
Institute of Social Studies

Graduate School of Development Studies

# THE RELATIONSHIP BETWEEN FOREIGN AID INFLOWS, REAL EXCHANGE RATE AND EXPORT PERFORMANCE IN DEVELOPING COUNTRIES: THE CASE STUDY FOR UGANDA

A Research Paper presented by:

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In Partial Fulfillment of the Requirements for Obtaining the Degree of:

Master of Arts in Development Studies
Specialization:

## ECONOMICS OF DEVELOPMENT

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The Hague, December 2006

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## Dedication

I dedicate this paper to my Parents and Guardians Mr. Charles Mayanja, Mrs. Rachael Mayanja

and

My lovely mother Margaret Nalwoga Kafeero

## Acknowledgements

To make it possible to produce this research paper, I would like to extend my sincere thanks to my Supervisor Jan Van Heemst for the valuable and technical guidance during my research work. Special thanks go to my second reader Niek de Jong for the constructive comments that gave me insights on how to go about with my research work. Thanks to all my lectures for the great education service rendered to me. And my sincere gratitude also goes to Albert Musisi for his academic guidance during my research paper writing.

Am indebted to my family for their kind and Moral Support .My colleagues and friends who worked around the Clock to ensure I had the right Data. Their encouraging words were highly appreciated and complemented to the successful completion of the MA program.

I am really grateful for Nuffic for grating me a scholarship that has enabled me to study at the Institute of Social Studies and smoothly stay in the Netherlands.

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# List of Acronyms

| | |
|---|---|
| MFPED | Ministry of finance Planning and Economic development |
| IMF | international monetary fund |
| SAP | Structural adjustment program |
| GDP | Gross Domestic Product |
| UK | United Kingdom |
| USA | United States of America |
| REER | Real effective exchange rate |
| OLS | Ordinary Least Squares |
| Max | Maximum |
| MDG | Millennium Development Goals |
| Min | Minimum |
| Obs | Observation |
| ODA | Official development assistance |
| TOT | Terms of Trade |
| BLUE | Best linear Unbiased estimates |
| IFS | International financial Statistics |
| WBDI | World Bank development indicators |
| VIF | Variance inflation factor |
| GDP tp | Gross Domestic Product of the trading Partners |
| ARDL | Autoregressive Distributed lag |

## Abstract

This research investigates the relationship between Foreign aid inflows, real exchange rate and exports in Uganda from 1982-2004.With the intension of coming up with the policy implications. Using OLS and Cochrane Orcutt estimation methods, we empirically tested the effect of the aid inflows on the real exchange rate and also the effect of the exchange rate onto the exports .And the results revealed that an increase in Aid inflows within the Ugandan economy brings about the real exchange rate depreciation. And on the other hand it was found out that an appreciation of the real exchange rate can bring about a loss of competitive of the Ugandan exports.

This paper concludes that the Uganda should not be afraid of receiving more Aid inflows but take a cautious look on the real exchange rate management to reduce the exports vulnerability to loss of competitiveness. Secondly it should focus on increasing investment as it has a significant and positive effect on the export sector.

# CHAPTER 1: INTRODUCTION

## 1.1 Background

Uganda is among the sub Saharan African countries that adopted and showed commitment towards the economic reforms during the 1980s. Its commitment towards the reforms persuaded the donor community to increase the aid inflows into the country so that it smoothly implements the reforms (Atingi-Ego, 2005). The good economic performance resulted as one of the fruits for the implementation of the economic reforms in Uganda in the past years.

However, as much as there was a good economic performance registered for Uganda, exports were not performing according to the expectations as there still large trade deficits being experienced. This poor performance was initially blamed on the country's failure to liberalize the producer prices so that they can be determined by the market forces.

Then in the 1990s there was the liberalization of the market and this was carried out in most of the key sectors that included the foreign exchange markets, financial markets, coffee marketing and the tax system. Of which after the liberalization it showed that the problem that was to blame had been dealt with. So this raised expectations that the exports would do far better than it actually performed before the liberalization of the prices. And the expectations were not realized. So the real exchange rate appreciation was then suspected by both the government of Uganda and the Donor community to be the main cause as to why the exports are not performing as expected (Belshaw et al, 1999).

## 1.2 Statement of research problem

The international community has mobilized the industrial countries to make a commitment and fulfill the 0.7% of their GNP to the aid assistance. Of which if the all these countries placed their 0.7% of their GNP this would increase official aid assistance to the developing countries for the poverty reduction and also enable them work towards the achievement of the MDG by the year 2015 (Heller and Gupta, 2002). So the scaling up of Aid raises concern in a way that it might lead to the appreciation of the exchange rate and consequently lead to the loss of the export competitiveness of the recipient country. And this is referred to as the Dutch disease. Uganda being the beneficiaries of the aid inflows there is a threat to the future prospects of its long term growth. When you look at the East Asian Success that was based on the export led growth,

Uganda needs to ensure that its exports do not loose competitiveness due to the real exchange rate appreciation that might be brought about by the Aid inflows.

However if the Aid inflows to the recipient country are entirely spent on the importation of goods and services there will hardly be an effect on the economy's money supply and the balance of payments. But if they are spent on the non tradable goods and services then increase in the domestic prices will be experienced due to the increased demand. This will bring about the exchange rate appreciation because more foreign exchange will be required to exchange for the local currency in order to meet the increased demand. So with the appreciated real exchange rate the producers of the tradable goods and services are destined to low profit because their produce looses competitiveness and the producers of the non tradable goods and services are in position of gain plus their wage labour. This shrinks the tradable sector as compared to the non tradable sector leading to the trade deficits. So at the end of the day the intentions of aid to boost economic growth get diverted in the long run because the engine of growth of the economy gets narrowed.

### 1.3 Relevancy and justification

Uganda is one of the beneficiaries of the Aid inflows that has experienced increasing Aid inflows for the past years to the extent that by the year 2003, over 50% of the Ugandan budget was being financed by foreign resources (Atingi-ego, 2005).So there is need to find out what effects it brings onto the Ugandan economy particularly on the real exchange rate and the exports. In other wards the relevancy of this study is to analyze the possible effects of these Aid inflows on the real exchange rate and the exports' competitiveness.

Further more similar studies have been carried out on the different countries like the study on Ghana by Tareke (2005) and Sackey (2001), Harvey (1992) for Botswana, Nyonyi (1998) for Tanzania, Roemer (1998) for Indonesia, Bevan and Adams (2004) for Uganda, Ouatarra and Strobl (2004) for the CFA franc zone, all these have found no evidence of the Dutch disease during the time period of their study in spite of their experiencing resource windfalls during this time. While other studies have found the existence of the Dutch disease like that of Adenauer and Vagassky (1998) carried out on 4 CFA countries, Atingi –ego(2005) study on Uganda and also a study on Sri Lanka by White and Wignaraja (1992) found the Dutch disease. So according

to the above experiences the debate is still on going and one of the reasons as to why this study is carried out is to contribute to the debate and find out what happened for the Ugandan case using a different methodology from those that were used by the earlier researchers.

### 1.4 Objective of the study and the working Hypothesis

The Main objective of this study is to analyze whether the Aid inflows appreciate the real exchange rate or not and also whether the appreciation of the real exchange rate leads to the export competitiveness loss or not. In other wards does the Dutch disease exist in Uganda due to the increased aid inflows or not?

Another objective of the study is to come up with the policy implications for the study. The working hypotheses that are subjected to testing in order to meet the objective of our study include;

-Aid inflows appreciate the real exchange rate of the recipient country.

-The appreciated real exchange rate declines the export competitiveness of the recipient country.

### 1.5 Research Methodology

This study uses time series data for Uganda from the 1982-2004, in order to find the relation ship between Aid inflows, real exchange rate and the exports. OLS and Cochrane Orcutt estimation methods are used in the empirical analysis in addition to the use of descriptive statistics and explanatory data.

The data to be used for the study comes from the different sources which include the World Bank development indicators, International financial statistics, African development indicators, reports, working papers and journals related to this research.

### 1.6 Scope and Limitation of the study

The study will be analyzed based on data from 1982-2004 due to the data unavailability of the earlier years. The data for the variables come from the different sources in order to come up with the required data .However there is a problem of unavailability of certain variables, of which the proxies have been used in order to avoid their omission. So the limitation here is that it is not the exact variables that are used but other similar variables are opted to represent them because of the unavailability of the exact variables.

## 1.7 Organization of the study

This research paper is organized in a way that Chapter 2 includes the theoretical Framework with its respective relevant literature review concerning the Aid inflows, real exchange rate and the export competitiveness. Chapter 3 gives an overview of the Ugandan economic situation. It will also describe and show the impact of the reforms on the different macroeconomic indicators with special attention on the aid inflows, export performance and the real exchange rate. Chapter 4 contains the specification of the model, Description of the variables with their respective trends and the estimation procedure. Chapter 5 presents the results/ findings from the empirical estimation of the models and other diagnostic tests. Chapter 6 presents the policy implications and the conclusions.

## CHAPTER 2: THEORETICAL FRAME WORK

### 2.1. Introduction

This chapter deals with what is known so far about the Dutch disease and also looks at the precautions which can be taken so as to be able to deal with the Dutch disease. It includes also the literature review of previous researches that have been carried out on the Dutch disease. It further looks at the other factors of influence to the real exchange rate appreciation and the contraction of the exports other than the increased foreign Aid and the RER appreciation respectively as explained in the Dutch disease phenomena.

### 2.2 .The Dutch disease Phenomenon

The Dutch disease is an economic concept that explains the misfortunes brought by the resource abundance to different countries. This Dutch disease originated from the Netherlands that had abundant gas in their northern part of the country in the 1960s.This gas was exported and it brought in lot foreign exchange revenues which led to the appreciation of the country's real exchange rate and the other export sectors were constrained. Therefore the Dutch disease involved increased foreign revenues from the export of natural resources, appreciation of the real exchange rate and subsequently the contraction of the export sector. And this is through the spending and the resource movement effect.

After having a brief on what involves the Dutch disease this leaves us a puzzle of what the real exchange rate appreciation means. Real exchange rate appreciation can be best described by first knowing what the real exchange rate means.

### 2.3. Real Exchange rate Concept

There are several definitions of the real exchange rate being used and according to Edwards (1989:5) the two definitions of the real exchange rate are based on the power purchasing parity (PPP) approach and the other on the tradable and the non tradable goods and services. But for the purposes of this study we shall define the real exchange rate basing on the tradable and non tradable goods. So the RER is defined as a ratio of the domestic price of the tradable goods and services relative to the price of non-tradable goods and services as illustrated below: [1]

[1] Reason as to why this particular definition of the real exchange rate was used it is because it gives us an index of the degree of international competiveness for the country's tradables, it summarizes the incentives that show the resource allocation among the tradables and the non tradable sector (Edwards, 1989:5).

$RER = P_T / P_N$ Where RER is the real exchange rate, P is the price; T represents tradable goods and N for the non tradable goods.

However as it will be discussed in detail later, the World Bank where the data for this study comes from, defines the RER the opposite way. It defines it as a ratio of the domestic prices of the non tradable goods and services to that of the tradable goods and services. This is illustrated below:

$RER = P_N / P_T$

So for both definitions an appreciation of the real exchange rate occurs when there has been an increase in the domestic prices of the non tradable goods while the world prices of these tradable goods remain constant. This appreciation of the real exchange rate portrays the country's fall or reduction in the degree of the international competitiveness of its tradable goods and services[2].

Having looked at what the Dutch disease phenomenon means and its related mechanism of the real exchange rate appreciation, it is crucial to look at the core Dutch disease model.

### 2.4 The Core Dutch disease model

Corden and Neary (1982) explain the core Dutch disease model as a model that is comprised of two tradable and one non tradable sector[3]. The tradable sector is sub divided into the booming and the lagging or non booming sector. Among the tradable sector, the booming sector may comprise of the extraction of oil or natural gas, the mining of minerals like diamond, gold, and cooper and the production of agricultural products like the Coffee, Cocoa while the lagging or non booming sector may comprise of the manufacturing and sometimes the agriculture.

These resource booms brought about by the exchange of minerals, oil and agricultural produce create a resource abundance situation[4]. This creates two effects within the economy that can be explained by the Swan and Salter framework with the Dutch disease assumptions into consideration (Ibid; Nkusu, 2004). And these effects include the spending effect and the resource movement effect with certain assumptions put into consideration. These assumptions are full and efficient utilization of the factors of production, a mobile factor of production that is transferable between sectors, perfect elasticity of demand of the tradable goods and a small open economy.

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[2] See Edwards (1989)

[3] The non tradable sector involves the service provision like transport services and construction.

[4] According to Corden (1984) resource boom can be experienced because of factors that include the exogenous technological progress, rise in world price of the export good of the country.

*The spending effect*

If there is an increased foreign financial inflow, it ends up creating abundance of resources within an economy which leads to the higher real incomes that consequently increase demand for both the tradable and the non tradable. However it should be noted that the tradable goods prices are usually a fixed internationally unlike that for the non- tradable goods and services. So the increase in demand pushes up the prices for the non tradable goods and that for the tradable goods remain fixed which appreciates the real exchange rate. This discourages the production of the tradable goods and services leading to the deterioration of the trade balance. In the spending effect that is where we have the indirect deindustrialization when there is further shift of labour from the lagging or non booming tradable sector to the non –tradable sector.

***The resource movement effect***

This involves the shifting of the productive resources like labour from the lagging or non-booming tradable sector to the booming sector and this is referred to as direct - deindustrialization. The productive resource reallocation is because the production in the booming sector is more profitable and also brings about the increase in the marginal productivity of labour as compared to the lagging sector. Therefore labour moves from the lagging sector to the profitable booming sector due to its being in position to provide higher wages. This results into the contraction of the lagging tradable sector.

However as much as the earlier discussion of the core Dutch disease model shows how the contraction of the tradable sector comes about , this is challenged when the tradable goods are categorized into 2 that is the imports and exports. Of which some imports are in form of raw materials that are used for the industrial use or manufacturing of goods. In case of the real exchange rate appreciation, the firms using imported inputs and those that can substitute the domestic inputs for the imported ones will benefit during this period. This is because the imports will be cheaper which will lead to increase in production of the tradable goods alongside the non-tradable goods and services (Nkusu, 2004; Bandara, 1995).

Having looked at the resource boom effects of the core Dutch disease model there is also need to look at the other sources of the boom and also other provisions to be able to cater for the characteristics of the developing countries. Most of the developing countries do not fully comply with the assumption of the core Dutch disease model as stipulated earlier. And yet they also experience large foreign resource inflows or resource boom not only from the natural resources

but also from the large Aid inflows and the workers remittances. So there is need to incorporate such considerations to be able to study the Dutch disease among some of the developing countries.

Under these modifications there propositions of holding the core Dutch disease assumptions constant like the full employment of the factors of production and the small economy so as to be in line with many of the low income countries' characteristics (Nkusu,2004). The low income countries' characteristics include the presence of Unemployment, production below potential due to supply bottlenecks. And these supply bottlenecks which led to the inefficient use of the factors of production like land, labour and also by lack of proper infrastructure like roads. So in other wards in order to cater for these special characteristics, it involves holding some of the Dutch disease model assumptions constant and also cater for the large aid inflows, workers remittances in the Dutch disease model.

The large Aid inflows and the workers remittances tend to involve increased Foreign exchange inflows into the country which is similar to that experienced with the resource boom from the exports of the country. So with such a consideration that they also involve increased foreign exchange inflows into the country, they are considered under the modification of the core Dutch disease model in order to suit the situation of the developing or low income countries.

Therefore with the modification in place, the analysis of the Dutch disease is carried out in the natural resources rich countries as well as in countries that receive a lot of capital inflows like foreign Aid inflows and the workers remittances.

And when you consider their effect, we assume that they have similar effects on the economy because they all involve foreign resource inflows. So the large aid inflows or workers remittances that come into the country tend to appreciate the real exchange rate and contract the export sector as claimed by the Dutch disease theory.

***Remedies/Prevention measures***

There are preventive measures that could be used to avoid the adverse effects that are brought about by the increased foreign resource inflows and these include the avoidance of the external debt, devaluation during the time of the boom and the diversification of the economic structure. Of which if these are taken up during the time of the foreign resource boom into the economy the

export sector is bound to be protected from the adverse effects of the real exchange rate appreciation.

### 2.5. A Literature review about the Dutch disease

Different studies have been carried out on the countries that have experienced the resource booms or large resource inflows. Of which these studies have come up with varying results, where by there are those in line with the Dutch disease model and others are contradicting from it. A study by Sackey (2001) on Ghana between the years of 1962 – 1996 using an empirical model found that the real exchange rate depreciates with the large Aid inflows which contradict with the Dutch disease model. Despite the contradiction of the real exchange rate from the expectations of the theory, the study went further to look at the exports and found out that large aid inflows have a positive impact on the exports sector. Of which it recommended policy management that focus on ensuring sound macroeconomic fundamentals. However also Tareke (2005) also carried out a similar study on Ghana from 1970-2002 .Using the ARDL approach to co-integration on the REER model, the findings first of all showed that the aid inflows depreciate the real exchange rate .Secondly with the export model it was found that the aid inflows have a negative effect on the export performance of Ghana which is contradicting with some the findings of Sackey (2001) about the same country.

A study by Nyonyi (1998) on Tanzania on the years between 1967- 1995 also found the exchange rate depreciation especially the times between 1985 and 1993 when Tanzania received large Aid inflows. This differed from the Dutch disease model which suggests that an increase in external resource inflows leads to the real exchange rate appreciation and contraction of the export sector.

Another study by Harvey (1992) on Botswana as one of the mineral rich countries that experiences large resource inflows from its diamond and finds out that this country has not suffered from the Dutch disease. And yet it was expected in the mineral booming economy that received resources inflows from the discovery of the large diamond deposits. According to Sarraf and Jiwanji (2001)'s study, it is due to the sound economic policies and the good management of the resource boom. Botswana also avoided external debt and diversified its economic structure.

According to Usui (1997) Indonesia dodged the Dutch disease during the 1970 oil boom because the Indonesian government geared its surplus budget expenditure to strengthening the tradable sector, avoided the external debt and devaluation during the oil booming period (Rosser,2004). Similarly according to Roemer (1994) he argues or explains that Indonesian government was able to avoid the adverse effects of the Dutch disease due to the good exchange rate management. He further explains that periodically Indonesia used to devalue its exchange rate during the oil boom ,of which during the 1986 it adopted the crawling peg and its currency maintained real value ever since then.

However there are similar studies in support of the Dutch disease model and these include that of White and Wignaraja (1992) study on Sri Lanka for the period of 1997-1988. Using an econometric model it was revealed that increased Aid inflows was one of the major factors besides the remittances that contributed to the real exchange rate appreciation and contracting of the tradable goods and services. And another study about the impact of foreign capital on macroeconomic performance in Sri Lanka was carried out using the CGE models. And this found that appreciation of the real exchange rate may lead to an expansion of the tradable sector of which this differs a bit from the Dutch disease (Bandara, 1995).

Another study by Adenauer and Vagassky (1998) on the 4 CFA countries that included Burkina Faso, Togo, Senegal and Cote d'Ivoire during the period of 1980 -1993 also supports the Dutch disease model. This is due to the fact that their findings found the real exchange appreciation and export sector contraction. But when Ouattara and Strobl (2004) carried out a study on the relationship between aid inflows and the real exchange rate in the 12 countries of CFA franc zone using a dynamic panel analysis from the 1980- 2000, the results showed no Dutch disease phenomena[5]. This diverts from the earlier findings of study by Adenauer and Vagassky (1998) on the 4 countries which happen to be part of the 12 countries by Ouattara and Strobl (2004).However it went ahead and recommended that these countries can still get large Aid inflows with no fear of contracting the export sector.

In the context of the Ugandan economy, similar studies have been carried out and these included that of Atingi-ego (2005), Adams and Bevan (2004). Using the examination of the trends by

[5] The 12 countries of the CFA region included Benin, Burkina Faso,Cameroon,Central Africa Republic,Chad,Republic of Congo,Cote d'voire,Gabon,mali,Niger,Senegal and Togo.

Atingi-ego (2005), the study identifies the Dutch disease in June 2003.It was argued that it was this real exchange rate appreciation that was responsible for the further appreciation of the REER and a fall in the export competitiveness during that period. The study came up with the policy implication that the government may need to reduce the local currency injection in the economy that is resulting from the poverty eradication programs. This would be done in order to come up to levels that tally with the demand conditions of the economy. And also to increase the productivity by directing the increased expenditure to the public goods that will increase productivity within the economy. These may include the provision of the high yielding seeds to the farmers, putting up of infrastructures like roads for the easier transportation of the produce to the markets.

However Adams and Bevan (2004) also carried out a study on Uganda using the CGE model and found out that beyond the short run the Dutch disease does not exist. And he also argued that learning by doing effect has caused high export growth and total output despite the increased public expenditure to the non tradable goods and services in Uganda.

So this study contributes to the same debate in a different way by use of the Econometric model with the time series data which seems to be different from the earlier studies on Uganda. This is because the above studies used the descriptive (exploratory) data analysis and the other by the CGE model.

The different countries that were studied came up with different experiences regarding the Dutch disease. And it has been found out that these different outcomes are due to the different circumstances like policies the countries have, use of the different models in the analysis of the countries, use of the different variables and estimation during varying time periods. These differences leave a question on what would be the appropriate method, variables to use during the estimation and time period to use for this study. So this brings us to look at the other factors or variables that would be of influence to the real exchange rate, exports and that will be a base to come up with a model for estimation.

***Other factors that would be of influence to bring about the Dutch disease.***

Critically looking at the Dutch disease phenomenon it is hard to blame the increase in the foreign revenues into the economy as the cause of the real exchange rate appreciation and consequently the contraction of the export sector. This is because within an economy there are other factors or variables that can influence the real exchange rate leading to an appreciation and also there exists

other factors that can lead to the contraction of the export sector other than the real exchange rate appreciation. The other factors that influence the real exchange rate include the terms of trade, technological progress, and composition of the government expenditure, Openness and the growth of money. Well as the other factors that influence the exports other than the real exchange rate appreciation include investment and growth of the trading partners. These factors will give us a basis for the model specification later.

Having looked at the Dutch disease phenomena, core model, literature review and the other factors that influence the real exchange rate and the exports, however it is necessary to look at the Ugandan economic situation.

## CHAPTER 3: AN OVERVIEW OF UGANDA'S ECONOMIC SITUATION

### 3.1. Introduction

The objective of this chapter is to show a general overview of the economic situation of the Ugandan economy with the main focus on the economic performance and with a special interest on Aid inflows, export performance and exchange rates.

### 3.2. Economic reforms in Ugandan Economy since 1980 up to Date

Uganda is among the sub Saharan African countries that adopted economic reforms which it implemented in three phases during the periods of 1980-1985 for the first phase, 1986-1991 came the second phase and the third phase started in the 1992 up to date (Atingi-Ego 2005).And these included the Stabilization, Liberalization of markets plus the structural adjustment and the Public Expenditure Reform.

Having got financial support from the IMF and World Bank, Uganda carried out the Macroeconomic Stabilization between 1980 and 1985 that involved the strict control of the Government expenditure. This was done after its experience of macroeconomic problems like high inflation, and balance of payment problems that came along within the Ugandan economy. These macro economic problems were due to the use of printing money in order for the government to pay for its huge deficits during the Idi Amin's regime in the 1970s and in the1980s.As the stabilization process was going on, a fiscal discipline component was slotted into the program during the 1983/84 financial year. Unfortunately by the end of that fiscal year the program was cancelled by the sponsors because government had violated some of the performance criteria and bench marks that were set for the program (Atingi-Ego and Sebudde 2004).

The second phase started after the Guerilla war and this is when Museveni came into power in the 1986 .During his regime the Economic Recovery Program was adopted in the 1987 with the financial support again from the IMF and the World Bank. The essence behind this Economic recovery program was to create economic stability and to stimulate production within the Ugandan economy.

The Economic recovery program was followed by a stakeholders' consultative meeting in 1989 that recommended adjustments within the economy if Uganda was to become resilient to economic shocks. With the sponsorship from the World Bank and the IMF the recommendations were picked from the stakeholders' consultative meeting and designed into a structural Adjustment program (SAP). Its implementation started in 1990 and it involved the liberalization of the exchange rate, trade and the market activities with the objective of reducing Government involvement in the economic activities.

Uganda having experienced the tough times of high inflation and over valuation of the exchange rate in the 1980's the exchange rate policy has been related to the exchange rate management and trade arrangements (ibid).

### 3.3. The impact of the Economic reforms on the Ugandan Economy

***Table: 1.Summary of some of the Macro economic indicators for Uganda***

| year | **1982** | **1985** | **1986** | **1987** | **1993** | **1994** | **1995** | **1996** | **1997** | **1998** | **2004** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aid as %GDP | 6.10 | 5.12 | 4.90 | 4.79 | 18.94 | 18.84 | 14.51 | 11.19 | 12.97 | 9.83 | 16.99 |
| Inflation (Annual %) | 33.01 | 61.19 | 61.68 | 66.67 | 5.73 | 8.87 | 7.91 | 6.73 | 6.48 | -0.02 | 3.22 |
| GDP growth (Annual %) | ... | -3.31 | 0.39 | 3.96 | 8.33 | 6.40 | 11.52 | 9.07 | 5.10 | 4.91 | 5.73 |
| GDI as %GDP | 9.74 | 8.73 | 8.45 | 9.72 | 15.22 | 14.63 | 15.66 | 16.68 | 17.05 | 15.92 | 22.16 |
| Government expenditure as %GDP | 11.18 | 14.49 | 9.01 | 7.96 | 9.79 | 10.32 | 9.82 | 10.33 | 10.80 | 12.87 | 14.52 |
| Revenue as % GDP | 5.92 | 6.13 | 4.50 | 2.31 | 7.51 | 7.89 | 9.07 | 9.72 | 10.42 | 10.10 | ... |
| Exports as %GDP | 7.43 | 7.28 | 7.38 | 6.99 | 5.80 | 7.17 | 8.27 | 9.64 | 11.88 | 9.64 | 11.55 |
| Imports as a %GDP | 18.40 | 18.11 | 18.63 | 21.11 | 14.14 | 14.82 | 20.65 | 21.40 | 20.76 | 20.41 | 18.53 |
| Exports growth (Annual %) | ... | -3.5 | 1.7 | -1.5 | -4.4 | 31.5 | 28.6 | 27.22 | 29.5 | -14.9 | 6.2 |
| Trade balance (% of GDP) | -10.9 | -10.8 | -11.3 | -14.1 | -8.3 | -7.6 | -12.4 | -11.8 | -8.9 | -10.8 | -6.9 |

**Source: Authors own extraction from the WBDI (2006) and for the inflation, trade balance, exports, imports are authors own computations. Revenue as a % of GDP is computed from IFS 2006.**

***Economic growth and inflation***

Uganda's implementation of the economic reforms, has made it possible to experience improved economic performance which is characterized by the GDP annual growth rate that was from -3.3% in the 1985 to 11.5% in the 1995. The inflation levels were managed especially during the second phase of the economic reforms to the extent that it reduced to single digit levels especially from the 1993 up to 2004. These provided Uganda a favorable environment that was macro economically stable.

***Aid inflows and investment***

The improved economic growth and reduced inflation within the Ugandan economy provided a favorable environment that was macro economically stable. This built confidence among the investors and the donor community that led to an increase in the capital inflows within the country that included the private transfers and aid inflows .Of which the aid inflows increased from 6.1% of GDP in 1982 to approximately 17 % of GDP in 2004. And also there has been a tremendous increase in the Gross domestic investment (GDI) that is from 9.7% of GDP in 1982 to 22.2% in the 2004.

***Government expenditure***

The general government expenditure increased from 11.2% of GDP in 1982 to 14.5% of GDP in 2004 and yet the Government revenue is growing at a slower rate as compared to the Government expenditure. So this created a deficit that was usually financed by the foreign Aid that is composed of the loans and grants. This increasing expenditure with the expectation of getting from other sources other than the government revenue has created a dependency syndrome to the Uganda. This has reached an extent that over 50% its budget planned expenditures by the year 2003 was financed by the foreign grants and loans (Atingi-Ego, 2005).

*Export performance*

Before looking at the export performance lets have a general overview of the Ugandan exports. These are categorized into two; that is the traditional exports and the non traditional exports. The traditional exports include the coffee as the major export for Uganda and others like the tobacco, tea and cotton. However due to the fluctuating world prices of the mentioned tradition exports, there was diversification of these traditional exports to the non traditional exports that included fish, maize, flowers, hides and skins. This export diversification helped the economy to reduce its vulnerability to the external shocks like reduced international prices of the traditional crops. Of which according to the MFPED (2003), the non traditional exports like fish fetched $3 millions more than the traditional coffee exports in the financial year 2001/02. Looking at the mentioned exports both the tradition and the non tradition they are all agricultural products of which this means that Agriculture is the major contributor to the Ugandan exports.

In 1982 the exports were about 7.4% of the GDP, of which it remained stagnant for over a period of about 10 years that is up to 1993.Of which after that there was an experience of the increasing exports as a percentage of GDP and by the end of 2004 it was 11.6% of the GDP. However between the 1994 and 1997 there are huge shots in the exports and that was from about 7.2% to approximately 11.9% of GDP. This was due to the coffee boom that was experienced between the 1994 and 1995.Coffee being one of the major exports in Uganda, an increase in the coffee prices at the world market created this huge rise its export figures. And during the 1996 and 1997 there was also a high exports to GDP ratio that were due to the increase in the world prices of the non coffee exports.

Of which this was followed by a fall in the world commodity prices especially that of coffee and other exports like tea, cotton and tobacco fell in 1998 which ended up creating a sharp decline in the Ugandan exports from 11.9% of GDP in 1997 to 9.6% of GDP. And it was during 1998 period that one of the worst annual % growth figure for exports was experienced, which was up to -14.9%.This was due to the Elnino rainfalls that affected the agricultural yields of the country that contribute to the biggest part of the country's exports as earlier seen.

Looking at the trade balance, Uganda has been experiencing trade deficits during the time of study and we would consider looking at it in a way that there were experiences of the decline or rise in the trade deficit. The country experienced increasing trade deficits from approximately

10.9% of GDP in 1982 to 14.1% of GDP in the 1987.From which then it declined up to 7.6% of GDP in 1994.This was basically due to the coffee boom that Uganda experienced during that time. After that the trade deficit seems to be experiencing ups and downs in the trade deficit though by 2004 the trade deficit had gone to 6.9% of GDP.

So considering both the exports and the trade deficit, you find that even if the exports were increasing the trade deficit seemed to still exist. And this was basically due to the increasing imports as compared to the exports.

Therefore during the period of the reforms Uganda experienced good economic performance however the exports did not perform according to the expectations as shown by the trends in the trade deficit.

***The exchange rate policy***

Before the 1987, Uganda implemented the independent peg regimes where the local currency was pegged onto different foreign currencies like the US dollar and the Pound Sterling. This was done so as to use the exchange rate for inflation control and also to improve the export competitiveness of the country (Atingi-ego and Sebudde 2004).

In May 1987 when the Ugandan economy took up the economic recovery program, it carried out a more active exchange rate management policy and that was the crawling peg for a single official market. This involved massive devaluation with the intension of restoring the export competitiveness, increase government revenues from the trade taxes, promote non coffee exports and allocation of the foreign exchange to other sectors other than the special sectors of the economy. However before the adoption of this exchange rate regime that is in May 1987, the crawling peg was designed in a way to keep the real effective exchange rate constant. Looking at the evaluations by June 1989 the REER was not kept constant during the time of the implementation.

Then crawling peg for the multiple markets was introduced in the July 1989 until December 1991.This involved the recognition of the other foreign exchange rate markets like the foreign exchange bureaus .And also the discrete adjustments of the official exchange rates were carried out during this exchange rate regime. The intensions behind the crawling peg for the multiple markets was to raise the fiscal revenue by dampening the huge over hang liquidity that had accumulated over the previous financial year and that was 1988/1989.The other intensions were

to reduce the effects of large discrete jumps of the exchange rate plus the eliminating of the overvaluation of the local currency. However despite the implementation of the crawling peg for the multiple markets there were still premiums existing between the different market rates.

In January 1992 up to October 1993 the free float for the multiple markets was carried out and which was the major step towards the full liberalization of the exchange rate market. The multiple markets included the central bank direct sales, foreign exchange bureaus and the weekly Dutch auction. The objective of this exchange rate regime was to converge the multiple markets and also to use the market based approach to determine the exchange rate for the bureaus and in the allocation of the donor funds during the weekly Dutch auctions. By October 1993 the convergence of multiple markets was not reached because there was a presence of about 5.25% premium between the Bureau and the auction rate (Atingi-ego and Sebudde, 2004:9). That indicated that the intended objective was not met which required the convergence of the markets, so another alternative regime was adopted so as to come up with a single market based exchange rate and that was the managed float for the official exchange rate.

This managed float for the official exchange rate was brought on board in November 1993 of which involved the determination of the official exchange rate by the market, the interventions into the market for stability and meeting the required intended objectives. Besides coming up with the single market based exchange rates other objectives of this regime included to keep the foreign exchange market stable and eliminate the implicit tax on coffee exports that originated from the multiple taxes. It was during this exchange rate regime that Uganda fully completed the liberalization of the exchange rate and trade system.

Earlier before the exchange rate liberalization, Uganda experienced overvaluation of the exchange rate that was partly brought about by the measurements based on the premiums between the official and parallel exchange rates. So when the liberalization of the real exchange rate was carried out, it was mainly to restore the confidence in the local currency and minimize the price distortions.

The existence of the parallel market along side the official exchange rate was accused of creating distortions in the exchange rate market that is not conducive for the export competitiveness. However even after the full liberalization of the exchange rate market, still the

exports were not performing as expected because of the negative figures among the percentage annual growth of exports being recorded. So this created suspicion of the real exchange rate appreciation as the cause of poor export performance other than the failure to liberalize the exchange rate and the trade systems (Belshaw et al, 1999). Of which massive Aid inflows among other factors is suspected as the main cause of the appreciation of the real exchange rate.

So this brings us to test the hypothesis as to whether the massive aid inflows appreciate the real the exchange rate and also to test whether the real exchange appreciations contracts the export sector. And this will be looked at in the next chapter.

# CHAPTER 4: THE MODEL SPECIFICATION AND ESTIMATION METHODOLOGY

## 4.1. Introduction

The objective of this chapter is to show what models are going to be used for the carrying out the estimation or testing the hypotheses that were earlier mentioned. It will also describe the variables within the models and their respective trends. Further more it will look at the method that will be used for the estimation and the estimation procedure.

## 4.2. Specification of the models

The model specification helps to know what variables will be used in the estimation, and differentiate between the dependent variables from the independent/explanatory variables. This is done in order to study the relationship between Aid inflows, the real exchange rate and the exports. For this kind of study we are going to look at different models and that is the real exchange rate model and the export models.

All variables in the models are expressed in double-log so as to measure the elasticity of the dependent variable in respect of the explanatory variables of each model. This makes it easier as we shall later be able to interpret our estimation results in percentage changes (Gujarati, 1995:166). Secondly they are transformed into logarithms in order to achieve linearity .The linear regressions tend to work well when both the dependent and the explanatory variables are similarly shaped or they are turned into normality (Mukherjee et al, 1998:148-149). This is because if the explanatory variable is skewed while the dependent variable is normally distributed, one can hardly get the preferred error component that is normally distributed.

### *a) Real exchange rate model*

The Objective of this model is to find out the relationship between Foreign Aid inflows and the real exchange rate in Uganda. Earlier in the theory it is said that increased foreign inflows into the country brings about real exchange rate appreciation, of which a model is required to test the hypothesis of the said theory. So in order to control for the effect of other variables that affect the real exchange rate, we include the other determinants of the real exchange rate onto the model.
Following Edwards (1989), Atingi-Ego and Sebudde (2004), Ouattara and Strobl (2004) and Sackey (2001), not necessarily restricting ourselves to any particular model but how suitable it

will be to the available data. The real exchange rate model will include the factors that influence the equilibrium of the RER in the Ugandan economy. The Equilibrium real exchange rate can be defined as a ratio of the relative price of the tradable goods and services to the non tradable goods and services that for any given sustainable values of the relevant variables it will result in the attainment of both internal and external equilibrium at the same time (Edwards, 1989)[6].

So the factors that affect the equilibrium exchange rate of Uganda include the Terms of trade (TOT), composition of the Government expenditure (GC), Openness of the economy (OPEN), Net Aid inflows (AID), Growth of domestic credit ($M_2$) and the technological progress (TP).

In the real exchange rate (RER) model we opt for the real effective exchange rate (REER) to be used as a dependent variable .This is because in reality it is not easy to get the data for the price of the tradable goods and services plus that of the non tradable goods and services to come up with the ratio that defines the real exchange rate (Edwards, 1989:7).

So the real exchange rate model is as follows:

$$\ln REER_t = \alpha_0 + \alpha_1 \ln(AID)_t + \alpha_2 \ln(GC)_t + \alpha_3 \ln(TOT)_t + \alpha_4 \ln(Open)_t + \alpha_5 \ln(TP)_t + \alpha_6 \ln(M2)_t + u_t \quad \ldots\ldots(i)$$

The table 2 shows the expected effect of the independent variables on the real effective exchange rate as the effects will later be discussed in detail for each variable.

[6] The external equilibrium is when the current account at the moment and in the future is able to exist with the long run sustainable capital flows without causing problems. And internal equilibrium is when the non tradable goods market clears in the current period and is expected to be in equilibrium in the future periods with the assumptions that unemployment is at a natural level (Edwards, 1989:16).

*Table: 2.Effect of the independent variables on the REER*

| Independent variables | Effect on real effective exchange rate (REER). |
|---|---|
| Aid inflows (AID) | (+) |
| Terms of trade (TOT) | (?) |
| Government consumption (GC) | (?) |
| Technological progress (TP) | (-) |
| Openness (OPEN) | (-) |
| Growth of Domestic credit (M2) | (+) |

***Source: Authors own***

The effects of the different mentioned variables on the real exchange rate have been shown above. Where those with the (+) sign have an appreciating effect on the real effective exchange rate and those with (-) sign have a depreciating effect on the real exchange rate. And those with a (?) Sign their effect is undetermined. It depends on the condition; the effect can be positive or negative effect.

***b) The export performance model***

The rationale behind the export model is to be able to determine the relationship between the exports and the real exchange rate for the case of Uganda .Referring to the theory discussed earlier; it suggests that the real rate appreciation brings about the contraction of the exports. So this export model will help in the testing of the hypothesis for the case of Uganda. And to control the influence of other variables that also have an effect on the exports, the export model will include the other determinants of exports. Similarly in Elbadawi (1998), Tareke (2005), the export model includes the exports(X) as the dependent variable and the explanatory variables include the real effective exchange rate (REER), Growth of the GDP of the trading partners ($GDP_{tp}$ ), and net Aid inflows (AID).So the model is as follows:

$$\ln X_t = \beta_0 + \beta_1 \ln(REER)_t + \beta_2 \ln(I)_t + \beta_3 \ln(GDP_{tp})_t + \beta_4 \ln(AID)_t + \varepsilon_t \quad \ldots\ldots(ii)$$

Table 3 shows the expected effect of the independent variables on the export sector as they will later be discussed in detail for each variable.

*Table: 3. Effect of the independent variables on the Export sector*

| Independent variable | Effect on exports sector (X) |
|---|---|
| REER | (-) |
| Investment (I) | (+) |
| Growth of the trading partners (GDP tp) | (+) |
| Aid inflows (AID) | (?) |

***Source: Authors own***

The variables that have been indicated with the (-) sign have a negative impact on the exports meanwhile those indicated with (+) sign have a positive relationship with the exports performance. And (?) Sign means that the effect is undetermined; it depends on how the Aid inflows are being used so the effect can be positive or negative effect.

However having stated the export model in equation (i) we find that it has the REER as a variable along side other variables that are also included in the REER model. So we decided to come up with the second export model and that is the reduced model.[7] This will be estimated later and compare it with equation (i) estimates and a decision will be made on which of the two suits our study.

### 4.3 Description of the variables, their measurement and respective trends

This will include all the variables both for the real exchange rate and export model, how each variable will be measured and the trends of the variables.

***Real effective exchange rate (REER)***

The real effective exchange rate has alternative definitions of which can be expressed as $REER = P_d / EP_f$ and the other as $REER = EP_f / P_d$ .Of which if any of them is used instead of the other it does not change their economic implication.

So for this case due to the fact that later the REER data from the World Bank development indicators will be used, we shall define the real effective exchange rate (REER) as the ratio of the domestic consumer price index to the product of the nominal effective exchange rate and the wholesale price index of the trading partners. And this is expressed as $REER = P_d / EP_f$

[7] See Appendix A for reduced export model developed.

Where,

REER- real effective exchange rate

E-Nominal effective exchange rate

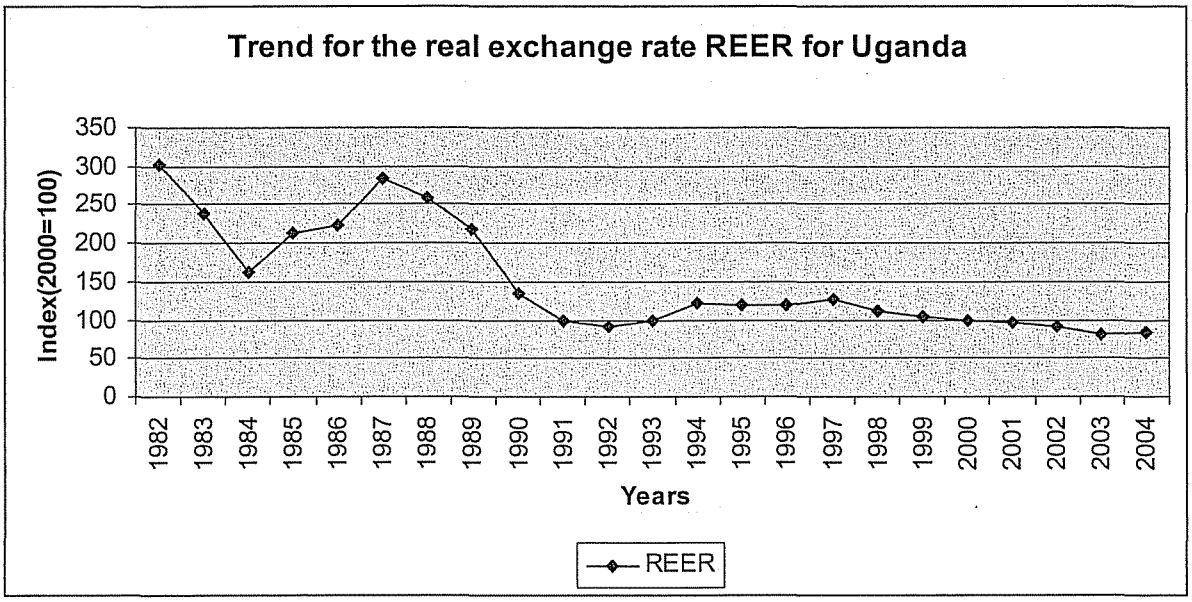
$P_f$ -Wholesale or producer price index of the trading partners

$P_d$ - Domestic consumer price index

According to Harberger in Edwards (1989:7), the consumer price index is used as a proxy for the non tradable and the whole sale price index is used as a proxy for the international price of the tradable goods and services.

The real effective exchange rate will be interpreted in a way that an increase in the index will mean that there is an appreciation of the real exchange rate and a decline in the index will indicate a depreciation of the real exchange rate. And the trend of the real effective exchange rate of Uganda has been shown in the figure 1.

***Figure: 1.Trend for the REER for Uganda***




***Source: Authors own and the figures are got from the World Bank Development Indicators 2006.***

The trend shows generally that there is a declining real effective exchange rate from 1982 to 2004.Of which according to the earlier discussions this means that there is a depreciating real exchange rate for Uganda

***Terms of trade***

This variable or factor refers to the amount of imports that a unit value of the country's export can buy or purchase and this can be expressed as the price of exports relative to that of imports as shown below:

$TOT = P_x / P_m$

Where

*TOT*: terms of trade

$P_x$ :Price of exports

$P_m$ :Price of imports

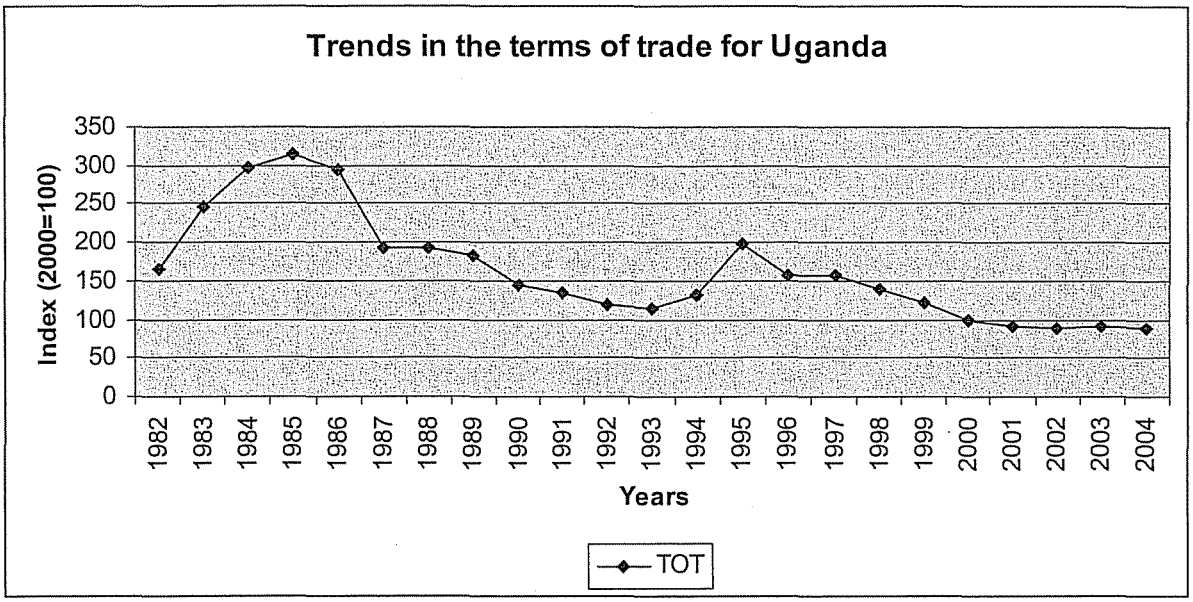
Developing countries are usually vulnerable to the volatile terms of trade that are brought about by the changes of the world prices of the country's exports relative to those of the imports. This volatility of terms of trade affects the equilibrium of the exchange rate. The real exchange reaction to the changes in terms of trade tends to be determined by the sum of the income and substitution effect proportional to the imports[8].Of which this reaction or effect is not conclusive; it depends on whether the income or substitution effect dominates (Edwards, 1989; Tereke, 2005). If the income effect dominates, then an increase in the relative price of the exports to the imports that is brought about by the improved terms of trade will lead to an appreciation of the real exchange rate. But if the substitution effect dominates then an increase in the relative price of exports to the imports or improved terms of trade will bring about a depreciation of the real exchange rate. Therefore the effect is not conclusive.

On the other hand if there are experiences of the declining terms of trade the expected effect on the real exchange rate for this case will also depend on whether income effect is stronger or the substitution effect. If the income effect is stronger than the substitution effect then we shall expect a depreciation of the real exchange rate due to the fact that with the declining terms of trade the real incomes will reduce leading to the low demand which will consequently lead to the fall in the prices of the goods and services. And if the substitution effect is stronger then we expect an appreciation of the real exchange rate. In other wards the effect is indecisive.

[8] The referred income effect situation is when the increased real incomes results into an increased demand for the non-tradable goods and services and for the substitution effect referred to is associated with the situation when the imports are cheaper and can be used as inputs for the production process instead of the domestically produced expensive inputs or raw materials.

The terms of trade for this study are measured as a ratio of relative prices of exports to that of the imports with the index as 2000=100 meaning that the base year is year 2000.Figure 2 shows that Uganda had increasing terms of trade in the early 1980's and it started declining in the after the mid 1980's. Of which it scaled up again between the 1994 and 1996 which was basically due to the coffee boom that Uganda had during that time but after then the terms of trade have been declining even more as compared to the declining periods in the early 1990s.

***Figure: 2.Trends in Terms of trade for Uganda***




***Source: Authors Own and the data used are from the WBDI (2006).***

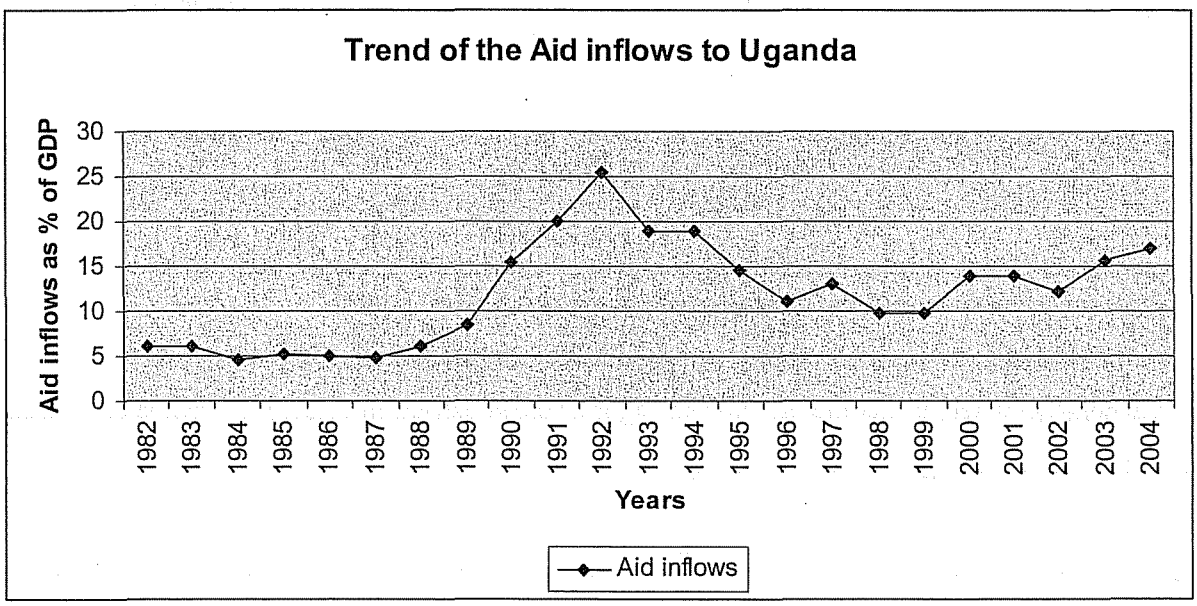
With the declining terms of trade the expected effect on the real exchange rate for this case will still depend on whether income effect is stronger or the substitution effect for Uganda as we shall see later in the coming sections of the paper.

***Aid inflows:*** The aid inflows affect the real exchange rate in a way that if there are increased Aid inflows within the economy, it will bring about a situation where the expenditures exceed the real incomes leading to an increased demand for the both the tradable and the non tradable goods. The price for the non tradable goods and services will rise while the tradable ones will remain fixed because they are internationally determined leading to an appreciation of the real exchange rate. And the decreased aid inflows will bring about the opposite effect of depreciating the real exchange rate.

However the aid inflows are also part of the export model so as to capture the policy environment in which the exports thrive in a particular country (Sackey, 2001; Tareke, 2005).
If there is a good policy environment for the exports like providing infrastructure like good roads and financial assistance to the exporters or the producers of the exports, aid inflows will tend to bring about an increased output from this sector and improve its competitiveness at the world market. But if there is a bad policy environment then there will be poor output from the sector. In other wards, the aid inflows will tend to be detrimental to the export sector if the policy environment is poor. And this happens to be a negative effect on the exports.

The ratio of net ODA inflows to GDP will be used as a measurement for the Aid inflows in this study. The net ODA is comprised of the official loans and the concessions loans. Next is the trend for net ODA inflows as a percentage of GDP for the Ugandan economy:

***Figure: 3.Trend of net ODA to Uganda***




***Source: Authors Own and the data used are from the WBDI (2006).***

According to figure 3, there has been an increase in the aid inflows into the Ugandan economy during the period of study. And in reference to the earlier discussion we expect the aid inflows to appreciate the real exchange rate.

For the exports sector it will entirely depend on how the Aid inflows were used to end up with the positive or negative effect. So for this case the estimation results in the next section will tell us what the situation is, for the case of Uganda with regard to the policy environment.

***Composition of the government expenditure***

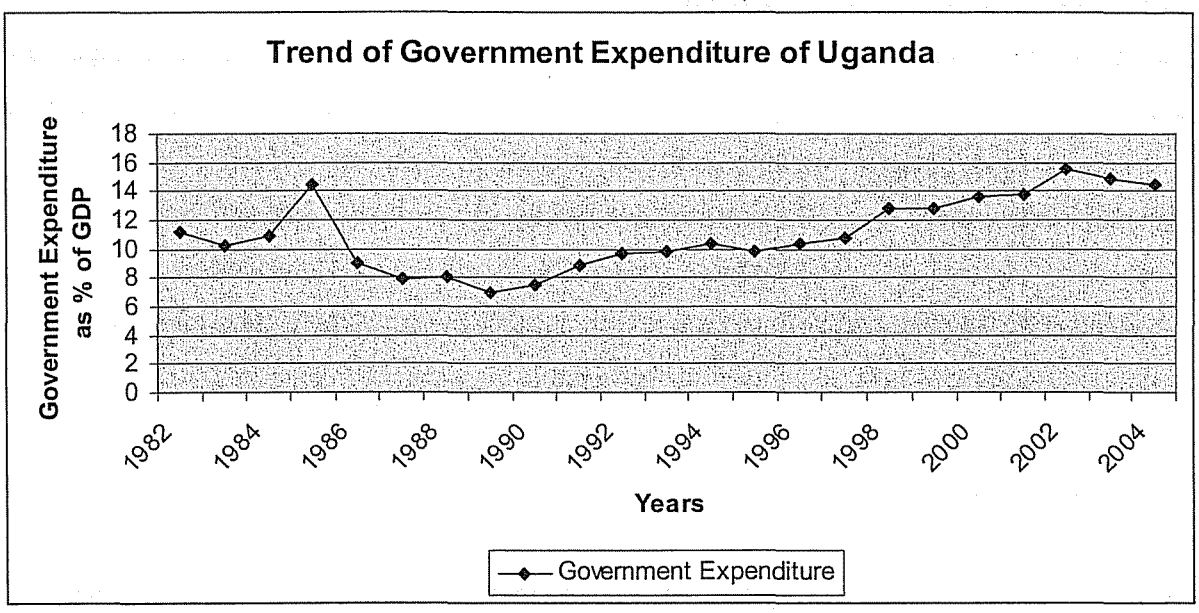
Looking at the government expenditure as a factor that affects the real exchange rate equilibrium, you find that it entirely depends on the composition of the expenditure to affect the real exchange rate equilibrium in a particular direction. Generally, if an increase in the government expenditure is on the non tradable goods and services, this will bring about an increase in the demand of these goods and services. This will lead to their increase in price and consequently leading to the real exchange rate appreciation. And if the increase in the government expenditure is directed towards the tradable goods and services then there is likely to be a depreciation of the real exchange rate.

However according to Edwards (1989:46) an increase in government expenditure that is funded by the public debt affects the equilibrium exchange rate in two ways; that is in period 1 an increase in the government expenditure on the non tradable goods and services will increase demand of these particular goods. This will exerts pressure on their prices leading them to increase and consequently causing an equilibrium real exchange rate appreciation.

Secondly since the government uses borrowed money to finance the increased expenditure in period 1, it will need to raise the taxes in order to finance the debt in period 2.This will tend to reduce the real incomes in the economy leading to a reduction in the demand of the non tradable goods and services in both periods. As a result a fall in their prices will come about leading to the equilibrium real exchange rate depreciation.

Considering on how the government expenditure is to be measured for this study, you find that there is hardly any existence of reliable and separate data of the tradable goods from the non tradable goods that are consumed by the Government of Uganda. So the ratio of total government expenditure to GDP is used as a proxy for composition of the government expenditure for easy measurement (Edwards: 136; Tareke, 2005).Next is the government expenditure trend for the Ugandan economy from 1982 to 2004.

*Figure: 4.Trend of Government Expenditure for Uganda*




***Source: Authors Own and the data used are from the WBDI (2006).***

Looking at the trend for the government expenditure for Uganda above, it has on average increased. And of which its expected effect on the real exchange rate is indecisive as earlier discussed This will be told from the results of the estimation of the real exchange rate model in the coming sections as to whether the increased government expenditure is directed towards the tradable or the non tradable goods and services. With government expenditure directed to the tradable goods and services, it will bring about a depreciation of the real exchange rate. And with the non tradable it will bring about an appreciation of the real exchange rate.

***Technological progress***

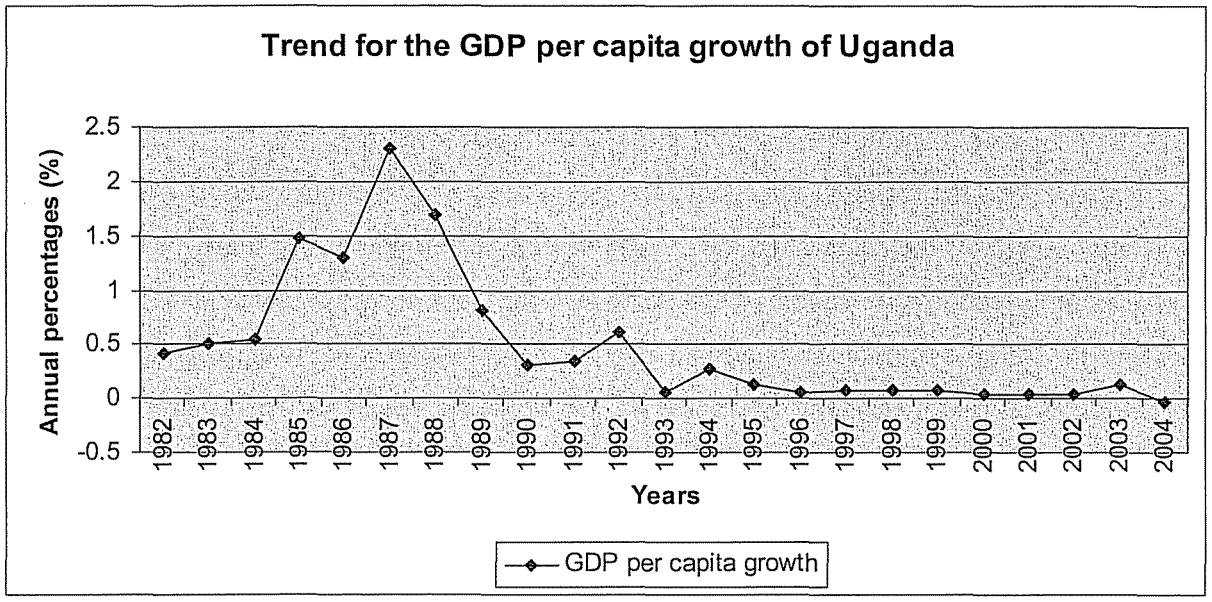
The technological progress is about the increase of productivity or productivity improvement of a particular sector or country. And for this case the concern of the technological progress is its effect on the real exchange rate equilibrium. According to Balassa cited in Edwards (1989:47) the productivity improvement increases with countries with high growth rate and reduces with the countries with low growth rate. Still in the countries the productivity improvement is not the same among the sectors, it said to be more rewarding in the tradable sectors as compared to the non tradable sector. The difference in the productivity improvements of the different countries will bring about an effect in the real exchange rate equilibrium which is an appreciation, with an assumption that prices of the tradable goods are the same among the countries.

Further more productivity within the country tends to have different effects on the equilibrium real exchange rate. When there is a productivity shock it is said to bring about a real exchange rate appreciation. This is because there tends to be a positive effect on the incomes which induces the demand of the non tradable goods and services. So the increase in demand leads to an increase in the equilibrium price of the non tradable goods and services.

On the other hand if there is productivity improvement within the country it will bring about the depreciation in the equilibrium real exchange rate when looked at the supply side. This productivity improvement can lead to an increase in supply which reduces the demand for the non tradable goods and services. This will lead to a reduction of their prices and consequently the real exchange rate will depreciate.

The GDP per capita will be used as a proxy for the technological progress to measure the productivity improvement in this study[9]. And the trends for the GDP per capita for Uganda show the following:

***Figure: 5.GDP per Capita growth for Uganda***




***Source: Authors Own computation and the data used are from the international financial statistics (2006).***

[9] The GDP per capita as a proxy for technological progress is based on the real exchange rate model by Edwards (1989) although he used the real GDP growth as a proxy for technological progress. These two can measure the productivity improvement of the country .However the suspicion of the reverse causality of the GDP in the GDP per capita with other variables like REER due to the fact that GDP is partly determined by the exports. Further tests will be carried later to check the way of causality plus their respective explanations.

And according to figure 5, Uganda has been experiencing the declining GDP per capita growth rate which is basically due to the high population growth rate (MFPED, 2003).This shows that as much as there is increasing GDP growth, the population is growing at a faster rate as compared to the GDP. So with the declining GDP per capita for this case its effect will be best determined after the estimating of the real exchange rate model.

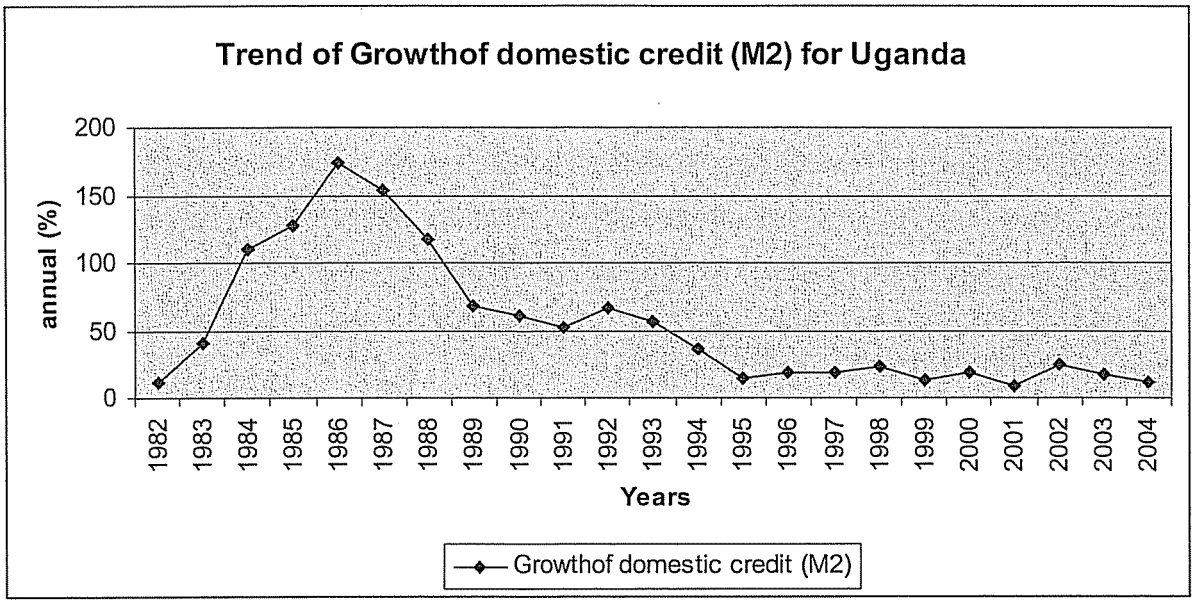
***Growth of Domestic credit*** $(M_2)$

This is also another factor that is seen to affect the real exchange rate, of which theoretically an increase in the money supply in the economy will lead to an increase in demand and also an increase in the prices. This increased demand and prices will consequently appreciate the real exchange rate.

However according to Mkenda in Tareke(2005), an increase in the money supply within an economy will bring about an increase in the demand and at the same time an increase of the imports within the country which will lead to an increased demand for the foreign exchange for the importation so as to meet the demand. This will lead to more local currency required to purchase a unit of foreign currency in order to import. And consequently lead to the depreciation of the real exchange rate.

Having looked at the different effects of increase in the domestic money supply there is need to look at the effect of the decrease in the money supply. According to the theory a decrease in the money supply within the economy tends to reduce the demand of the goods and services. This leads to the fall in the prices and consequently the depreciating effect is experienced on the real exchange rate. Below is the trend for the growth domestic credit for Uganda from 1982 up to 2004.

*Figure: 6.Trend of Growth of M2 for Uganda*




***Source: Authors Own and the data used are from the WBDI (2006).***

The Domestic money growth shows a declining trend from the 1986 onwards. With this declining trend shown in figure 6, we expect a depreciating effect on the real exchange rate according to the theory.

***Openness of the economy***

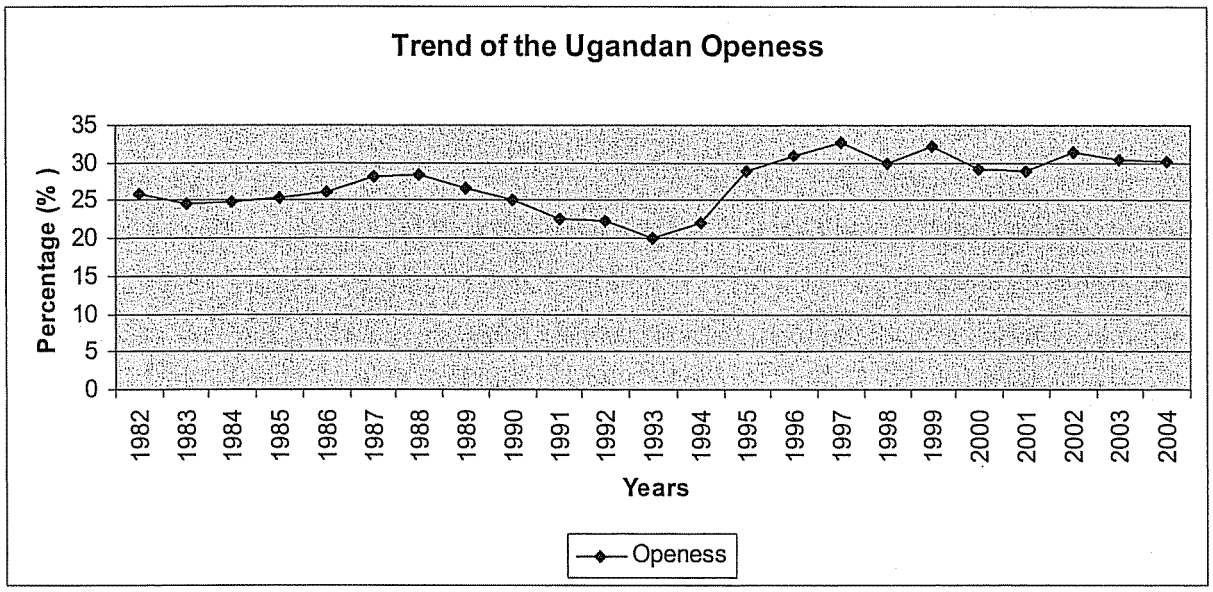
This looks at the extent at which the trade is liberalized within an economy and its effect on the equilibrium real exchange rate.

The openness of the economy affects the equilibrium real exchange rate in a way that if there is an increase in the openness or a reduction in the trade restriction, this will give room for imports to flock into the economy. And this will bring about an increase in supply and a fall in the prices hence real exchange rate depreciation.

However on the other hand a reduction in the openness or increase in the trade restrictions will bring about an appreciation of the real exchange rate. These restrictions will lead to less import supply which will lead to an increase in their prices and a reduction in their demand. So the reduced demand will bring about less foreign exchange demanded for the importation and this will lead to a real exchange rate appreciation. Therefore increased openness brings about depreciation while the reduced openness brings about an appreciation of the real exchange rate equilibrium.

Looking at the measurement of the openness, the import tariff would be the more appropriate proxy to be used for openness of the economy but it has been criticized not to cover the non tariff barriers (Edwards, 1989; Dollar and Kraay, 2001).Still for the Ugandan case there is unreliable information regarding tariff and non tariff barriers that would be appropriate to proxy the openness of the economy. So the ratio of the sum of the imports and exports to GDP is used to represent or measure the openness of the economy (Outtara and Strobl, 2004; Atingi-Ego and Sebudde, 2004). Figure 8 shows the Openness of the Uganda's economy.

***Figure: 8.Trend of Openness for Uganda***




***Source: Authors Own computation and the data used is from the WBDI (2006).***

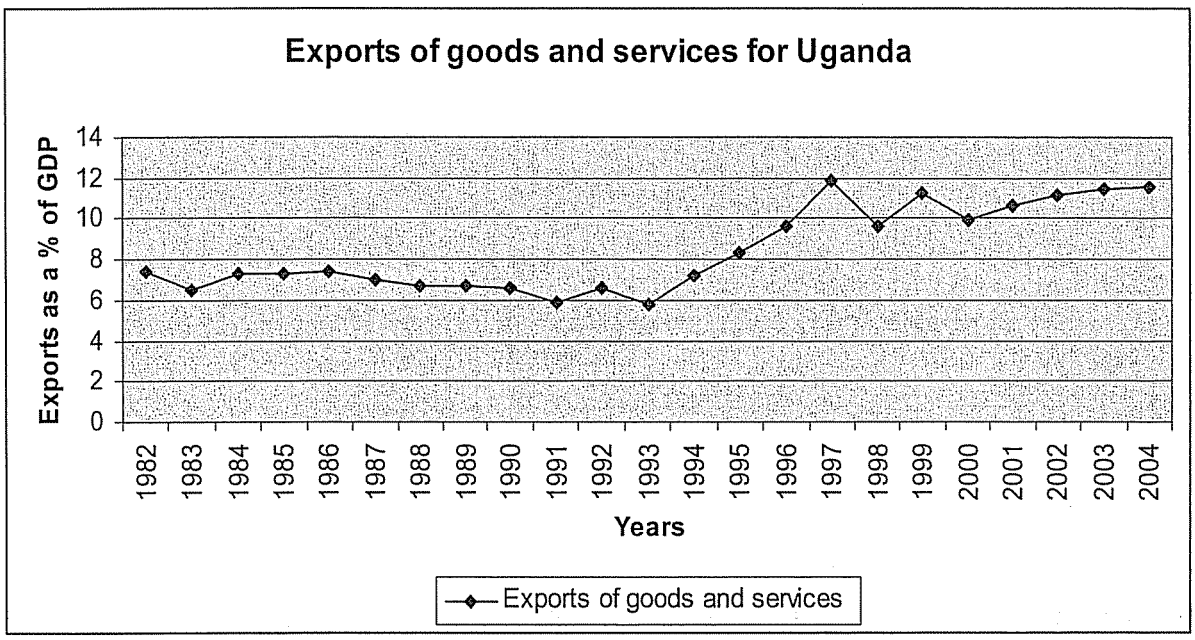
The openness of Uganda show an increasing trend during the study period from 26% in 1982 to 30% in 2004.Of which according to the theory that has been earlier discussed we expect a depreciating effect on the real exchange rate for the Ugandan economy.

***Exports:*** Exports involve the goods and services that are produced or manufactured within the country and sold to another country. For the purpose of this study the exports are going to be measured as a percentage of GDP[10] .This is calculated from the World Bank Development indicators 2006 by using the exports of goods and services at constant local Currency Unit and

[10] However there are suspicion of the exports have a reverse causality with the REER in the export model ,this is where the REER affects the exports and the exports affect the REER.Further tests will be carried later to check if one variable can statistically detect the way of causality when subjected to lags.

the GDP at Constant local currency Unit so as to eliminate bias in figures due to inflation. So the trends in the figure 7 show the exports as a percentage of GDP for the Ugandan economy.

*Figure: 7.Exports of goods and services for Uganda*




***Source: Authors Own and the data used are from the WBDI (2006).***

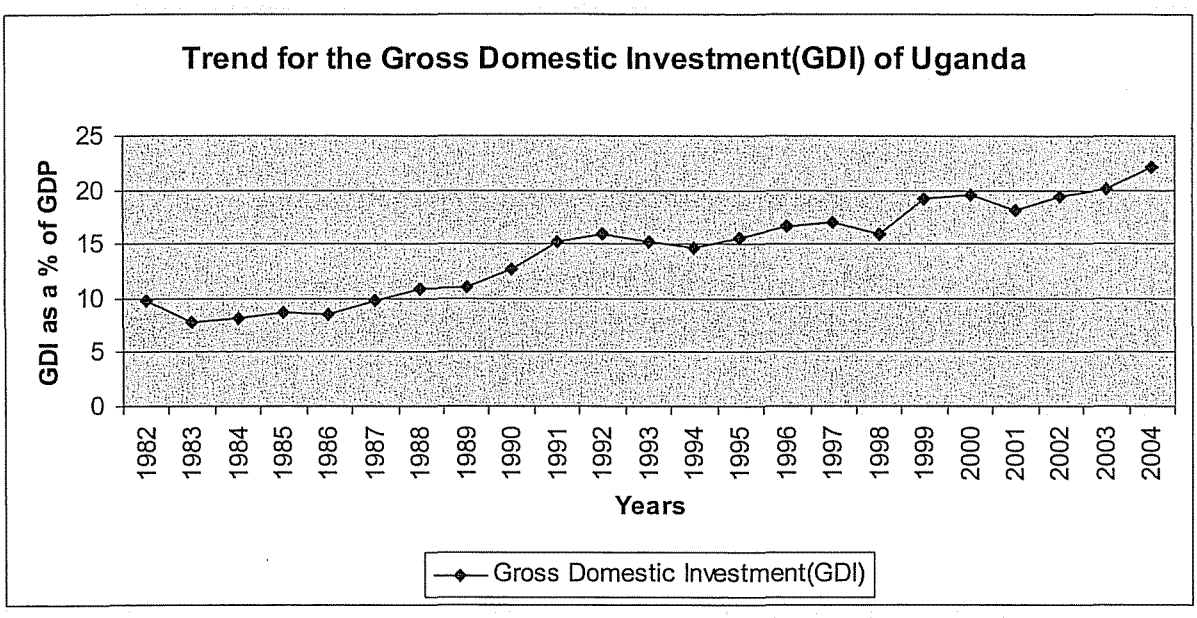
The trend show there was some kind of stagnation in the exports from the 1982 to1993 of which the exports relatively started increasing after that. However the increasing trend still was not relatively stable as there are some declines during 1998 and 2000.In reference to the earlier discussed theory, the increase in the export makes us expectant to have a depreciating real exchange rate.

***Gross Domestic Investment***

This is one of the factors that affect the export performance of the country, of which investment is expected to increase productive capacity within the country leading to the increase in the exports. So an increase in investment within the country is expected to increase the exports and the decrease in the investment leads to the decline in the export sector.

The Gross Domestic investment is going to be measured as a ratio of investment to GDP expressed in percentage. The figure 9 shows the trend of the Gross domestic investment of Uganda for the period of study:

*Figure: 9.Trend for the gross Domestic Investment for Uganda*



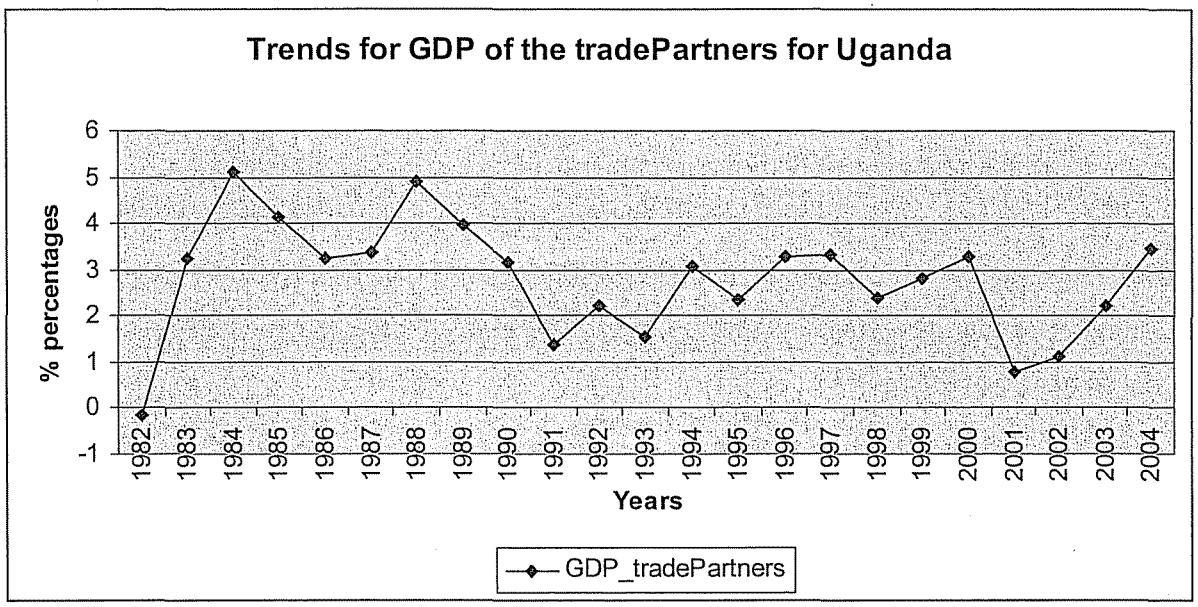

***Source: Authors Own and the data used are from the WBDI (2006).***

The results from the Gross domestic investment of Uganda show an increasing trend. This gives us an expectation that the exports are also increasing for the Ugandan economy as earlier discussed in the theory.

***GDP growth rate of the country's trading partner:*** This affects the export performance in a way that an increase in the GDP growth rate of the trading partner is bound to have an increasing demand effect on the country's exports. And when the GDP growth rate of the trading partners goes down the demand of the country's exports also declines which leads to the contraction of the export sector. Since there is reduced demand, the production of the goods for export will also go down. Therefore the GDP growth rate of the trading partners is expected to have a positive effect on the exporting country (exports).

GDP growth of the Trading Partners is measured by summing up all the GDP for the Trading partners of Uganda in each year and then an annual growth is calculated from the totals. This can be expressed in percentages. For this study five main trading partners for Uganda have been considered to compute the GDP growth of the trading partners and these included Kenya, USA, UK, Germany and Japan. The trend for the GDP growth for the Uganda's trading partners has been shown below:

*Figure: 10.Trends for the GDP of the trade Partners for Uganda*




***Source: Authors Own and the data used are from the WBDI (2006).***

Looking at the figure 10, it shows a fluctuating trend in the GDP growth of the trading partners during the time of study. This tends to affect the export sector in an inconsistent way in other wards it is not clear on a particular direction the trend is taking. So there are expectations or suspicions that it might have no particular effect on the exports of Uganda.

### 4.4 Estimation procedure and methodology

The econometric estimation methods going to be used for the testing of the hypotheses and coming up with consistent predictions will be OLS and Cochrane Orcutt procedure. Carrying out OLS estimation on the time series data, there are more likely chances of getting invalid results due to non stationary data and also endogenity of the variables.

Endogenity of the variables is another problem that the time series data are likely to find .This endogenity involves the reversal causality among the variables that is the explanatory variable affecting the dependent variable and the dependent variable affecting the explanatory variable. In other wards a two way effect among the variables, so the granger causality test can be used to statistically know whether one of the variables can detect the direction of causality when subjected to lags. If it happens to be a two way or reversal causality, then the OLS estimation is bound to get inconsistent and doubtful results (Gujarati, 1995:363).

*Non stationary time series data*

The non stationary time series can be regarded as those series whose moments are not time invariant while the stationary time series are those whose moments are time invariant (Mukherjee et al, 1998:349). Non stationarity is among the common problems in the time series data and of which if regressed with this problem it may lead to the production of the spurious regressions. However other problems may include heteroskedasticity and multicollinearity that can also lead to the production of doubtful results. These can be detected by using Cook-Weisberg's test and the variance inflation factor respectively and be able to decide for a solution on how to get rid of them.

The presence of non stationarity in time series can be due to the existence of autocorrelation within the data and this still can lead to the outcome of spurious regressions (Ibid: 396-398). However different tests can be used to detect the non stationary time series data after each of the OLS estimations of equation (i) and (ii) are done. These tests include the augmented Dickey fuller test and the Durbin Watson statistic test that can be used to test for the unit root. However for this study we are to use the Durbin Watson statistic test other than the augmented Dickey fuller because the Dickey fuller requires a lot data. There are situations when the augmented Dickey fuller test requires 5 lags and yet we have few years of data that is from 1982 to 2004. So for this reason we would prefer the Durbin Watson statistic test for unit roots that does not require many lags to test for stationarity.

Using the Durbin Watson statistic as a unit root test, if there exists positive autocorrelation of the residuals or a kind of trend; this means that there exists non stationary time series around the mean (Mukherjee et al, 1998).On the other hand when there exists no trend around the mean or the residuals are randomly distributed around the mean, then it will mean that the data is stationary. Therefore the distribution of the residuals around the mean can tell us whether the time series are stationary or not.

*Autocorrelation due to misspecification of Variables*

However this autocorrelation problem may sometimes be as a result of misspecification of variables. By using the Durbin Watson test as earlier stated, we can tell whether there is autocorrelation or not. If there happens to be autocorrelation then we go further to check if this auto correlation problem is due to misspecification of variables. So in order to find out whether

there is misspecification or omitted variables we can use the Ramsey Reset test. And if the test results showed that there are no omitted variables or misspecification then we go ahead to deal with genuine autocorrelation. Eliminating autocorrelation will help us to avoid invalid results that are inefficient and biased, so we opt for the Cochrane Orcutt procedure.

***Cochrane Orcutt estimation procedure (method)***

The Cochrane Orcutt procedure will be used to eliminate the autocorrelation that is bound to make our time series data non stationary. The reasons as to why this method has been used is because it carries out the differencing to make the data stationary and also tries to eliminate autocorrelation problems. So at the end of the day, the Cochrane-Orcutt procedure will produce valid results which are Best Linear Unbiased and Efficient (BLUE). And the procedure can be illustrated below:

Suppose our models (i) and (ii) each has an error that follows the AR (1) procedure then they will be written as follows:[11]

$$\ln REER_t = \alpha_0 + \alpha_1 \ln(AID)_t + \alpha_2 \ln(GC)_t + \alpha_3 \ln(TOT)_t + \alpha_4 \ln(Open)_t + \alpha_5 \ln(TP)_t + \alpha_6 \ln(M2)_t + \rho\mu_{t-1} + \nu_t \quad \ldots\ldots(iii)$$

Where $\nu_t \sim \mu(0,\sigma^2)$

$$\ln X_t = \beta_0 + \beta_1 \ln(REER)_t + \beta_2 \ln(I)_t + \beta_3 \ln(GDP_{tp})_t + \beta_4 \ln(AID)_t + \rho\varepsilon_{t-1} + \nu_t \quad \ldots\ldots(iv)$$

Where $\nu_t \sim \varepsilon(0,\sigma^2)$

So when we lag equation (iii) and (iv), each by one period and in each of the equations multiply by $\rho$ then subtract the result from each of the equations (iii) and (iv) so we get:

$$(1-\rho)\ln REER_t = (1-\rho)\alpha_0 + (1-\rho)\alpha_1 \ln(AID)_t + (1-\rho)\alpha_2 \ln(GC)_t + (1-\rho)\alpha_3 \ln(TOT)_t + (1-\rho)\alpha_4 \ln(Open)_t + (1-\rho)\alpha_5 \ln(TP)_t + (1-\rho)\alpha_6 \ln(M2)_t + \nu_t \quad \ldots\ldots(v)$$

$$(1-\rho)\ln X_t = (1-\rho)\beta_0 + (1-\rho)\beta_1 \ln(REER)_t + (1-\rho)\beta_2 \ln(I)_t + (1-\rho)\beta_4 \ln(GDP_{tp})_t + (1-\rho)\beta_5 \ln(AID)_t + \nu_t \quad \ldots\ldots(vi)$$

[11] The reduced form export equation (A1) also goes through the same procedure, equation (i) and (ii) are used to illustrate how the Cochrane Orcutt procecudure works.

Then we are able to define the new variables as follows:

From equation (v) we have

$\ln REER_t^* = \ln REER_t - \rho(\ln REER)_{t-1}, \ln AID_t^* = \ln AID_t - \rho(\ln AID)_{t-1}, \ln GC_t^* = \ln GC_t - \rho(\ln GC)_{t-1},$

$\ln TOT_t^* = \ln TOT_t - \rho(\ln TOT)_{t-1}, \ln OPEN_t^* = \ln OPEN_t - \rho(\ln OPEN)_{t-1}, \ln TP_t^* = \ln TP_t - \rho(\ln TP)_{t-1},$

$\ln M2_t^* = \ln M2_t - \rho(\ln M2)_{t-1}$

So for the new variables for estimation become:

$$\ln REER_t^* = \alpha_0^* + \alpha_1^* \ln(AID)_t^* + \alpha_2^* \ln(GC)_t^* + \alpha_3^* \ln(TOT)_t^* + \alpha_4^* \ln(Open)_t^* + \alpha_5^* \ln(TP)_t^* + \alpha_6^* \ln(M2)_t^* + v_t \quad \text{.....(vii)}$$

And now from equation (vi) we have

$\ln X_t^* = \ln X_t - \rho(\ln X)_{t-1}, \ln REER_t^* = \ln REER_t - \rho(\ln REER)_{t-1}, \ln I_t^* = \ln I_t - \rho(\ln I)_{t-1},$
$(\ln GDP_{tp})_t^* = (\ln GDP_{tp})_t - \rho(\ln GDP_{tp})_{t-1}, \ln AID_t^* = \ln AID_t - \rho(\ln AID)_{t-1}$

So it becomes

$$\ln X_t^* = \beta_0^* + \beta_1^* \ln(REER)_t^* + \beta_2^* \ln(I)_t^* + \beta_3^* \ln(GDP_{tp})_t^* + \beta_4^* \ln(AID)_t^* + v_t \quad \text{.....(viii)}$$

Therefore the OLS becomes now efficient and the coefficients of the estimated variables of equation (vii) and (viii) become equal to the coefficients of the estimated variables of equations (i) and (ii) respectively.

That is $\alpha_i^* = \alpha_i$ where $i = 1,2,3,4,5,6$ and $\beta_i^* = \beta_i$ where $i = 1,2,3,4$

And the intercepts would be $\alpha_0 = \alpha_0^*/(1-\rho)$ and $\beta_0 = \beta_0^*/(1-\rho)$ respectively, where they can be got from the estimation of the residuals of the original regression.

The differencing procedure is also carried out which reduces the number of observations. This helps to correct the non stationary data.

The residuals generated after the estimation of (vii) and (viii) still show that there still exist autocorrelation the procedure may be repeated until there is no auto correlation.

However if it is not clear whether there is autocorrelation or not that is after using the Cochrane Orcutt procedure meaning that the results fall in the indecisive region. We can adopt the runs test to have a confirmatory check for the autocorrelation. According to Mukherjee et al (1998:383) if

there exists positive autocorrelation then there will be few runs than when there is no autocorrelation and if there is negative autocorrelation then there will be more runs than when there is no autocorrelation.

Using the expected number of runs it is possible that we can develop the confidence interval around the expected number. And when the runs are less than the lower bound then there is positive auto correlation in other wards we reject the null hypothesis. Also when the runs are more than the upper bound then there is negative auto correlation and still reject the null hypothesis. So if the number of runs falls within the confidence interval then we accept the null hypothesis that there is no autocorrelation. So Appendix B (i) shows the details of the how the procedure can be used to test the mentioned hypothesis as shown in Mukherjee et al (1989).

And if autocorrelation is not present after the runs test, we can go ahead and interpret the results from the Cochrane Orcutt as valid results. Also the graph of the residuals generated can be used to tell if autocorrelation still exists, by seeing how randomly residuals are distributed around the mean as discussed earlier.

## CHAPTER 5: THE EMPIRICS AND DISCUSSION OF THE RESULTS

### 5.1 Introduction

This chapter is going to show the empirical results from the estimated export and the real exchange rate models .And also diagnostic tests results will be discussed to show as to whether the models meets certain crucial key assumptions. Of which it will also show and discuss the measures that have been taken to make improvements were certain assumptions are not met.

### 5.2. Real exchange rate model Estimation results.

***Table: 4.OLS and Cochrane Orcutt estimates at 95% confidence interval***

| **Estimated variables** | **OLS estimation results** | | **Cochrane-Orcutt estimation results** | |
|---|---|---|---|---|
| ln reer | *Coefficients* | *( t -value)* | *Coefficients* | *( t-value)* |
| ln Aid_GDP | -0.68 * | (-6.05) | -0.69 * | (-6.65) |
| ln TOT | -0.11 | (-0.73) | -0.10 | (-0.88) |
| ln government expenditure | -0.62 * | (-3.53) | -0.73 * | (-4.89) |
| ln m2_growth | -0.19 * | (-3.28) | -0.17 ** | (-2.60) |
| ln openness | -0.57 *** | (-1.87) | -0.51 *** | (-1.96) |
| ln GDP_ per capita | 0.13 * | (2.96) | 0.11 ** | (2.16) |
| Constant | 11.3 | (6.39) | 11.19 | (6.69) |
| **Other results for the estimations** | | | | |
| $R^2$ | 0.93 | | 0.96 | |
| Number of observations | 22 | | 21 | |
| **Diagnostic tests** | | | | |
| log GDP-per capita does not granger cause log REER (probability at 2 lags) | | 0.02 | | |
| log REER does not granger cause log GDP-per capita (probability at 2 Lags) | | 0.94 | | |
| Ramsey Reset test (misspecification test) | | 0.49 | | |
| VIF (test for multicollinearity)<br>- the largest VIF outcome | | 4.18 | | |
| Cook and Weisberg's test (test for heteroskedasticity) | | 0.72 | | |
| Durbin-Watson statistic (original taken after OLS) | | 2.6 | | |
| Durbin – Watson (transformed after Cochrane Orcutt) | | 2.42 | | |

***Significant at 1%level, **Significant at 5% level, ***Significant at 10% level**

### 5.2.1. OLS estimation result explanations

When the real exchange model was estimated with OLS, the results show that Aid inflows, government expenditure, growth of money (M2) and GDP per capita are statistically significant at 5 % level. However the Aid inflows, government expenditure and the growth of money (M2) have a negative relationship towards the real effective exchange rate unlike the GDP per capita which has a positive relationship. This indicates that a 1% increase in Aid inflows, government expenditure and the growth of money (M2) leads to the depreciation of the real exchange rate by 0.68%, 0.64% and 0.19% respectively. And a 1% increase in the GDP per capita leads to the appreciation of the real exchange rate by 0.13%.The terms of trade results are statistically insignificant. The openness is statistically significant at 10% level with a negative effect meaning that at 1% increase in the openness leads to depreciation by 0.57%.The $R^2$ indicates the changes in the real effective exchange rate are explained by 93% of the variables of the model.

However some diagnostic tests were carried out to ensure that the data is plausible to key assumptions like constant variance, no reversal causality among the variables, no omitted variables, no multicollinearity and no autocorrelation. And in case of non compliance to any of the key assumptions, improvements were made so as to avoid the potential problems that will lead to doubt the results.

Using the granger causality test at 2 lags, it reveals that we have a one way causality from the GDP per capita to the REER at 5% level of significance. And the other causality from the REER to GDP per capita is insignificant as shown in table 4. This means that we do not have reverse causality between the GDP per capita and the REER that is bound to give us inconsistent results.

A test for Multicollinearity was also carried out using the variance inflation factor and the results for the real exchange rate model show that the highest VIF is 4.18 which is less than 10 meaning that the problem of multicollinearity among the explanatory variables is really minimal to make our equation unsolvable (Hamilton 2004:212).

Another test was carried out and this was the Ramsey reset test in order to check whether the real exchange rate model is correctly specified because misspecification of the model can lead to effects like the heteroskedasticity and the autocorrelation. And the results showed that there were no omitted variables as the resulted probability was 0.49 which is greater than the probability

value 0.05.This meant that the model was well specified. So with a well specified model in case of autocorrelation or heteroskedasticity it would be a genuine one other than being caused by model misspecification.

The Cook and Weisberg's test for finding heteroskedasticity was carried out and the result was 0.72 .This means that there is no heteroskedasticity since the result is above the probability value 0.05, in other wards there is no violation of the assumption that the error terms should have the constant variance. When violated it tends to be detrimental to our least square estimations because it will not produce BLUE estimates but linear unbiased estimates which are not best (Mukherjee et al, 1998:251).

Another Diagnostic test was carried out in order to test for autocorrelation and this was the Durbin Watson test .The results from the test showed 2.6 which falls in the indecisive region, so we were not sure as to whether the autocorrelation existed or not. But it is safer to suspect the existence of autocorrelation with such a result so that we are to get a solution to it. The reason as to why we should ensure that we do not have autocorrelation is because we are likely to have a spurious regression which is related to non stationarity .So by ensuring that there is no autocorrelation we are moving towards having a true model that is stationary. So we further estimate our variables using the Cochrane Orcutt to eliminate the autocorrelation.
When you look at the transformed Durbin Watson test after the Cochrane Orcutt estimation, the result is 2.42.This still falls in the indecisive region so we can not make any conclusions about the autocorrelations disappearance. So Runs test was used further to confirm whether there is auto correlation or not.

Basing on the results from the runs test in appendix B, the probability is 0.38 which indicates that there is no auto correlation because it is greater than the probability value 0.05.
However, we come up with the same conclusion if we calculated the runs test using equation (ix) for the expected number of runs and (xi) for the standard deviation, then use the confidence interval (xii). We find that the number of runs which is 14 falls between the lower bound and upper bound of the confidence interval so we accept the null that there is no autocorrelation (see appendix B).So we go ahead to interpret the results from the Cochrane Orcutt estimation of the real exchange rate model without the fear of our results being inefficient and biased estimates due to autocorrelation.

### 5.2.2. The Cochrane Orcutt estimation results explanation

The Cochrane Orcutt results from the regression of the real exchange rate model in table 4, show that Aid inflows have a significant effect on the real exchange rate and a 1% increase in the net Aid as a percentage of GDP will depreciate the real exchange rate by 0.69%.In other wards an increase in Aid inflows brings about a depreciation of the real exchange rate in the Ugandan economy. This leads to the rejecting of the hypothesis that Aid inflows lead to the appreciation of the Real exchange rate as stipulated by the Dutch disease theory. There might be causes as to why this is not happening as expected and the one of them could be the existence of the under utilization of the factors of production like land and labour as earlier discussed. Of which an increase of the aid into the economy might have increased the demand and in order to cater for this excess demand there was stimulation of the use of the unutilized factors of production. This might have lead to the supply of goods and services to be more than the demand leading to the low prices and consequently depreciating the real exchange rate.

Looking at the other factors that were used in the real exchange rate model like the government expenditure it is also significant on the real exchange rate at a 5% level. And it shows that a 1% increase in government expenditure brings about a 0.73% depreciation of the real exchange rate. As earlier discussed the government expenditure is expected to either have depreciation or an appreciation on the real exchange rate depending on the situation. And for the Ugandan case it has shown that the government expenditure causes a depreciation of the real exchange rate which means that Uganda may be using borrowed money for its expenditures and then raises the taxes to finance the debts. This reduces the real incomes among the population which leads to less demand of the non tradable goods and the fall of their prices, leading to the depreciation of the real exchange rate. Another argument as to why the Uganda is experiencing the depreciation effect from the government expenditure might be due to the government spending more on the tradable goods and services other than the non tradable goods and services during the period of the study.

The terms of trade resulted with the negative coefficient which would have meant a depreciation effect on the real exchange rate and since it is statistically insignificant we can not make any decisive conclusions as far as its effect on the real exchange rate is concerned. This deviates from the expectation of the theory that it would either appreciate or depreciate the real exchange rate since the effect is statistically insignificant.

The growth of money-M2 has a significant effect on the real exchange rate at a 5% level of significance. And according to the results it shows that a 1% increase in money growth leads to a depreciation of the real exchange rate by 0.17%.In reference to the earlier discussed theory there might be a lot of importation within the economy. The increase in the money supply within an economy might have brought about an increase in demand of non tradable goods and services but also increase the demand of the tradable goods and services like imports .This increase in the demand of the imports might have led to the increased demand of the foreign currency in order to import and meet the increased demand. This increased demand in the foreign currency might have led to the raise of its price where by more of the local currency was required for the purchase of a unit of foreign exchange leading to the depreciation of the real exchange rate.

Openness of the economy has a significant effect on the real exchange rate and the coefficient is negative which means that a 1% increase in the openness of the economy will bring about a depreciation of the real exchange rate by 0.5%.This depreciating results indicate that there might have been a reduction in the trade restrictions within the Ugandan economy which has given room for the increased supply of imports into the country leading to the fall in their prices. Due to the fact that they are cheaper they are demanded more, stimulating more importation that requires more foreign exchange. This basically leads to the increase in demand of the foreign exchange and a lot of the local currency will be required to buy the foreign exchange hence depreciation of the real exchange rate.

The GDP per capita has a positive coefficient and has a statistically significant effect on the real exchange rate at a 5% significance level. A 1% increase in the GDP per capita leads to a 0.1% appreciation of the real exchange rate. According to the earlier discussion this effect means that if the Ugandan economy experiences a productivity shock there would be an increase in the demand of the non tradable goods and services which will bring about a rise in prices and consequently lead to the appreciation of the real exchange rate. Looking at the $R^2$ , it is high which means that 96% of the independent variables explain the effect on the real exchange rate. For the achievement of the stationary time series data, the Cochrane Orcutt also carries out the differencing as it is evidenced by a reduction in the sample size from the 22 observations to 21 observations.

*Comparison of the OLS and the Cochrane Orcutt results for the REER model*

When you look at the results in table 4 for the initial regression of OLS and that of the Cochrane Orcutt, the results are almost the same. The reason behind this little difference between the two results is that there was little or minimal autocorrelation with the estimated variables.

### 5.3. Export model estimation results

In the estimation of the export models that is the export model in equation (ii) and the reduced export model in equation (A1), we are to choose one among the two results to take as valid results for interpretation. Looking at the results for OLS and Cochrane Orcutt in the Appendix C and D respectively, we find that the Original export model (ii) at least satisfies most of the Diagnostic tests taken unlike that of the reduced model. In order for the results to be regarded as valid they have to meet a certain standards like passing the diagnostic tests. And these include the test for heteroskedasticity, multicollinearity, misspecification and autocorrelation. Secondly back to the hypothesis of the study, the reduced form export model hardly answers our hypothesis.[12] So for these reasons we choose to interpret those of equation (ii) other than the reduced model.

[12] The hypothesis of the study referred to is "the appreciated exchange rate declines the export competitiveness of the receipt country". Here we need the exports as the dependent variable and the REER as the one of the explanatory variables. With the rest of the variables as the control variables we can get the effect of the REER on the exports. And for the reduced form exports it does not have the REER in the explanatory variables.

*Table: 5. OLS and Cochrane Orcutt estimates at 95% confidence interval*

| **Estimated variables** | **OLS estimation results** | | **Cochrane-Orcutt estimation results** | |
|---|---|---|---|---|
| ln exports | *Coefficients* | *(t-value)* | *Coefficients* | *(t-value)* |
| ln REER | -0.20 | (-1.27) | -0.28 *** | (-2.09) |
| ln GDI_Gdp | 0.94 * | (5.60) | 0.98 * | (7.10) |
| ln AID_Gdp | -0.49 * | (-5.65) | -0.56 * | (-7.92) |
| ln GDP_tp | 0.04 | (0.57) | 0.04 | ( 0.73 ) |
| constant | 1.76 | (1.49) | 2.19 | ( 2.20 ) |
| **Other results for the estimations** | | | | |
| $R^2$ | 0.83 | | 0.90 | |
| Number of observations | 22 | | 21 | |
| **Diagnostic tests** | | | | |
| log REER does not granger cause log exports ( probability at 4 lags) | 0. 057 | | | |
| log exports does not granger cause log REER (probability at 4 lags) | 0.375 | | | |
| Ramsey reset test (misspecification test) | 0.19 | | | |
| VIF (test for multi collinearity)<br>- the largest VIF outcome | 6.78 | | | |
| Cook and Weisberg's test (test for heteroskedasticity) | 0.73 | | | |
| Durbin-Watson statistic (original taken after OLS) | 2.1 | | | |
| Durbin – Watson (transformed after Cochrane Orcutt) | 2.0 | | | |

***Significant at 1%, **Significant at 5% level, ***significant at 10% level.**

### 5.3.1. OLS estimation result explanations

When an OLS was carried out on the export model the $R^2$ got shows that 83% of the changes in the exports are being explained by the model. And the results also showed that the real effective exchange rate and the GDP growth of the trading partners is not statistically significant .While the gross domestic investment is statistically significant at 1% level with a positive effect on the exports. The resulted coefficient indicates that a 1% increase in the gross domestic investment leads to a 0.94% increase in the exports. Aid inflows were found to be statististically significant and with a negative effect on the exports. A 1% increase in the Aid inflows would lead to a 0.49% decline in the exports.

However for the OLS results to be regarded as valid results it has to meet certain key assumptions like no endogenity among the variables, no heteroskedasticity, no autocorrelation, no misspecification and no multicollinearity. So the diagnostic tests were carried out so that there

is absolutely no reason to doubt our results and in case there is a problem, measures can be taken to improve the situation so that we end up with valid results.
Using the granger causality test at 4 lags, it revealed that there is a one way causality and that is from the REER to the exports at 10% level of significance. And the other causality from the exports to the REER is insignificant as shown in table 5. This means that we do not have reverse causality between the REER and the exports that is bound to give us inconsistent results.

The diagnostic tests for Multicollinearity using the variance inflation factor was carried out among the explanatory variables in the export model. And the results for the export model show that the highest VIF is 6.78 which is less than 10 meaning that the problem of multicollinearity among the explanatory variables is really minimal to create problems when trying to solve the equation.

A Ramsey reset test was also carried out on the export model so as to check whether variables are correctly specified or not. And the results revealed that there are no omitted variables due to the fact that the resulted probability was 0.19 which is greater than the probability value 0.05.
The Cook and Weisberg's test was another diagnostic test that was carried out with the intension of finding out whether there is heteroskedasticity in the export model or not. And the findings show that there is no heteroskedasticity due to the fact that the result is 0.73 which is greater than the probability value 0.05.Therefore there is a constant variance among the residuals of the export model. When the assumption of constant variance for the error term is violated it tends to be detrimental to our least square estimations because it ends up producing linear unbiased estimates other than the BLUE estimates.

Using the Durbin Watson Statistic test the export model was checked to find out whether there was autocorrelation or not .And the result was 2.1 which falls in the indecisive region, so with this indecisiveness we are not sure as to whether the autocorrelation exists or not. Once again being on the safe side it better to suspect the existence of autocorrelation with such a result .This will help us get rid of the autocorrelation in case it exists though its presence can hardly be tracked. The reason as to why we should ensure that we do not have autocorrelation is that we might end up with a spurious regression which is related to non stationarity .So by getting rid of autocorrelation we are moving towards having a true model that is stationary. So we further estimate our variables using the Cochrane Orcutt to eliminate the autocorrelation.

### 5.3.2. Cochrane Orcutt estimation result explanations

The Cochrane Orcutt results in table 5 show that the real effective exchange rate at 10% level is significant to the exports. A 1% increase in the REER will bring about a 0.28% decline in the exports. The gross domestic investment and Aid inflows are statistically significant at the 5% level and have a positive and negative relationship respectively on the exports. Where a 1% increase in the gross domestic investment will bring about a 0.98% increase in the exports .And for the aid inflows, a 1% increase in the aid inflows will bring about a 0.56% reduction in the exports. And the growth in the GDP of the trading partners is statistically insignificant even after the carrying out the estimation using the Cochrane Orcutt. The $R^2$ became higher with the Cochrane Orcutt than it was with the OLS that was from 83% to 90%.And the Durbin Watson transformed result is 2.0, this shows that there is no more autocorrelation because this result falls in the acceptance region. So with no auto correlation after the Cochrane Orcutt procedure we are sure that we have a true model that is also stationary and the interpreted results are now valid.

***Comparison of the OLS and the Cochrane Orcutt results of the export model***

Still with the export model the results of the two regressions are not far from each other this is also because the extent of autocorrelation among the residuals of the export model was minimal.

## CHAPTER 6: SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

This study looks at the relationship between aid inflows, real exchange rates and exports in Uganda from the period of 1982 – 2004.Based on the Dutch disease theory there are fears that increased Aid inflows could lead to the real exchange rate appreciation hence negatively impacting on the export sector competitiveness.

This study used time series data and applied the Cochrane Orcutt procedure that deals with non stationarity and autocorrelation to analyze the occurrence of the Dutch disease in Uganda. The results show that despite the increased Aid inflows there was a depreciation of the real exchange rate. This refutes the earlier hypothesis that Aid inflows appreciate the real exchange rate.
Openness, Government expenditure and the domestic credit also have a depreciating effect on the Real exchange rate during the study period. So this depreciating effect that has been experienced by Uganda's real exchange rate may be due to the macroeconomic policy framework and the way the aid is being utilized. The aid might have been directed towards the tradable goods that involve the provision of public goods like the roads, improved agricultural extension services that stimulate production. And with the liberalization, it might have brought more imports onto the market. All these increase supply of goods and services onto the market that lead to the low prices and consequently real exchange rate depreciation.

Applying the same techniques to the export model as those applied to the real exchange rate model it was found that the real exchange rate appreciation is associated with a reduction in exports as % of GDP which is consistent with the said hypothesis that the appreciated real exchange rate negatively impacts on the export competitiveness. And also the increase in aid inflows impact negatively on the exports sector according to the results. While increases in the gross domestic investment impact positively on the exports.

In summary, the findings of this study tend to contradict with the Dutch disease theory's expectations. And this makes this study become similar to the findings of earlier studies carried like that of Ghana by Tareke (2005) and Sackey (2001), Harvey (1992) for Botswana, Nyonyi (1998) for Tanzania, Roemer (1998) for Indonesia, Bevan and Adams (2004) for Uganda, Ouatarra and Strobl (2004) for the CFA franc zone. All these found no evidence of Dutch disease in spite of the fact that these countries experienced resource windfalls during their study period.

Therefore one of the policy implications that have risen from this study is that Uganda shouldn't shun away from receiving Aid inflows because of the fear to loose export competitiveness. This is because according to the study aid has proved to have a depreciating effect on the REER. However precautions are needed as aid inflows have a negative effect on the country's exports. This can be done so that aid inflows aren't managed or utilized wrongly especially towards the non tradable goods that will result into disastrous effects on the export competitiveness. So the foreign Aid inflows may be directed towards the tradable goods like the provision of the public goods and spending on the imports that will stimulate the private sector productivity.

It has shown that if there is an exchange rate appreciation then it will suffocate the export sector. Then there is need of a cautious exchange rate management to reduce the exports vulnerability to the real exchange rate appreciation that reduces its competitiveness at the world market. And since the Openness also showed a deprecating effect on the real exchange rate, then there should be more liberalization of the economy to allow in more imports that will contribute to the increase in productivity. Similarly the domestic credit also has a depreciating effect on the real exchange rate then the Central bank needs to maintain it's a crucial role in avoiding the increase in the domestic credit or having expansionary monetary policy that are disastrous to the export competitiveness.

There may also be an increased investment promotion in the country as it has a significant and positive effect on the Ugandan exports. Of which these investments may be directed towards the increasing of productivity of the agricultural sector from which most of Uganda's exports come from.

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## APPENDICES

### APPENDIX A: The reduced form export model and the summary statistics

We decided to put all the determinants of the REER as the substitutes for the REER in the export model (ii) to come up with the reduced form export model.

$$\ln X_t = \beta_0 + \beta_1 \ln(TOT)_t + \beta_2 \ln(I)_t + \beta_3 \ln(GDP_{tp})_t + \beta_4 \ln(AID)_t + \beta_5 \ln(GC) + \beta_6 \ln(M2) +$$

$$\beta_7 \ln(Open) + \beta_8 \ln(TP) + \varepsilon_t \quad \ldots\ldots(A1)$$

***Table: A1.Summary Statistics for the estimated variables from 1982-2004.***

| Variables | Obs. | Mean | Std.Dev | Min | Max |
|---|---|---|---|---|---|
| ln REER | 23 | 4.92 | 0.43 | 4.38 | 5.71 |
| ln Aid/GDP | 23 | 2.36 | 0.53 | 1.50 | 3.23 |
| ln TOT | 23 | 5.02 | 0.39 | 4.47 | 5.75 |
| ln GC/GDP | 23 | 2.38 | 0.23 | 1.94 | 2.74 |
| ln M2 | 23 | 3.59 | 0.92 | 2.22 | 5.16 |
| ln GDI/GDP | 23 | 2.62 | 0.32 | 2.06 | 3.10 |
| ln GDP tp | 23 | 0.98 | 0.47 | -0.24 | 1.63 |
| ln exports/GDP | 23 | 2.10 | 0.24 | 1.76 | 2.47 |
| ln Openness | 23 | 3.30 | 0.13 | 3.48 | 2.99 |
| ln GDP per capita | 23 | -1.44 | 1.35 | -3.45 | 0.84 |

***Source: Author's own***

The variables for each variable are 23 but when they are subjected to the empirical estimation the variables reduce to 22 as seen in table 4 and table 5.This is because of the presence of the negative figure which end up not recognized and they are reduced from 23 to 22.

All the Data of the variables was from the WBDI (2006) apart from the GDP per capita that was computed from the IFS (2006).

**APPENDIX B: Computation of the runs test for autocorrelation.**

***(i) Derivation of the Confidence interval to be used for computation***

If the expected number of runs is $E(R) = \frac{2N_1N_2}{n} + 1$ ..... (ix)

Where $N_1$ - Number of positive residuals

$N_2$ - Number of negative residuals

n= $N_1 + N_2$ (total number of observations).

R – Total number of runs

And the variance is $\sigma_R^2 = \frac{2N_1N_2(2N_1N_2 - n)}{n^2(n-1)}$ .....(x)

So the standard deviation is $\sigma_R = \sqrt{\frac{2N_1N_2(2N_1N_2 - n)}{n^2(n-1)}}$ ..... (xi)

Therefore the 95% confidence interval is $E(R) - 1.96\sigma_R \leq R \leq E(R) + 1.96\sigma_R$ ..... (xii)

***Table: B1. Runs test results***

| **Observations** | **Out comes** |
|---|---|
| Number of Positive residuals ( $N_1$ ) | 11 |
| Number of negative residuals ( $N_2$ ) | 11 |
| Total observations ( n ) | 22 |
| Number of runs ( R) | 14 |
| Probability | 0.38 |
| Computed Expected number of runs- E (R) | 12 |
| Computed standard deviation | 4.49 |

***Source: Author's own***

***(ii) Computation of the runs test using the Confidence interval***

$$E(R) = \frac{2N_1N_2}{n} + 1 = \frac{2x11x11}{22} + 1 = 12$$

Where $N_1$ - Number of positive residuals = 11

$N_2$ - Number of negative residuals = 11

n- Total number of observations = 22

R – Total number of runs = 14

So the standard deviation is

$$\sigma_R = \sqrt{\frac{2N_1N_2(2N_1N_2 - n)}{n^2(n-1)}} = \sqrt{\frac{2x11x11([2x11x11]-22)}{22^2(22-1)}} = \frac{53240}{10164} = 2.29$$

Therefore the 95% confidence interval is $E(R) - 1.96\sigma_R \leq R \leq E(R) + 1.96\sigma_R$

$$= 12 - 1.96x2.29 \leq 14 \geq 12 + 1.96x2.29$$

$$= 7.51 \leq 14 \leq 16.49$$

So the total number of runs lies between the lower bound and the upper bound of the confidence interval .So we accept the null hypothesis that there is no autocorrelation.

## APPENDIX C: Selection of the OLS Estimation results for the Export Model

*Table C1.Comparison of the export model results for selection*

| **Estimated variables** | **Original export model - equation (ii)** | | **Reduced export models – equation (A1)** | |
|---|---|---|---|---|
| ln exports | *Coefficients* | *(t-value)* | *Coefficients* | *(t-value)* |
| ln REER | -0.20 | (-1.27) | ..... | ..... |
| ln GDI_Gdp | 0.94 * | (5.60) | -0.03 | (-0.12) |
| ln AID_Gdp | -0.49 * | (-5.65) | 0.07 | (0.57) |
| ln GDP_tp | 0.04 | (0.57) | 0.03 | (0.61) |
| ln TOT | ..... | ..... | -0.03 | (-0.28) |
| ln govt exp. | ..... | ..... | 0.37 * | (3.50) |
| ln m2-growth | ..... | ..... | -0.004 | (-0.09) |
| ln GDP percapita | ..... | ..... | -0.02 | (-0.73) |
| ln Openess | ..... | ..... | 1.20 * | (3.49) |
| Constant | 1.76 | (1.49) | -2.71 | (-2.00) |
| **Other results for the estimations** | | | | |
| $R^2$ | 0.83 | | 0.94 | |
| **Diagnostic tests** | | | | |
| VIF (test for multi collinearity) - the largest VIF outcome | 6.78 | | 31.45 | |
| Ramsey reset test (misspecification test) | 0.19 | | 0.20 | |
| Cook and Weisberg's test (test for heteroskedasticity) | 0.73 | | 0.99 | |
| Durbin-Watson statistic test | 2.1 | | 2.92 | |

***Significant at 1%level, **Significant at 5% level, ***Significant at 10% level**

## APPENDIX D: Selection of the Cochrane Orcutt Estimation results for the Export Model

*Table D1.Comparison of the export model results*

| Estimated variables | Original export model - equation (ii) | | Reduced export models -equation (A1) | |
|---|---|---|---|---|
| ln exports | *Coefficients* | *(t-value)* | *Coefficients* | *(t-value)* |
| ln REER | -0.28 *** | (-2.09) | .... | |
| ln GDI_Gdp | 0.98 * | (7.10) | -0.03 | (-0.15) |
| ln AID_Gdp | -0.56 * | (-7.92) | 0.07 | (0.72) |
| ln GDP_tp | 0.04 | ( 0.73 ) | 0.019 | (0.44) |
| ln TOT | ..... | | 0.01 | (0.13) |
| ln govt exp. | ..... | | 0.37 * | (4.44) |
| ln m2-growth | .... | | 0.47 | (1.11) |
| ln GDP percapita | ..... | | -0.06 * | (-2.31) |
| ln Openess | ..... | | 1.24 * | (5.28) |
| Constant | 2.19 | (0.043) | -3.29 | (-3.70) |
| **Other results for the estimations** | | | | |
| $R^2$ | 0.90 | | 0.98 | |
| **Other tests** | | | | |
| Durbin-Watson statistic (transformed) | 2.0 | | 2.69 | |
| Runs test (probability) | .... | | 0 | |

***Significant at 1%level, **Significant at 5% level, ***Significant at 10% level**