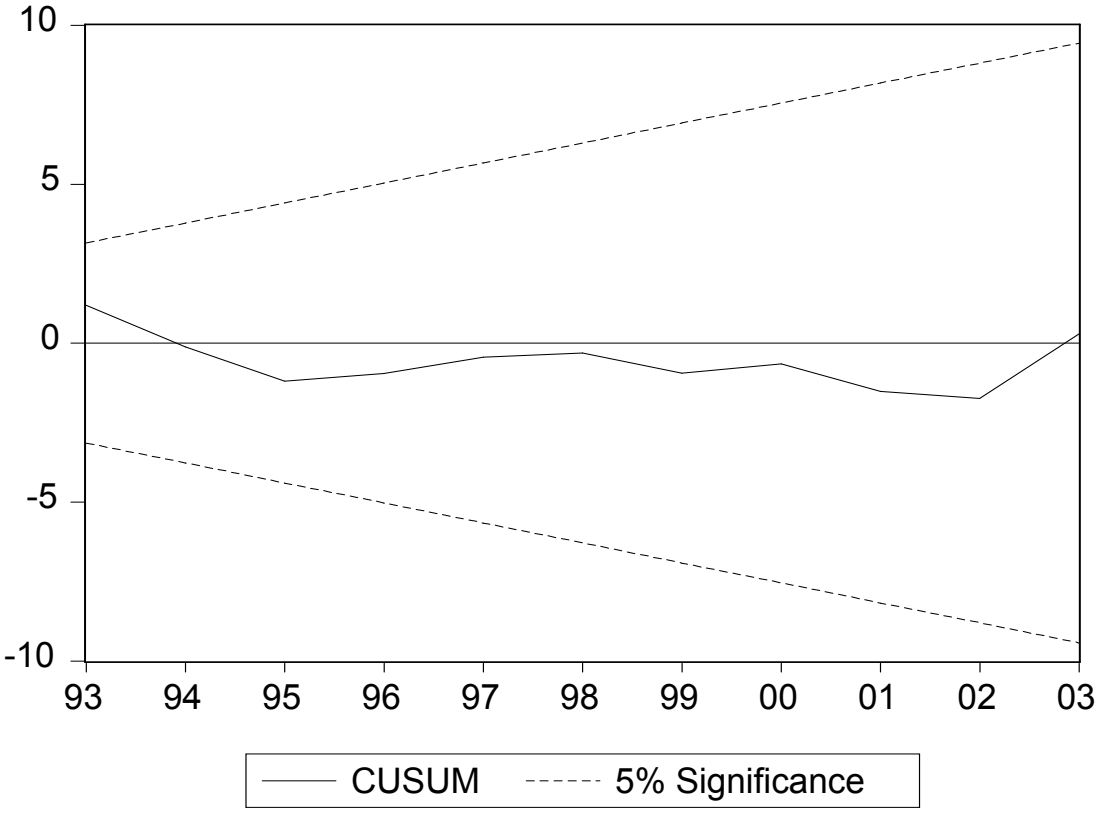
Appendix 3

Recursive Residuals

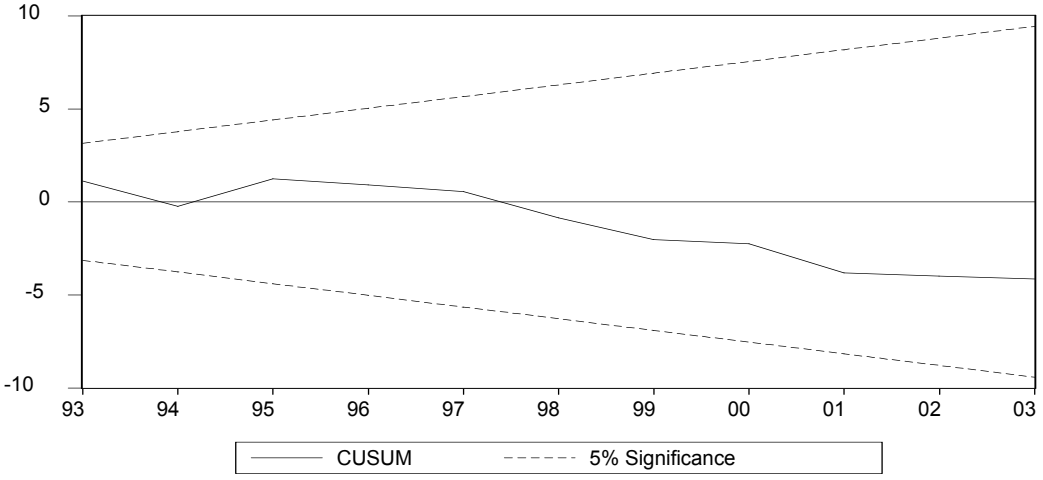


Appendix 4

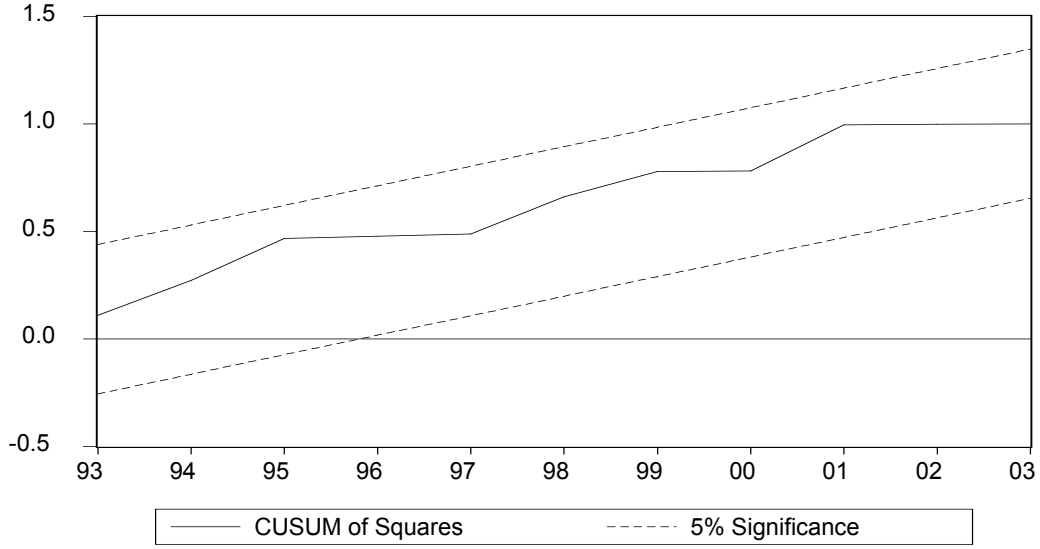
Cusum Test



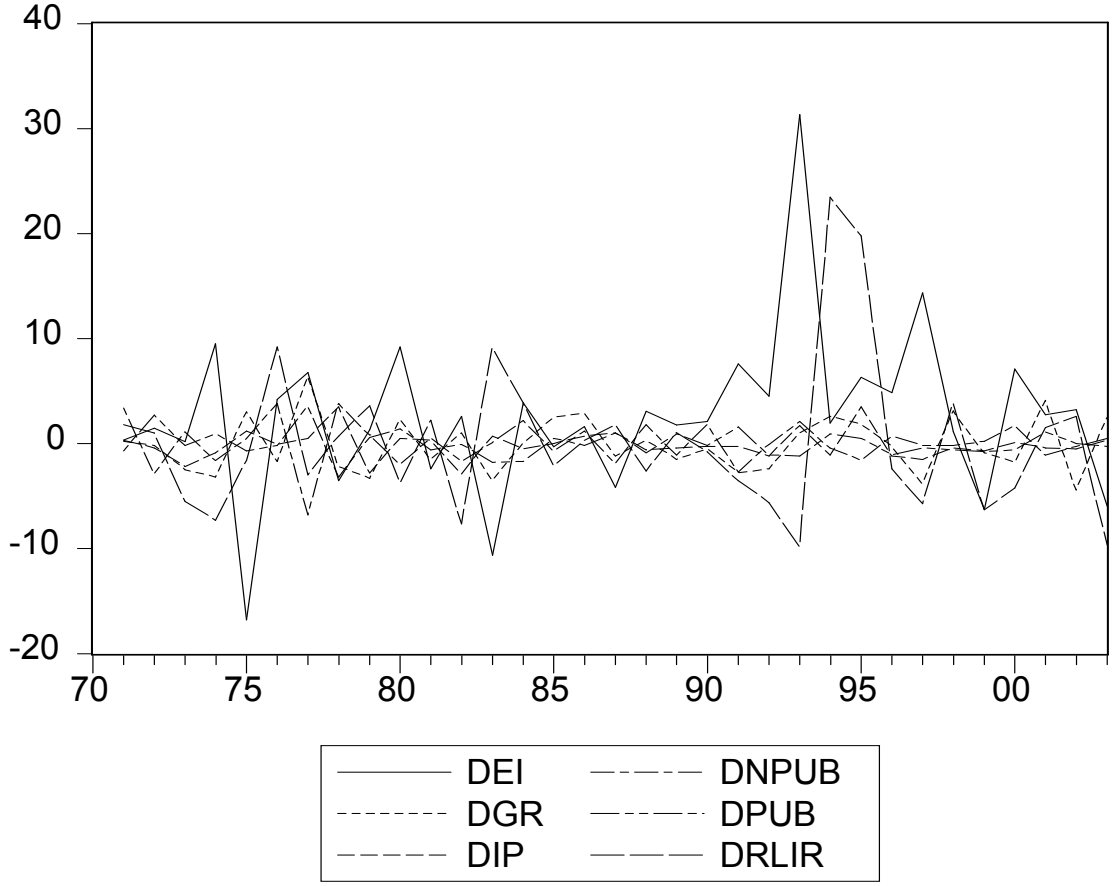
Appendix 5: cusum test for the long run regression results



Appendix 6: cusum of squares test for the long run regression results

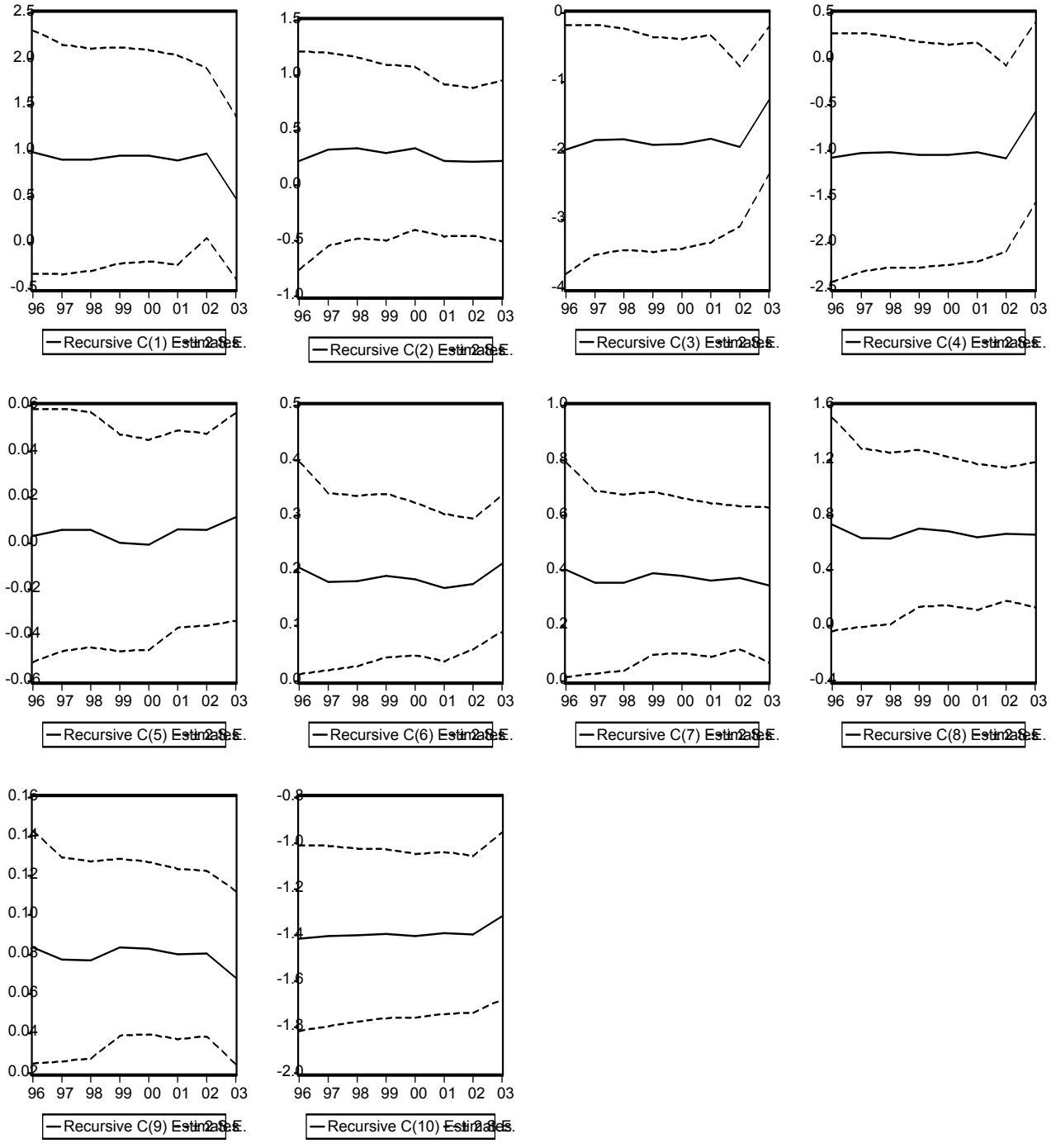


Appendix 7: Graphical representation of the differenced variables series.



Appendix 8

Recursive Estimates



Appendix 9

DATA USED IN THE STUDY

YEAR	DIL	DPR	DSAP	EI	GR	IP	NPUB	PUB	RLIR
1970	0	1	0	17.25	6.8	13.7	-0.7	6.7	2.5
1971	0	1	0	17.58	7	14	2.7	6	4.3
1972	0	1	0	19.03	6.8	13.6	-0.2	8.7	5.3
1973	0	1	0	19.19	4.3	11.4	0.9	8.5	-0.2
1974	0	1	0	28.71	1.1	10.5	-0.7	9.4	-7.5
1975	0	1	0	11.92	4.1	11.7	-0.2	8.7	-9.1
1976	0	1	0	16.13	2.4	11.6	3.6	8.5	0.1
1977	0	1	0	22.9	8.8	12.1	-3.2	12.1	-2.9
1978	0	1	0	19.35	6.6	15.6	0.6	8.9	-2.2
1979	0	0	0	20.65	3.3	12.8	1.4	9.5	1.4
1980	0	0	0	29.84	5.6	13.3	-0.6	10.9	-2.32
1981	0	0	1	27.42	4.1	13.6	-0.1	10.3	-0.08
1982	0	0	1	30	5.1	10.7	-1.8	10.2	-7.7
1983	0	0	1	19.35	1.6	11.4	-1.7	8.4	1.43
1984	0	0	1	23.23	1.6	10.9	0.5	6.7	5.32
1985	0	0	1	22.9	4.1	10.9	-0.2	7.2	3.2
1986	0	0	1	24.52	7	11.6	1	7	3.5
1987	0	0	1	20.32	5.8	12.6	-0.9	8	5.3
1988	0	0	1	23.39	6.1	12	0.9	7.1	2.7
1989	0	0	1	25.16	4.6	11.6	-0.2	8	3.75
1990	0	0	1	27.26	4.1	11.3	1.6	7.8	2.95
1991	0	0	1	34.84	1.3	11	-1.1	9.4	-0.6
1992	1	0	1	39.35	-1.1	9.8	-1.2	8.3	-6.23
1993	1	0	1	70.65	-0.1	11.5	0.9	7.1	-16.01
1994	1	0	1	72.58	2.5	10.4	0.5	8	7.44
1995	1	0	1	78.87	4.3	13.9	-1.1	8.5	27.2
1996	1	0	1	83.71	4	12.7	-0.4	7.4	24.79
1997	1	0	1	98.06	0.2	11.2	-0.6	7	19.05
1998	1	0	1	99.19	3.3	10.8	-0.8	6.4	22.89
1999	1	0	1	92.9	2.4	10.1	-0.6	5.6	16.58
2000	1	0	1	100	0.6	10.2	1.1	5	12.34
2001	1	0	1	102.74	4.7	9.8	0	6.1	13.87
2002	1	1	1	105.97	0.3	9.3	-0.3	6.1	16.45
2003	1	1	1	100	2.8	9.6	0.2	5.8	6.77