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THE BEHAVIORS AND DYNAMICS OF THE REAL EXCHANGE RATE OF THE 'BIRR' AFTER THE ECONMIC REFORM

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Abstract

The paper adopts a single equation approach to examine the real exchange rate behavior and exchange rate misalignment after devaluation and foreign exchange rate liberalization. The paper finds that real exchange rate and the macroeconomic fundamentals affecting real exchange rate are cointegrated. It also shows that devaluation, foreign exchange market liberalization and some of the policy measures taken by government such as reducing government consumption and deficit, new investment policy and other measures that increase the capital inflow narrow the gap between the parallel market foreign exchange rate and the official market foreign exchange rate, make the behavior of the real exchange rate fairly variable. In other words, the misalignment of the real exchange rate declines and the exchange rate movement becomes more stable. These are the desired goals that could be achieved by the devaluation of the exchange rate and through foreign exchange rate liberalization.

Key words: *Bilateral official real exchange rates, Bilateral parallel market real exchange rate, Real effective exchange rate, Equilibrium real exchange rates*

CHAPTER ONE

1. Introduction

1.1. Background

Many of the developing countries pursued to sustain their fixed exchange parities for a considerable amount of time even after the collapse of the Bretton Woods system. As a result, it is believed that most of the developing countries experienced an "overvalued" currency for a long time that had been inherited from the import-substitution regime. Developing countries though never left the exchange rate determination to the market, over time moved to an arrangement where exchange rate was frequently adjusted. Recently trade liberalization, foreign exchange liberalization and devaluation of local currency have appeared as common features of the development policy. Such policies are intended to make the real exchange rate more aligned to the market determined "equilibrium" exchange rate and to enhance the competitiveness in the international market. However, "equilibrium" real exchange rate is an unobservable variable. It depends on a number of macroeconomic fundamentals, many of which are endogenously determined within the economy. Devaluation of currency is just one exogenous policy instrument that affects the real exchange rate. Formulation of a correct exchange rate policy, to a large extent, depends on proper understanding of real exchange rate behavior and some objective conjecture about the value of equilibrium exchange rate. Based on this motivation, in recent years, a few case studies have been conducted on real exchange rate behavior and exchange rate misalignment in developing countries. (see Mongaerdini, 1998; Mahar and Naqvi, 1998 cited in Edwards, 1989; Baffes et. al., 1997, and Edwards, 1991).

Ethiopia had pursued fixed exchange rate policy during the 'Derg' regime and that in turn over-valued the exchange rate of 'Birr'. Such overvaluation discouraged export diversification and made imports artificially cheap. The "Derg' government, thus, imposed quantitative restriction in the allocation of foreign

exchanges in order to curb the problem that arouse due to shortage of foreign currency.

EPRDF overthrow the 'Derg' regime and assumed power in May 1991. In early 1992, the TGE dismantled the command economic system and introduced comprehensive economic reform to remove the distortions from the economy. Among the economic reform packages, foreign exchange liberalization and devaluation of the currency were the very important measures. The objectives of these measures were basically to correct the exchange rate for high domestic inflation, to reduce exchange rate misalignment and to improve the country's external balance.

Despite a strong need of examination of real exchange rate behavior and possible exchange rate misalignment after foreign exchange liberalization and devaluation, no significant formal study has been made in this regard in Ethiopia[1]. It is now imperative to examine whether our currency is still overvalued after devaluation and introduction of managed and moderately flexible exchange rate policy is adopted

This paper, therefore, attempts to fill up this gap by making a similar analysis using Ordinary Least Square (OLS) approach—a relatively more common technique of analyzing real exchange rate behavior.

1.2 Statement of the problem

The relationship between the behavior of real exchange rate and economic growth becomes an important issue both from the positive (descriptive) and normative (policy prescription) perspectives (Cottani *et al*, 1990 cited in Drine and Rault, 2003). This is because the role of the real exchange rate in economic growth is vital.

[1] The only studies tat the author knows in this regard are Asmerom Kidane(1999), Befekadu Degefe(1991), Derese Degefa(2001), Andualem Berhanu (1996) and Equar Desta (2001).

IMF and World Bank, therefore, have insisted many developing countries to devalue their currencies for two main reasons. First, real exchange rates have linkage with economic growth, to stimulate the economic growth of developing countries and by reformulate their economic policies. The second reason is to improve the international competitiveness of developing countries by making import expensive and export cheap and to shift resources from non-tradable to tradable sectors. In fact it is apparent that real exchange rate is usually taken as a good proxy as a measure of the degree of international competitiveness.

Moreover, the incorporation of currency devaluation in the structural adjustment program implicitly mean that there is disequilibria (misalignment) in the real exchange rate of those countries in which structural adjustment program is taking place. Thus, the nominal devaluation is a means to equilibrate (align) the real exchange rate.

Ethiopia is one of the developing countries where IMF and World Bank applied the above stated program and instructed to devalue its currency as the 'Derg regime' had pursued fixed exchange rate policy that made the country's economy, internationally uncompetitive.

A study (Andualem Berhanu, 1996) done based on this exchange rate regime revealed that the behavior of both effective and bilateral real exchange rates is highly fluctuating or unstable and they signify that there is no predictability of international competitiveness of the country.

Ethiopia devalued the 'Birr' for to reasons. The first reason was the influence of the above-mentioned international organizations to reform the economy where devaluation is one package of the reform. The second reason was that the government[2] had believed that devaluation will remove the misalignment of real exchange rate of the 'Birr', make the country internationally competitive and this in turn will improve the economic performance of the country.

[2] The Prime Minister's Office The TGE (1992). Perspectives on Devaluation in Ethiopia.

The research question here is, do devaluation and other measures taken by the Ethiopian government result in the desired real exchange rate alignment of the 'Birr' and international competitiveness.

In other words, what have been the behavior and dynamics of the real exchange rate of the 'Birr' after devaluation and introduction of the three methods of exchange rate determinations and what measures have been taken to align (equilibrate) the real exchange rate of the 'Birr'?

1.3 Objective of the study

The objective of this research in general is to check whether the measures taken by policy makers attained the desired goal and identify the factors that contribute for the failure, if any.

The specific objectives of this study are:

a) Identify the behavior (path) of the real exchange rate of the 'Birr' after the economic reform.
b) Determine the equilibrium real exchange rate of the 'Birr,' the stability (long-run equilibrium), the dynamic (short-run equilibrium) of the real exchange rate of the behavior of the 'Birr' and their implications.
c) Identify the determinants of the real exchange rate of the 'Birr'.
d) Examine the effectiveness of devaluation and the three methods of exchange rate determination.
e) Give some policy recommendations.

1.4 Significance of the study

The study enables policy makers and any interested individuals to know about the behavior of the real exchange rate of the 'Birr' and its impact on the country's economy. Moreover the study shows the determinant of the real exchange rate of the 'Birr' and the factors that affect the real exchange rate equilibrium in the short-run and long run. This will assist policy makers to understand the causes/factors

that misaligned the real exchange rate of the 'Birr' and the possible solutions to curb the problems that levels.

1.5 Data Sources and Methods of Data Analysis

1.5.1 Data Sources

For this study data are collected from published and unpublished secondary sources. The main sources are National Bank of Ethiopia (NBE) quarterly bulletins, International Financial Statistics, and different publications of the Ethiopian Economic Association.

1.5.2 Methods of Data Analysis

In analyzing the data, combinations of statistical and econometric techniques are used.

In the first technique, statistical and time series properties such as means, standard deviations, and trend coefficients, coefficients of variations, maximums, minimums and correlation matrices will be used. These measurements are used to show the variability, trend and behavior of the real exchange rates.

On the econometrics part, different procedures are performed. The first procedure is testing the stationarity of the time series data. This procedure is mandatory prior to proceeding to regression analysis. A given time series data is said to be stationary if it has a zero or at least constant mean, constant variance overtime and if the covariance between observations in two time periods depends only on the distance of the lag between the time period rather than on the actual time the covariance is computed (Gujarati, 1995, Harris, 1995). The second procedure is integration order test. It is apparent that most time series data have stochastic trend and such stochastic trend can be removed by differencing once (Baffs *et* al). Such variables are integrated of order

one, or I(1). This means these variables are non-stationary in levels but after differencing once. This stationarity test is done using Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) methods because it has superior small sample properties.

The third procedure is cointegration test. It is apparent that some times series data are integrated order one while other integrated order zero. If times series data that are not stationary at level and regression is done, the result will be spurious that has high R^2 and significant t-statistics. But the results would be meaningless. In order to solve this problem cointegration test is performed using either the Engle or Granger (1987) two step procedure or Johansen maximum likelihood method. In the Engle-Granger method, first, the long run static model, consisting of I(1), is estimated and obtain the residual then, second, the stationarity of the residual is tested. If the residual is found stationary, the variables used are said to be cointegrated and they have long run relationship. Next to this, the error correction model is estimated and the first difference of the dependent variable regressed on the first difference of the explanatory variables (with the appropriate lag) and the first lag of the residual obtained from the static model.

The other method is the Johansen maximum likelihood procedure for the estimation and determining the presence of cointegration vectors in vector autoregressive (VAR) system. This system is one form of multivariate modeling where no variable in the system is assumed to be exogenous a priori.

Based on these methods, both the dependent (real exchange rate) and independent or explanatory (fundamentals of real exchange rate) variables will be checked whether they are stationary and integrated of

order one. And also the co-integration equations and the error correction counter parts will be specified.

Since the time framework on which this paper focuses is from 1991/92 to 2003/04, the annual data collected are not sufficient for econometric analysis. Thus, they will be converted to quarterly data using different conversion methods. Based on the econometric techniques both the long-run equilibrium and the short-run dynamic adjustment parameters will be estimated.

1.6 Model Specifications

After performing the above mentioned procedure the next step is modeling of the real exchange rate. In modeling and analyzing the real exchange rate, this paper will basically adopt the model by Edwards (1989, 1991). The rationale to use this model, as Edwards (1989) noted because it allows for both real and nominal variables to play a role in the short and long run determination of real exchange rates.

1.6.1 Constructing Real Exchange Rates

Prior to modeling first the bilateral real exchange rates and the real effective exchange rates should be constructed. The former use to measure the behavior of the real exchange rate against the U.S. dollar where as the real effective exchange rate (REER) helps to measure the behavior of real exchange rate of a currency against the currency of different countries.

Based on Edwards' (1991) formula the following three indices are constructed.

$$BRERI_{USI}=\frac{E_{US} \times WPI_{US}}{CPI_{Eth}} \quad \text{----------} \quad (1)$$

$$BRERI_{US2} = \frac{E_{US} \times CPI_{US}}{CPI_{Eth}} \quad (2)$$

$$REERI = \frac{\sum W_{jt} x E_{jt} x WPI_{jt}}{CPI_{ETH}} \quad (3)$$

Where E_{US} is the nominal exchange rate of the 'Birr' with the United States dollar.

- CPI_{US} is the consumer price index of the United States.
- WPI_{US} is the wholesale price index of the United States, which is taken as the proxy for the price of tradable goods.
- CPI_{ETH} is the consumer price index of Ethiopia proxied by General Price Index and used as the proxy of non-tradable goods.
- W_{jt} is the average trade share of country j at time t.
- E_{jt} is the nominal exchange rate of the respective trade partner j against the 'Birr' at time t.
- CPI_{jt} is the consumer price index of the respective trade partner j of Ethiopia at time t.
- WPI_{jt} is the wholesale price index of the respective trade partner j of Ethiopia at time t.

In constructing of the above indices the following procedures will be pursued:

a) The nominal exchange rate indices (E_{US}) are taken from NBE Quarterly Report.

b) CPI_{ETH} is consumer price index for Ethiopia proxied by General Price index of the country.

c) REER index is taken from NBE unpublished report.

The other index developed is the parallel market bilateral real exchange rate (PMRER). This index is developed with respect to the currency to which the domestic currency is pegged. In view of this the general PMRER index with respect to the U.S. dollar is given by;

$$PMRER1_t = (PM)_t \frac{WPI^{us}}{CPI_{Eth}} \text{----------} (4)$$

Where $(PM)_t$ is an index of the parallel market bilateral nominal exchange rate with respect to the U.S. dollar,

- WPI^{US} is the U.S. wholesale price index, and
- CPI_{Eth} is the domestic country price index.

All variables are as defined above.

1.6.2 Modeling the Equilibrium Real Exchange Rate (ERER)

The model of equilibrium real exchange rate used in this paper is formulated based on the model developed by Sebastian Edwards (Edwards, 1991)

According to Edwards (1991) real exchange rate (RER) is defined as follows.

$$RER = (P^*_T/P_N) \text{----------} (5)$$

Where P^*_T is the domestic price of tradables and P_N is the domestic price of non-tradables.

In dealing with the modeling of the ERER, it is necessary to bear in mind that the ERER is not an immutable number. If there are changes in some variables that affect the internal and/or the external equilibrium of a country, the ERER will be changed.

The general theoretical model of the ERER is given by the following equation:

$$ERER_{it} = f(TOT_{it}, GCGDP_t, INVGDP_t, EXCRE_t, DEH_t, EXCON_t) \text{----} (6)$$

Where ERER is equilibrium real exchange rate,

TOT is the terms of trade,

GCGDP is the ratio of government consumption and gross domestic product,

INVGDP is the ratio of investment and gross domestic product,

EXCRE is excess supply for domestic credit,

DEH is the ratio of government deficit and lag of high powered money,

EXCON is exchange control.

In the model of ERER there is no one equilibrium value of the real exchange rate, but rather a vector of equilibrium relative prices and RERs.

The models with regard to the behavior and dynamics real exchange rates are Edwards (1991) specified as follow.

$$\Delta \log e_t = \theta\{\log e^*_t \log e_{t-1}\} - \lambda\{Z_t - Z_t^*\} + \varnothing\{\log E_t - \log E\} - \psi\{PMPR_t - PMPR_{t-1}\} \quad (7)$$

where e is the actual exchange rate,

- e^* is the equilibrium real exchange rate, which in turn is a function of the fundamentals,
- Z_t is an index of macro economic policies like the growth of domestic credit,
- Z^* is the sustainable level of macroeconomic policies to be defined later,
- E is the nominal exchange rate,
- $\varnothing$, λ, and θ are positive parameters that capture the most important dynamic aspects of the adjustment

This shows that the actual dynamics of real exchange rate responds to the above variables which can called the three forces. For instance, in the real dynamics the term $-\lambda\{Z_t - Z_t^*\}$ measures the role of macroeconomic policies in real exchange rate behavior. Thus, According to the above model if macro economic policies, other things remain constant, are inconsistent the RER will appreciate (Edwards

Based on Edwards (1991), the model for ERER can be specified as follow:

$$\text{Log } e_t^* = \beta_0 + \beta_1 \log (TOT)_t + \beta_2 \log (GCN)_t + \beta_3 \log (CAPCONTROLS)_t + \beta_4 \log (EXCHCONTROLS)_t + \beta_5 \log (TECHPRO)_t + \beta_6 \log (INVGDP)_t - \psi\{PMPR_t - PMPR_{t-1}\} + U_t \quad (8)$$

Where e_t^* is equilibrium exchange rate at time t,

- $(TOT)_t$ is terms of trade at time t,
- $(GCN)_t$ is government consumption of non tradables at time t,
- $(CAPCONTROLS)_t$ measures of extent of controls over capital flows at time t,
- $(EXCHCONTROLS)_t$ is index of the severity of trade restrictions and exchange controls at time t,
- $(TECHPRO)_t$ is the measure of technological progress at time t,
- $(INVGDP)_t$ is the ratio of investment to GDP at time t,
- U_t is the error term at time t.

Edwards (1991) uses proxies for some variables for which data are not available as follows:

- TECHPRO is proxied by the rate of growth of real GDP,
- CAPCONTROL is replaced by the lagged ratio of net capital flows to GDP for there is no appropriate proxy,
- EXCHCONTROL is proxied by the spread between the parallel and official rates in the foreign exchange market,
- GCN is proxied by Government consumption/GDP i.e. GCGDP.

Based on these models, the long run and short run (Equilibrium) Real Exchange Rate models are specified as follow.

1.6.3 The long run (Equilibrium) Real Exchange Rate Model:

Though the model is generally as given above, the one that will be estimated in this paper is given as follow. As it can be clearly seen,

some of the variables are not used because of the unavailability of time series data.

The purpose of this model is to show the long run relationship exists between the dependent variable and each independent variable.

$$ERER = \alpha_0 + \alpha_1 TOT + \alpha_2 EXCON + \alpha_3 EXCRE + \alpha_4 INVGDP + \alpha_5 DEH + \alpha_6 GCGDP + \alpha_7 NOMDEV + \alpha_8 PMRER + \alpha_9 CAPINF + \varepsilon_t \quad (9)$$

Where EREER is effective real effective exchange rate,

- TOT is terms of trade,
- EXCON is exchange control, which is proxied by tariff revenue from imports/total value of imports,
- EXCRE is excess credit proxied by the rate of growth of domestic credit less the lagged rate of growth of real GDP,
- INVGDP is the ratio of investment spending to GDP,
- DEH is the ratio of Government deficit to lagged high-powered money,
- GCGDP is the ratio of government consumption spending to real GDP,
- NOMDEV is nominal devaluation,
- PMRER is the parallel marker real exchange rate proxied by parallel market bilateral real exchange rates(PMBRER),
- CAPINF is capital inflows, which is the difference between total disbursement and total debt services.

1.6.4 The short run (Equilibrium) Real Exchange Rate Model

After establishing the long run equilibrium model the next step is modeling the short run equilibrium real exchange rate. This short run equilibrium real exchange rate shows the dynamic behavior of the real

exchange rate in the short run. In fact it is also called the short run error correction model.

Thus, the short run model that will be used in this paper is given as follow.

$$\Delta ERER = \alpha_0 + \alpha_1 \Delta TOT + \alpha_2 \Delta EXCON + \alpha \Delta_3 EXCRE + \alpha_4 \Delta INVGDP + \alpha_5 \Delta DEH + \alpha_6 \Delta GCGDP + \alpha \Delta_7 NOMDEV + \alpha_8 \Delta\ PMRER + \alpha_9 \Delta CAPINF + e_t \quad (10)$$

Where Δ represents the change of difference while other variables are as defined above.

1.7 Hypothesis

In doing this study the hypotheses that will be tested are the following:

a) Empirical evidences assert that in most developing countries the two alternative bilateral real exchange rates indices (BRER of PPP and BRER of Salter-Swan model) move closely together. Thus, the two alternative bilateral real exchange rate indices in Ethiopia move closely together.

b) The BRER and MRER indices move in opposite direction in Ethiopia after the exchange rate reform.

c) The movements of the three real exchange rates i.e. the two bilateral and the multilateral real exchange rates are fairly variable (or are not as such highly volatile) and they have significant long-term trends and stable.

1.8 Organization of the Study

The paper is organized in the following form: The first chapter discloses the issues to be investigated and the motivation of the study. As mentioned in this chapter, the motivation of the study is lack of enough empirical evidences on the topic after the economic reform, particularly the liberalization of foreign exchange market.

Conceptual, theoretical and empirical evidences are discussed in the second chapter. Under the conceptual framework, the measurement, determinants and equilibrium of real exchange rates are discussed. Pertaining to literatures, only some literatures that are highly related to the behavior of real exchange rates reviewed.

Chapter three deals with the exchange rate policy and economic reform in Ethiopia is covered. In this chapter, the rational for devaluation, the introduction of the auction system, the establishment of Forex Bureaus, and inter-bank foreign exchange market are discussed.

Chapter four presents the empirical results and interpretation of the coefficients in the long run and short run.

Conclusions and policy recommendations are presented in chapter five.

CHAPTER TWO

REVIEW OF THEORETICAL AND EMPERICAL LITREATURE

2.1 Review of Theoretical Literature

2.1.1 Measurements of Real Exchange Rates

The rational why RER is measured is in order to see its movement (behavior) there by to determine the country's competitiveness. For instance, RER is said to be appreciated when it declines and depreciated when it increases. Accordingly, an increase (depreciation) of RER makes the tradable sector of the economy more profitable causing resources to move from the non-tradable sector to tradable one. Hence, the depreciation of the RER shows an increase in the country's external competitiveness and a decrease (appreciation) in RER results the opposite result provided that the relative prices of goods in the rest of the world is constant in both cases.

But the crucial question is how can the RER be measured? In this section, the methods of RER measurements and the problems associated with each method are reviewed. The first problem related with the measurement of RER is choosing the price index. This is nothing but choosing the appropriate proxy for each price levels used in RER measurement. The second problem is related to choosing the appropriate exchange rate. The third problem is related to choosing the appropriate baskets and weighting of domestic and foreign goods for measurement of RER.

With regard to the first problem, different theories suggested different approaches. Purchasing Power Parity is the first theory that forwards its idea to solve the problem of choosing the appropriate proxy. According to this theory RER can be measured using the same CPI or WPI of home and foreign country, or using some components of CPI. This rationales to measurer RER using this method, according to PPP, are data on CPI are easily available, CPI is the correct measure of inter-country relative prices in the case of two countries, CPI makes

computation RER easy, CPI contains a broad group of goods including services, and a RER obtained using this method provide comprehensive measures of changes in competitiveness.

As a result of these, it is widely used in empirical studies on developed and developing countries. For instance World Bank staffs have made research on real exchange rate on (T.Wang, 2004, Krichene, 1998, X. Li, 2003) Even though, this method has these advantages, its drawbacks are (1) it fails to capture changes in the relative incentives guiding resource allocation across the tradable and non tradable sectors, (2) CPI is an imperfect measure of non-tradable prices (3) the index used includes large number of traded goods.

The second approach in measurement of RER is Salter-Swan or tradable –non-tradable approach. According to this approach RER is the ratio of the tradable and non-tradable goods. Since it is difficult to obtain the price of these goods, they are proxied by wholesale and consumer price index respectively. Some scholars accept this method of measuring RER because, according to them, (1) foreign countries' WPIs can be considered as fair proxies for the world price of tradable goods and the domestic CPI contains a very high proportion of non-tradable goods, thus, these indexes are more reasonable for the measurement of RER, (2) the same index can be computed for a large number of countries and (3) using WPIs, which contain mainly tradable goods, to compute the RER would solve some of the problem arising from CPIs. These propositions, however, have also been subject to criticism. The criticism forwarded against these propositions says that (1) WPIs contain highly homogeneous tradable goods whose prices tend to be equated across countries when expressed in a common currency, (2) there are considerably more variation in how WPIs series are constructed across countries than for the corresponding CPIs, (3) the RER computed using these indices will not vary enough to measure actual changes in competitiveness (Keynes, 1930; Officer, 1982 cited in Edwards, 1989), (4) variation in the RER can occur even if the law of one price holds for individual goods, if the weights on those two goods differ in the respective consumption basket, (5) using WPI may include a large component of imported intermediate goods, such that the resulting RERs are not a good measure of competitiveness,

(6) international comparisons based on WPIs (as well as other indices) may be distorted by the use of different weights across countries.

In spite of all these arguments, a more practical proposition to construct the RER index is using CPI or WPI to build the proxies for tradable goods and non-tradable goods. This is because these indices are available on monthly bases in every country. The problems with this proposition are (1) selecting which components are to be included as part of the price index, (2) selecting what weight to attach to each component of the proxies. These problems are insurmountable and their solution will basically require good judgment. For more purpose, however, it is advisable to stick to RER indices constructed from the traditional price indices because the cost of building these series is relatively low and cross country comparison can be made more easily (Edwards, 1989).

The second problem is related to identify which nominal exchange rate is most appropriate in measuring RER. Pertaining to determining the appropriate nominal exchange rates there are two different views. The first view says for industrial countries, the single nominal exchange rate which is used as official exchange rate truly represents the market price of foreign currency in that they have unified exchange rate and currencies that are freely convertible for current and capital transactions.

The second view says for developing countries, unlike industrial countries, the official exchange rate does not represent the market price of foreign currency because their currencies are not readily convertible for capital transaction even if they have unified exchange rate, which is more common. Moreover, these countries confront many problems, which are acute in developing countries application but not found in developed countries such as the prevalence of exchange control, parallel (black) foreign exchange market, substantial smuggling, unrecorded trade, and large shifts in the terms of trade, trade policy and trade partners (Hinkle and Montiel). These problems create complexity in measuring the RER in developing countries and also the RER obtained using official nominal exchange rate could be quite misleading to use as an economic indicator. Thus, deciding which of the two exchange rate, official nominal

exchange rate or parallel nominal exchange rate, is more relevant to measure a country's RER is not an easy task even though this depends on the situation in the country concerned. It may in some cases be desirable to use both these exchange rates for analytical purposes rather than trying to arrive at single unique measures of the external RER. In this regard, Jogenson and Paldam (1986) (cited in Hinkle and Nsengiyumva, 1999) argue that using an average of the parallel and official rate is usually much more stable and representative than either of the two rates separately

2.1.2 Types of Real Exchange Rates

Basically both PPP and Salter and Swan approaches use two methods of RER measurements. The first real exchange rate measurement is bilateral real exchange rate. This exchange rate is used when only two trading partner countries are considered. Note that the practical method of measuring BRER using these approaches is shown in section 1.6.1. BRER is not only the simplest and easiest to calculate the external RER indices[1] but also it serves to compare the price of a representative consumption or production basket of a foreign country measured in the same currency, it also indicates the relative value of the domestic and foreign currencies and useful both as a bilateral and as a more general indicator of the external RER in cases in which a country belongs to a currency bloc or has one dominant trading partner (Edwards, 1991) Moreover, BRER measures the competitiveness of a country with its trade partner. In other words, a decline in BRER index reflects an increase in the price or cost of domestic goods and services relative to foreign goods and services. This means that if BRER declines, the country's goods and services will be expensive in the trade partner country, and thus, it cannot be competitive. Nevertheless, it should be noted that bilateral movement could be misleading indicator of the overall decline in the dollar's value.

The second type of real exchange rate is multilateral RER (MRER). The multilateral RER is also commonly known as real effective exchange rate (REER). In order to compute REER, in practice, some sort of weighted, or

[1] The detail of external and internal exchange rates are discussed in Hinkle and Montiel, 1999 PP41-45

'effective' measure is used. By far the most common means of calculating an effective RER is to weight the currencies by trade weights. This simple statement hides a number of complications such as (1) does one use export weights, import weights or both? What does one do about third market-that is how does one measure RER when one wishes to measure relative prices between the home country and foreign goods in third foreign country?

Like the BRER, an increase or decrease in the value of MRER (REER) reflects real depreciation (appreciation) of the domestic currency. Moreover, these real exchange rates provide a measure of the degree of competitiveness of a country relative to a group of its trade partner. It should be noted, however, that in a world where the principal currencies are floating, multilateral real exchange rates could exhibit significant departures from bilateral real exchange rates (Edwards, 1991). Note that the practical method of measuring MRER (REER) using these approaches are shown in section 1.6.1

2.1.3 Determinants of Equilibrium Real Exchange Rates

Equilibrium real exchange rate (ERER) is determined by a number of variables such as government consumption, investment, terms of trade, capital inflow etc. These immediate determinates of ERER are called real exchange rate fundamentals here after called simply fundamentals (Edwards, 1989)

These fundamentals are generally categorized in to two groups: external fundamental and domestic fundamental. The domestic fundamental in turn can be divided into those variables that are directly affected by policy decisions and those that are independent of policy decisions.

In the empirical literature, however, researchers focus on fundamentals that are relevant to their particular solution. Edwards (1989), for instance, identified fundamentals that are domestic and susceptible to policy impact such as the composition of government expenditure, import tariffs, import quotas, export taxes, exchange and capital controls, and other taxes and subsidies.

Elbadawi and Soto (1995) also identified that the main determinants or fundamentals of RER in developing countries are terms of trade, the degree openness of an economy, capital flows and nominal exchange rate.

In this section, the most important fundamentals of ERER for developing are discussed below.

Terms of Trade (TOT): - is one of the determinants of RER that is given as a ratio of the relative price of a country's exports and imports as shown below.

TOT= Px/Pm

Where, TOT is terms of trade, Px is relative price of export and Pm is relative price import.

The impact of TOT on RER is analyzed mainly in two ways. The first analysis is traditional which says the deterioration of the TOT reduces the real income and results in a decline in the demand for non-tradable goods. In order to restore equilibrium the relative price of non-tradables has to decline that is there has to be an equilibrium real appreciation. The converse is true for equilibrium real depreciation (Edwards, 1991).

The second, view criticizes the traditional view by saying the income effect is only part of the story-and under some circumstances, not even the most important one. In order to understand the way, how TOT shocks affect the equilibrium RER, income and substitution effects, as well as inter-temporal ramifications, should be analyzed. According to this view, a decline in the TOT causes a reduction in real income, and therefore, a fall in demand and the relative price for non-tradable goods. However, the substitution effect of a TOT worsening is less straightforward. Again assuming non-tradable and tradable goods are substitutes, a TOT worsening will cause the non-trade price to decline relative to importable but rise relative to exportable, leaving ambiguous the change in the relative price of the non-tradable to the tradable as a whole. If we assume that the income effect dominates, we would expect a real depreciation in the response to a TOT worsening.

The problem of the recent view, however, is that when the effects of TOT are analyzed in such a way, the TOT impact on RER becomes ambiguous (Edwards,

1989, Elbadawi and Soto, 1995 and Baffs et al, 1999). This is because the direct income effect operating through the demand for non tradable may dominate the indirect substitution effect that operates through the supply of non-tradable.

Capital Flow: Capital flow affects the relative price of tradable to non-tradable and hence RER. Some economists like McKinnon (1976), Cordon (1981) and Harberger (1982,1983) have studied the impact of capital flow on RER assuming it is an exogenous action (Edwards, 1991). For example, if there is an exogenous capital inflow, it can increase the demand for non-tradable commodities, hence raising its price in the process. This would in turn appreciate the RER. Edwards (1989) in his study of 12 developing countries found that an increase in capital inflow appreciates the RER as expected.

Actually, capital flow is not necessarily exogenous rather it could be endogenous. In many cases capital flow tend to endogenous responding to a number of variables including interest rate differentials. According to Edwards (1991) liberalization of capital account has two effects on equilibrium RER. The first effect is a reduction of tax on foreign borrowing will result in an increase in the relative price on non-tradables or in equilibrium RER appreciation2. The intuition behind the real appreciation is the adjustment that takes place through an inter-temporal substitution effect, which operates via movements in the consumption rate of interest and income effect. In general, the reduction of tax on borrowing shall simultaneously: (a) increase the inflow of capital or foreign borrowing, (b) appreciate RER and (c) worsen the current account balance in the initial period. But in the next period, the appreciation or depreciation of RER depend on whether the inter-temporal substitution or the income effect dominates (Edwards, 1991).

Moreover, an increase in the interest earning on the foreign assets of the country (if the country is a net creditor) and an increase in the net capital flow of the country have the same effect on the equilibrium RER.

[2] Note that imposing capital control or restricting capital flow means imposing high tax on foreign borrowing that makes domestic interest rate lower than the world interest there by capital inflow is low.

Moreover since liberalization of capital flows could improve or worsen the capital account, depending on the interest rate differential between the domestic and the world economy prior to the liberalization (i.e. depending on whether the controls acted, on balance, to deter inflows and outflows). If the removal of such controls leads to a higher (lower) level of capital inflows, the ERER would appreciate or depreciate (Mongardini J., 1998).

Pertaining to the developing countries, in the last decade or so, the world has also witnessed unprecedented capital market opening in developing countries (Hnery, 1997a) Concurrent with this opening is a large flow of capital to developing economies. This shows that capital flows in developing countries are exogenous and do not necessarily have an origin on interest rate differentials. A common case is foreign aid where a poorer country can increase expenditure above income due to transfer made from abroad. Even if there is a view that says an inflow of capital increases the demand for non-tradable goods in the recipient country and thus leads to the real appreciation of exchange rate, in actual case, the impact of capital inflow on RER depends on the propensity to consume non-tradable goods in two consecutive periods and income elasticities of demand for home goods. If the propensities to consume in the two periods are different from zero capital inflow has no effect on equilibrium RER. On the other hand, if for some reasons, there is no inter-temporal substitution in consumption, the capital inflow will appreciate the RER in the initial period only.

Government Consumption: With regard to the effects of government consumption expenditure on RER, there are three views. The first view says that changes in the level of government expenditure will also affect RER movement. This is because government spending is composed of mainly non-tradable goods. An increase in government expenditure, therefore, will lead to a rise in demand for non-tradable goods. This is the substitution effect. However, the increase in government spending has to be financed through higher taxes (either current or future) leading to a decline of disposable income and a fall in demand for non-tradable goods. This is income effect. In most cases, the substitution effect will dominate, and the RER appreciates (Edwards, 1989).

According to the second view, the effect of government consumption spending on the RER, depends on whether such consumption is predominantly on traded goods or non-traded goods. In fact, here one has to ignore the tax distortion effect to make the discussion simple. If the government increases it's spending in non-tradable goods in the first period by financing these additional spending by loans, the equilibrium real exchange rate will be affected in two ways. During the first period, the demand increase entails a rise in the price of non-tradable goods and hence a RER appreciation. However, for the second period the state can increase taxes to pay for their debt, which reduces the available income, and then demand falls. This fall in demand leads to a decrease of the non-tradable goods price and hence to a RER depreciation. From this, it may be noted that it is impossible to tell a priori the effect of changes in government consumption of non-tradable on the equilibrium RER. The same situation will occur when the impact of changes in government consumption of tradable on the equilibrium real exchange rate is analyzed (Edwards 1989).

The third view states that higher government spending can lead to a more appreciated RER because they will likely produce a net increase in aggregate demand. The magnitude of the effect will depend on the offset coefficient between public and private savings. But even if there is a perfect offset, the different 'taste' between the public and private sectors can result in a shift in the demand for non-tradable goods and a consequent appreciation. As noted before, this government spending effect should appear with constant returns to scale, mostly in the short rum, where the capital stock is rather fixed.

Edwards (1989) estimated six econometric models of RER determination for developing countries and found out that an increase in government consumption appreciated the RER in four of the equations he estimated for a group of 12 developing countries, while in the other two equations (models), an increase in government consumption depreciated the RER.

In addition to all these Paiva C. (2001) states that higher government consumption will leads to an appreciation of the exchange rate (probably

reflecting a higher ratio of nontradables to tradables in the government consumption bundle vis-à-vis the private trade sector.

Domestic Investment: The effect of domestic investment on RER depends on whether an increase in investment changes the composition spending on tradable or non-tradable goods. If the increase of domestic investment rate entails a rise of the share of the non-tradable goods, this will lead to a RER appreciation (Edwards, 1989, Baffes et al, 1999).

On the contrary, if the relative share of tradable goods goes up, one will get RER depreciation. Baffes et al (1999) found that an increase of investment rate leads to a real exchange rate depreciation in Ivory Cost. Edwards (1989) also obtained the same result for a group of 12 developing countries.

Exchange rate control: Under conditions of generalized exchange controls and rationing, the RER indicies computed using official rates will become more and more irrelevant for a number of transactions-and in particular for imports, rather the parallel market premium will become higher as exchange controls become more pervasive and generalized and as fewer and fewer transaction are allowed through the official market. When there is a massive domestic credit creation under generalized exchange controls and active parallel market, the parallel RER and official RER indices move higher growth of domestic credit will simultaneously generate an appreciation of the official RER index and a depreciation of the parallel market RER (Edwards, 1991).

Nominal Devaluation: Nominal devaluation will have positive effect on the RER and lasting effect on the equilibrium RER if it is undertaken from a situation of RER misalignment and accompanied by "appropriate" macroeconomic policies. Moreover, it is neutral in the long run.

2.1.4 The Dynamic Behavior of Real Exchange Rate

RER behavior and economic growth are linked in two ways (Cottani et al, 1990): First, the RER is one link between policy and performance. Consequently,

policies aimed at stabilizing the RER around a realistic level may encourage growth via this mechanism. Large swings in RER are associated with greater uncertainty with respect to relative prices which, in turn, causeing greater risk and shorter investment horizons. This leads to high adjustment costs, as production moves back and forth from tradable to non-tradable sectors, and increased interest rate volatility owing to financial instability. RERMIS also lowers profitability in the industries in which relative prices are reduced and often takes the form of domestic currency overvaluation, thus hurting tradable activities. Second, both economic growth and the RER are influenced by policy which in turn increases the correlation between the variables without necessarily implying causality in one direction or the other policies that produce a stable environment and encourage a more efficient utilization of resources also lead to stable and well aligned RERs. It should be noted that, while the first link suggests that the RER is an immediate determinant of growth performance, the second link implies that RER behavior is a reflection of policies that have broader implications on performance than those directly associated with the RER.

i) Equilibrium Real Exchange Rate

The term 'equilibrium' is usually used to show the equality of two things. For instance, when the demand for a good/service equal to the supply of the same, it is said to be that there is equilibrium. This idea is applicable in the case of real exchange rate but with slightly different context. The real exchange rate is said to be at equilibrium when the actual real exchange rate equals the long run equilibrium value. Nevertheless, the converse does not hold true as it applies to goods market. Thus, the distinction between equilibrium and disequilibrium (misalignment) RER becomes the core of all empirical analysis of exchange rate behavior.

The equilibrium RER is defined as the relative price of tradable to non-tradable that result in the simultaneous attainment of equilibrium in the external sector (the tradable sector) and the internal sector (the non-tradable sector) of the economy (Edwards, 1989).

In other words, equilibrium RER refers to the theoretical RER that would have prevailed if the economy were simultaneously in internal and external balance. Internal balance refers to the economy operating at full employment and at full capacity output while external balance refers to a sustainable current account position given a country's desired capital position as a net lender or borrower.

The equilibrium RER is, however, not unambiguous concept in economic literatures and a large number of equilibrium exchange rate concepts have been proposed (see Montiel, P.J. 1999). Among these theories, theory of purchasing power parity (PPP), the behavioral equilibrium exchange rate (BEER) and the fundamental equilibrium exchange rate (FEER) are reviewed in this section.

According to PPP theory the equilibrium RER is constant because its equilibrium level is formed by looking at the value of the RER in some distant period that exhibited external equilibrium (Dornbush, 1982 cited by Edwards, 1989). Furthermore, this theory argued that recent co-integration and unit-root test econometrics models do not test for the proportionality and symmetry restrictions, and consequently do not even imply that the RER is stationary let alone be constant or unity. Thus, according to this theory, the policy implication and RER predictability are unattainable in this type of modeling (Elbadawi, 1997).

On contrary to PPP theory, Elbadawi (1994) argued that given co-integration[3], the basic equilibrium RER is adequate since it accounts the following desirable properties: (1) it is consistent with a behavioral model specifying the equilibrium RER towards looking function of the fundamentals, (2) it allows for flexible dynamic adjustments of the RER towards the equilibrium, (3) it allows for the influence in the short-to-medium run of macroeconomic and exchange rate policies on the RER, and (4) the stochastic nature of fundamentals allows the time-series decomposition in to permanent (sustainable) and transitory components and a relatively straight forward computation of the equilibrium.

[3] The idea of co-integration states that even though individual series may be non-stationary, there may exist a linear combination of the series that is stationary.

The more recent theory is the behavioral equilibrium real exchange rate (BEER). Clark and MacDonald develop this theory in 1999/00. This theory attempts to explain the actual behavior of the RER in terms of the relevant economic variables. BEER considers the dynamic aspect explicitly and attempts to explain the actual behavior of the RER in terms of the relevant economic variables (Nilson, 2002).

Fundamental equilibrium exchange rate (FEER) is another theory developed by Williamson (1983,1984). The terminology " fundamental equilibrium exchange rate " (FEER) was introduced by Williamson (1985) to designate the concept that the equilibrium exchange rate is driven by economic fundamentals and can therefore deviate substantially from the of PPP.

According to FEER concept, the equilibrium RER paths are based on the permanent historical time-series components of the fundamentals. The difference between the equilibrium RER and the FEER essentially relates to the normative concept of what is a "sustainable equilibrium" (Williamson, 1994 cited in Elbadawi, 1997).

In spite of these controversies and due to the fact that the existence of an equilibrium value of the RER does not mean that the actual RER has to be permanently equal to this equilibrium value, the actual RER will often depart from its equilibrium value. This deviation is called real exchange rate misalignment. Misalignment of RER is defined as the deviation of the actual RER from its long run equilibrium value (Haque and Montiel. 1999).

ii) Misalignment (Disequilibrium) Real Exchange Rate

Exchange rate misalignment may be defined as the deviation of the actual RER from its long run equilibrium value (Montiel. P.J.1999). Like equilibrium RER, exchange rate misalignment becomes an important concern for policy makers because correction of a real exchange rate misalignment (RERMIS) is widely acknowledged a one of the crucial conditions for improving economic performance and ensuring macroeconomic stability, a misallocation of resources,

and capital flight. As a consequence, macroeconomic disequilibrium whose correction generally entails both demand management policies as well as RER adjustments. In practice, however, RERMIS has come to be associated with overvaluation, particularly in the case of developing countries. It is widely acknowledged that such misalignments competitiveness by overpricing exporting. This would result in foreign exchange resources. This, in turn, ultimately lead to a sharp devaluation in the wake of an external balance of payment crises with the associated adverse impact on domestic prices and production.

The other effect of RERMIS is causing a misallocation of resources by distorting the prices of domestic goods relative to each other and to international prices. This would adversely affect domestic investment, causing losses to domestic production through reduced efficiency.

The third effect of RERMIS is affecting domestic financial market adversely by increasing uncertainty in financial market and by encouraging speculation against the domestic currency. If the overvaluation is sustained, many industries and banks may fail due to speculation. In the latter case, the government may have to bear costs to bail out the financial system.

Deviations from PPP can be viewed from two perspectives: traditional and efficient-market perspectives. The traditional perspective argues that there are three possibilities for the PPP deviations:

Shocks that have transitory effect. In such case, PPP deviations ε_t are serially-uncorrelated white noise.

Real shocks that have permanent effects on the current level of the RER, but the effects gradually die out. In this case, PPP deviations are persistent, but relative PPP holds in the long run. The RER thus displays mean reversion.

All previous real shocks have permanent effects on the current exchange rate level. In this case, ε_t is a non-stationary process, implying that relative PPP does not hold in the long run.

iii) Long run Equilibrium Real Exchange Rate

The long run equilibrium RER is defined as the ratio that, for sustainable values of other real variables such as trade, taxes, capital flows and technology, results in the simultaneous attainment of internal and external equilibrium. Edwards

(1989) also stated that the long run equilibrium RER is affected by real variables only that can be classified as internal and external fundamentals.

As far as determination of long run equilibrium concerns, there are at least four approaches. Out of these four approaches only two of them are here discussed briefly.

The first approach is the (relative) PPP-based approach. This approach is widely used by many economists (refer section 2.2.3.). With regard to the methodology Haque and Montiel (1999) said that an economist could use one of the following methodologies in order to compute long run equilibrium RER.

The analyst can simply adopt ex ante the traditional relative-PPP view on the determination of the long run equilibrium RER that essentially takes the long run equilibrium RER to be constant. The decision to apply this PPP approach in this case would be made without considering the data.

The analyst may view the long run equilibrium RER as being determined by a broad set of fundamentals, which may turnout ex post to be stationary in a time series sense for the specific country concerned. In this case the approach is adopted only after RER for the country concerned passes a stationary test.

Either of the above mentioned methods used the theoretical and empirical work on PPP has suggested that equilibrium RER may be estimated either using (i) a base year or (ii) long term trend value. When the analyst uses a base year method, he/she chooses or identifies a base period where the actual RER coincides with equilibrium-PPP value or transitory shocks are negligible. Thus, the actual RER in the base period represents the estimate of the equilibrium rate and the nominal exchange rate consistent with the long run equilibrium RER from that movement on can be calculated by simply adjusting the nominal exchange rate for the cumulative difference between domestic and foreign inflation. If the analyst uses method (ii) the stationarity of the RER forces the analysts to take position that its fundamental determinants are either individually stationary-that is, their "permanent" values have not changed during the samples period although the fundamentals may have been subject to transitory variations-

or that any non stationarity fundamentals must be co-integrated among themselves.

Like wise other theories, this has also its own advantages and limitations. Some of the advantages of the PPP-based approach are (i) it requires limited data, (ii) the methodology is simple and transparent, (iii) a number of multi-country statistical analysis of misalignment are also available for comparative purposes. On the other hand, the limitations of this method are (i) external data are used for all traded goods in lieu of the theoretically preferable external RER for traded goods as a result of lack of data on internationally traded goods, (ii) The PPP-based analysis relies on relatively, simple base-year or mean-trend estimates of the equilibrium RER. If there are permanent changes in fundamentals and hence in the equilibrium RER base period estimates of misalignment may no longer relevant and PPP analysis is of little help in determining the new equilibrium RER, and the last limitation is RER can be quite volatile-and coverage to the mean, is typically quite slow. Hence, the RER may diverge from a PPP-based equilibrium for longer periods, and it may be of little practical use for policy purposes.

iv) Short run Equilibrium Real Exchange Rate

In the short run, according to Edwards (1989) the RER may be affected by both real and nominal factors. Under predetermined nominal exchange rate regime inconsistent macroeconomic policies will generate, in the short run, RER misalignment. If the system is left on its own, the convergence of the actual to the equilibrium RER will usually take some time. The speed at which this convergence will actually take place will depend on the model's parameters, and on the extent of capital mobility.

2.1.5 Theory of Purchasing Power Parity

The theory of purchasing power parity (PPP) is one of the fundamental principles in international finance. It states that prices across countries should be equal when converted to a common currency (absolute PPP), or less strictly, the change in the exchange rate should be equal to the difference between the changes in the domestic and foreign price indices (relative PPP).

The purchasing power parity (PPP) theory, sometimes called the "inflation theory of exchange rates" can be traced back to the Salamanca school in 16th century in Spain, and to the writing of Gerrard de Malynes appearing in 1601 in England (Hoontrakul, 1999). In fact, David Ricardo first discussed the concept of PPP and latter Keynes appreciated it. The Swedish economist Gustav Cassel, however, first used the term "Purchasing Power Parity", in `1998. Cassel explained PPP in his book as follow:

> *" At every moment the real parity between two countries is represented by this quotient (inflation) between the purchasing power of the money in the one country and the other. I propose to call this parity the 'purchasing power parity'. As long as any thing like free movement of merchandise and a some what comprehensive trade between the two countries takes place, the actual rate of exchange can not deviate very much from this purchasing power parity" (Cassel, 1918 PP 413, Cited by Isard 1997).*

In the simplest version of PPP, the price level in one country is equal to the product of the price level in the other and the nominal exchange rate between their currencies. This theory has been consistently used as a base line assumption in both theoretical and empirical research on exchange rate.
According to Purchasing Power Parity (PPP) theory, RER is defined as the value of nominal exchange rate (E) corrected by the ratio of the foreign price (P*) to the domestic price (P) as shown below (Edwards, 1989).

$$e_{ppp}=E\ (P^*/P)\text{----------}(2.2.1)$$

These two prices are broad based price index such as CPIs of foreign and home country (Haque, N.U. and Montiel, P.J. 1999)1. The concept behind this definition is that CPIs of home and foreign country expresses each country's price situation that is inflation. Thus, defining RER using CPI along with the nominal exchange rate is appropriate. In fact, the arguments to and against are discussed in detail in the theoretical review part.

Basically, the corner stone of PPP is the ' law of one price' that states that the price of a homogeneous good is the same in all countries when expressed in common numerior in the absence of tariffs, quotas, and other trade barriers, trade arbitrage in goods markets.

Since PPP equates the prices of two homogenous goods in different countries, it is possible to say that PPP is in essence, the rate of currency conversion that equalizes domestic and foreign price levels (Lan, 2003). The mechanism behind PPP is the international (free) trade that makes the prices of two goods equal across countries when expressed in the same currency. Hence the theory of PPP is essentially a theory of internationally traded goods.

Many economists deal with PPP theory in relation to exchange rate in different contests. Frenkel (1978) said that PPP is a central building block in the monetary models of exchange rate determination (Ahking, 2003). Lan (2004) also enhanced this idea as follows:

> *" PPP is a theoretical equilibrium condition that connects the behavior ef exchange rates and prices in the long run" (Lan, 2004 p 10)*

Despite the fact that the theory has been known for centuries PPP remains as controversial as ever. During the past three decades, there have been heated debates about the validity of PPP and professional confidence in the theory has experienced considerable ups and downs.

[1] The advantages, disadvantages, and other ideas related to the measurement of RER are discussed in detail under measurement of RER.

First, practically PPP exchange rate does not hold most of the time due to differences in representative commodity bundles, transportation costs, tariffs and other business to trade, imperfect or incomplete market and imperfect information. For this argument, PPP theory responds that the exchange rate tendency to equate the ratio of price levels in the two countries, as defined above, ensures that the common currency prices of a standard basket of goods is everywhere the same so that there exists no arbitrage advantage to buying in one market over another. It also ensures that the real (exchange rate adjusted) purchasing power of both currencies is everywhere the same so that there exists no incentive to switches from one currency to another and both money are therefore willingly held. Thus, the PPP doctrine remains a useful tool even when real structural changes produce systematic disparities between exchange rate movements and changes in national price levels because it identifies divergent rate of price inflation as an important source of exchange rate movements and points out that this source could be eliminated if countries would pursue stable non-inflationary monetary policies.

Another argument against PPP theory is that the existence of transportation and other related costs, differential taxes and all other factors that derive a wedge between goods prices in different countries hinder PPP to perform well. This argument refutes the unnecessary of arbitrage in currency exchange explained by PPP theory. The absence of similar consumer preferences in different countries also makes the PPP theory unworkable.

2.1.6 The Theory of Mundell –Fleming or Aggregate Production Cost

The Mundell-Flemming (Keynesian) model is an open economy macroeconomic model used for industrial countries. This model main emphasis is to show how the policy mix affects the exchange rate, international trade competitiveness and aggregate economic activity.

The Mundell- Fleming (Keynesian) model is given as follows:

$$Y + IM = C + I + G + EX \qquad Y = C + S + T$$

$$S + T = I + G + NX \qquad NX = EX - IM$$

The model assumes that each country produces a single unique aggregate good (that is, its GDP), which it both consumes and exports. As the price of each country's good is determined by its cost of production, in the Mundell – Fleming model, the price index in the definition of RER is an out put price index or production cost in the economy, which is composed of exports and goods produced and sold domestically by a country (Nsengiyumva, F and Montiel, 1999).

Based on this, this theory constructs RER using the GDP deflators, which are available at much lower frequencies particularly in developing countries and defines as follow (Montiel, P.J.1999)

$$MFRER = E_{fc} \times P_{GDPd} / P_{GDPf} \text{---------- (2.4)}$$

Where MFRER is the Mundell-Fleming real exchange rate, E_{fc} is units of foreign exchange per units of domestic currency; P_{GDPd} and P_{GDPf} are, respectively, the domestic and foreign GDP deflators.

The concept of this theory lies on the assumption of the home country's GDP and exports are a single composite good whose prices are in parallel with the foreign country's GDP deflators. Similarly, the foreign currency price of import is assumed to move in parallel with the foreign country's GDP deflators (Montiel, P.J.1999).

The Mundell-Fleming version of the RER can also be viewed as measuring competitiveness in the aggregate production of all goods, both traded and non-traded.

This model assumes that export price deflator is equal to the home country's GDP deflator and the import price deflator is equal to the foreign country GDP deflator. This assumption makes that the RER and terms of trade are equal and endogenous (Ibid).

Thus, it is more appropriate for industrial countries as their trade is dominated by differentiated manufactured products, their terms of trade most of the time do not vary substantially and their (CPIs) and GDP deflators more largely in parallel (Ibid).

Like other theories, this theory also has faced counter arguments. The first argument against Mundell-Flemming theory is its concept of competitiveness is based on the domestic and foreign goods, which are not perfectly substitutable. According to this argument, for countries that produce a large share of standardized goods for their export this model does not work because their main problem is not how to produce at lower cost and to sell at lower price rather adequacy of domestic incentive to produce goods that are not greatly differentiated from other similar countries and to sell at similar prices. Due to this difference, this theory becomes seriously misleading in the presence of terms of trade changes.

The other counter argument is Mundell-Flemming model is less applicable for developing countries that rely heavily on exports of few primary products and whose terms of trade are exogenously determined. In developing countries export pries are volatile than the GDP deflator, and it is often desirable analytically to distinguish between the terms of trade and RER.

The limitation of Mundell-Flemming model is its production cost and price indexes (such as GDP deflator) include export prices but exclude the prices of import of final goods. Thus, the GDP deflator and the Mundell-Flemming RER may be heavily influenced by swing in the volatile prices of commodity exports and will tend to diverge from the CPI and PPP RER.

Mundell-Flemming model is not applicable to developing country where GDP deflator data are available on yearly bases. The model shows good result when high frequency data are used that is Mundell-Fleming model is suitable for GDP deflator available on quarterly or monthly bases. Moreover, GDP deflator cannot be taken as an ideal measure for international comparison among

developing countries as non-standardized methods are used for its computation in some low-income countries (Haque, N.U. and and Montiel, P.J. 1999).

2.1.7 Tradable Non tradable or the Salter-Swan Model

The modern economic interpretation of the real exchange rate owes much to the early work of Australian economist Salter (1959) and Swan (1960) (Sall and Ndiaye, 1997). These two economists developed the two goods RER for developing countries, which is useful to analyze theoretically the effects of macro economic policies, and productivity changes on the RER.

In their work these economists put the distinction between tradable and non-tradable goods in the context of open economy macro economic model.[1]

This theory defines RER as the ratio of the price of traded and non-traded goods or its inverse, which is given as follows (Edwards, 1989)[2]

$$RER \equiv e \equiv P^*_T / P_N \text{----------(2.2)}$$

Where P_T^* is the world price for traded goods and P_N is the (domestic) price of non-traded goods.

As it is difficult to calculate or obtain the price of traded and non-tradable goods, though they are useful for analytical purpose, the above RER definition (equation 2.2) is amended as follow.

$$RER \equiv e \equiv E\, P^*_T / P_N \text{----------(2.3)}$$

Where E is the nominal exchange rate, and P^*_T and P_N are as defined above.

This definition summarizes incentives that guide resource allocation across the tradable and non-tradable sectors. An increasing of e, which is depreciating of

[1] Tradable goods refer to exportable and importable where as non-tradable (home) goods refer to goods that are not traded internationally.

[2] In this case there are two points to be noted. The first is defining RER as indicated in equation 2.2 or its inverse is a matter of convention or tradition. For instance, in Latin America, there is a tradition of defining RER as equation 2.2 while others define RER as the inverse of the above equations. The second point to be noted is that the debate on whether the RER should be defined as equation 2.2 or its inverse. IMF has adopted the inverse while the Latin Americans used equation 2.2 (Edwards, 1989).

the domestic currency, will make tradable sector profitable and resources will move to tradable from non-tradable sector. On the other hand, a decline of (appreciating of the domestic currency) will make the tradable sector unprofitable because the domestic cost of producing tradable goods is increased. This represents deterioration the country's degree of international competitiveness if the relative prices in the rest of the world remain constant (Edwards, 1991). In other words, this approach is used as a measure of the competitiveness of tradable sector.

According to this theory, inflation, tariffs and non-tariff barriers result real exchange rate appreciation that reduces the competitiveness of tradable sector. On the contrary, trade liberalization most likely lead to real exchange rate depreciation, if a stable macro economic environment supports it.

The counter arguments for this theory are two. The first argument says the theory is conceptually not suitable for analyzing in the terms of trade and commercial policy because it does not distinguish between, imports and exports (Montiel, P.J. 1999). The second argument says this theory has difficulty to measure accurately because of lack of data for accurately dividing goods into tradable and non-tradable.

2.2 Review of Empirical Literature

Many economists have done empirical studies on RER behavior, determination and estimation of using different approaches to see the determinants impact on the RER and to forward policy recommendation in relation to macro economic adjustment, macro economic performance, dynamic behavior, etc with reference to developing countries. Some of them are briefly reviewed here below.

Atiqur Rahmana and Syed Abul Basherb (2001)[1], have done research on *'Real Exchange Rate Behavior and Exchange Rate Misalignments in Bangladesh'* using a single equation approach. Despite the limitation of this methodology, their research findings revealed that real exchange rate and the macroeconomic fundamentals affecting real exchange rate forms a co-integrating vector and also trade liberalization and increase in debt service burden results in a real depreciation of currency. Where as increase in capital inflow, improvement in terms of trade, and increase in government consumption of non-tradable results in a real appreciation of currency. Further their research findings reveal that nominal devaluation has been able to partly retain its effect to have a real devaluation in the short run and their currency was considerably overvalued until late 1980s. However, real exchange rate broadly was in equilibrium during the 1990s.

P.F Diamandis and G.P.Kouretas (1996) wrote an article on *'Exchange Rate Determination: Emperical Evidence for the Greek Drachma*[2]. These scholars have done their research using Johansen multivariate cointegration technique. From their research they found that the proportionality of the exchange rate to relative monetary aggregate is accepted for the bilateral real exchange rate of the Greek Drachma with respect to five currencies. More over they accept the hypothesis of the estimated

[1] Economists in North South University, Dhaka, Bangladesh and York University, Toronto, Canada respectively.
2 Economists in University of Crete, Greece.

coefficient display stability in recursive estimates while they reject the hypothesis of sample independency of the cointegration space in all cases.

John Baffes Ibrahim A. Elbadawi and Stephen A. O'connell (1997) in their research *'Single-Equation Estimation of the Equilibrium Real Exchange Rate'* they have tried to estimate the degree of exchange rate misalignment which was one of the most challenging empirical problems in open-economy. As they mentioned in their study the fundamental difficulty was that the unobservable character of equilibrium value of the real exchange rate despite the assertion of standard economic theories that the equilibrium real exchange rate is a function of observable macroeconomic variables, and that the actual real exchange rate approaches the equilibrium rate over time. These economists have used an econometric methodology for estimating both the equilibrium real exchange rate and the degree of misalignment using annual data from Côte d'Ivoire and Burkina Faso. Their empirical findings for Côte d'Ivoire and Burkina Faso are broadly consistent with the empirical literature on equilibrium real exchange rates in developing countries, and they line up well with estimates obtained by other methods. But they are not robust.

C. Pattichis, M. Maratheftis, and S. Zenios (2002)3 in their empirical research called *'Economic Fundamentals and the behavior of the real effective exchange rate of the Cyprus pound,* they investigate whether the real effective exchange rate of the Cyprus pound is misaligned by generating measures of the equilibrium rate. The approach is based on the idea that the equilibrium value of the real exchange rate is determined by economic fundamentals. Two measures of the equilibrium rate are estimated: one using the current values of the fundamentals and one using the long-run values of the same variables. The results show that there is no evidence of any serious misalignment.

[3] Economists in Lebanese American University and Cyprus International Institute of Management, Standard Chartered Bank, London, UK, and University of Cyprus, Nicosia, Cyprus respectively.

Yihui Lan (2003),in his paper called '*The long-term behavior of exchange rates'* found that the test he used results not only favor PPP, but also suggest a shorter half-life of deviations from parity than that previously reported in much of the literature. As PPP holds, there exists a long-run equilibrium value to which the actual exchange rate reverts, which we identify with the "equilibrium exchange rate" (EER).
E

Elbadawi and Soto (1995) were amongst the economists who have done study on the RER and macroeconomic adjustment in SSA and other developing countries. These economists found that only capital flow and FDI are co-integrated with the long-term equilibrium RER. These findings, indeed a free with the view that, if capital flows are determined to be genuinely Long-term, the change in RER is a true equilibrium phenomenon, and in this case no parry action will be required.

J.P. Joyce and L. Kamas(2003) evaluate the *'Real and Nominal Determinants of real Exchange Rates in Latin America: Short-Run Dynamics and Long-Run Equilibrium'* using cointegration analysis and found that terms of trade and productivity explain much of the variation in the real exchange rates. And also when nominal variables are included in the model, the nominal exchange rate accounts for most of the variation in the real exchange rates of all three countries.

Elbadawi & Soto (1997) in their research evaluate the effects of the volume of trade and they found a result that support trade liberalization requires more depreciated equilibrium RER. They also corporate the view that with out real depreciation, trade liberalization could be difficult to sustain (as in the case of Coted' Ivorie since the mid 1986-1994 devaluation). The effects of shocks of the terms of trade are, thus, locally ambiguous. But the result that there economists found in this regard implies that in developing countries substitution effect dominates income effect because the sign of the parameter is negative which contrary to the conventional result. In fact, there

authors have got positive sign to the terms of trade which is complies with the theoretical view.

Ghura and Grennes (1993) also have made study on RER and macro economic performance in SSA. These two scholars used pooled time series and cross section data for 33 countries in SSA. According to their study RER misalignment and economic performance have negative relationship. These authors conform that higher levels of misalignment are accompanied by higher levels of macroeconomic instability. Both lower levels of RER misalignment, and instability lead to better economic performance. Moreover, according to these authors, black market premium tend to show a greater degree of misalignment in RER than alternative measures (Ghura and Grennes)

The study done by Edwards (1991) indicated that RER measured using either official as parallel market nominal exchange rates did not behave according to the PP theory, Second, Edwards (1991) found that, using 12 developing nations, real and monetary factors have indeed affected RERs in the way predicated by the theory. In particular, these results show that, *cetirus-paribus*, "excessively" expansionary macroeconomic policies will result in RER on evaluation. These results also provide strong support for the view that equilibrium RER respond to real disturbances such as terms of trade shocks, and can exhibit significant movements through time. Moreover, the regression results show that for most fundamentals, it is important to make a distinction between temporary and permanent disturbances (Edwards, 1991).

As far as the context of Ethiopia, till now only two master theses and one paper are done. The first paper was done by Andualem Berhanu (1996) under the title of *'The Behavior and Dynamic of Real Exchange Rates'.* The second paper was done by Equar Desta (2001) under the title of *'The Determinants of Real Exchange Rates'.* Melese Minale (2001) also has done paper for NBE on the *'Determinants of The Equilibrium Real Exchange Rate'.*

Andualem Berhanu (1996) in his research he considered the period of 1960 to 1991 and analyzed the data using OLS. From his research he found that the behavior of the real exchange rate is unstable, some of the fundamentals considered in his study are statistically insignificant to determine the real exchange rate, and the real exchange rate of the 'Birr' has been misaligned.

Equar Desta (2001) has taken the period of 1985Q1 to 2000Q2 for his study and analyzed his data using VAR method. As he mentioned in his study he found that terms of trade, government consumptions, capital flow and import tariffs were the main determinants of real exchange rates in the long run while nominal devaluation and domestic credit have significant effect on the real exchange rate in the short-run. According to him, these findings indicate that trade and exchange rate liberalization would result real exchange rate depreciation that in turn boosts the country's export, improve the balance of payments of the country and improve the exchange rate stability.

Melese Minale (2001) in his part also evaluated the determinants of the equilibrium real exchange rates using VAR method and found that there exists unique cointegration relationship between the real exchange rate and its fundamentals. Moreover terms trade, exchange and trade control, and investment to GDP ratio were found statistically significant in the long run. However, in the short run terms of trade, investment to GGDP ratio, nominal devaluation, excess credit and the ratio of fiscal deficit to high powered money were statistically significant.

CHAPTER THREE

EXCHANGE RATE POLICY AND ECONOMIC REFORM IN ETHIOPIA

3.1 The Rational for Devaluation

Like many other developing countries, Ethiopia had followed a fixed pre determined nominal exchange rate pegged to the U.S. dollar since 1973 up to the massive devaluation of the 'Birr' introduced in October 1992. This fixed exchange rate policy stayed for two decades despite the floating of the major world currencies including the U.S. dollar.

As a result of this, the 'Birr' became overvalued against the world major currencies including the U.S. dollar. Scholars who did research in this regard confirmed this fact.

For instance, Asmerom Kidane (1994) concluded that the Ethiopian Birr was in a continuous appreciation when it was measured using whether nominal, real or parallel exchange rate indices. It was apparent that the prevalence of significant black-market premium for foreign exchange, and the higher real exchange rate as compared to the nominal exchange rate indicate that the 'Birr' was over valued.

This overvaluation results in imbalance on the trade and current accounts even if there was substantial amount of private transfers from abroad, commodity grant by NGO and there was significant amount of surplus on services (invisible trade). In order to cover the deficit the government had been obliged to borrow from domestic banks and external lenders. This in turn increases the debt burden and services. More over the fixed exchange rate policy creates severe external imbalance both in relation for foreign exchange requirements and aggregate expenditure. Besides to these, misalignment of real exchange rate was too high. After considering these problems and the appropriateness of the existed exchange

rate the Ethiopian government, at that time it was called Transitional Government of Ethiopia (TGE), had tried to assess whether there is a case for devaluation or not. According to the study done by Prime Minister's Office of the TGE, two causes or factors were identified for the balance of payment disequilibrium and real exchange rate misalignment. The balance of payment disequilibrium was the internal cause which was the result of the macroeconomic and sectoral policies pursued by the 'Derg' regime while real exchange rate was the external factor which was attributed to adverse terms of trade and price shocks of traded goods.

After identifying the problems the TGE decided to devaluate the currency to rescue the economy. But the question was which devaluation method should be followed. Actually devaluation can be made either with a unified or multiple exchange rates. In a unified exchange rate there is a single rate applied uniformly for all foreign exchange transactions of exports, impost, transfers, and capital flows. In a multiple exchange rate variable rates are used for different commodity groups of imports and exports, services (or invisible trade), transfers and capital flows. New export goods may be given a favorable exchange rate as a means of encouragement, while as unfavorable exchange rate may be used for imports of unessential goods to provide more space for imports of essential goods.

It is apparently known that multiple exchange rates for exports and imports alter the prices of traded goods and consequently the resource allocation and the pattern of consumption. However, there are two problems here. One problem is the reallocation of resources may entrench uncompetitive industries (and activities) and result in inefficient use of resources. The second problem is the desired pattern of consumption (of imports) may have an unintended effect of encouraging domestic production of unessential goods (whose relative prices have risen) rather than essential goods. Because of these problems multiple exchange rate devaluation could not be introduced.

When devaluation was introduced, it was predicted that the following outcomes would be attained.

1. Devaluation would stabilize the economy and economic growth would be attained,
2. Devaluation would narrow gap in the current account deficit by increasing the profitability of exports and making them more competitive and at the same time, the local currency cost of imports was expected to increase. This ultimately would eliminate, if not reduce, the balance of payment deficit.
3. Devaluation results inflation as the cost of production of agriculture and manufacturing would be increased as the result of devaluation.
4. Devaluation would enable bona fide exporters to offer a competitive price to the coffee producers.
5. Devaluation would reduce external imbalance, it would encourage the use of under-utilized labor or excess capacity.
6. Devaluation would improve the government budget by increasing the taxes revenue from import and export.
7. Devaluation would reduce or eliminate the parallel market premium, and improve efficiency in resource allocation.

After taking the above-mentioned ideas in to considerations, the TGE devalued the Ethiopian Birr from 2.07 ETB for one U.S. dollar to 5.00ETB for the same one U.S. dollar on October 1992.

3.2 The Introduction of the Auction System.

Following the devaluation of the Birr, TGE has introduced some measures that pave the way the exchange rate to be determined by market through National Bank of Ethiopia (NBE). On May 1, 1993 NBE introduced the retail auction market which be held ever fortnight. At this time, they country had two types of exchange rates. The rate obtained or determined through the auction was the one and the other was the

predetermined exchange rate which is the devaluation value. The former rate was called marginal rate while the latter was official rate. The official rate was applicable to import commodities which were classified as essential and for debt servicing where as the marginal rate was used to import any items by importers. Since the inception of the auction system, no shortage of forex supply has been observed and also the marginal rate was not as such highly volatile.

On July 25,1995 NBE announced that as the official and marginal are unified, there is neither official nor marginal rate rather single exchange rate which would be determined through auction. The reason for the introduction of this measure was that the government lifts the privilege or implicit subsidy given to the so called 'essential' items. Thus, the marginal rate became official rate. Since then, based on the auction result, this exchange rate has been applied for all imports. As the demand for forex increased, after a year stay, NBE declare that the auction would be weekly to satisfy the demand for forex. This action stayed up to September, 1998 only and replace by wholesale auction. This was the same as the retail auction system except the participant in this auction, unlike the retail auction where any eligible importers were allowed to participate, are pre determined. In the wholesale auction the participants were banks and investors who want forex above half a million. In fact in both types of auction the bid was held openly in the presence of bidders.

3.3 The Establishment of Forex Bureaus

In the process of liberalizing further the exchange rate and move towards a fully realistic exchange rate, in 1996 the NBE allowed the authorized commercial banks to establish their own foreign exchange permit desk and forex bureaus. These banks are allowed to issue foreign exchanges permit to importers and exporters against the submitted the required documents as specified by NBE, with the exception of coffee, and collect commission for NBE and for their own through the foreign exchange permit desk. Nevertheless, these banks are not allowed to give permit for the values of import and export exceeds U.S.D one million.

On the other hand, these banks are allowed to buy and sell forex through their forex bureaus. Actually the purchase of forex has no limit while sale forex is undertaken as per the limit set by NBE. The establishment of these bureaus could reduce the gap existed between the parallel market rate and the exchange rate offered by banks.

3.4 Inter-Bank Foreign Exchange Market

The above auction method could not satisfy the bank's demand for foreign currency as their customer, importers, request for foreign currency became beyond the amount of foreign currency they bought from NBE and NBE was unable to satisfy banks request due to shortage of foreign currency. On the other hand, some banks could accumulate excess foreign currency beyond their utilization capacity and the limit they allowed to hold in their safe/account In order to alleviate this problem, NBE through Directive No.IBD/01/98 allowed authorized commercial banks to buy and sell foreign exchange each other between weekly whole sale auctions. As this method could not resolve the above mentioned problem, the NBE again amend its directive and allowed banks to buy and sell foreign currency between them as they want by quoting buying and selling rate. In due course of performing this activity, each bank is expected to adhere with the code of conduct issued by NBE. This activity is still operational.

CHAPTER FOUR

The Behavior of Real Exchange Rate in Ethiopia From 1st Quarter of 1992 to 2nd Quarter of 2002

4.1 Some statistical and time series properties of the Real Exchange Rates of the Birr.

This section briefly deals with regarding the behavior of real exchange Rates of Birr using statistical and time series properties of the real exchange rates. The main reason for using statistical properties in this study is in order to evaluate formally the behavior of the five types of real exchange rates namely official bilateral real exchange rate I (OFFBRERI), official bilateral real exchange rate II (OFFBRERII), real effective exchange rate I (REERI), parallel market bilateral real exchange rate I (PMBRERI) and parallel market bilateral real exchange rate II (PMBRERII).

4.1.1 Coefficients of Correlations

Coefficient of correlation analysis is closely related but conceptually different from regression analysis, particularly from R^2. The primary objective of coefficient of correlation analysis is to measure thc strength or degree of linear association between two variables.

Therefore, the coefficients of correlations appeared in Table 4.1.1 below show the degree of linear association between the real exchange rates. This helps to compare formally the behavior of the five alternative real exchange rates.

Table 4.1.1 Correlation matrix of the real exchange rates of the 'Birr'

	OFFBRERI	OFFBRERII	REERI	PMBRERI	PMBRERII
OFFBRERI	1.000000	0.997118	0.823169	0.935130	0.938446
OFFBRERII	0.997118	1.000000	0.827749	0.928128	0.939610
REERI	0.823169	0.827749	1.000000	0.678150	0.695013
PMBRERI	0.935130	0.928128	0.678150	1.000000	0.994123
PMBRERII	0.938446	0.939610	0.695013	0.994123	1.000000

Source: own computation

From the above table one can clearly observes that each bilateral real exchange rate is highly positively correlated or have higher positive degree of association with the other bilateral real exchange rates. In other words, these bilateral real exchange rates move

closely together in the same direction. This implies that they, in Ethiopia context, have similar behavior.

Therefore, according to Edwards (1991), with construction of particular type of bilateral real exchange rate the selection of the price index i.e. CPI or WPI would not result practical problem. This means that since the above bilateral real exchange rates have similar behavior if any policy analyst or interested individual construct any type the above mentioned bilateral real exchange rate, using either PPP approach (using CPIs of U.S. and Ethiopia) or Salter-Swan approach (using WPI of U.S. and CPI of Ethiopia) he/she will arrive at similar conclusion pertaining to the behavior of real exchange rates. More over the strong correlation existed between the two official bilateral real exchange rates implies that as these exchange rates have similar behavior one can speak about the behavior of real effective exchange rate using one of the bilateral real exchange rate but with out constructing the real effective exchange rate. However, the correlation between real effective exchange rate and each parallel market bilateral real exchange rates is not as such strong as compared to the correlation existed between the real effective exchange rate and official bilateral real exchange rates. Thus, though they follow the same direction it is hardly possible to speak about the behavior of real exchange rate based on the parallel bilateral real exchange rate and vice versa.

4.1.2 Trend and Variability

Table 4.1.2 Trend coefficients of the real exchange rates of the 'Birr

Variable	Trend coefficient[1]
OFFBRERI	0.2260
OFFBRERII	0.2475
REERI	1.44550
PMBRERI	0.04154
PMBRERII	0.17072

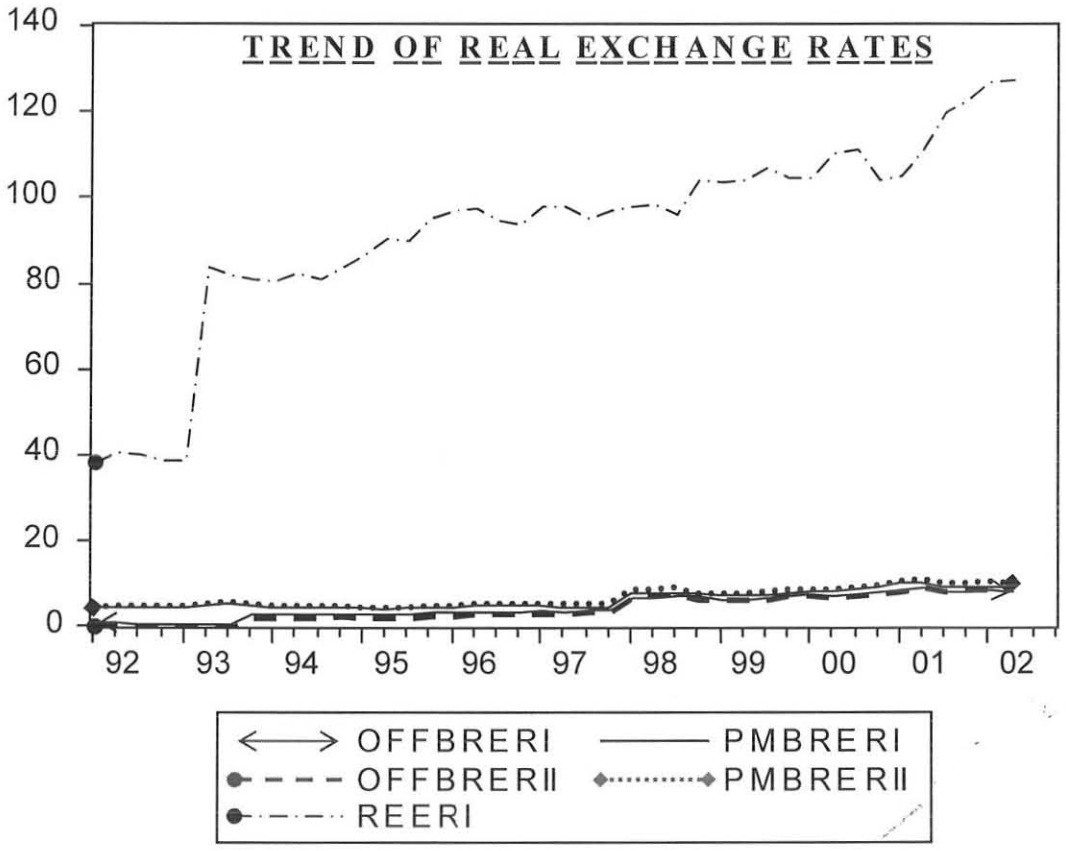
Source: own computation

Trend in general the movement of some thing, in this case the real exchange rates. As it is clearly seen in the above table, all types of real exchange rates have positive trend coefficients. This shows that each real exchange rate move upward by the magnitude of the coefficients appeared in the table. This implies that these real exchange rates are

[1] The trend coefficients are computed using the method of Averages as described by Hawking and Weber (1980) (Cited in Andualem B.1996).

depreciated continuously with out significant fluctuation. Infact, the deprecation magnitude of REERI is higher than the other types of real exchange rates.

Figure 1



The real exchange rates depicted in figure1 above have two important characteristics. First, they are fairly variable. Second, it appears that these exchange rates have had significant long-term trends during the whole periods and steady real exchange rate depreciation was observed in the whole period under consideration. This figure enhances the idea discussed above under the trend coefficients of these real exchange rates.

If the REERI is excluded and only the official and parallel market bilateral real exchange rates are graphed, one could clearly observe the true trends of these variables as shown in figure 2 next page. The graphs show that all the bilateral real exchange rates were highly depreciated during the first quarter of 1998 due to the fall of consumer price index (CPI) of the country at higher amount.

Figure 2

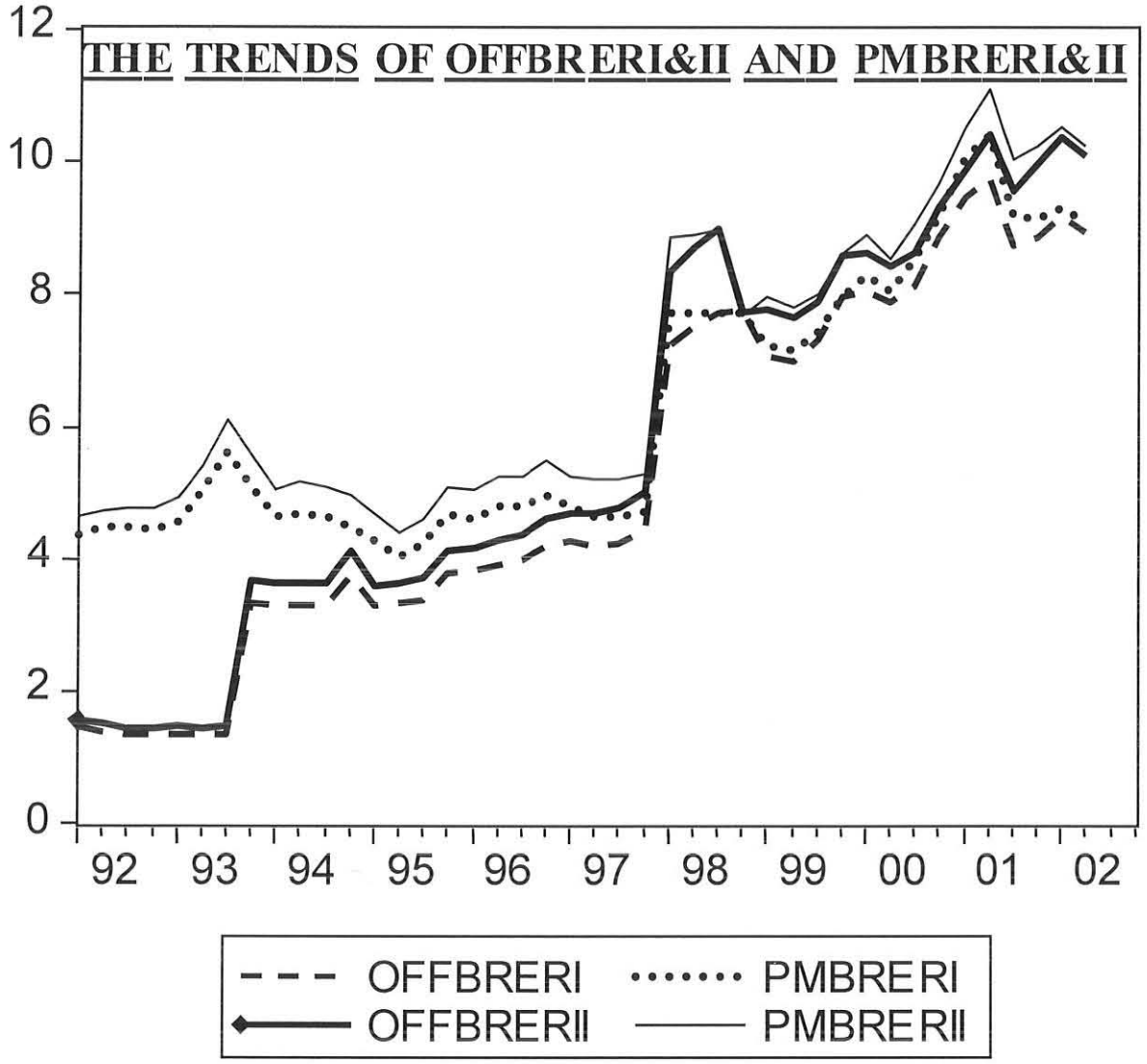


Table4.1.3 The statistical properties of real exchange rates (1992Q1 TO 2002Q2)

Variability Measurement	OFFBRERI	OFFBRERII	REERI	PMBRERI	PMBRERII
Mean	5.266667	5.748571	89.42857	6.284524	6.850000
Maximum	9.770000	10.430000	124.6000	10.41000	11.10000
Minimum	1.340000	1.440000	35.90000	4.040000	4.380000
Std. Dev.	2.769481	3.020504	22.88037	2.013767	2.193376
Coefficient of Variation	7.487408	8.906217	511.0468	3.958706	4.696352

Source: own computation

The other main statistical properties of the real effective exchange rates, nominal effective exchange rate and the two bilateral real exchange rates are the mean standard deviation, the coefficient variation and the range. These properties are shown in the

above table. As it is clearly indicated in the above table the variability of each bilateral real exchange rates are more or less came near each other in all measurements of variability. Nevertheless, the variability of REERI is much higher in every aspect as compared to the bilateral real exchange rates variability. This indicates that in addition to the positive trend as discussed above, the bilateral real exchange rates move with smaller variability which means in other words these exchange rates did not show any volatility. On contrary to these, the REERI showed significant variability in all measurements as compared to the bilateral real exchange rates though the variability is not negative.

These indicate that due to devaluation and the introduction of managed floating exchange rate system a) the real effective exchange rate had been significantly more volatile, and b) increase the exchange rate variability and affects the stability the real effective exchange rate.

In general, the steady real exchange rate depreciation may not only be due to the introduction of managed floating exchange rates and nominal devaluation but also due to the behavior of the US wholesale and consumer price index with the attached trade weights.

Many developing countries used the US dollar as the reference currency when formulating their nominal exchange rate policies. Thus, when the US dollar appreciates or depreciates with respect to other major industrial countries currencies it necessarily results in a real appreciation of their currencies. This effect is clearer when the small country has a fixed nominal rate with respect to the US dollar.

As Ethiopia is one of the small countries and its nominal rate varies in a very small amount with respect to the US dollar, the 'Birr' may depreciate continuously due to the depreciation of US dollar.

In general, the main findings of the analysis can be summarized as follows. First, all types of real exchange rates have exhibited significant long-run trends. Second, since the introduction of devaluation and other exchange rate determination methods, real exchange rate deprecation could be detected. Third, all types of real exchange rates are

not as such highly and frequently volatile throughout the periods under consideration except during the first quarter of 1998 but exhibit steady depreciation. Fourth, the degrees of all types of real exchange rates variability have not increased significantly except during the first quarter of 1998. Fifth, during the period under consideration, the official and parallel market bilateral real exchange rates moved in similar direction. Sixth, the difference between the official and parallel market bilateral real exchange rates, in other words, the premium had been gradually declining the introduction of devaluation and the premium approached to 0.1 since second quarter of 1998 which is highly insignificant.

The possible reasons for the continuous deprecation of real exchange rates and the decline of the gap between the official and parallel market real exchange rates were

a) Devaluation
b) Adoption of foreign exchange auction system
c) Opening of forex bureaus to be engaged in retail transactions
d) The banning of franco valuta
e) The strict control of NBE on the daily exchange rate fluctuation i.e. the daily inter-bank foreign exchange rate, and
f) Banks profit margin on the buying & selling price of foreign currency is very small.

Another reason for the stability of all types of real exchange rates movements is the economic agent of this market closely follow developments associated with exchange rate liberalization, supply of forex in the official market, negotiations with international financial institutions, particularly with the IMF. To put it succinctly, the supply and demand sides more or less had no significant problem that made volatile these real exchange rates. These are internal reasons. There are also external reasons which are related to foreign trade partners and the appreciation and/or depreciation of US dollar itself.

4.2 Mode Specification, Estimation and Results

In analyzing the determinants of the real exchange rate (RERs), the model developed by Edwards (1989, 1991) is used. The advantage of this model is that it allows for both real and nominal variables to play a role in the short rum determination of RER. The detail of model

specification is discussed in chapter one. However, prior to getting start to regression some procedures should be performed.

4.2.1 Stationary Test

The first procedure that should be performed is testing the stationarity of data. When one wants to construct an econometric model (or relationship) between economic variables using time series data on the variables he/she test the stationarity of each time series variable. If regression is made with out testing the stationarity of the time series data, the regression would be spurious, which is a series problem as discussed by Granger, 1974 and Phillips 1986 (cited in Harris, R. 2003) and Gujirati (1989). Moreover, as Stock and Watson (1989) discussed the usual test statistics (t, F, DW, and R^2) will not possess standard distribution if some of the variables in the model have unit root are non-stationary. Granger (1986) showed that any non-stationary time series could achieve stationarity if difference appropriately until it becomes stationary.

Based on the above mentioned theory the stationarity of each time series is tested as shown in table 4.3.1.1 below. To this end, Augmented Dickey-Fuller (ADF) test statistic is employed to test for the existence of unit root test. According to this test, real effective exchange rate, official bilateral real exchange rates, nominal effective exchange rate, terms of trade, investment to GDP ratio, and government consumption to GDP ratio seems to be I(1) while government deficit to high powered money ratio, exchange control, capital inflow, excess credit and nominal devaluation are found to be I(0).

Table 4.3.1.1 ADF Tests for Unit Roots
1st Quarter of 1992 to 2nd Quarter of 2002

Variable	Criteria	Tests on Level and lags			Tests on differences and lags			Integrated order
		0	1	2	0	1	2	
OFFBRER I	a	1.346	1.15	1.258	(5.573)	(4.201)	(3.537)	I(1)
	b	(0.7301)	(0.8451)	(0.8507)	(6.005)	(4.772)	(4.246)	
	c	(2.854)	(3.176)	(3.047)	(5.923)	(4.706)	(4.240)	
OFFBRER II	a	1.318	1.193	1.203	(5.762)	(4.072)	(4.029)	I(1)
	b	(0.700)	(0.785)	(0.821)	(6.198)	(4.600)	(4.913)	
	c	(3.097)	(3.372)	(3.522)	(6.109)	(4.526)	(4.837)	
PMBRERI	a	1.206	1.084	1.102	(4.563)	(3.052)	(3.048)	I(1)
	b	(0.731)	(0.764)	(0.842)	(6.088)	(4.400)	(4.713)	
	c	(2.803)	(3.471)	(3.623)	(6.408)	(4.724)	(4.952)	
PMBRERII	a	1.200	1.174	1.092	(5.563)	(3.004)	(4.147)	I(1)
	b	(0.721)	(0.665)	(0.822)	(6.6587)	(4.352)	(4.952)	

	c	(3.109)	(3.567)	(3.623)	(6.523)	(4.534)	(5.168)	
REER I	a	1.323	1.337	1.447	(6.250)	(4.544)	(3.534)	I(1)
	b	(1.896)	(1.994)	(2.326)	(6.713)	(5.170)	(4.321)	
	c	(1.896)	(2.890)	(3.174)	(6.715)	(5.262)	(4.553)	
NEER I	a	1.164	1.150	0.993	(6.053)	(3.892)	(3.251)	I(1)
	b	2.39	(2.669)	(3.109)	(6.503)	(4.359)	(3.827)	
	c	2.12	2.270	(2.720)	(6.887)	(4.951)	(4.747)	
ToT	a	(2.236)	(1.416)	(1.186)	(9.507)	(5.830)	(4.802)	I(1)
	b	(4.475)	(3.310)	(-3.315)	9.388	(5.755)	(3.612)	
	c	(4.547)	(3.333)	(-3.297)	(9.271)	(5.702)	(4.716)	
INVGDP	a	1.419	1.455	(1.461)	(6.245)	(3.870)	(2.980)	I(1)
	b	(1.834)	(2.068)	(2.549)	(6.663)	(4.370)	(3.572)	
	c	(2.238)	(2.432)	(2.809)	(6.597)	(4.355)	(3.627)	
GCGDP	a	1.097	1.116	(1.124)	(6.245)	(4.247)	(3.359)	I(1)
	b	(0.532)	(0.507)	(0.497)	(6.454)	(4.504)	(3.662)	
	c	(1.965)	(1.906)	(1.856)	6.409	(4.478)	(3.642)	
DEH	a	(4.777)	(3.558)	(2.307)	(9.120)	(8.148)	(13.840)	I(0)
	b	(6.588)	(6.063)	(4.59)	(9.003)	(8.038)	(13.640)	
	c	(6.667)	(6.245)	(4.902)	(8.870)	(7.917)	(13.550)	
EXCRED	a	(7.719)	(10.531)	(21.300)	(8.690)	(8.805)	(29.600)	I(0)
	b	(7.629)	(10.400)	(21.320)	(8.578)	(8.687)	(29.210)	
	c	(7.522)	(10.263)	(21.460)	(8.450)	(8.560)	(28.800)	
EXCON	a	(1.860)	(1.020)	(0.510)	(8.460)	(10.720)	(6.686)	I(0)
	b	(7.360)	(5.790)	(2.690)	(8.363)	(10.570)	(6.660)	
	c	(7.180)	(5.750)	(2.690)	(8.188)	(10.270)	(6.460)	
CAPINF	a	(8.610)	(6.670)	(5.260)	(11.510)	(10.780)	(8.320)	I(0)
	b	(8.520)	(6.890)	(5.170)	(11.360)	(10.650)	(8.200)	
	c	(8.410)	(6.780)	(5.080)	(11.220)	(10.660)	(8.240)	
NOMDEV	a	(6.130)	(3.940)	(3.300)	(11.240)	(7.060)	(5.870)	I(0)
	b	(6.590)	(4.410)	(3.860)	(11.090)	(6.960)	(5.790)	
	c	(6.920)	(4.850)	(4.590)	(10.950)	(6.870)	(5.710)	
Critical Values 1%	a	(2.620)	(2.621)	(2.623)	(2.621)	(2.623)	(2.624)	
	b	(3.597)	(3.602)	(3.607)	(3.602)	(3.607)	(3.612)	
	c	(3.597)	(3.602)	(3.607)	(3.602)	(3.607)	(3.612)	
5%	a	(1.949)	(1.494)	(1.950)	(1.949)	(1.950)	(1.950)	
	b	(2.934)	(2.936)	(2.938)	(2.936)	(2.938)	(2.940)	
	c	(3.597)	(3.602)	(3.607)	(2.936)	(2.938)	(2.940)	

Note:- a, b, and c represents without interrupt and trend, with interrupt, and with interrupt and trend respectively.
Source: own computation

As shown in the above table, testing for stationarity and the order of integration are completed, the next question is how to prove with the regression analysis. One possibility is to continue estimating the model using their first differences. But this procedure forces us to lose valuable long term information on the economic variables. Thus, the solution to this problem is to find out whether the variables are co integrated.

4.2.2 Co-integration Test

Time series variables are said to be co-integrated if their linear combination is found to be stationary. Harris (1995) explained the meaning of co-integration as follow.

> *" the economic interpretation of co integration is that if two or more series are linked to form an equilibrium relationship spanning the long run, then even though the series themselves may contain stochastic trends (i.e. be non-stationary) they will nevertheless move closely together overtime and the difference between them will be stable (i.e. stationary)" PP. 22)*

There are, accordingly, two major procedures to test for the existence of co-integration, namely, the Engle-Granger two steps procedure and the Johansen Maximum likelihood estimation procedure. Though the latter has own advantages if there are more than two variables and is considered as the proper way of treating co-integration analysis in recent economic analysis (see Harris 1995), I used the Engle-Granger procedure for the following reasons:

a) In the VAR system all variables are treated symmetrically, as opposed to the standard univariate models that usually have a clear interpretation in terms of exogenous and endogenous variables,

b) The other drawback of the VAR system is one has to model all the variables at the same time, which will be a problem if the relation for some variable is flawed. This may give bias in the whole system and one may have been better of conditioning on that variable,

c) Further, the multidimensional VAR model uses many degrees of freedom. Since the sample size used here is 42, which is small enough, using Johansen would result in rejection of the null hypothesis while it is true,

d) The VAR system well specified system and as a result of this it is sensitive for any variable change. Where as the Engle -Granger procedure assumes common factor restriction which produces super-consistent estimator of β for long run model and also consistent estimator of α for error correction model. Thus, weak exogeneity test is not required (Ericsson, N. R. and. McKinnon, J. G, 2000,. Sørensen, B E, 2005)

Engle and Granger (1987) used the following procedure to do cointegration test.
First they estimated the long run relationship using the ordinary least squares (OLS) as follows.

$$y_t=\beta x_t+\varepsilon_t \text{----------(a)}$$

This regression achieves a consistent estimate of the long run steady state relationship between the variables in the model and all dynamics and endogeniety issues can be ignored asymptotically. This arises because of what is termed the 'super-consistency' property of the OLS estimator when the series are cointegrated.

Then they advocated ADF tests of the following kind:

$$\Delta\acute{\varepsilon}_t=\psi\acute{\varepsilon}_{t-1}+\Sigma_{i=1}^{p-1}\psi_i\,\Delta\acute{\varepsilon}_{t-1}+\mu+\delta_t+\omega_t \quad \omega_t \sim IID(0,\sigma^2) \text{ ----------(b)}$$

Where the $\acute{\varepsilon}_t$ are obtained from estimating (a). The question of the inclusion of the trend and or terms in the test regression equation depends on whether a constant or trend term appears in (b).

The purpose of the co-integration test is to determine whether groups of non-stationary series are co-integrated or not. To test for the co-integration relationship, unit root test have been undertaken on the respective error terms and it is observed that three co-integration relationships are sensible. These co-integration relationships are those given by equations that appear in the tables attached as appendix. Some variables are not included in the long run regressions as they are insignificant.

Based on the results from these stationarity tests on the data the empirical short run dynamic adjustment model for the real exchange rates of the 'Birr' is, therefore, done. These short run counterparts of the co-integration relationships are given by equations that appear in the following section.

4.2.3 Estimation of the Model

a) LONG RUN RELATIONSHIP

The long run relationships of different real exchange rates are discussed as follow. However, prior to interpreting of the results obtained it is good to note tthree things that could not be addressed in this study. The first thing is the distinction between temporary and permanent changes. Theoretically such changes have different effects on real exchange rates and attention should be given to these changes when modeling real exchange rates. Nevertheless, such changes in the fundamentals i.e. the explanatory variables of the model are not considered here because of the difficulty of separating them.

An expectation of an economic agent on real exchange rates is one important factor that affect real exchange rate equilibrium path. This fact is not also considered in this study, as it is difficult to measure expectation at this level.

Despite the above-mentioned facts, the cointegration relationships derived out from the stationarity test results give meaning to the econometric results obtained. Thus, the following regressions results are interpreted in light of this view.

lnOFFBRERI=2.9367+0.2638lnCAPINF+0.5816lnGCGDP+1.5634lnINVGDP
t-statistic (1.8306) (2.0683) (1.8511) (6.9544)
P-Value = (0.0757) (0.0461) (0.0726) (0.0000)

-0.1105lnNOMDEV+0.0640lnTOT+0.7098PMBRERI
(-1.7830) (1.3503) (2.2725)
(0.0833) (0.1856) (0.0293)----------(4.1)

R^2 =0.955041 F-statistic=44.90940
Adj R^2 =0.935334 Prob (F-statistic)=0.0000
D.W. test=1.745996 Wald-test Chi-square df (5) 269.4564
Prob (Chi-square)=0.0000

lnOFFBRERII= 2.8404+0.2721lnCAPINF+0.5526lnGCGDP+1.5772lnINVGDP
t-statistic (1.8337) (2.1577) (1.8950) (6.8438)
P-Value = (0.0752) (0.0379) (0.0664) (0.0000)

-0.1114lnNOMDEV+0.0675lnTOT+0.7304lnPMBRERII
(-1.7920) (1.4395) (2.4748)
(0.0818) (0.1589) (0.0183)----------(4.2)

R^2 =0.9565 F-statistic=45.5606
Adj R^2 =0.9370 Prob (F-statistic)=0.0000
D.W. test=1.7255 Wald-test Chi-square df (5) 273.3635
Prob (Chi-square)=0.0000

lnREERI= 7.1980+0.3145lnGCGDP+1.3767lnINVGDP+0.1099 lnEXCRE
t-statistic(41.2273) (6.0399) (16.4327) (6.1031)
P-Value =(0.0000) (0.0000) (0.0000) (0.0000)

+0.0051lnNOMDEV+0.0111lnTOT
(0.2324) (0.6537)
(0.8175) (0.5175)----------(4.3)

R^2 =0.9368 F-statistic=106.7421
Adj. R^2 =0.9280 Prob. (F-statistic)=0.0000
D.W. test=1.5638 Wald-test Chi-square df(5) 533.7105

Prob (Chi-square)=0.0000

Technically speaking the coefficients of each variable that appeared in the above real exchange rates regressions are the cointegrating parameters. These coefficients represent the gravitational plane towards the actual planes that are constructed from the various combinations of the actual values of the explanatory and explained variables at different points of time.

The basic idea behind this technical interpretation is that the market force and government policies would cause the real exchange rates and fundamentals (the explanatory variables) to move along a certain fixed path called equilibrium path in the long run. This implies that the actual values of the fundamentals variables are the equilibrium as well as the fitted values of the various respective real exchange rates.

The above three regressions denote the results for the determination of OFFBRERI, OFFBRERII and REERI. As one can clearly sees, the R^2 of each regression is high enough which implies the dependent variable of each regression are well explained by the independent variables. Moreover, the F statistics and Wald test of each regression show that the two bilateral real exchange rate and the real exchange rate fundamentals are jointly significant in determining each real exchange rate which implies that there is no misspecification or the variables used in the model have impact on the dependent variable.

As far as the sign of the coefficients are concerned, INVGDP and TOT have got the expected positive signs while GCGDP have got unexpected positive signs. NOMDEV has got the unexpected negative sign for the two bilateral real exchange rates and expected positive sign for REERI. PMBRERI and PMBRERII have a positive sign which is the expected. Moreover almost all variables are significant in the two bilateral real exchange rates. With regard to REERI regression GCGDP, INVGDP and EXCRE are significant where as NOMDEV and TOT are not.

The magnitude of each significant variable on the dependent variable is explained as follows. If GCGDP increases, say, by 10%, then it is clear that the real exchange rates

will depreciate by the amount appeared in each regression. However, it is impossible to say that government expenditure is on tradable or non-tradable goods and state the actual effect. The possible reason for this could be, though it is difficult to get data on the composition of this variable, government may reduce its expenditure on non-tradable goods or follows contractionary fiscal policy.

As the coefficient of the ratio of investment to GDP (INVGDP) has got positive sign, if investment increases by 10%, the real exchange rates will depreciate by the amount given in each regression. This indicates that the investment policy has long run effect on the real exchange rates.

With regard to nominal devaluation (NOMDEV), the magnitude of this variable is very high as for REERI. This shows that the power of NOMDEV to appreciation and depreciation is high. If NOMDEV increases by 10%, the bilateral real exchange rates will appreciate by the amount appeared in their regressions and real effective exchange rate will depreciate by the given amount appeared in the REERI regression though it is statistically insignificant. This implies that the devaluation would achieve the desired goal in the long run.

EXCRE is another significant variable in the REERI regression. If EXCRE increases by 10% the REERI will depreciate by the amount appeared in the regression. This indicates that the government is pursuing non-expansionary monetary policy.

With regard to the PMBRER I& II, both are significant in the two bilateral real exchange rate regressions. As discussed in the statistical analysis section these variables have similar behavior and they are highly correlated. Hence, the PMBRERI & II can explain the OOFBRERI &II respectively. In other words, according to the statistical analysis result, we can say that any one can express the behavior of the OFFBRERI &II just by looking at the behavior of PMBRERI&II. This fact is also ascertained in the above regressions. If PMBRER I &II increases by 10%, OFFBRERI& II will be affected positively by the amount appeared in the regressions. This implies that the foreign exchange liberalization and devaluation narrow the gap existed between the official and parallel market exchange rate and enable one variable

to explain the other. In this regard it can be said that the foreign exchange liberalization and devaluation brings the desired result.

b) SHORT-RUN RELATIONSHIP

After short analysis of the long run relationship exists between real exchange rates and fundamentals the next step is estimating the error correction term to see the short run relationship or short run dynamic of the relationship. The error correction term of each regression is shown below.

ΔlnOFFBRERI=0.0158+0.0405ΔlnCAPINF-0.0294ΔlnDEH+0.0708ΔlnEXCON

t-statistic	(2.3713)	(2.1561)	(-3.2435)	(2.7707)
P-Value =	(0.0239)	(0.0387)	(0.0028)	(0.0092)

+0.0011 ΔlnNOMDEV+0.2063ΔlnPMBRERI-0.0396ECM01(-1)

(0.1394)	(2.8947)	(-2.1926)
(0.8900)	(0.0068)	(0.0318) ----- (4.4)

R^2 =0.7386 F-statistic =14.1667

Adj. R^2 =0.6333

D.W. test=2.3619 Prob (F-statistic)= 0.0000

ΔlnOFFBRERII= 0.0449+0.2873ΔlnCAPINF-0.0327ΔlnDEH+0.2934ΔlnEXCON

t-statistic	(2.2824)	(5.2322)	(-1.2344)	(3.9219)
P-Value =	(0.0292)	(0.0000)	(0.2260)	(0.0004)

-0.0197ΔlnNOMDEV+0.6709ΔlnPMBRERII-0.4101ECM02(-1)------(4.5)

(-1.4716)	(3.2730)	(-4.2073)
(-0.8165)	(0.0026)	(0.0002)

R^2 =0.6924 F-statistic=7.7511

Adj. R^2 =0.6160 Prob (F-statistic)= 0.0000

D.W. test=1.9323

ΔlnREERI=0.0135+0.3452ΔlnGCGDP+0.6429ΔlnINVGDP+0.0868ΔlnEXCRE

t-statistic	(1.0950)	(2.1056)	(3.4316)	(7.0726)
P-Value	(0.2812)	(0.0427)	(0.0016)	(0.0000)

+0.0126ΔlnNOMDEV -0.0211ΔLNTOT-0.8604ECM03(-1)

(0.9028)	(-1.5450)	(-5.6914)
(0.3730)	(0.1310)	(0.0000)----------(4.6)

R^2 =0.7420 F-statistic=16.2941

Adj. R^2 =0.6964 Prob. (F-statistic)=0.0000

D.W. test=1.5972

The above short run regressions show that some variables that have long run effect for all real exchange rates do not have effect for short run. Those variables that are significant imply that they have effect in the short run. The coefficients of the explanatory variables, particularly the significant variables, are interpreted as the short – run dynamic adjustment parameters.

A crucial parameters in the estimation of the short run dynamic models is the coefficient of the error correction term which measures the speed of adjustment of the real exchange rates to their equilibrium level. The adjustment speed estimated for the short run of REERI is near to 0.9 which indicates that the adjustment is very fast.

In the two bilateral real exchange rate (OFFBRERI &II) regressions, equation 4.4 and 4.5 CAPINF, EXCON and PMBRERs are significant in the short run. This implies that polices issued related to capital account liberalization and other forms of policies that increase the capital inflow would affect the OFFBRERI &II in the short run. Moreover policies issued related to exchange control would have immediate effect on the two bilateral real exchange rates. Any fluctuation occurs in the parallel market of foreign exchange would highly affect the official bilateral real exchange rate in the short run.

In the REERI regressions (equation 4.6) only TOT has negative coefficient which implies that if TOT increases by 10% the REERI will appreciate by the amount appear in the regression. In other words, the negative coefficient of TOT indicates that this explanatory variable shows a fall in movement away from its correct value as the real exchange rate begins to drift away from its equilibrium value. This is to adjust the disequilibrium movement of the real exchange rate. On the other hand, other explanatory variables have positive signs which imply that if any one of them increases by 10%, then REERI will depreciate by the amount appeared in the regression. This indicates the effectiveness of the government policies applied after the economic reform, particularly EXCRE. This situation can be explained as follows. A positive coefficient shows that the respective explanatory variable increases in its movement away from its correct value as the real exchange rate begins to drift away from the equilibrium path.

To summarize, even if some variables that were considered important becomes unsatisfactory in the long run and short run regressions, in general the models are useful as their joint significance levels as measured by the F-statistic has got policy implications. Also the importance of all explanatory variables in the determination of the long run bilateral real exchange rates and GCGDP, INVGDP and EXCRE in the determination of the long run real effective exchange rate should be given due attention as they are directly related with government policies. Moreover variable CAPINF, DEH, EXCON and PMBRERs, and GCGDP, INVGDP, TOT and EXCRE should get due attention as they are important in the determination of the short run OFFBREREI&II and REERI. **REERI is the main concept that this study focuses.**

4.2.4 MISALIGNMENT OF THE REAL EXCHANGE RATE OF THE 'BIRR'

Misalignment of the real exchange rate is generally defined as s sustainable departure of the actual real exchange rates from its equilibrium value. The actual real exchange rate is given in the appendix. However, the fitted values of the three real exchange rates indexes should be taken with great care from the respective models reported above as proxies of the respective equilibrium real exchange rate indexes.

In light of this view, the differences between the actual real exchange rate and the respective fitted values from regression equation give the estimated levels of misalignment. The estimated levels of misalignment for the three real exchange rates are given in the following figures.

Figure 3

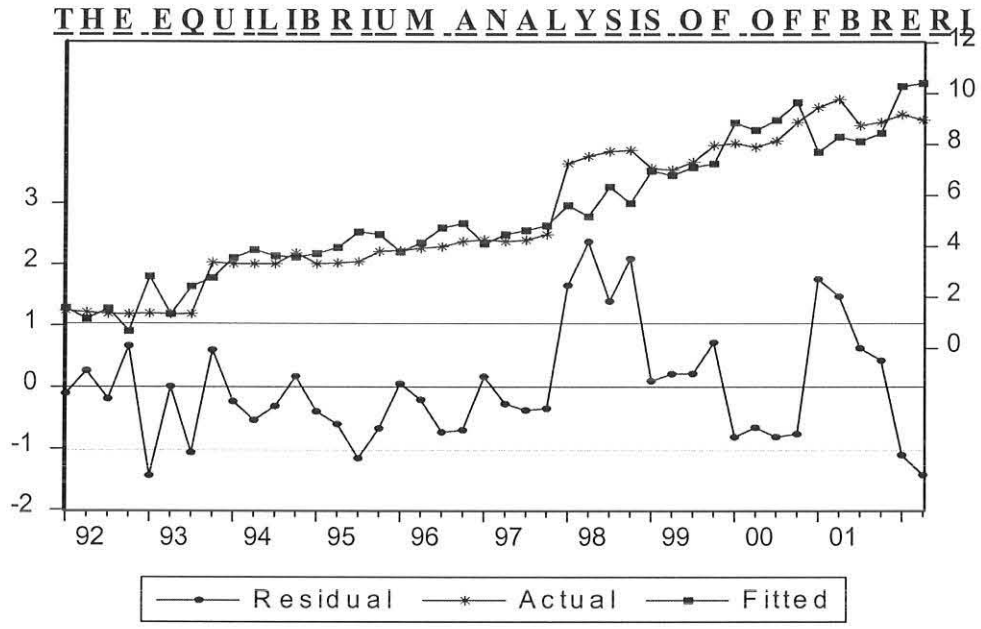


Figure 4

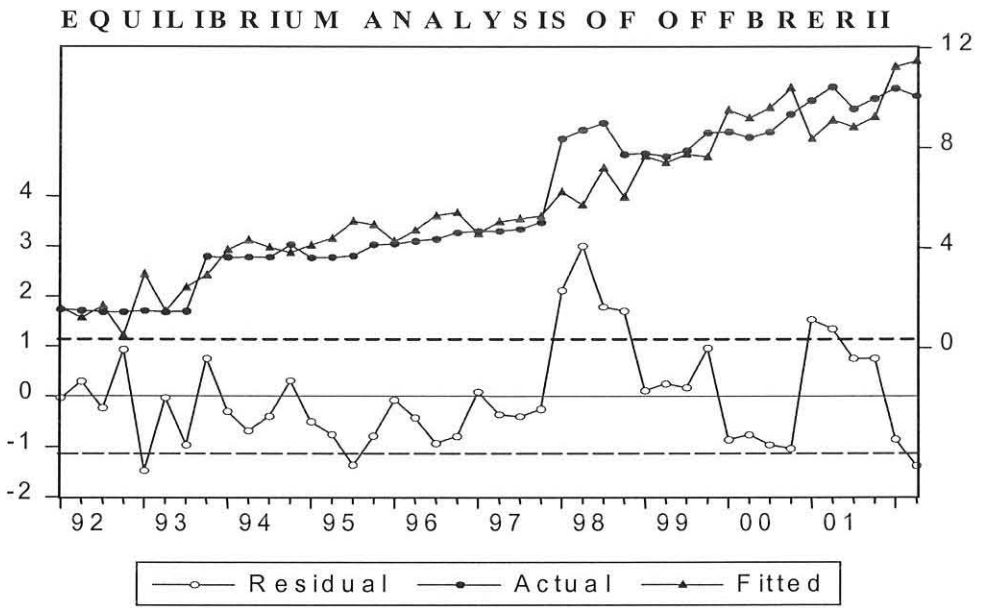
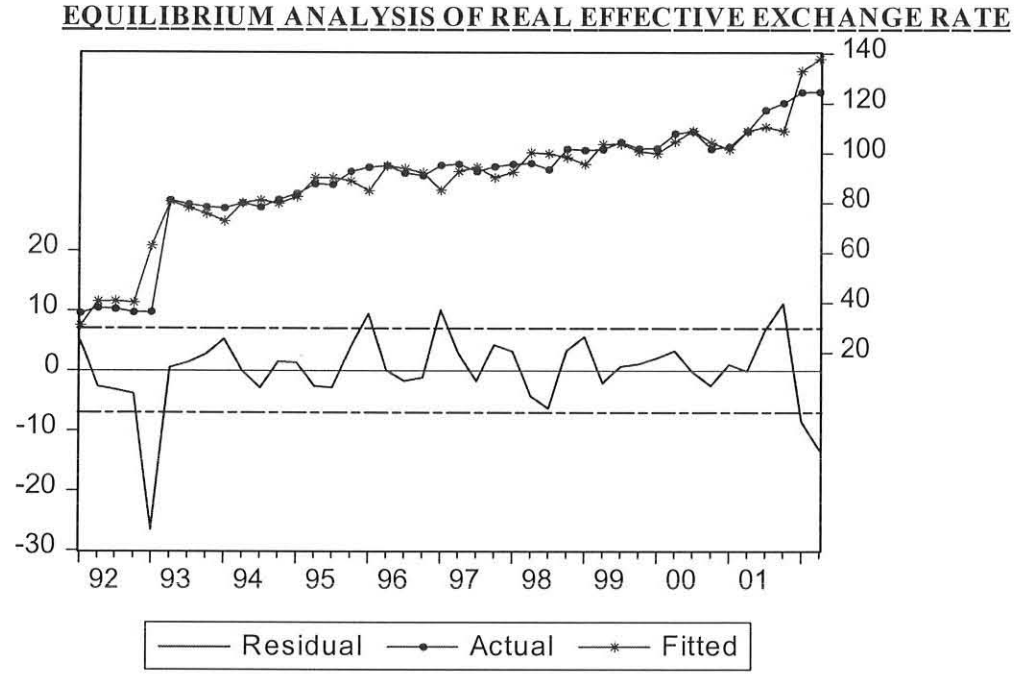


Figure 5



As one sees the above graphs, he/she can observe that misalignment of the real exchange rates is very minimal and it can be said that the equilibrium is attained. This shows that devaluation and the liberalization of foreign exchange market along with different real exchange rate determination methods introduced could bring the desired result. The positive side of reducing misalignments is alleviating the severe losses of welfare and efficiency in economy that could be resulted from misalignment.

CHAPTER FIVE

CONCLUSION AND POLICY RECOMMENDATION

5.1 CONCLUSIONS

The main aim of this study has been to examine the behavior and dynamics of the real exchange rate of the 'Birr' after the devaluation and liberalization of the foreign exchange market and to assess the measures that have been taken to align the real exchange rate.

In order to achieve the stated aim of the study descriptive statistical method, the Engle-Granger cointegration test method and OLS regression analysis are used and the results, in general, indicate that devaluation and foreign exchange market liberalization could result in the desired goals.

Specifically the following conclusions are drawn from the study.

1. The two bilateral real exchange rates are moving together smoothly, and no fluctuation is observed. The real effective exchange rate is also moving up ward without any significant fluctuation.
2. The two bilateral real exchange rates have smaller variability. But REERI has higher variability which requires due attention by policy makers.
3. The non-stationarity of the three real exchange rates and some of the fundamentals at level but not at first difference implies that there is cointegration between each real exchange rate and their fundamentals.
4. Both the cointegration and error correction regressions show that some of the fundamentals are individually statistically insignificant while they are jointly significant.
5. The correlation coefficients of all types of real exchange rates indicate that policy makers will not face problems whichever real exchange rate they use for policy formulation.
6. The correlation coefficients of the parallel and the official real exchange rates indicate that both types of exchange rates are moving not only in the same direction but also they are highly correlated. Moreover, the variability of these

two types of real exchange rates is very small. This implies that the price of foreign currency at the black market and at the banks is nearly equal. Thus, the premium becomes negligible. This is a positive result of devaluation and the introduction of new foreign exchange policies.

5.2 POLICY RECOMMENDATIONS

On the basis of the research of this study, the following policy recommendations can be forwarded in order to formulate and execute polices in relation to the exchange rates, and improve the level of international competitiveness of the country.

1) As discussed earlier, when capital inflow increases, the country's exchange rate behavior will not only be stable but also it will not have foreign currency constraint which in turn will reduce the appreciation of its currency if not increase the depreciation further. If the country's currency is not as such appreciated it will be competitive in the international market for products that it exports and also imports will not be cheap which again forces the population to use the domestic products which again helps to save foreign currency. This was the main reason that the Ethiopian government has introduced new investment policy and amends it many times to attract foreign investors. Despite the effort made as indicated in the econometric regression the role of this variable in the determination of real exchange rate becomes almost nil. Thus, the investment policy should be further modified in a way that attracts foreign investors and foreign currency and the country should establish good relationships with countries and institutions that give aid, grant and loan.

2) Devaluation is one of the foreign exchange policy reform package introduced to reduce the misalignment of real exchange rates and improve the deteriorated terms of trade. This measure resulted in negative effect for bilateral real exchange rates and also it can not be effective for REERI that contains the real exchange rates of trade partner countries. One possible reason for this is, though it is said that the foreign exchange rate is determined by market, the NBE already controls the ceiling and floor of the daily exchange rate market.

For instance, the daily exchange rate of dollar moves up by 0.001cents only since banks are allowed to buy and sell foreign exchanges among them. The other currencies exchange rates are computed and fluctuated in accordance with the movement of the US dollar and hence their fluctuations do not truly reflect the international price of each foreign currency. This indicates that the foreign exchange market should be further liberalized and the exchange rate should move freely.

3) Even if TOT has positive relationship with real exchange rates, it has become an insignificant factor in the determination of real exchange rates. Therefore, the government, in addition to further liberalizing the foreign exchange market, should encourage investors to be engaged in the production of exportable goods because since the sign of TOT is positive, the increase in exportable items will further depreciate the real exchange rate that will again make the country competitive in the international market.

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Appendix I.a
COINTEGRATING REGRESSION

Dependent Variable: OFFBRERI				
Method: Least Squares				
Date: 06/04/05 Time: 09:46				
Sample (adjusted): 1992Q1 2002Q2				
Included observations: 42 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-7.477384	1.610443	-4.643060	0.0001
CAPINF	0.005315	0.002878	1.846561	0.0738
DEH	-1.994436	1.776971	-1.122380	0.2698
EXCON	1.962921	3.694089	0.531368	0.5987
EXCRE	0.008186	0.009044	0.905188	0.3719
GCGDP	38.47719	4.104871	9.373545	0.0000
INVGDP	41.95559	7.325901	5.727021	0.0000
NOMDEV	-0.040119	0.017038	-2.354668	0.0246
TOT	0.008413	0.029842	0.281912	0.7798
R-squared	0.888182	Mean dependent var		5.266667
Adjusted R-squared	0.861075	S.D. dependent var		2.769481
S.E. of regression	1.032259	Akaike info criterion		3.088786
Sum squared resid	35.16344	Schwarz criterion		3.461144
Log likelihood	-55.86450	F-statistic		32.76540
Durbin-Watson stat	1.070713	Prob(F-statistic)		0.000000

Source: own computation

Appendix.I.b

UNIT ROOT TEST FOR RESIDUAL OF OFFBRERI

Null Hypothesis: RESID-OFFBRERI has a unit root				
Exogenous: None				
Lag Length: 1 (Fixed)				
			t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic			**-2.796883**	**0.0063**
Test critical values:	1% level		-2.624057	
	5% level		-1.949319	
	10% level		-1.611711	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(RESID-OFFBRERI)				
Method: Least Squares				
Date: 06/04/05 Time: 09:49				
Sample (adjusted): 1992Q3 2002Q2				
Included observations: 40 after adjustments				

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
RESID-OFFBRERI(-1)	-0.498530	0.178245	-2.796883	0.0081
D(RESID-OFFBRERI(-1))	-0.065250	0.167339	-0.389928	0.6988
R-squared	0.255633	Mean dependent var		-0.042489
Adjusted R-squared	0.236045	S.D. dependent var		0.979832
S.E. of regression	0.856418	Akaike info criterion		2.576590
Sum squared resid	27.87116	Schwarz criterion		2.661034
Log likelihood	-49.53180	Durbin-Watson stat		1.922290

Source: own computation

Appendix II.a

COINTEGRATING REGRESSION

Dependent Variable: OFFBRERII				
Method: Least Squares				
Date: 06/04/05 Time: 10:32				
Sample (adjusted): 1992Q1 2002Q2				
Included observations: 42 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8.517806	1.776882	-4.793682	0.0000
CAPINF	0.006783	0.003176	2.135897	0.0402
DEH	-1.703112	1.960620	-0.868660	0.3913
EXCON	2.531209	4.075871	0.621023	0.5389
EXCRE	0.010372	0.009978	1.039427	0.3062
GCGDP	40.53895	4.529107	8.950761	0.0000
INVGDP	48.95369	8.083029	6.056355	0.0000
NOMDEV	-0.046308	0.018799	-2.463352	0.0191
TOT	0.013061	0.032927	0.396664	0.6942
R-squared	0.885561	Mean dependent var		5.748571
Adjusted R-squared	0.857818	S.D. dependent var		3.020504
S.E. of regression	1.138942	Akaike info criterion		3.285487
Sum squared resid	42.80727	Schwarz criterion		3.657845
Log likelihood	-59.99522	F-statistic		31.92033
Durbin-Watson stat	1.006818	Prob(F-statistic)		0.000000

Source: own computation

Appendix II. b

UNIT ROOT TEST FOR RESIDUAL OF OFFBRERII

Null Hypothesis: RESID02 has a unit root				
Exogenous: None				
Lag Length: 1 (Fixed)				
			t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic			-2.858126	0.0054
Test critical values:	1% level		-2.624057	
	5% level		-1.949319	
	10% level		-1.611711	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(RESID02)				
Method: Least Squares				
Date: 06/04/05 Time: 10:34				
Sample (adjusted): 1992Q3 2002Q2				
Included observations: 40 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID02(-1)	-0.485037	0.169705	-2.858126	0.0069
D(RESID02(-1))	-0.034305	0.165792	-0.206918	0.8372
R-squared	0.240440	Mean dependent var		-0.042173
Adjusted R-squared	0.220452	S.D. dependent var		1.049043
S.E. of regression	0.926221	Akaike info criterion		2.733299
Sum squared resid	32.59966	Schwarz criterion		2.817743
Log likelihood	-52.66599	Durbin-Watson stat		1.940337

Source: own computation

Appendix III.a

COINTEGRATING REGRESSION

Dependent Variable: REERI				
Method: Least Squares				
Date: 06/04/05 Time: 10:45				
Sample (adjusted): 1992Q1 2002Q2				
Included observations: 42 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-35.99733	10.93994	-3.290450	0.0024
CAPINF	-0.011051	0.019554	-0.565155	0.5758
DEH	9.194646	12.07118	0.761702	0.4516
EXCON	-3.441550	25.09440	-0.137144	0.8918
EXCRE	0.186054	0.061434	3.028512	0.0047
GCGDP	197.1304	27.88489	7.069433	0.0000
INVGDP	624.6090	49.76575	12.55098	0.0000
NOMDEV	0.107119	0.115741	0.925509	0.3614
TOT	0.062105	0.202723	0.306353	0.7613
R-squared	0.924400	Mean dependent var		89.42857
Adjusted R-squared	0.906073	S.D. dependent var		22.88037
S.E. of regression	7.012263	Akaike info criterion		6.920607
Sum squared resid	1622.671	Schwarz criterion		7.292965
Log likelihood	-136.3328	F-statistic		50.43867
Durbin-Watson stat	1.554884	Prob(F-statistic)		0.000000

Source: own computation

Appendix III.b

UNIT ROOT TEST FOR RESIDUAL OF OFFBRERII

Null Hypothesis: RESID-REERI has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 1 (Fixed)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-4.806619	0.0020
Test critical values:	1% level		-4.205004	
	5% level		-3.526609	
	10% level		-3.194611	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(RESID03)				
Method: Least Squares				
Date: 06/04/05 Time: 10:48				
Sample (adjusted): 1992Q3 2002Q2				
Included observations: 40 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID-REERI(-1)	-1.156651	0.240637	-4.806619	0.0000
D(RESID-REERI(-1))	0.336717	0.175681	1.916637	0.0632
C	-1.991057	2.166911	-0.918846	0.3643
@TREND(1992Q1)	0.096786	0.091377	1.059203	0.2966
R-squared	0.437586	Mean dependent var		-0.264135
Adjusted R-squared	0.390718	S.D. dependent var		7.946278
S.E. of regression	6.202587	Akaike info criterion		6.582450
Sum squared resid	1384.995	Schwarz criterion		6.751338
Log likelihood	-127.6490	F-statistic		9.336593
Durbin-Watson stat	1.953255	Prob(F-statistic)		0.000106

Source: own computation

Appendix IV

Granger Causality Tests for OFFBRERI		
Sample: 1992Q1-2002Q4		
Lags: 2		
Null Hypothesis:	F-Statistic	Probability
OFFBRERI does not Granger Cause CAPINF	0.97952	0.38555
OFFBRERI does not Granger Cause DEH	1.32335	0.27923
OFFBRERI does not Granger Cause EXCON	0.25759	0.77436
OFFBRERI does not Granger Cause EXCRE	0.77155	0.47000
OFFBRERI does not Granger Cause GCGDP	2.30571	0.11464
OFFBRERI does not Granger Cause INVGDP	0.56020	0.57613
OFFBRERI does not Granger Cause NOMDEV	1.50018	0.23709
OFFBRERI does not Granger Cause TOT	0.65154	0.52745

Source: own computation

Appendix V

Granger Causality Tests for OFFBRERII		
Sample: 1992Q1-2002Q4		
Lags: 2		
Null Hypothesis:	F-Statistic	Probability
OFFBRERII does not Granger Cause CAPINF	1.08630	0.34857
OFFBRERII does not Granger Cause DEH	1.04387	0.36279
OFFBRERII does not Granger Cause EXCON	0.32823	0.72239
OFFBRERII does not Granger Cause EXCRE	0.24431	0.78457
OFFBRERII does not Granger Cause GCGDP	1.88535	0.69200
OFFBRERII does not Granger Cause INVGDP	1.00145	0.37763
OFFBRERII does not Granger Cause NOMDEV	1.40613	0.25860
OFFBRERII does not Granger Cause TOT	1.04720	0.36165

Source: own computation

Appendix VI

Granger Causality Tests for REERI		
Sample: 1992Q1-2002Q4		
Lags: 2		
Null Hypothesis:	F-Statistic	Probability
REERI does not Granger Cause CAPINF	2.15613	0.13090
REERI does not Granger Cause DEH	0.04609	0.95501
REERI does not Granger Cause GCGDP	0.59889	0.55495
REERI does not Granger Cause EXCON	0.04515	0.95591
REERI does not Granger Cause EXCRE	0.41343	0.66456
REERI does not Granger Cause INVGDP	1.14368	0.33026
REERI does not Granger Cause NOMDEV	1.63790	0.36690
REERI does not Granger Cause TOT	0.62261	0.54238

Appendix VII EQUILIBRUM ANALYSIS OF REERI

Period	Actual of REERI	Fitted Values of REERI	Residual of REERI
1992Q1	35.9000	30.9948	4.90519
1992Q2	37.9000	40.5898	-2.68985
1992Q3	37.5000	40.6897	-3.18967
1992Q4	36.2000	40.0732	-3.87316
1993Q1	36.3000	62.8182	-26.5182
1993Q2	81.0000	80.5086	0.49145
1993Q3	79.4000	78.0445	1.35548
1993Q4	78.4000	75.6789	2.72112
1994Q1	77.9000	72.6663	5.23373
1994Q2	80.0000	80.0601	-0.06011
1994Q3	78.3000	81.1638	-2.86381
1994Q4	81.3000	79.8149	1.48513
1995Q1	83.8000	82.4712	1.32877
1995Q2	87.6000	90.2001	-2.60009
1995Q3	87.4000	90.2211	-2.82108
1995Q4	92.7000	88.8619	3.83811
1996Q1	94.4000	84.9229	9.47714
1996Q2	95.0000	94.9641	0.03589
1996Q3	92.1000	93.8057	-1.70567
1996Q4	91.0000	92.1588	-1.15879
1997Q1	95.2000	85.1079	10.0921
1997Q2	95.6000	92.6882	2.91183
1997Q3	92.7000	94.4668	-1.76685
1997Q4	94.6000	90.3068	4.29315
1998Q1	95.6000	92.4025	3.19751
1998Q2	96.0000	100.248	-4.24841
1998Q3	93.5000	99.8150	-6.31497
1998Q4	101.700	98.3541	3.34593
1999Q1	101.200	95.5927	5.60735
1999Q2	101.500	103.599	-2.09883
1999Q3	104.400	103.715	0.68479
1999Q4	101.800	100.718	1.08162
2000Q1	101.900	99.8540	2.04605
2000Q2	107.900	104.603	3.29734
2000Q3	108.700	108.941	-0.24087
2000Q4	101.700	104.229	-2.52885
2001Q1	102.600	101.559	1.04140
2001Q2	108.800	108.869	-0.06923
2001Q3	117.300	110.522	6.77845
2001Q4	120.100	108.883	11.2171
2002Q1	124.500	132.963	-8.46291
2002Q2	124.600	137.855	-13.2553

Source: own computation and NBE Quarterly Reports

Appendix VIII EQUILIBRUM ANALYSIS OF OFFBRERI

Period	Actual of BRERI	Fitted of BRERI	Residua of BRERI l
1992Q1	1.47000	1.57476	-0.10476
1992Q2	1.41000	1.14740	0.26260
1992Q3	1.35000	1.54142	-0.19142
1992Q4	1.34000	0.67458	0.66542
1993Q1	1.37000	2.81089	-1.44089
1993Q2	1.34000	1.33275	0.00725
1993Q3	1.35000	2.41861	-1.06861
1993Q4	3.36000	2.75953	0.60047
1994Q1	3.31000	3.54432	-0.23432
1994Q2	3.31000	3.84871	-0.53871
1994Q3	3.31000	3.62127	-0.31127
1994Q4	3.74000	3.56931	0.17069
1995Q1	3.31000	3.70771	-0.39771
1995Q2	3.34000	3.94571	-0.60571
1995Q3	3.40000	4.56026	-1.16026
1995Q4	3.79000	4.46455	-0.67455
1996Q1	3.83000	3.77730	0.05270
1996Q2	3.92000	4.12953	-0.20953
1996Q3	3.98000	4.71599	-0.73599
1996Q4	4.19000	4.89254	-0.70254
1997Q1	4.26000	4.09311	0.16689
1997Q2	4.19000	4.46375	-0.27375
1997Q3	4.24000	4.61719	-0.37719
1997Q4	4.46000	4.81090	-0.35090
1998Q1	7.26000	5.60662	1.65338
1998Q2	7.54000	5.17039	2.36961
1998Q3	7.73000	6.33478	1.39522
1998Q4	7.78000	5.68845	2.09155
1999Q1	7.07000	6.97133	0.09867
1999Q2	7.00000	6.78794	0.21206
1999Q3	7.32000	7.10599	0.21401
1999Q4	7.97000	7.25008	0.71992
2000Q1	8.04000	8.85594	-0.81594
2000Q2	7.90000	8.55939	-0.65939
2000Q3	8.14000	8.95281	-0.81281
2000Q4	8.88000	9.64381	-0.76381
2001Q1	9.46000	7.70098	1.75902
2001Q2	9.77000	8.29359	1.47641
2001Q3	8.75000	8.11902	0.63098
2001Q4	8.88000	8.45292	0.42708
2002Q1	9.18000	10.2869	-1.10689
2002Q2	8.96000	10.3970	-1.43696

Source: own computation and NBE Quarterly Reports

DECLARATION

I, the undersigned student, declare that this thesis is my own original work and it has never been presented for a degree in any other university and that all sources of materials used for the thesis have been acknowledged.

Name: Tamiru Demeke

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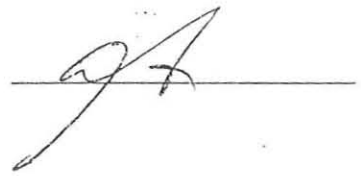
Signature: 

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