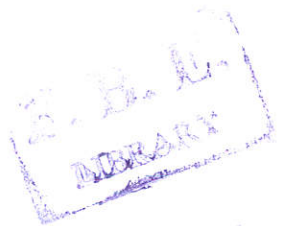


**THE EFFECT OF EXCHANGE RATE CHANGES ON TRADE
BALANCE OF ETHIOPIA
(1970/71 – 2005/06)**

**BY
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“The Effect of Exchange Rate Changes on Trade
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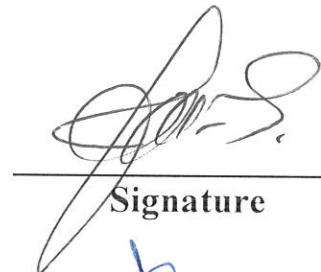
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ABSTRACT

The purpose of this paper is to analyze the effects of change in exchange rate of Birr on the trade balance of Ethiopia. The study employs the standard Augmented Dickey-Fuller test in order to test the stationarity of all variables at levels and first differences and the Johansen and Juselius' approach to estimation of multivariate cointegration systems on the quarterly data in the period 1970/71QI – 2005/06QI. In order to establish the existence or absence of a j-curve phenomenon in Ethiopia, we employ impulse response function to trace the effect of real effective exchange rate on the trade balance of Ethiopia.

The main findings of the study show that: first, there is a negative relationship between the trade balance and the real effective exchange rate appreciation indicating that a real depreciation will improve the trade balance in the long run; second, the results indicate that there seem to be no clear evidence of the J-curve phenomenon.

The policy implication of the finding is that to improve its international competitiveness and its trade balance deficit, Ethiopia can use depreciation/devaluation based adjustment policy. Competitiveness, however, goes beyond currency depreciation. I.e. currency depreciation alone is unlikely to be able to increase competitiveness. Therefore, Ethiopia has to use also export diversification strategy i.e. the government has to pursue to diversify export commodities from agriculture to other products both

vertically and horizontally in order to be competitive and reduce its trade deficit since most of export items relied on few primary commodities.

The negative sign of domestic real income indicated that a rise in domestic income of Ethiopia encourages its consumers to demand more foreign goods, leading to a deterioration of trade balance in favor of its major trading partners. In this regard, the government has to promote import substitution strategy In order to shift the demand of domestic consumers towards domestic goods.

Key words: Exchange rate, trade balance, J-curve

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The reaction of the trade balance to exchange rate changes is a fundamental issue in an open economy macroeconomics. There are two reasons that justify this statement. First, policy-makers are often concerned about whether the trade balance is at an appropriate level for what they consider to be optimal inter-temporal trade. Knowing how the exchange rate changes affect the trade balance in the long run helps these policy makers target the trade balance at that time scale. Second, trade balance fluctuations affect a country's national income in the short term. Therefore, knowing how the exchange rate changes affect the trade balance can help policy makers target national income.

Despite substantial empirical studies, the effects of exchange rate changes on the balance of payments, especially those that relate to the trade balance, are still not well understood. Neither theoretical nor empirical work has established definitely whether a nominal devaluation of a country's domestic currency improves its trade balance, or even if exchange rates play a role in determining trade flows. This issue continues to be relevant to the understanding of the short-run and long run relationship between those

two variables, the formulation of policy, and the applied literature in international trade and finance.

A change in the exchange rate has two effects on the trade balance: the price effect and the volume effect. While the price effect works to make import more expensive to domestic importers, it causes domestic exports to be cheaper for foreign buyers, at least, in the short run and as the volume of exports and imports do not adjust instantaneously in the short run, trade balance may initially experience some deterioration in the short run, following the currency devaluation. However, following eventual adjustment process of exports and imports to the currency devaluation, price effect will tend to dominate in the short run while volume effect will dominate in the long run, hence, reversing the overall effect in favor of the trade balance improvement, assuming that Marshall-Lerner condition¹ holds.

With regard to lessons of experience, historical data for developed and developing countries have shown that devaluation may cause a negative effect on the trade balance in the short run but an improvement in the long run; that is, the trade balance followed a time path which looked like the letter "J". The main explanation for this J-curve has been that, while exchange rates adjust instantaneously, there is a lag in the time consumers and producers take to adjust relative prices (Junz and Rohomberz,

¹ Marshall - Lerner condition is a mathematical formula according to which a country's trade balance is improved by the depreciation of the exchange rate if the sum of the country's demand for imports and the demand for the rest of the world for its exports is greater than 1

1973). In terms of elasticities, domestically, there is large long run export supply elasticity and low short run import demand elasticity.

Studying the relationship between trade balance and exchange rates is especially important for many developing economies like Ethiopia where trade flows continue to drive balance of payments accounts due to the low level of development of capital markets. The low level of development of capital market in Ethiopia means that the government has to rely primarily on the banking system for the financing of fiscal deficit. Even though a treasury bills auction market was established in 1995 in order to limit the reliance on central bank financing of the deficit, auction market has been dominated by commercial banks and has remained unable to attract non-bank investors.

Both the Imperial and the Derg governments tried to improve Ethiopia's balance of trade, the former by encouraging exports and the latter by curtailing imports. However, Ethiopia's foreign trade balance has basically been in deficit since 1953, with the exception of 1975, when a combination of unusually large receipts from sales of oil seeds and pulses resulted in a surplus. In general, foreign trade has grown faster the national economy, particularly in the early 1970s, but it has accounted for only a small percentage of the national economy. In EFY 1972/73, exports and imports accounted for 13 and 12 percent of GDP, respectively. By EFY 1988/89, exports had declined to 8 percent of GDP, and imports had jumped to 21 percent. Virtually, all machinery and equipment had to be imported, as well as intermediate goods for agriculture and

industry, including fertilizer and fuel. Increased cereal shipments accounted for the growth in imports. In the 1980s, Ethiopia faced severe famines and droughts. Consequently, the country, which had been virtually self-sufficient in food supplies in the 1970s, became a net importer of food worth as much as 243 million Birr annually during the period EFY 1983/84 to 1987/88. The military government failed to correct the country's historical trade deficit, despite efforts to regulate exports & imports. Consequently, during the 1980s the trade picture worsened as imports grew rapidly and foreign aid slowed².

In this regard, understanding of the short run and long run impact of exchange rate changes on trade balance of Ethiopia is useful for policy makers to know whether its effect on trade balance is positive or not.

The given study addresses the question of whether real effective exchange rate changes (appreciation/depreciation) have any significant and direct impact on Ethiopia trade balance.

1.2 Statement of the Problem

Economic theory postulates that devaluation of a country's currency will likely improve a nation's trade balance. However, despite plenty of theoretical & empirical studies, the question whether exchange rate changes (appreciation/depreciation) are apt policy for

² See <http://countrystudies.us/ethiopia/104.htm>

the improvement of trade balance and country's competitiveness must be treated as an open. There is still a considerable disagreement concerning the effectiveness of currency depreciation as a tool for improving a country's balance of trade. Therefore, the assessment of the exchange rate-trade balance relationship using recent advancements in the field of time series econometrics can provide a fresh look for the issue. Several reasons make it important, first, it should be verified whether there is a long run relationship between trade balance and exchange rate, if the answer is negative, then depreciation based adjustment policy may not a reasonable solution to balance a country's foreign trade. Second, in the case of long-run relationship it should be revealed whether depreciation leads to improvement of merchandise trade balance and country's competitiveness. Third, the analysis of the response of the trade balance in the short-run provides a useful insight in to the immediate impact of exchange rate changes, i.e. whether there is an adverse short-run effect.

Devaluation discourages imports by making imports relatively more expensive and provides encourage to greater import substitution. Import substitution creates domestic industries to provide for local use of some of the goods, which were previously imported (saving of foreign exchange). The main advantage of import substitution is that there will be a reduction in the relative importance of foreign trade to the economy, thus, reducing the susceptibility of the economy to externally induced fluctuations. In general, devaluation by discouraging imports helps a developing country to save its foreign exchange so as to use it in priority sectors. However, in Ethiopia, the value of imports

has been increasing overtime despite its expected reduction due to devaluation. It is therefore, necessary to know the short run and long run effect of exchange rate change on trade balance of Ethiopia.

During the derg regime, the main component of Ethiopia's considerable current account deficit was the merchandise trade deficit and it is the result of stagnating exports and increasing imports. In order to improve the trade balance, Ethiopia adopted its first structural adjustment program (SAP) in October 1992. The economic reform packages include foreign exchange liberalization and devaluation of the currency. A devalued exchange rate, it is argued, increases the competitiveness of exports, making imports more expensive, and shift resources from sector producing non-tradable to those producing tradable. However, the nature of Ethiopian imports may not allow easily and in a short period of time to encourage import substitution industries to produce some imports domestically. So, what was the Ethiopia exports and imports before and after the reform period? Is there any improvement in export sector and a decline in import sector following devaluation or is there any improvement in trade balance deficit of Ethiopia following the reform period? What will be the response of Ethiopia's trade balance due to a change in exchange rate in the short and long run? How long does it take for the trade balance of Ethiopia to be positive? These are some of the issues, which will be investigated in this study.

Even though various studies had been conducted in the areas of trade liberalization and on the exchange rate policies in Ethiopia, a formal quantitative estimate of the long run and short-run impacts of exchange rate changes on the merchandise trade balance is scanty. To the best of author's knowledge, there is no such an attempt on the existence or non-existence of j curve effect on trade balance of Ethiopia. Therefore, closing this gap is the motivation of this paper.

1.3 Objectives of the Study

The primary objective of this paper is to examine the role of exchange rate in determining short and long-run trade balance behaviour for Ethiopia.

The specific objectives of the study are:

- i) To identify the determinants of the trade balance and show the direction of their influences using econometric techniques and
- ii) To attempt and establish the existence of a j-curve phenomenon

1.4 The Hypothesis to be tested

The hypothesis that will be tested in this study is the following: -

There is a long-run relationship between the trade balance and real effective exchange rate and the evidence of J-curve in Ethiopia.

To test the hypothesis co integration analysis will be conducted and the existence of co integrating vectors will help answer part of our hypothesis about the long-run relationship. If found that real effective exchange rate variable is negatively related to the trade balance, this entails that real appreciation will not lead to a long-run improvement in the trade balance or real depreciation will lead to a long run improvement in the trade balance. The hypothesis about J-curve will be tested using the generalized impulse response functions.

1.5 Significance of the Study

The underlying economic principle on exchange rate is that misalignment of exchange rates (either overvaluation or undervaluation) has economic side effects. Overvalued Birr may have seriously undermined the growth of Ethiopian exports, by making foreign currency price of exports high which constraints foreign demand for exports and by constraining domestic supply of exports by inducing a shift in the domestic production patterns from exports to non-traded goods. Besides constraining exports, overvalued Birr may have stimulated imports because they became cheaper in the domestic currency units a result of overvaluation. Overvaluation may have also undermined production of import substitutes because of cheap imports (Narendra et al, 1989). Furthermore, Ethiopia's balance of trade has been in deficit for long period, and hence there is a need for continuing with a gradual real effective exchange rate management

in order to gradually improve the country's export competitiveness and for correcting balance of trade deficit.

Therefore, quantifying the short-run and long run responsiveness of the merchandise trade balance to exchange rate changes is important to economic policy for several reasons. First, it establishes whether there is a stable long-run relationship between the exchange rate and the merchandise trade balance. If such a stable long-run relationship does not exist, then depreciating the exchange rate does not seem to be a reasonable way to improve the country's competitiveness on a long-term basis. Second, if a long-run relationship does exist, then it is necessary to establish whether depreciation is likely to lead to a net improvement of the trade balance in the long run. Third, quantifying the extent of the trade balance improvement would be desirable, since doing so would enable us to weigh the trade balance benefits against the costs of permanent depreciation. Fourth, the estimate of the short-run dynamics provides information regarding the immediate and medium-run impacts of exchange rate changes on the trade balance. More specifically, the question here is whether depreciation has an adverse short-run impact on the merchandise trade balance. If it does, it seems reasonable to estimate the persistence and extent of the adverse effect. Fifth, in a broader sense, the estimates may also provide some information regarding the impact of expenditure-reducing policies, both monetary and fiscal, on the domestic trade balance.

1.6 Scope of the Study

To analyze the effect of exchange rate changes on trade balance of Ethiopia, the study period spans from 1970/71QI to 2005/06QI due to availability of data. Especially, National Bank of Ethiopia does not have data on real effective exchange rate before the year 1970/71.

1.7 Limitations of the Study

Even though the findings of the study has important implications, there are, however some limitations regarding the data used for this study. One limitation of this study is the methodology used for generating quarterly GDP data. First, It applies constant coefficients over the study period. Second, it ignores private sector contribution to industry and third, the share of other sub-service sector is equally divided in to four quarters.

Another limitation of this study is the use of aggregated data. Even though policy makers are more interested in single, average outcomes than in case by case information, the aggregated approach may suffer from "the aggregation bias problem", namely, a significant relation between the trade balance and the exchange rate between Ethiopia and one major trading partner could easily be offset by an insignificant relation with another trading partner. In estimating the J-curve, researchers either use

aggregated or bilateral data. Rose and Yellen (1989) argue that use of bilateral data is useful because you do not require a proxy for the world income variable as in the aggregation analysis, which reduces aggregation bias. In this study, the aggregated world GDP, which is a proxy for world income and real effective exchange rate, may also have these problems.

1.8 Organizations of the Study

This paper is organized as follows:

Chapter one highlights the issues to be investigated in this study. Conceptual, theoretical and empirical evidences on definition and measurement of real exchange rate, exchange rate devaluation and trade balance are discussed in the second chapter. Chapter three tries to provide a brief overview of the Ethiopian economy with particular reference to exchange rate policy and foreign trade regime. Chapter four describes the data source, model specification and the methodology to be used in the study. Chapter five presents estimation and interpretation of the empirical results obtained from the estimated models. Finally, chapter six provides the conclusion to the study as well as the policy implications and recommendations emerging from the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 THEORETICAL LITERATURE

2.1.1 The Real Exchange Rate: Definition and Measurement

The Nominal Exchange Rate (NER): can be defined as the amount of the domestic currency required for purchasing a unit of the foreign currency. Movements in the nominal exchange rate index indicate either an appreciation or depreciation of the domestic currency against the set or basket of other currencies. It is a price and, like other prices, conveys information and incentives to guide decisions about what to produce and consume.

The importance of the nominal exchange rate is that, it is a policy intervention variable that the government can announce or fix at any time and as such it shows the intention of government in the foreign exchange rate market.

The Real Exchange Rate (RER): In defining the RER, there are two approaches. The first and more traditional approach is based on the purchasing power parity (PPP) doctrine, which defines the RER as the value of the nominal exchange rate (E) corrected by the ratio of the foreign price (P^*) to the domestic price level (P) i.e.

$$\text{RER} = E \cdot P^*/P \dots\dots\dots(2.1)$$

This definition, however, is subjected to limitation in measuring the degree of international competitiveness of the country in question. As discussed in Edwards (1989), it fails to capture changes in the relative incentives guiding resource allocation across the tradable and non-tradable sectors. The second approach, which is given due attention in the modern literature on the real exchange rate is the tradable and non-tradable approach. According to this approach, the real exchange rate is defined as the relative price of tradable goods (P_T) and non-tradable goods (P_N)³:

$$\text{RER} = P_T/P_N \dots\dots\dots(2.2)$$

An increase in RER makes the tradable sector of the economy more profitable causing resources to move from the non-tradable sector to the tradable one. Hence, the depreciation of the real exchange rate shows an increase in the country's external competitiveness.

Although the definition of RER given above is analytically useful, it is difficult to calculate in practice. A more operational definition of the real exchange rate is therefore, offered in some empirical literatures as follows:

$$\text{RER} = EP^*/P \dots\dots\dots(2.3)$$

Where E = the nominal exchange rate

³ Tradable goods are those that have export or import potential. Some goods are non-tradable, either because of their nature or due to high transportation costs per product unit, high tariffs or other restrictions.

P^* = wholesale price indices (WPI) of the country's trade partners used to proxy PT

P = the country's consumer price index (CPI) used to proxy P_N .

In the practical sections of many real exchange rate literatures, the multilateral real exchange rate that considers the exchange rate of the domestic currency with respect to the trading partners has been advocated as a more reliable proxy for measuring the country's external competitiveness with respect to its trade partners.

With respect to the mathematical formulation of constructing the multilateral real exchange rate, the following formula has been used:

$$NEER_t = \sum_{j=1}^N W_{jt} E_{jt} \dots\dots\dots(2.4)$$

Where,

$NEER_t$ = index of nominal effective exchange rate in period t for the home country

W_{jt} = the weight attached to partner j in the computation of NEER (interms of import, export or total trade) share at time t

E_{jt} = nominal exchange rate defined as foreign currency per domestic currency.

N = number of trading partners

The real effective exchange rate (REER) is obtained by deflating the NEER by the ratio of relative prices of tradable to non-tradable commodities. In choosing the relative price indices we take the wholesale price index (WPI) of the partner countries as a

proxy for the price of tradable as this comprises mostly of tradable goods, and CPI of the country to proxy the non-tradable price.

$$REER_t = \sum_1^N W_{jt} E_{jt} P_t / P^*_{jt} \dots \dots \dots (2.5)$$

Where,

REER_t = index of real effective exchange rate in period t for the home country

E_{jt} = nominal exchange rate defined as foreign currency per domestic currency.

P*_{jt} = Wholesale price indices of partner j in period t

P_t = CPI of Ethiopia in period t

W_{jt} = the weight attached to partner j in the computation of NEER (interms of Import, export or total trade) share at time t

j= 1,2,N refers to the N trade partner countries

2.1.2 Approaches to the Balance of Payments

There are heated debates in the economic literature on the impact of devaluation on trade balance. Several theories have been advanced in this regard to explain the effect of devaluation on the trade balance. The most common ones are the Elasticity, Absorption and Monetary approaches.

2.1.2.1 The Elasticity Approach

To study the relationship between exchange rate and the trade balance, one must begin with a precise study of the elasticity view of balance of payments. The analysis was pioneered by Alfred Marshall, Abba Lerner and later extended by Joan Robinson (1937) and Fritz Machlup (1955) as cited by Keith Pilbeam (1998,pp.58). This approach is the first of non – classical or Keynesian approach to the analysis of current account deficit to change in exchange rate or devaluation. It states that the elasticity of demand for exports by foreigners and that of imports by domestic residents determine trade balance or balance of payments. This approach provides an analysis of what happens to the current account balance when the country devalues its currency. The elasticity approach focuses on demand conditions by assuming that the supply of domestic exports and foreign import are perfectly elastic so that changes in demand values have no effect on prices. In effect, the assumption implies that domestic and foreign prices are fixed so that changes in relative prices are solely caused by changes in nominal exchange rate.

The Marshall-Lerner condition upon which the theory is built states that, starting from a position of equilibrium in the current account; a depreciation/devaluation of a domestic currency improves the current account only as long as the sum of elasticity of foreign demand for exports and elasticity of domestic demand for imports exceeds unity. However, if this sum is less than unity, then devaluation will worsen the current account. This follows from the belief that transaction completed at the time of

depreciation/devaluation may dominate a short-run change in the trade balance, leading to the deterioration of trade balance during the contract period, before quantities of exports and imports adjust. As the elasticities of export and imports improve over time, quantities adjust to the new effective prices, causing the trade balance to rise. However, Williamson (1983) as cited by Eric Ben Kamoto (2006) is critical of elasticity approach arguing that the higher import prices caused by devaluation could stimulate increases in domestic prices of non-traded goods. The consequence is a rise in inflation and this could potentially reduce the benefits of devaluation as manifested in the increase in the trade balance.

A general consensus accepted by most economists is that elasticities are lower in the short run than in the long run, in which case the Marshall -Lerner conditions may only hold in the medium to long run. Goldstein and Kahn (1985), in an excellent survey of the empirical literature, conclude that in general long-run elasticities (greater than two years) are approximately twice as much as short-run elasticities (0-6 months). Further, the short run elasticities generally fail to sum to unity while the long run elasticities almost always sum to greater than unity.

The possibility that devaluation may lead to worsening rather than improvement in the balance of payments led to much research in empirical estimates of the elasticity of demand for exports and imports. Economists divided up in two camps popularly known as 'elasticity optimists' who believed that the sum of these two elasticities tended to

exceed unity, and 'elasticity pessimists' who believed that these elasticities tended to less than unity. It was argued that devaluation might work better for industrialised countries than for developing countries. Many developing countries are heavily dependent upon imports so that their price elasticity of demand for imports is likely to be very low. While for industrialized countries that have to face competitive export markets, the price elasticity of demand for their exports may be quite elastic. The implication of the Marshall Lerner condition is that devaluation may be a cure for some countries balance of payments deficits but not for others (Keith Pilbeam (1998)). The general consensus among economists as indicated by empirical investigations on the elasticity approach is summarised by what is called the J-curve effect

Despite its contribution in terms of both theoretical and empirical relevance, the elasticity approach has been criticized on a number of grounds. Some of these include the following: first, It wrongly assumes that the demand for imports and supply of exports depend on money prices and cross price effects are assumed to be zero; i.e. factors other than prices which affect import and export are ignored. Second, The dynamic effects of income & its interdependence with expenditure is ignored and it lacks to explicitly explain the sources of production increase that cause a trade balance to improve. Third, the approach simply assumes other things to remain unchanged and ignores any direct effect of devaluation on the domestic price level and wages. Fourth, It deals with only the current account & ignores the capital account of the balance of payments.

2.1.2.1.1 The Marshall-Lerner-Robinson Condition

Whether devaluation or depreciation of the nominal exchange rate brings about improvements or deterioration in the trade balance depends on the elasticity of supply of exports and demand of imports, which can be summarized by what is called the Marshall – Lerner condition.

The Marshall- Lerner- Robinson condition is given by the following formula:

$$\frac{\partial T^*}{\partial E} = \left(\frac{PX}{E^2} \right) (\eta_f + \eta_h - 1) \dots\dots\dots(2.6)$$

(See the derivation of Marshall-Lerner condition on annex I)

Where η_f is the own price elasticity of export demand

η_h is the own price elasticity of import demand

$T^* = (PX/E) - P^*M^*$ define the trade balance in units of foreign currency

E = the nominal exchange rate of domestic currency per unit of foreign currency

P = Domestic price

From equation (2.6), the following three conditions hold based on the sum of η_f and η_h :

$$\frac{\partial T^*}{\partial E} > 0 \text{ if and only if } \eta_f + \eta_h > 1 \dots\dots\dots(2.6a)$$

$$\frac{\partial T^*}{\partial E} < 0 \text{ if and only if } \eta_f + \eta_h < 1 \dots\dots\dots(2.6b)$$

$$\frac{\partial T^*}{\partial E} = 0 \text{ if and only if } \eta_f + \eta_h = 1 \dots\dots\dots(2.6c)$$

2.1.2.1.2 The J-curve

Most economists and policy makers believe that currency devaluations bring about competitive advantage in international trade. When a country devalues its currency, domestic export goods become cheaper relative to its trading partners resulting in an increase in quantity demanded. Devaluation as a policy prescription is mainly aimed at improving the trade balance. However, there is a time lag before the trade balance improves following a real depreciation. The short run and long run effects of depreciation on the trade balance are different. Theoretically, the trade balance deteriorates initially after depreciation and some time along the way it starts to improve until it reaches its long run equilibrium.

The time path through which the trade balance follows is a J-curve. The time lag comes about as an impact of several lags such as recognition, decision, delivery, replacement and production (Junz and Rhomberg, 1973). Following a real depreciation, traders take time to recognize the changes in market competitiveness, and this may take longer in international markets than in domestic markets before information is passed on the stakeholders because of distance and language problems. Some time is spent on deciding on what business relationships to venture into and for the placement of new orders. There is a delivery lag that explains the time taken before new payments are made for orders that were placed soon after the price shocks. Procurement of new materials may be delayed to allow inventories of materials to be used up, this is a

replacement lag. Finally, there is a production lag before which producers become certain that the existing market condition will provide a profitable opportunity.

One explanation for the J-curve phenomenon is that the prices of imports rise soon after real depreciation but quantities take time to adjust downward because current imports and exports are based on orders placed some time back (Eric Ben Kamoto (2006)). On the other hand, domestic exports become more attractive to foreign markets but quantities do not adjust immediately for the same reason. An increase in value of imports against a constant or a small change in the value of exports results in a trade deficit in the short run. As time passes by, importers have enough time to adjust their import quantities with respect to the rise in prices while quantity demand for exports increases and this result in an improvement in the trade balance. The long-run improvement in the trade balance occurs when the Marshall-Lerner condition holds. In the long run the volume effect dominates the price effect of a real depreciation. In order for the trade balance to improve the sum of imports and exports demand and supply elasticities must be greater than unity.

The possibility that in the short run the Marshall Lerner condition may not be fulfilled although it generally holds over the long run leads to the phenomenon of what is popularly known as the J-curve effect, which is illustrated in fig (1). The idea underlying the j-curve effect is that in the short run export volumes and import volumes do not change much, so that the price effect outweighs the volume effect leading to

deterioration in the current account. However, after a time lag export volume start to increase and import volumes start to decline; consequently the current deficit starts to improve and eventually moves in to surplus. The issue then is whether the initial deterioration in the current account is greater than the future improvement so that the over all devaluation can be said to work.

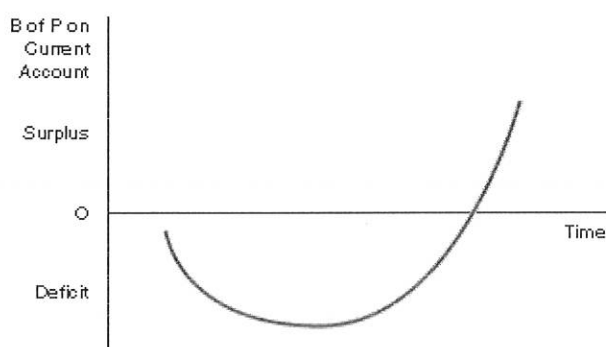


Figure 1: The J-curve effect

The figure above shows the effect of a depreciation of the currency on the trade balance on current account. In the short term the trade balance worsens as the deficit grows. This is the so-called **J curve** effect.

2.1.2.2 The Absorption Approach

One of the major defects of the elasticity approach is that it is based upon the assumption that all other things are equal. However, changes in export and import volumes will have implications for national income and consequently income effects need to be incorporated in a more comprehensive analysis of the effects of devaluation.

Alexander (1952) as cited by Keith Pilbeam (1998,pp.65-66) gave an important evaluation of this effect, focusing on the fact that a current account imbalance can be viewed as the difference between domestic output and domestic spending (absorption).

The model can be explained by using simple mathematical derivation as follows:

Taking the equation for national income,

$$Y = C + I + G + X - M \dots\dots\dots(2.7)$$

and defining domestic absorption as $A = C + I + G$

Equation (2.7) can be rearranged as follows:

$$CA = X - M = Y - A \dots\dots\dots(2.8)$$

Equation (2.8) states that the current account (CA) represents the difference between domestic output and domestic absorption. A current account surplus means that domestic output exceeds domestic spending, while a current account deficit means that domestic output is less than domestic spending. Transforming equation (2.8) in to difference form yields:

$$dCA = dY - dA \dots\dots\dots(2.9)$$

Equation (2.9) implies that the effects of devaluation on the current account will depend up on how it affects national income relative to domestic absorption. If devaluation

raises domestic income relative to domestic absorption, the current account improves. If, however, devaluation raises domestic absorption relative to domestic income, the current account deteriorates. Understanding how devaluation affects both income and absorption is therefore central to the absorption approach to balance of payments analysis.

Absorption can be divided in to two parts: a rise in income will lead to an increase in absorption which is determined by the marginal propensity to absorb denoted by "a". there will also be a 'direct effect' on absorption which is all the other effects on absorption resulting from devaluation denoted by Ad. Thus the change in total absorption, dA, is given by:

$$dA = adY + dAd.....(2.10)$$

Substituting equation (2.10) in to 2.9 yields:

$$dCA = dY - adY - dAd$$

$$dCA = (1-a)dY - dAd.....(2.11)$$

Equation (2.11) reveals that there are three factors that need to be examined when considering the impact of devaluation. First, Is the marginal propensity to absorb

greater or less than unity? Second, does devaluation raise or lower national income? And third, does devaluation raise or lower direct absorption?

For the above condition to be fulfilled, it is worth distinguishing two possible states of an economy: First, below full employment so that income may rise and secondly, full employment so that national income cannot rise.

The Effects of Devaluation on National Income

Clearly a relevant question if the economy is at less than full employment is whether devaluation is likely to raise or lower national income. If the marginal propensity to absorb is less than unity then a rise in income will raise the income-to-absorption ratio and thus will improve the current account. If income were to fall this would raise the absorption-to-income ratio (as absorption would fall by less than income) which would worsen the current account.

There are two important effects on income that need to be examined, the employment effect and the terms of trade effect.

Employment effect: If the economy is at less than full employment (providing the Marshall-Lerner condition is fulfilled) there will be an increase in net exports following devaluation. This will lead to an increase in national income and employment via the

foreign trade multiplier. However, if the Marshall-Lerner condition is not fulfilled, then exports would fall implying that national income falls. Hence, it is not clear whether the employment effect will raise or lower national income.

Terms of Trade effect: The terms of trade is the ratio of price of exports to the price of imports, and can algebraically be expressed as:

$$\text{Price of exports/price of imports} = P/SP^* \dots\dots\dots(2.12)$$

Where P is the domestic price index, P* is the foreign price index, and S is the exchange rate (domestic currency units per unit of foreign currency).

A devaluation (a rise in S) tends to make imports more expensive in domestic current terms and this is not matched by a corresponding rise in export prices, this means that the terms of trade deteriorate. Deterioration in the terms of trade represents a loss of real national income because more units of exports have to be given up to obtain a unit of imports. Hence, the terms of trade effect lowers national income.

Overall, the effects of devaluation on the income of the devaluing country are ambiguous. Even if there are increased net exports earnings (which relies on the Marshall-Lerner condition being fulfilled), the negative terms of trade effect works to reduce national income.

Even if income rises overall, it is still not clear what the implications of such a rise are for the current account; this will depend upon the value of the marginal propensity to absorb. If this is less than unity then an increase in income leads to an improvement in the current account because income rises by more than absorption. If, however, the marginal propensity to absorb is greater than unity then the increased income would lead to an even bigger rise in absorption resulting in a worsening of current account.

The absorption approach has some important lessons for policy-makers. Its central message is that raising domestic income relative to domestic absorption will improve the current balance. In this respect, devaluation is more likely to succeed if it is accompanied by economic policy measures that concentrate on raising income while constraining absorption.

A Synthesis of the Elasticity and Absorption Approaches

Initially, it was believed that the absorption approach was an alternative to the elasticities approach; the latter concentrating on price effects while the absorption approach concentrated on income effects. However, authors such as Tsiang (1961) and Alexander (1959) as cited by Keith Pilbeam (1998,pp.71-72) showed that the two models are not substitutes, but rather are complementary.

To understand this complementarity, consider the effects of devaluation on income. Exports will increase more than imports, so raising income only if the Marshall-Lerner elasticities condition is fulfilled. If the Marshall-Lerner condition is not fulfilled then exports will rise by less than imports, implying that income will fall. Hence the Marshall-Lerner condition is clearly relevant to the absorption approach. Similarly, when account is taken for income effects the necessary elasticity conditions for a devaluation to improve the current account is affected. This is because of the elasticities sum to greater than unity so that there is an initial improvement in the current account; this improvement leads to an increase in income, which induces a larger increase in imports than in the absence of such an income effect. For this reason, the initial improvement in the current balance has to be more pronounced than in the absence of such income effects. This implies that the sum of elasticities needs to be somewhat greater than the unity value derived from the elasticity approach. Thus, the absorption approach is relevant to the elasticity approach.

In sum, according to this approach, the overall effect of devaluation on the current account depends on the assumptions of the state of that economy i.e. if it is less than full employment and on the fulfillment of the Marshall-Lerner condition (i.e. the effect of devaluation on current account is inconclusive and ambiguous)

2.1.2.3. The Monetary Approach

The monetary approach which views the balance-of-payments surpluses and deficits as monetary flow resulting from stock disequilibrium in the money market, assumes that the balance of payments is essentially a monetary phenomenon in international monetary economy, which requires the analysis in terms of monetary concepts. The approach contends that a deficit in the balance of payments is due to an excess supply of stock of money in relation to money demand whereas a surplus is a flow resulting from an excess demand for money in relation to the stock of money supply. Based on this premise, the monetary approach regards the balance of payments disequilibrium as a reflection of disequilibrium in the money market. The immediate effect of depreciation/devaluation is to make domestic goods competitive in relation to purchasing power parity (PPP) compared with foreign goods, raising the demand for domestic currency. As the demand for domestic currency exceeds its supply, the comparative advantage of depreciation / devaluation would improve the balance of payments as domestic demand for foreign goods falls while foreign demand for domestic goods increases. In the monetarist's view, the effect of the currency depreciation / devaluation on the balance of payments should be transitory only as the monetary authorities do not simultaneously engage in expanding money supply through open market operations. However, if the monetary authorities increase money supply via open market operations, aggregate demand and domestic prices will rise,



eliminating the very comparative advantage that the currency depreciation /devaluation was meant to generate.

2.2. Empirical Literature

The short-run and long-run relationships between the trade balance and exchange rate have been subject to many empirical studies. Here a brief overview is provided of methodologies and results of the literature for developed and developing countries. This will demonstrate that the variety of results, often for identical countries, may stem from empirical evidence being extracted from different time periods and different methodologies.

Developed countries, especially the United States, have received most of the attention in this field of research. In their seminal paper, Rose and Yellen (1989) employed disaggregated, bilateral data and do not find support for the J-curve effect nor evidence of a long-run relationship in the case of U.S data for the period 1960 to 1985. Neither did Bahmani-Oskooee and Brooks (1999), Analyzing bilateral disaggregated U.S. trade data with respect to six major trading partners using autoregressive distributed lag model (ARDL) approach find evidence of a J-curve effect. However, they did report a significant long-run relationship between the trade balance and the exchange rate, indicating that a real depreciation of the U.S. dollar has a favorable effect on the U.S. trade balance.

✓ Bahmani-Oskoe, Mohsen, and Aise (1994) tested 41 developed and less developed countries for the existence of co integration and the J-curve effect applying the Engle-Granger two-step procedure. The results indicated that the trade balance and the real effective exchange rate are co integrated for only fourteen countries. In the countries exhibiting co integration, there was some evidence of the J-curve effect. Gupta-Kapoor and Ramakrishnan (1999) analyzed the impact of the yen depreciation on Japanese trade balance data with respect to seven major trading partners employing a vector error correction model (VECM). The estimated impulse response function indicated the existence of a J-curve for Japan. Jung and Doroodian (1998) obtained similar results for Japan. They applied the Shiller lag model to first difference finding support for the J-curve effect. In conclusion, evidence seems to suggest that the J-curve is an empirical phenomenon, i.e. it may or may not be found in a given country.

Cooper (1971) studied the effect of 24 devaluation episodes in 19 developing countries over the period 1959 –1966. He found that, overall, devaluation improved trade balance and balance of payments. Musila and Newark (2003) criticizes the results of cooper on the grounds that the methodology used is unsound. That is, it is not possible to distinguish between the effects of devaluation and macroeconomic factors on trade balance.

Bahmani-Oskoe et al. (2003) conducted a study on India's trade balance following up on previous studies, which did not find any significant results on the subject.

Researchers argued that the problem could probably be the use of aggregated data. As a result they employed disaggregated data to investigate the J-curve hypothesis against India's trading partners. The empirical results of the study did not support the J-curve pattern but the long-run real depreciation of India's rupee had significant effect on the improvement of the trade balance.

Kamin (1988) study of devaluation and macroeconomic performance finds that devaluation does improve trade balance because it stimulates exports. Salant (1977) finds that devaluation improves the balance of payments of not trade balance.

Gylfason and Risager (1984) also reach similar conclusions that devaluation improves trade balance, on the contrary, the studies of Laffer (1977) and Miles (1979) find that devaluation does not improve trade balance. Himarios (1985) criticised the work of Miles (1979) on the ground that there are serious deficiencies in the methodology and tests used, and accounting for these deficiencies reverses the results.

The study by Rawlins and Praveen (2000) examined the impact of devaluation on trade balance of some selected African Counties. Rawlins and Praveen specified and estimated an Almon Distributed lag process of trade balance using annual data. The model consists of monetary and fiscal policy variables. Rawlins and Praveen found that the real exchange rate depreciation did not improve Ghana's trade balance in the year of the

devaluation. Rawlins and Praven conclude that the J-curve effect appears not to be significant in the case of Ghana.

✓ Frank W.Agbola (2004) studied the effect of devaluation on trade balance of Ghana on annual data spanning the period 1970 to 2002. He used the Johansen multivariate co-integrating procedure to test the long-run relationship between trade balance and other explanatory variables. He find that devaluation does not improve the trade balance of Ghana in the long run.

Marial A.Yol and Ahmed Z.Baharumshah (2005) conducted a study on the effect of exchange rate changes on the bilateral trade balance of Egypt, Morocco and Tunisia vis-à-vis the US and Japan, in addition to attempting to establish whether these effects produce a j-curve phenomenon. They employed the Johansen co integration and error correction model on the annual data in the period 1970 –2003.They find the mixed evidence about the existence of the j-curve effect. A classic J-curve pattern is observed only in case of Morocco/Japan in which the trade balance deteriorates almost immediately following the devaluation of the real exchange rate and recovers after two years. In cases of Egypt/US, Morocco/US and Tunisia/Japan, no clear evidence of the J –curve phenomenon is found.

Tihomir Stucka (2004) examined the effects of exchange rate change on the trade balance in Croatia. He used the Auto Regressive Distributive Lag (ARDL) "delta" approach and he find evidence of the J-curve effect in Croatia.

Eric Ben Kamato (2006) tests the j-curve effect on the trade balance in Malawi and South Africa. He employed co integration analysis, vector error correction model and generalized impulse response analysis to investigate the j-curve effect on the trade balance in Malawi and South Africa and he get evidence of j-curve hypothesis. Although he find a long run positive relationship between the trade balance and real effective exchange rate in Malawi, the empirical results did not exhibit a statistically significant J-curve. Using variance decomposition analysis, he find that shocks in the real effective exchange rate have significant attributes on the forecast error variance in the trade balance in South Africa. For Malawi, Shocks in real effective exchange rate have little influence on the trade balance forecast error variance.

Mohsen, Bahmani-Oskooee and Yongqing Wang (2006) conducted a study on the j-curve effect on trade balance of china versus her trading partners. They used disaggregate data by country and recent advances in time series modeling to estimate a trade balance model between china and her 13 major trading partners. They find that real depreciation of the Chinese currency has a favorable impact on her trade balance with a few partners, especially the USA. not much support is found for the j-curve hypothesis.

Hernan Rincon (1998) examined the role of exchange rates in determining the short-run and long-run trade balance behavior for Colombia. The econometric procedure he used is the Johansen and Juselius' approach to estimation of multivariate cointegration systems. He find that exchange rate do play a role in determining the short and long run behavior of the Colombian trade balance.

Ahmed Zubaidi Baharumshah (2001) attempted to identify the major economic factors that influence the bilateral trade balance of Malaysia and Thailand with the US and Japan. Unrestricted VAR model was estimated using quarterly frequency data from 1980: I to 1996 :IV. He find that real effective exchange rate is an important variable in the trade balance equation and devaluation improves the trade balance of both economies in the long-run. He also find that no j-curve effect and causal run from exchange rate to trade balance.

R. Scott Hacker and Abdunasser Hatemi (2004) tested the trade J-curve for three transitional central European countries –the Czech Republic, Hungary and Poland in their bilateral trade with respect to Germany using generalized impulse response functions. They find that there are some characteristics associated with a j-curve effect for each country i.e. after a (real or nominal) deprecation the export-to import ratio briefly drops to below its initial value with in a few months and then rises to along run equilibrium value higher than the initial one.

✓ Olugebenga Onafowra (2003) examined the short run and long run effects of real exchange rate changes on the real trade balance of three Asian countries (Thailand, Malaysia and Indonesia) in their bilateral trade to the US and Japan with in a co integrating Vector error correction model (VECM). He also used generalized impulse response functions in order to investigate the response of trade balance on exchange rate shock i.e. the J-curve effect. The co integration analysis indicated that there is a long run steady –state relationship among real trade balance, real exchange rate, real domestic income and real foreign income. For Indonesia and Malaysia in their bilateral trade to both the US and Japan, and for Thailand in its bilateral trade to the US, their findings suggest that there are short run J-curve effects. With a real depreciation there is an initial worsening in the trade balance that lasts about 4 quarters but this is followed by an improvement in the long run. Thailand has the opposite movement in its bilateral trade to Japan; a real exchange rate devaluation shock initially improved then worsened and then improved the trade balance.

Guilherme Moura and Sergio Da Silva (2005) conducted a study on the existence or non-existence of a Brazilian J-curve. They find that the Marshall Lerner Condition holds true for Brazilian trade Balance, and no evidence of a short run J-curve.

Maylene Y.Damoense and Frank W.Agbola (2001) conducted a study to examine the impact of currency devaluation on South Africa's trade balance over the period 1979:I to 2003:III. They find that exchange rate devaluation has negative effect on South Africa's

trade balance in the long run. They also find that domestic income, foreign income and domestic money supply have a negative impact on the trade balance, while foreign money supply and interest rates have a positive impact on South Africa's trade balance.

Equar Desta (1999) examined the impact of devaluation on Ethiopian external trade. He used a simple regression equation by taking trade balance to GDP as a dependent variable and the lagged real exchange rate, the lagged real GDP and terms of trade as independent variables. He estimated the data using the ordinary least squares method with the help of SPSS computer software. He found that the coefficient of the lagged real exchange rate is negative while the coefficients of lagged real GDP and terms of trade are negative and positive respectively. He never used any type of methodology to know the short run and long run relationship between variables i.e. stationarity and cointegration test was not conducted.

From above, it is clear that neither theoretical nor empirical studies have established definitely whether a devaluation of a country's domestic currency would improve its trade balance. This clearly suggests that in studying the j-curve phenomenon, it is crucial to separate and identify both the short and long run implications of devaluation on the trade balance. In estimating the J-curve, researchers either use aggregated or bilateral data. Rose and Yellen (1989) argue that use of bilateral data is useful because you do not require a proxy for the world income variable as in the aggregate analysis, which reduces aggregation bias.

Having discussed the expected effects of exchange rate devaluations on the trade balance, we construct the hypothesis in the case of Ethiopia under section 1.4 and will be tested in chapter 5.

CHAPTER THREE

AN OVERVIEW OF THE ETHIOPIAN ECONOMY

3.1 Background

Ethiopia is a country, which is richly endowed with huge unskilled manpower, arable land and natural resources. However, much of its potential is not yet exploited. To start with, out of the sixty percent of its landmass, which is known to have the potential for agricultural development, only 15 percent is said to have been developed. Although its contribution to the national economy is very limited, the country's livestock wealth is the 2nd largest in Africa. The mineral resources potential is also high, much of it yet to be exploited. A few of them are gold, platinum, marble, tantalite, copper, potash, soda-ash, zinc, nickel, iron, and natural gas⁴.

The Ethiopian economy remains heavily dependent on agriculture, which accounts for about 50 percent of the GDP. An estimated 85% of the population gains its livelihood directly or indirectly from agricultural production. The Ethiopian commodity export sector is basically characterized by the dominant share of agricultural raw commodities in generating the greater proportion of the export earning of the country. These export

⁴ See <http://countrystudies.us/ethiopia/104.htm>

commodities together have accounted for more than 90 percent of the total merchandise export earning ⁵.

The level of development of the manufacturing sector in Ethiopia is at its infancy; and the country's industrial base is very low. The share of intermediate and capital goods industry is very insignificant. The industrial sector is heavily dependent on imports of semi-processed goods, raw materials, spare -parts and fuel. In addition to imported inputs, the factories depend upon backward and subsistence agriculture for their raw material demand.

Like many other Sub Sahara African (SSA) countries, Ethiopia has faced economic crises over the last three decades. The poor economic performance was attributed to both internal & external factors. The economic policy of the Derge regime (1974 - 1991) could be considered as the major internal cause. Internal factors include macroeconomic mismanagement such as overvalued real exchange rate and excessive fiscal deficit. On the external side, the oil crises 1970s, deteriorating of terms of trade, and an increase in the interest rate of developed countries relative to the countries interest rate could be identified as factors contributing to the poor performance of the economy.

During the Derg regime Ethiopia's economy was characterized by large budget deficits, overvalued exchange rate and persistent deficit in the balance of payment. More over, the fiscal imbalance was largely financed by money creation and through domestic bank

⁵ See <http://countrystudies.us/ethiopia/104.htm>

borrowing during the Derg period. Apparently, such financing has led to a price rise of non-tradable. However, the domestic price of tradable increases roughly at the lower international rate. Hence, the real exchange rate, at a fixed nominal exchange rate, declined (appreciation of the rate). As these external and internal factors affected the real exchange rate of the country, it is worthwhile to look into the performance of the national economy at large. In particular, there are important linkages between exchange rate misalignment and the macroeconomic condition of a given nation in the sense that a persistent misalignment of exchange rate has a negative impact on investment, productivity and hence, no economic growth.

The Derg regime (1974 –1991) was characterized by command and central planning where the public sector covers almost all major economic activities. However, in the post 1991 period, Ethiopia began moving from a state run economy to the market oriented economy and it allows the private sector to play an active role in the economy. During this period, the country is in the process of taking various reform measures. Among the economic reform packages, foreign exchange liberalization and devaluation of the currency were the very important measures.

The industries include food processing and beverages, automotive industries which include production of components and parts, textile and textile products and garments, leather and leather products, fertilizers (mini-Plant) and chemicals, drugs and pharmaceuticals are some among others.

With regard to the foreign direct investment (FDI) alone indicates that from 1992 - 2005, a total of 11,760 foreign and domestic investment projects with aggregate capital of 129 billion Birr have been issued with investment licenses of these more than 4 thousand projects are under operation and implementation⁶.

Besides, the foreign currency inflow has helped to facilitate transfer of technology and skills, earn & save foreign exchange and create backward and forward linkage effects in the economy. The "service" sector which consists of Trade, Transport and Communications, Banking, Insurance and Real State, Public Administration and Defense, Education, Health and Domestic and other personal services has increased.

The Agricultural Development Led-industrialization embraces the export-led developments strategy as an engine of growth, incorporates a parallel and co-ordinated development of agriculture and industry. The strategy has two layers, an outer layer, an export led growth and an inner core Agricultural development led-industrialization. The export contribution will come through the supply of commodities for direct export and through industrial value added. The inner core will come in two ways. First, by establishing a deliberate reliance of industry on domestic agriculture as inputs to agro business of various types. Second, it is intended to improve smallholder productivity thus reducing employment pressures and acting as an increased source of demand or local industry goods.

⁶ See <http://www.ethiopianmission.ch/business-eco.htm>

An economic reform programme developed in cooperation with the World Bank and the International Monetary Fund (IMF) and on a series of structural adjustment programmes since 1992 supports the country's development strategy. Major gains have been made from the reform programme, particularly as a result of liberalization, low inflation, fiscal discipline and low government borrowing, infrastructure improvement and the growth of the private sector.

The government has initiated a privatization programme since 1995/96. Since this period of time, 85% of 909 factories have been privatized. However the number of manufacturing industries at the verge of the EPRDF led government was 283 operating only 20% of their manufacturing capacity compared with 70% currently.⁷

3.1.1 GDP and its Components

Ethiopia is reputed for her natural and human resources potential. Nevertheless, like any other developing country, it has suffered from severe internal and external shocks particularly beginning from the early 1970s. While the external shock has largely been explained by the instability of world primary commodity prices, the domestic shocks have been attributed to structural problems, natural calamities (such as drought and famine) and man made crises (such as civil war) and misguided economic policies (among these include the fixed exchange rate policy).

⁷ See <http://www.ethiopianmission.ch/business-eco.htm>

Growth was relatively satisfactory in the late 1960s and early 1970s. The average rate of growth of GDP in real terms for the period 1967/68 - 1971/72 was 4% per annum (Mekonnen, 1992). However, since 1974 the Ethiopian Economy was persistently declined deep in to serious crises until the 1992 reform year. Real economic growth had been below zero for the large part of the military regime (1974- 1991). The average real GDP growth for the last four years of the Derg period was almost zero (0.33%) per year compared with an average population growth of 3% leading to a net decline in per capital income. Particularly, during the last few years of the military regime, the average growth rate of real industrial GDP was below zero and lowest with an all time lowest growth rate of about -4.4% in 1990/91 fiscal year. However, available data shows that, after the downfall of the military regime, Ethiopia's Economy has bounced back from a negative performance to a positive one and in some cases showed remarkable growth (Derrese Degefa, 1996).

Table 1: Average Annual Percentages Growth of GDP and its components

Commodity	The Imperial regime (1970/71– 1973/74)	The Derg Regime (1974/75– 1990/91)	The EPRDF Regime (1991/92 2004/05)	The Whole period (1970/71– 2004/05)
Agriculture	1.34	1.55	3.21	2.20
Industry	2.39	1.45	6.48	3.60
Distributive	5.01	1.01	6.78	3.53
Other service	7.23	4.87	6.11	5.63
GDP	2.56	1.67	4.71	3.04

Source: National Bank of Ethiopia

Note: The raw data from National Bank of Ethiopia and MOFED with two different base periods is linked in to one base period by the author and the above percentage is based on linked series of GDP.

The average growth rate of real GDP during the three identified periods 1970/71 - 1973/74, 1974/75 - 1990/91, 1991/92 – 2004/05 were 2.56, 1.67 and 4.71 respectively (see table 1).

Table 2: Average percentages share of GDP components

Commodity	The Imperial regime (1970/71–1973/74)	The Derg Regime (1974/75–1990/91)	The EPRDF Regime (1991/92–2004/05)	The Whole period (1970/71–2004/05)
Agriculture	63.60	57.22	51.03	55.47
Industry	10.92	12.15	12.14	12.00
Distributive	26.49	31.39	35.79	32.59
Other service	8.65	12.90	18.76	14.76

Source: National Bank of Ethiopia

As table 2 shows, Ethiopia's economy is dominated by agriculture and it accounts on the average to 55.47% of GDP from the period 1970/71 –2004/05. Agricultural sector is said to provide 90% of the country's exports and around 85% of employment. This implies that economic growth of Ethiopia is heavily dependent on agricultural growth. Hence, agricultural output is the single most important determinant of Ethiopia's overall economic and the problem of this sector and the internal and external constraints it usually faces are the most important problem of the country's economy. The average share of agricultural GDP for the periods 1970/71 - 1973/74, 1974/75 - 1990/91 and 1991/92 – 2004/05 were 63.60, 57.22 and 51.03 respectively (see table 2). Economic growth is often followed by a decline in the share of agriculture in GDP. In this regard, however, Ethiopia's economy has been stagnant for long without showing a significant change in the relative share of the sector. It is then apparent that the process of

development in Ethiopia has failed to exhibit a fundamental structural transformation of the economy.

The Ethiopia government has given due attention to the enhancement of this sector since the introduction of the economic reform in 1992. Nevertheless, in contrast to its size in the economy, agricultural growth is still very low as it is characterized by extremely low productivity. The poor performance of the agricultural sector meant that it failed to raise the transfer of resources between agricultural and other sectors implying that overall productivity was hindered.

3.2 The External Sector

3.2.1 The Export Sector

The export sector has played an important role to bring about rapid economic growth in developing countries. However, most of them largely depend, for their source of currency earning on a single product or a very narrow range of low value of products, mostly agricultural commodities and minerals. Basically these traditional exports face limited demand due to their low-income elasticity.

Likewise, the Ethiopian commodity export sector is basically characterized by the dominant share of agricultural raw commodities in generating the greater proportion of

the export earning of the country. These export commodities together have accounted for about 90 percent of the total merchandise export earning. The major export items, in order of their significance in the total commodity export value include coffee, hides and skins, oil seeds, pulses, chat, fruits and vegetables. Export of "chat" has become one among the most important items in the post reform periods (table 4 and appendix IX)

Since agriculture, in general, is under the vagaries of nature, particularly in the Ethiopian case, the high concentration on non-traditional export goods resulted in an unstable export performance. What is more, the sector is highly susceptible to the erratic nature of prices and unpredictable demand in the international market.

The total amount of export value in 1970/71 was 425.12 million Birr. It has steadily increased to 1,338.53 million Birr in 1978/79. In the 1991/92, however, fluctuated and reached 279.03 million Birr. After the reform period i.e. 1991/92, export earnings increased with little fluctuations and recorded 7,331 million Birr in 2004/05. The merchandise export on the average contributed about 3.25 percent of GDP during 1970/71 to 2004/05, the highest was 9.03 percent of GDP in 2004/05; and the lowest was 0.65 percent of GDP in 1991/92 (see annex XI)

According to Shiferaw (1995) as cited by Mehret (2006), in 1942 merchandise exports was valued at 66 million Birr. Between 1945 and 1950, merchandise export averaged

about 64 million Birr. In 1950s, earnings from merchandise exports increased quite considerably and averaged about 143 million Birr. During the period 1960 to 1974, exports steadily increased with average growth of 8.83 percent per annum rising from 194.6 million Birr in 1960/61 to 556.5 million Birr in 1973/74. However the contribution to GDP remained low. Starting from 6.8 percent of GDP in 1960/61, it averaged 7.0 percent until 1973/74, Even in the year where export earning was above imports, 1972/73, the earning was 8.7 percent of GDP.

Starting from 647.45 million Birr in 1974/75, the export earning increased to 1,338.53 million Birr in 1978/79. In the 1980s export earning declined and reached 279.03 million Birr in 1991/92. Exports contribution to GDP during the Derg regime was on the average 2.2 percent of GDP which is lower than 5.08, which is the contribution of exports to GDP during the EPRDF regime (see annex XI). The major policy factors, which contributed to the poor performance of the external sector in this period, are the overvalued exchange rate, which was a disincentive for exporters, heavy taxation of exports and the marginalization of the role of the private sector.

After the reform period (post 1992), the new government made a new policy to promote the export sector. These include the abolition of tariffs and incentives to exporters. In the post 1992 period, export has increased from 1,601.63 million Birr in 1992/93 to 7,331.26 million Birr in 2004/05. The rate of growth of export averaged about 46.19 percent annually. Its contribution to GDP, however, does not show an

improvement; it was on the average 5.08 percent during the period the EPRDF regime (see annex XI and table 3)

Table 3: Average Annual Percentages Growth of Export, Imports and GDP

Period	Exports	Imports	GDP
Imperial regime (1970/71 – 1973/74)	13.24	3.71	2.56
Derg regime (1974/75 – 1990/91)	14.66	10.99	1.67
EPRDF regime (1991/92 – 2004/05)	46.19	23.87	4.71
The whole period (1970/71 – 2004/05)	27.52	15.65	3.04

Source: National Bank of Ethiopia

The major factor that contributed to poor performance of the export sector for the whole period is its dependence on agricultural products and lack of diversification in the exportable commodities. Since agriculture in Ethiopia depends on weather, the high concentration of exported goods resulted in an unstable export performance.

3.2.1.1 The Structure of Exports

Ethiopia's export sector is characterized by over dependence on few agricultural products, with very limited exports of manufactured and semi-manufactured goods. This

structure of concentrating on few agricultural commodities has not significantly changed over time. The achievements of current reform program are below expectations, as it has not lead to a radical shift in the structure of exports. Most of the export items directly originate from the agricultural sector. Besides, Coffee has still remained to be the dominant export commodity, though its share in the value of total exports fluctuates from time to time. It accounted for an average of 56.92 percent of export earnings between 1970/71 and 2004/2005. Hides and skins, Oil seeds, Pulses, chat, fruits and vegetables, live animals and meat and meat products constituted 11.76 percent, 5.31 percent, 4.35 percent, 5.12 percent, 4.14 percent, 1.19 percent and 0.94 percent respectively. The combined share of coffee along with the above seven items is 89.74 percent (table 4 and appendix IX). This indicates that the dominant shares of Ethiopian export sector are agricultural commodities and it confirms that the diversification of the export sector is limited to these agricultural raw commodities.

The absence of diversification and the high dependency on specific commodities make the export sector to be exposed to external shocks. Accordingly, the value of major export items fluctuated from year to year interms of value due to the volatile and erratic behavior of prices and unpredictable demand in the international market. Similarly, on the supply side, these agricultural items are influenced by a large number of factors that are endogenous to the suppliers' production decisions and behavior.

Although there have been occasionally relative increases, the value of exports has declined from Birr 1,338.53 million Birr in 1978/79 has gone down to Birr 279.03 million Birr in 1991/92 (see annex XI). The major reason behind Ethiopia sluggish export growth had been the reduced competitiveness of exportable. This weakness ran across virtually all exports and was largely the result of the appreciation of the country's real effective exchange rate.

The years before devaluation (1974/75 to 1990/91), the contribution of Coffee to the value of total export declined. Thus, the value of coffee exports has fallen from 87.94 percent in 1978/79 to 49.70 percent in 1990/91. However, on average, coffee contributed more than 60% of total export earnings during the above period. Hides and skins, oil seeds, pulses, chat, Meat and Meat products, Fruits & vegetables and live animals constituted 11.35 percent, 2.77 percent, 3.74 percent and 1.77 percent, 0.61 percent, 5.90 percent and 1.98 percent during the above period respectively (see table 4 below)

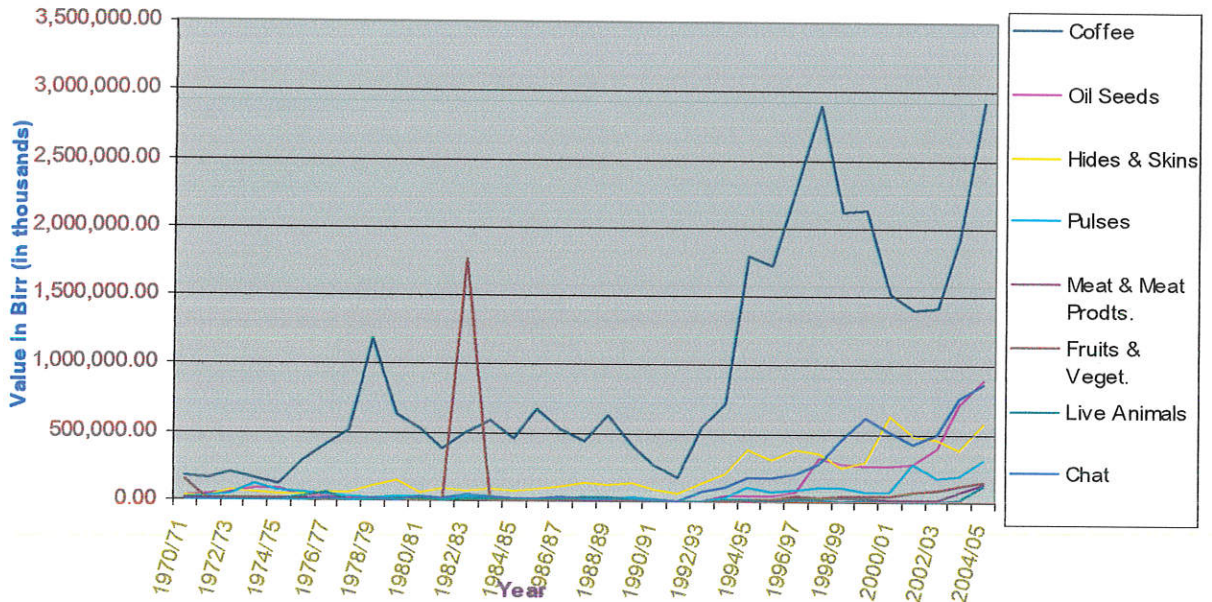
Table 4: Percentage share of Major Export items

Commodity	The Imperial regime (1970/71 – 1973/74)	The Derg Regime (1974/75– 1990/91)	The EPRDF Regime (1991/92 – 2004/05)	The Whole period (1970/71– 2004/05)
Coffee	43.23	60.63	56.32	56.92
Hides and Skins	10.44	11.35	12.63	11.76
Oil seeds	12.42	2.77	6.37	5.31
Pulses	11.07	3.74	3.18	4.35
Chat	0.85	1.77	10.41	5.12
Meat and Meat products	3.43	0.61	0.63	0.94
Fruits and Vegetables	9.67	5.09	1.42	4.14
Live animals	0.67	1.98	0.37	1.19

Source: National Bank of Ethiopia

From table 4, we can understand that coffee constituted the highest share of total export value and has not changed over the period under consideration. However, the contribution of oil seeds and pulses declined during the Derg as well as the EPRDF regime. The contribution of chat from total export value has increased sharply to 10.41 percent as compared to its share during the Imperial as well as the Derg regime with amount of 0.85 and 1.77 percent respectively. We can also see graphically the trend of major export items from 1970/71 – 2004/05 in figure 2.

Figure 2: Value of Major Export Commodities



Problems of Ethiopia's foreign trade can be classified in to broad categories, namely, demand and supply side problems. The world demand for agricultural products (Ethiopia's major export items) is limited due to slow growth of population, low-income elasticity of demand for these goods, the development of agricultural substitutes in industrial countries. Moreover, the world price of primary products are characterized by price fluctuation and deteriorating terms of trade.

On the supply side, policy problems, structural constraints and natural factors (drought, diseases, etc) are major factors, which constrain Ethiopia's foreign trade. Demand side and supply side problems together have led to ever-growing trade deficit, which directly

affects the size and signs of the current account balance since the invisible trade is highly limited. As a result, the deficit in the current account of the balance of payment of Ethiopia has been widening from time to time. This deficit is covered mainly through external finance and this would lead to ever -increasing debt burden.

As a whole, a few agricultural products had characterized the export sector of Ethiopia, a few market directions, trade restrictions and other unnecessary subsidies and fixed exchange rate policy. All these made the export sector to remain at its lowest level. Its poor performance, in turn, contributed to widening deficit in the balance of trade of the country.

3.2.2 The Import Sector

In order to undertake investment projects, expand production and ensure the availability of consumer goods, Ethiopia has to import those goods that are not domestically produced or whose substitutes are not domestically available.

Imports have been above exports in all the years under consideration except in 1972/73. In contrast to export, imports continuously increased throughout the whole period with an average growth rate of 15.65 percent per annum. Imports as a proportion of GDP was 1.35 during 1970/71 – 1973/74, 3.88 during 1974/75 – 1990/91 and 17.42 during 1991/92 – 2004/05 (see annex XII)

According to Shiferaw (1995) as cited by Mehret (2006), between 1945 and 1960 imports remained at low levels and averaged about 67 million Birr, reflecting the low level of economic performance. However, as with exports, imports assumed increasing importance starting from the 1960s and began to grow more steadily with economic expansion. The value of merchandise imports increased from about 73 million Birr in 1950 to 208 million Birr in 1959, rising at annual average of 11.6 percent. This was considerably higher than the rate of increase in exports (9.3 percent). Imports as a proportion of GDP was 3.88 on the average during 1970/71 to 1990/91.

During the Derge regime, the government made a strong effort to implement an import substitution strategy to curtail imports. However, due to misguided policy in the industrial sector, import payments increased from 668.80 million Birr in 1974/75 to 2,131.95 million Birr in 1990/91 (see annex XII). Unlike exports, imports increased continuously in the Derge regime and are above export for the whole period.

Even after the devaluation of the national currency in 1992, imports showed no sign of decrease. Starting 3,669.76 million Birr in 1992/93, import payment reached 31,434.17 million Birr in 2004/05 and increases with annual average growth of 23.87 percent, which is less than export growth of 46.19 percent (see annex XII). However, export could not catch-up and cover the import payments. Imports as a proportion of GDP in this period recorded the highest at 17.42 on the average. The main reason for the increase of imports during this period was trade liberalization, ease of foreign exchange

control, the rationalization of tariffs and the abolition of quantitative restrictions policies adopted by the government.

3.2.2.1 The Structure of Imports

The structure of Ethiopian imports, like exports, has remained rigid as the production and absorptive capacity of the economy failed to show any significant structural changes. By the end use, the Ethiopian imports could be classified in to five major categories: raw materials, semi-finished goods, fuel, capital and consumer goods. Table 5 shows the share of total value of imports by end use.

Table 5: Percentage Share of Imports by End Use

Commodity	The Imperial regime (1970/71–1973/74)	The Derg Regime (1974/75–1990/91)	The EPRDF Regime (1991/92 – 2002/03)	The Whole period (1970/71–2002/03)
Raw Materials	4.13	3.35	1.81	2.83
Semi-finished products	19	14.9	15.65	15.77
Fuel	11.9	14.65	16.64	15.1
Capital goods	31.66	34.63	32.21	33.22
Consumer durables	14.06	9.57	9.23	10.05
Consumer non-durables	18.53	22.07	20.4	20.9
Miscellaneous	0.76	0.8	4.04	2.14

Source: National Bank of Ethiopia

As table 5 shows fuel, capital goods and consumer goods (consumer durables and non-durables) take a large share of Ethiopia's imports in value terms. During the period 1970/71 – 2002/03, imports of capital goods accounting 33.22 percent of the total imports was dominant followed by consumer goods (durables and non-durables) which accounts 30.95 percent of the total imports. The other two categories, semi-finished good and fuel accounts on the average 15.77 and 15.1 percent of total imports respectively. The share of imports of raw materials, however, is insignificant with a share of 2.8 percent of the total imports.

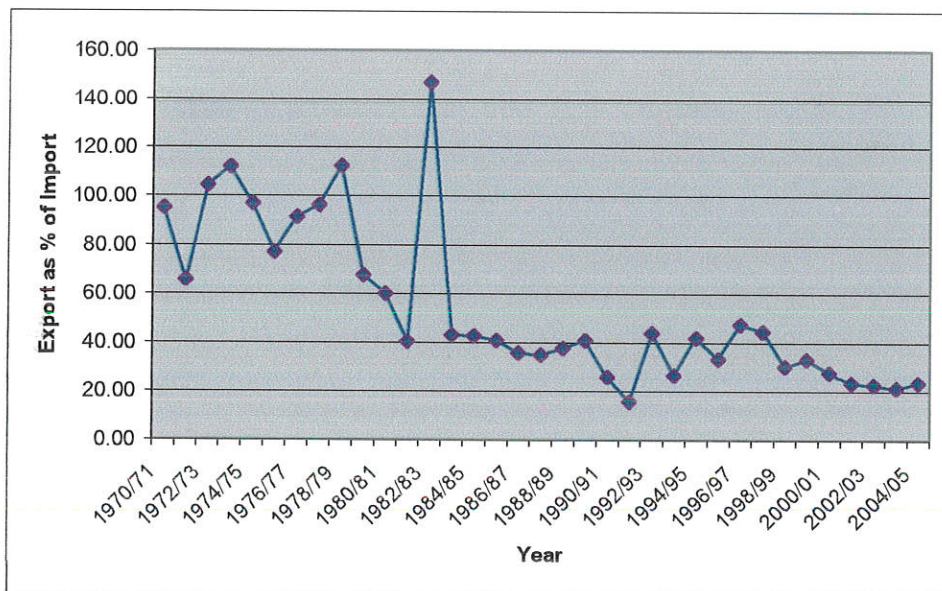
3.2.3 Trade Balance

The central theme of this paper is to examine the effect of exchange rate changes on trade balance of Ethiopia. Economic theory determines a number of key variables that have significant effect on imports, exports and trade balance. To see the effect of changes in exchange rate on trade balance of Ethiopia, it is desirable to examine its effects on exports and imports independently.

Except the 1973 surplus due to the substantial increase in the export of oil seeds and pulses, the trade balance has been in deficit and it is widening from time to time worse. The deficit widened from 0.07 percent of GDP in 1970/71 to 29.68 percent of GDP in 2004/05. The deficit was 0.08 percent of GDP in the imperial Regime (1970/71 – 1973/74), 1.66 percent of GDP in the Derg Regime (1974/75 – 1990/91) and 12.35 percent in the post reform period (1991/92 – 2004/05) (see annex XII).

The widening trade deficit is also reflected by the decline of foreign exchange earnings from exports of goods that cover imports. For the imperial period (1970/71 – 1973/74), foreign exchange earnings from exports of goods used to cover about 94.13 percent of total imports. For the Derg period (1973/74 – 1990/91), the corresponding figure declined to 63.96 percent. During the EPRDF regime (1991/92 – 2004/05), foreign exchange earnings from exports of goods have further declined to finance only 30.83 percent of the country's imports (see figure 3)

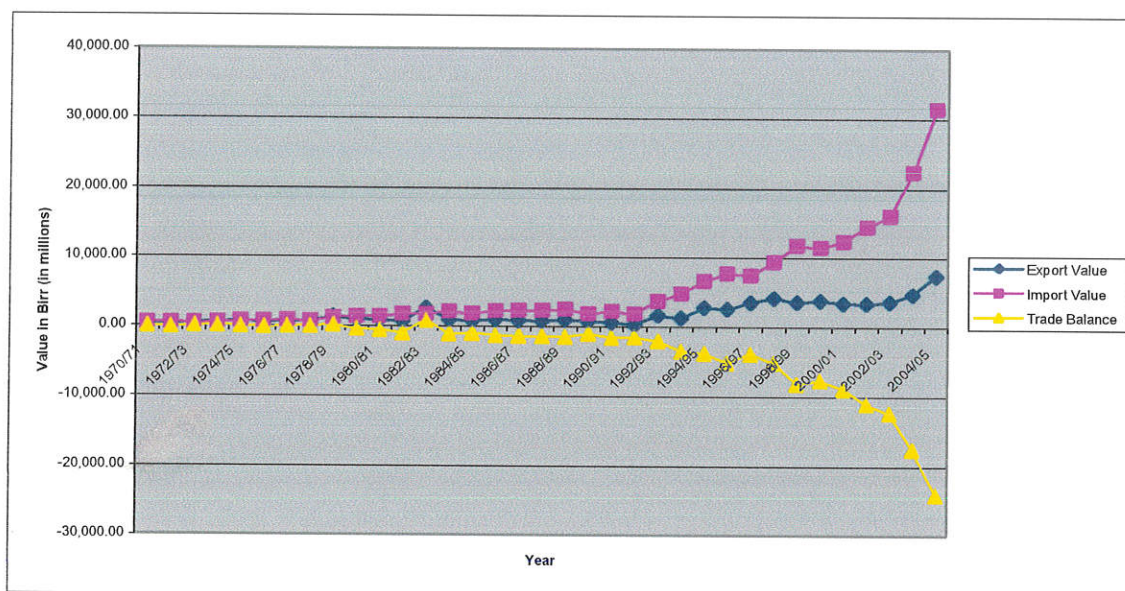
Figure 3: The Foreign earnings from Export of goods that finance Imports (1970/71 –2004/05)



Source: National Bank of Ethiopia

Figure 4 also shows the trends of export, import and trade balance

Figure 4: Comparison of Export value, import value and trade balance



Source: National Bank of Ethiopia, own computations

Figure 4 shows the steady growth of both import and export following the 1992 devaluation. During the period from 1992/93 to 2004/05, both import and export grew. However the growth of import is higher than the growth of export and the trade deficit has been increasing persistently.

Two reasons could be given to this deteriorating trade deficit. First, by comparison, the slow growth of exports and the substantial increase in imports caused by escalating demand for consumer goods and capital goods led to an ever-widening trade deficit. Secondly, like any developing country, the merchandise trade is still dependent on export of few primary products and import of raw materials, intermediate goods, and fuel. Capital and consumer goods. The fluctuation and the declining trend of price of primary commodities greatly affected export earnings, and the trade balance.

Generally, high susceptibility to external shocks, high dependence on agricultural commodities, high price and low-income elasticity of demand and low supply response characterize the Ethiopian export sector. On the other hand, imports intrinsically are higher price inelastic which are either necessities in production or consumption or very strategic commodity and are invariably required by the country.

3.3 The Ethiopian Exchange Rate Regime

For early half a century up until October 1992, the exchange rate of Ethiopian currency against its reference or reserve currency, the US dollar, was determined by government decree. The country's legal tender currency, the then called Ethiopian dollar (hereafter Ethiopian Birr as it replaced the Ethiopian dollar in September 1976) was issued and the official exchange rate of this currency with US dollar was created (with the official exchange rate of 2.48 Birr per US dollar) on July 23, 1945. After two decades, that is, on January 1, 1964 the Ethiopian Birr was slightly devalued to 2.50 Birr per US dollar (Equar Desta, 2001)

Following the collapse of the Bretton Woods system in 1971, the Birr was revalued to 2.30 Birr Per US dollar on December 21, 1971. The subsequent 10% devaluation of the US dollar, and temporarily brought about undervaluation of the Birr. In order to realign, the Ethiopian Birr was again revalued to 2.07 Birr per US dollar in February 1973. Since then, the Ethiopian currency has been pegged to the US dollar at the rate of 2.07 Birr per US dollar until massive devaluation of October 1992. This fixed official exchange

rate was left unaltered for two decades despite the floating of the major world currencies including US dollar. In effect the Birr became overvalued in terms of the US dollar as well as many other foreign currencies. One of the disadvantages of fixed exchange rate is that the exchange rate is not periodically adjusted to the fundamentals of the economy. Like many developing countries, Ethiopia's exports are not diversified and they are predominantly agricultural products whose price in the international market is declining against persistently rising prices of imports. The country therefore faces deteriorating terms of trade and overvaluation of the domestic currency or under competitiveness of the economy. This implies exports are unnecessarily dearer while imports are very cheap. In other words exports are over taxed and imports are subsidized which in turn discourages domestic production. Complicated with restrictive trade policies this causes the development of controlled border trade and parallel foreign exchange market. Ultimately, this results in external disequilibrium and balance of payments deficit (Equar Desta, 2001)

In the Imperial era, except for some essential consumer items, imports were free from licensing or other quantitative restriction and exporters were required to surrender their foreign exchange to commercial banks at the prevailing official exchange rate. The existence of macroeconomic stability and relatively liberal trade regime probably reduced misalignment of the actual exchange rate from its equilibrium in this regime. However, the Derg regime was characterized by persistent fall in real official exchange rate and steadily rising real parallel exchange rate signifying the overvaluation of the

currency. Under this overvalued exchange rate exports have been stagnating while imports have been rising over time since 1975/76.

Realizing the negative effect of an overvaluation of Birr on the country's trade balance and hence, on Balance of payments, Transitional Government of Ethiopia (TGE) devalued official exchange rate seven times with an official exchange rate gradually reaching 6.25 Birr per US dollar before the date of unification in the late 1992. The TGE also introduced a fortnightly auction for foreign exchange in May 1993 in an effort to liberalize the foreign exchange market and, hence, to achieve market determined exchange rate. The belief at the center of successive devaluation of official exchange rate and the adoption of the auction system is to attract foreign exchange in the parallel market back to the official line and there by strengthen official reserves.

From May 1993 up to the unification of the official and auction exchange rates on July 25, 1995, the exchange rate was partly determined by the government decree (applicable to the official rate) and partly by quasi-market force (applicable to the auction rate) as represented by fortnightly auctions. After the date of unification, the exchange rate of Birr against US dollar and the resultant cross-rates have been determined only through the auction system. Then, the official and auction exchange rates were unified on July 25, 1995. From the date of unification up to the present day, we have a quasi-market determined exchange rate

3.3.1 **Auction System**

Following the devaluation of the Birr the government took major steps that allowed the exchange rate to be market determined. In line with this, fortnightly, auction market for foreign exchange was introduced in May 1, 1993. Following these two rates, namely the official exchange rate and marginal rate emerged. The official rate was applicable to imports classified as 'essential' commodities (such as petroleum, pharmaceuticals, fertilizers, as well as official debt servicing). The marginal rate was determined only through the auction system and applied to other imports (other than the above stated imports). Since the inception of the auction system no sporadic forex supply has been observed and it is plausible to argue that exchange rate remained relatively stable. The National Bank of Ethiopia declares in advance the total supply of foreign exchange for each auction and the marginal rate is announced on the day the auction is held. In order to attend the auction, importers are required to have an import license for the commodity they want to import.

In order to avoid multiplicity of rate, the official and marginal rates were unified as of July 25, 1995 because the government bans the privilege or implicit subsidy enjoyed by the so-called essential commodities. Hence the official rate was irrelevant. Since then one auction determined official exchange rate system has been applied for all imports. Furthermore, the frequency of auction was also changed from fortnightly to weekly basis, starting August 1996, to accommodate the growing demand for foreign exchange. Thus, there was significant increase in demand for foreign exchange in the auction market.

Since its inception, several important modifications have been made to the operation of the auction; the retail auction (whereby the National bank of Ethiopia sells foreign exchange to final users) was replaced by wholesale auction in September 1998. Like the retail auction, the wholesale forex auction has been conducted openly in the presence of prospective bidders every Saturday. The Wholesale auction is different from that of the previous one in that the participants are not the final users of the foreign exchange but authorized commercial Banks and investors who want to bid for at least half a million U.S dollar. All foreign exchange won from the auction, other than by commercial banks, for which L/C is not established or transfer is not made, will be cancelled within 60 days from the date the bid is won. The marginal rate serves as an official rate for all transactions and it applies until the next auction date.

3.3.2 Foreign Exchange Bureaus

In an attempt to further liberalize the exchange rate and to move towards a fully realistic exchange rate, the National Bank of Ethiopia (NBE) allowed the establishment of foreign exchange bureaus in 1996. Only authorized commercial banks are allowed to establish forex bureaus. These banks are authorized to allow importers and exporters, excluding coffee, and provide associated services against submission of the required documents. They can approve imports for any values; but values of USD 1 million and above are subjected to open international competitive bidding backed by relevant documents.

Foreign exchange bureaus are authorized to engage in the purchase and sale of foreign exchange at freely negotiated rates and each foreign exchange bureau being free to quote buying and selling rates. The first licensed bureau went in to operation in April 1998; but at the end of December 2000, more than 26 bureaus are operating. From practical observation, it is plausible to say that the exchange rate quoted by the bureaus, particularly selling rate mostly remained very close to the parallel market rate.

Liberalization of external sector of the Ethiopian economy has been taking place in progression since the start of Structural Adjustment Program in October 1992. Before the introduction of the reform, there were relatively substantial restrictions on current account transactions; all international transactions were virtually under the control of the National Bank of Ethiopia (NBE). All transfers and payments abroad for exports, imports and invisible transactions required licenses issued by the NBE. There were quantitative restrictions on foreign exchange for personal travel abroad, business and medical purposes. Furthermore, exporters are required surrendering all foreign exchange earned to the NBE.

With the introduction of the reform, however, most of the restrictions that existed for long on current account transactions have been liberalized. Currently, there are improvements in the policy environment with respect to the current account transactions. The limit previously set in the amount of business and personal travel is waived. The payment (foreign currency) for personal and business travel will be made in acceptable instrument such as travelers check, draft and cash notes. But the cash note

payment shall not exceed USD 400 and the rest can be made in traveler's check, draft, etc. there is no export surrender now but exporters must sell their foreign exchange receipt within 28 days to any commercial banks at the attractive rate they get at the market.

3.3.3 The Parallel Foreign Exchange Market

Even though there is no consensus among researchers about the inception of the Ethiopian parallel market exchange rate, some of the opinion that it was non-existent or at its nominal before the derg assumed power. Befekadu Degefe (1994) stated that the significance of the illegal parallel market for foreign exchange has grown to the extent that impairing the operation of the official foreign exchange market during the post - 1974 and particularly since 1980/81 fiscal years. Willem Naude and Abu Girma (1994) as cited by Equar Desta (2001) noted that illegal parallel exchange rate system in Ethiopia developed in the 1970s, and expanded considerably during the 1980s. Be it as it may, one can intuitively say that the parallel market for foreign exchange started to expand and flourish during the 17 years of the Derg regime. Like many developing countries, the main factors that were behind the emergency of the parallel exchange market in Ethiopia, among others, were persistent external imbalance and fixed exchange rate policy, which led to overvaluation of the Birr since 1970s.

Undoubtedly, export performance of this country was virtually poor and export earnings remained scanty. Therefore, the National Bank of Ethiopia allocated foreign exchange to

importers through rationing. These measures worsened the forex problem and aggravated it extremely. Most of the private importers who could not get access to the official foreign exchange market resorted to the alternate parallel Market. On the other hand, those who acquire foreign exchange through private transfer from abroad continuously showed their preference for the parallel market, as official exchange rate was artificially low.

To this end, parallel foreign exchange market activities in Ethiopia have been important at various times in attracting traders and dealers, especially in the late 1980s, particularly when franco -valuta imports were allowed. The premium of the parallel market exchange rate has also depicted a substantial increase over the years. The premium, which was about 97% in 1975/76, moved up to 223.6% in 1990/91. Hence, parallel exchange rate premium over the last two decades had made a continuous expansion before the 1992 reform. However, after the introduction of the reform in Ethiopia and various exchange liberalization measures (devaluation, adoption of foreign exchange auction system and opening of forex bureau to engage in retail transaction) the margin of the premium began to narrow. Most importantly, the banning of franco-valuta imports in late 1996 contributed much to the small premium in the exchange rate market (Equar Desta 2001)

The Ethiopian parallel foreign exchange rate market is a very volatile market, which at times has showed a drastic fluctuation even after the economic reform program of

1992. This high degree of volatility was due to both economic and non-economic factors.

As the activities of the parallel market are often illegal measuring of its size is almost impossible. However, it is believed that the market accommodates significant transaction because contraband and most of franco-valuta imports are financed from the black market. Nowadays, the course of supply to the parallel market has showed fluctuation even in some cases have a seasonal behavior. As a matter of fact during holidays the amount of transfer sent from abroad by Ethiopians to their family shows an increase and this to some extent pushes up the supply of foreign Exchange in the Parallel market.

This shows sensitivity of this market to seasonal factors. Recently, the premium for foreign exchange declined and the sources of supply of foreign exchange to this market also decreased. Nevertheless, due to different factors, the demand for foreign exchange in this market is still strong. This is due to, first, the amount of foreign currency which is allowed for personal travel abroad is 1200 USD, travelers who wanted an additional foreign currency in excess of the allowed amount try to fill the gap from this market. Secondly, there is a need to finance illegal imports (contraband). Thirdly, according to some reliable sources, there are some agencies owned by foreigners, which are engaged in receiving or sending money from or to abroad illegally

To put it succinctly, the stated supply and demand side problems of the market mostly explain the observed volatile nature of the exchange rate in the parallel market and it is more or less a floating one (as it is governed by supply and demand of the currency) when compared with the official exchange rate.

3.3.4 Movements in the Real Effective Exchange Rate

In order to make quantitative assessment of the competitiveness of the Ethiopia's export sector vis-à-vis the rest of the world, it is important to construct the real effective exchange rate index (REERI), which is the measure of the price of the country's goods relative to the price of its trading partner countries, both expressed in domestic currency.

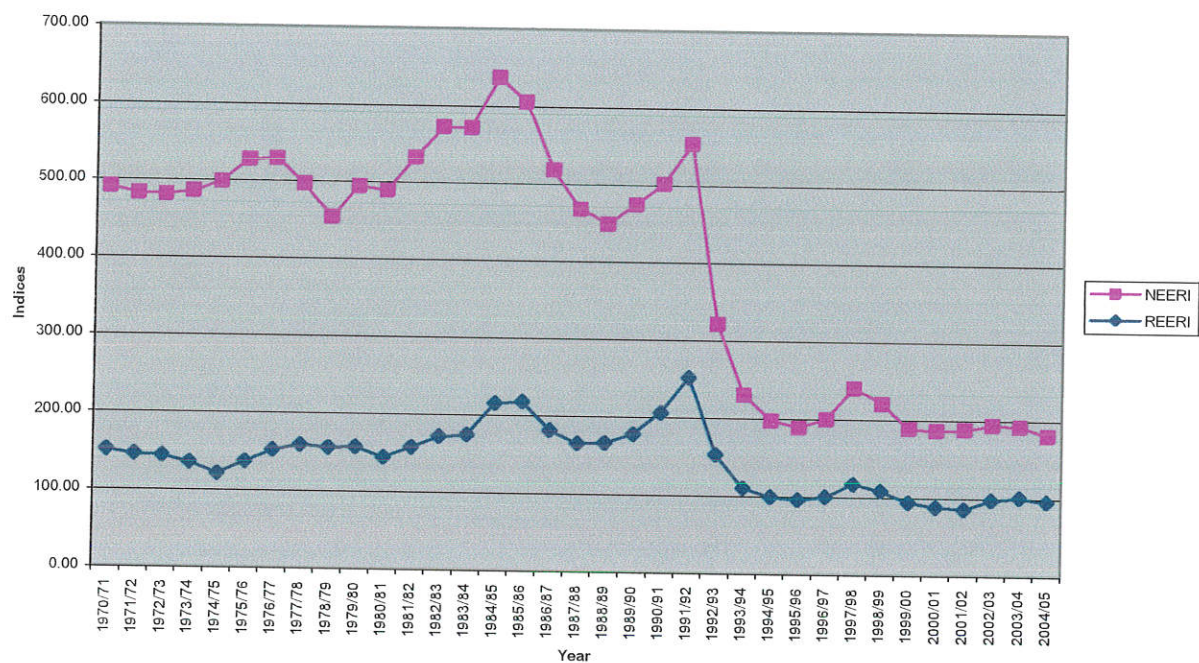
We used the IMF definition of the nominal exchange rate (USD per Birr) in which a decline in nominal exchange rate (E) shows currency depreciation. When the value of REER falls, either because of a decrease in E or a decline in the inflation differential or both, we speak of a real depreciation of the exchange rate and thus enhanced competitiveness of the country's goods vis-à-vis foreign goods. On the other hand, an increase in REER represents a real appreciation implying decline competitiveness of the home economy.

Observation of the trend of real effective exchange rate index from 1970/71 to 2004/05 reveals about seven distinctive periods with few exceptions: depreciation from 1970/71

through 1974/75, appreciation from 1975/76 through 1985/86 but 1978/79 and 1980/81, depreciation in 1986/87 to 1987/88, appreciation from 1988/89 through 1991/92, depreciation by about 64% in 1992/93 and the depreciation kept through 1995/96, appreciation in 1996/97 and 1997/98 and depreciation there after but the year 2002/03 and 2003/04 (see figure 5)

The following figure shows the trend of annual real and nominal effective exchange rate indices of Ethiopia for selected years. I.e. 1970/71 – 2004/05

Figure 5: Trends in Real and Nominal Effective Exchange Rate Indices of Ethiopia



CHAPTER FOUR

DATA, METHODOLOGY AND MODEL SPECIFICATION

4.1. MODEL SPECIFICATION

4.1.1 Theoretical Model

We start by defining the model, which follows the standard "two-country" imperfect substitute's model as specified in Goldstein and Kahn (1985) and Rose and Yellen (1989). In this model, imports, exports and the trade balance refer to the merchandise component. Key assumptions of the models are that neither imports nor exports are perfect substitutes for domestic goods, so that finite elasticities for demand and supply can be estimated for most traded goods.

Domestic income and prices of imports are the main determinants of demand for imported goods. Mathematically, we can express the volume of imports demanded domestically, M_d , is given by equation (4.1)

$$M_d = M_d(Y, P_M, P), \quad \frac{\partial M_d}{\partial Y} > 0, \quad \frac{\partial M_d}{\partial P_M} < 0, \quad \frac{\partial M_d}{\partial P} > 0 \dots\dots\dots(4.1)$$

Where,

M_d = the domestic demand for imports

Y = domestic income

P_M = the domestic currency price paid by domestic importers

P = the overall domestic price level, i.e. the price of all domestically produced goods

Similarly, the quantity of imports demanded by the rest of the world (equivalent to the supply for domestically produced goods) is given by equation (4.2)

$$M^*_d = M^*_d (Y^*, E, P^*_M, P^*), \frac{\partial M^*_d}{\partial Y^*} > 0, \frac{\partial M^*_d}{\partial P^*_M} < 0, \frac{\partial M^*_d}{\partial P^*} > 0 \dots\dots\dots(4.2)$$

Where,

M^*_d = the quantity of imports demanded by the rest of the world

Y^* = foreign income

E = the nominal exchange rate defined as the number of units of foreign currency per unit of domestic currency

P^*_M = the foreign currency price paid by foreign importers

P^* = the overall foreign price level

In other words, the demanded quantity is a function of the level of money income in the importing region, the imported goods' own price and the price of domestic

substitutes. Since we deal with aggregated data, the assumption is that inferior goods or domestic complements are excluded. This implies that domestic income and foreign income elasticity are assumed positive as well as the cross-price elasticities of demand. The own-price elasticities of demand are assumed to be negative. Furthermore, it should be noted that the demand variables are represented only by current income rather than permanent and transitory income.

Usually in such models homogeneity of the demand function is assumed, so that the consumer does not suffer from money illusion – demand will remain constant when doubling money income and prices. Hence, this homogeneity assumption is expressed by dividing the explanatory variables on the right hand side by their respective prices i.e P and P*. These way arguments of the demand function are expressed in real terms- real income and relative prices of import to domestically produced goods. As a result of these modifications we can re- write equations (4.1) and (4.2) as

$$\mathbf{M}_d = \mathbf{M}_d (Y_r, RP_M), \frac{\partial M_d}{\partial Y_r} > 0, \frac{\partial M_d}{\partial RP_M} < 0; Y_r = \frac{Y}{P}, RP_M = \frac{P_M}{P} \dots\dots\dots(4.3)$$

$$\mathbf{M}_d^* = \mathbf{M}_d^* (Y_r^*, RP_M^*), \frac{\partial M_d^*}{\partial Y_r^*} > 0, \frac{\partial M_d^*}{\partial RP_M^*} < 0; Y_r^* = \frac{Y^*}{P^*}, RP_M^* = \frac{P_M^*}{P^*} \dots\dots\dots(4.4)$$

Since the relative price of imports is equivalent to the foreign currency price of foreign exports adjusted for exchange rate, we may define the relative price of imports as

$$\mathbf{RP}_M = \frac{P_M}{P} = \frac{EP_x^*}{P} = \frac{EP_x^*}{P} \cdot \frac{P_x^*}{P_x^*} = \mathbf{Q} \cdot \frac{P_x^*}{P_x^*} = \mathbf{Qp}_x^* \dots\dots\dots(4.5)$$

Where $p_x^* = \frac{P_x^*}{P_x^*}$ represents the real foreign currency price of exports

Q = the real exchange rate defined in such a way that an increase in Q refers to depreciation of the domestic currency.

$$Q = \frac{EP_x^*}{P}$$

Finally, the quantity of imports supplied by the rest of the world to the domestic country, i.e. the rest of the world export supply function, and the quantity of exports domestically supplied to the rest of the world are given in equations (4.6) and (4.7)

$$\mathbf{X}_s = \mathbf{X}_s (P_x, P) \dots\dots\dots(4.6)$$

$$\mathbf{X}_s^* = \mathbf{X}_s^* (P_x^*, P^*) \dots\dots\dots(4.7)$$

Where X_s = the quantity of exports domestically supplied to the rest of the world

X_s^* = the rest of the world export supply function

P_x = the domestic currency price received by domestic exporters

P_x^* = the foreign currency price received by foreign exporters

In equilibrium, conditions (4.8) and (4.9) determine the demand and supply conditions for both regions:

$$M_d = X_s \dots \dots \dots (4.8)$$

$$M_d^* = X_s \dots \dots \dots (4.9)$$

Hence, defining the trade balance as

$$TB = P_x M^* - Q P_x^* M_d \dots \dots \dots (4.10)$$

And solving for levels of domestic exports and imports as well as the relative price level of imports as a function of the real exchange rate we obtain the partial reduced form of the domestic trade balance in (4.11)

$$TB = TB(Y_r, Y_r^*, Q), \frac{\partial TB}{\partial Y_r} < 0, \frac{\partial TB}{\partial Y_r^*} > 0, \frac{\partial TB}{\partial Q} > 0 \dots \dots \dots (4.11)$$

Hence, we expect real foreign income and real exchange rate depreciation to be positively related to the trade balance and real domestic income negatively related to the trade balance.

4.1.2 Empirical Model

Following Rose and Yellen (1989), Rose (1991), Bahamni-Oskooee (1991), Baharumshah (2001) and Krugman – Baldwin (1987), this study adopts the following model. An advantage of this model, in addition to its simplicity, it is ability to capture the effect of all the specified macro variables on trade balance. Thus the empirical model used in this study is

$$\ln(X/M) = \alpha_0 + \alpha_1 \ln RGDP + \alpha_2 \ln RWGDP + \alpha_3 \ln REER + \alpha_4 \text{DERPC} + \alpha_5 \text{DDROUGHT} + e_t \dots \dots \dots (4.12)$$

Where,

$\ln(X/M)$ = natural log of trade balance, X = export value, M= import value

$\ln RGDP$ = natural log of real gross domestic product (real domestic income)

$\ln RWGDP$ = natural log of real world gross domestic product (real foreign income)

$\ln REER$ = natural log of real effective exchange rate

e_t = error term

Let us rewrite equation (4.12) as follows

$$tb_t = \alpha_0 + \alpha_1 rgdp + \alpha_2 rwgdp + \alpha_3 reer + \alpha_4 derp + \alpha_5 ddrought \dots \dots \dots (4.13)$$

$$\alpha_1 > 0 \text{ or } \alpha_1 < 0, \alpha_2 > 0 \text{ and } \alpha_3 < 0$$

Where $tb = \ln(X/M)$ $derp = DERP$
 $rgdp = \ln RGDP$ $ddrought = DDROUGHT$
 $rwgdp = \ln RWGDP$
 $reer = \ln REER$

In this study, trade balance is expressed as a ratio of exports (X) to imports (M). The X/M ratio or its inverse has been used in many empirical investigations of the trade balance exchange rate relationship (see for example, Weixian, 1998; Gupta – Kapoor and Remakrishanan, 1999; Ahmad Zubaidi, 2001; Bahmani – Oskooee 2001; and Onatowora, 2003). The advantage of this ratio is that it is insensitive to the unit of measurement as it can be easily interpreted as nominal or real exchange rate, secondly, it is emphasized (Boyd et al., 2001) that in logarithmic model it gives the Marshall – Lerner condition exactly rather than approximating it. Furthermore, following studies by Rose (1991), Bahmani – Oskooee (1991) and Ahmad Zubaidi (2001), this study will use real effective exchange rate instead of nominal bilateral exchange rate.

4.2. The Data Sources and Definition of Variables

4.2.1 Sources of Data

The data used in this study are collected from different institutions. Quarterly data on real effective exchange rate index, value of export and import are obtained from National Bank of Ethiopia. Annual data on Gross Domestic Product (GDP) of Ethiopia is obtained from National Bank of Ethiopia and Ministry of Finance and Economic Development (MOFED). Quarterly data on nominal gross domestic product (NGDP) and price indices of Ethiopia's major trading partners are obtained from international financial statistics (IFS) database of the international Monetary Fund (IMF). The author computes real world gross domestic product (RWGDP) from Ethiopia's major trading partners as a proxy measure of foreign income. The data collected is quarterly for the period from 1970/71 (QI) to 2005/06 (QI).

4.2.2 Definition of Variables and Expected signs

The model specified in this study require data on the following variables:

I) Real Effective Exchange Rate (REER)

In the practical sections of many real exchange rate literatures, the multilateral real exchange rate that considers the exchange rate of the domestic currency with respect to the trading partners has been advocated as a more reliable proxy for measuring the country's external competitiveness with respect to its trade partners. It is also called the multilateral real effective exchange rate (Edwards 1989).

The data on real effective exchange rate that I got from National Bank of Ethiopia is based on the IMF definition of the nominal exchange rate (USD per Birr) in which a decline in nominal exchange rate (E) shows currency depreciation. When the value of REER falls, either because of a decrease in E or a decline in the inflation differential or both, we speak of a real depreciation of the exchange rate and thus enhanced competitiveness of the country's goods vis-à-vis foreign goods. On the other hand, an increase in REER represents a real appreciation implying declining competitiveness of the home economy.

Regarding with the methodology of constructing real effective exchange rate, see annex II

Expected Signs of Real Effective Exchange rate Index

The impact of exchange rate changes on trade balance is ambiguous, that is, it could be positive or negative. If there is a real depreciation or devaluation of the domestic currency, that is REER decrease, then the increased competitiveness in prices for the domestic country should result in it exporting more and importing less (the "volume effect"). However, the lower REER also increases the value of each unit of import (the "import value effect"), which would tend to diminish the trade balance. It is argued that in the short run import values effects prevail, whereas the volume effects dominate in the long run. The coefficient of REER satisfies the Marshall-Lerner condition

II) Gross Domestic Product (GDP)

Gross Domestic Product (GDP) is the market value of all final goods and services produced within an economy in a given period of time. Nominal GDP for any particular country is simply the value of its GDP measured in terms of current money prices. Real GDP is the value of goods and services measured using a constant set of prices. That is, real GDP shows what would have happened to expenditure on output if quantities had changed but prices had not. Because a society's ability to provide economic satisfaction for its members ultimately depends on the quantities of goods and services produced, real GDP provides a better measure of well being than nominal GDP.

In this study, we use annual GDP data series from 1970/71 - 2005/06 and for this study period there are two different base year prices. The first annual series of real GDP at constant 1980/81-factor cost includes the period from 1970/71 - 2005/06 and the second annual series of real GDP at 1999/00 (1992) constant price includes the period from 1994/95 - 2004/05. Our interest is to generate annual data for the study period 1970/71 - 2005/06 based on the current base year. I.e. 1999/00. Since these two series were computed based on two different base period prices, adjustment was made to link the old series (1980/81 base) and the new series (1999/00) base in to one linked series based on 1999/00 price (1999/00 base).

Linking of Series on Different Bases⁴

The purpose of rebasing is to obtain and use a base year price structure, which is more representative for the current period. As it is not meaningful to revalue all historical estimates at the base year price, the new structure is applied only to the estimates of the base year and after. To provide continuous time series, constant price estimates are linked at the new base year at both the aggregate level and at the sectoral level (eg manufacturing).

The formula adopted to link the constant price 1999/00 series to the previous constant price 1980/81 series in this study is:

⁴ The methodology is adopted from report of the Singapore Department of Statistics on “ rebasing and linking of National Accounts Series” which follows the United Nations System of National Accounts (SNA), February 2001

$$E_{1999/00}^x = E_{1980/81}^x * \frac{E_{1999/00}^{1999/00}}{E_{1980/81}^{1999/00}} \dots\dots\dots(4.14)$$

Where $\underline{E_{yy}^x}$ is the estimate of year x in base year yy prices.

This method preserves the growth rates associated with the previous base year.

After obtaining annual series for the period 1970/71 to 2005/06, attempts have been made to disaggregate these annual data in to quarterly series. I have used the methodology, which is used by Haile Kibret (2001) (See annex III for detail information regarding with computation)

Expected Signs of Real Gross Domestic Product

It states that the trade balance is affected by the rise of domestic income. Increase in home income would lower the trade balance due to increased demand for imports. However, it was revealed in recent years that adverse trade balance response to the rise of domestic incomes is not so certain a priori, as a rise of domestic incomes can increase both the demand for the country's exports if the latter have been supply constrained. Moreover if the rise of domestic incomes stems from an increase in the production of import-substitute goods, imports may decline. That is why the sign of the coefficient of real GDP is ambiguous. I.e. either positive or negative.

3) Real World Gross Domestic Product (RWGDP)

It is used as a proxy measure for foreign income. A rise in foreign incomes is led to an increase in the demand for country's exports. So, its sign expected to be positive. The author computes RWGDP based on quarterly data on nominal gross domestic product (NGDP) & price indices of Ethiopia's major trading partners, which is obtained from international financial statistics (IFS) database. For the computation of RWGDP, see the detail annex IV.

4) Dummy variables included in the Model

In regression analysis, a dummy variable (also known as indicator or bound variables) is one that takes the values 0 or 1 to indicate the absence or presence of some categorical effect that may be expected to shift the outcome. The following two dummy variables are included in our model.

- I) **DERP**: It is a dummy exchange rate policy change with value unity before 1992/93 when the exchange rates were fixed and a zero other wise.
- II) **DDROUGHT**: as a whole, the export sector of Ethiopia is characterized by a few agricultural products. These agricultural commodities are highly dependent on the availability of rainfall. It is known that natural factors like drought affect the trade balance of Ethiopia either by decreasing export supply and/or by increasing import as relief aid. Drought is a dummy variable

(lack of rainfall) which takes the values of unity for the years of drought and zero otherwise.

4.3 METHOD OF ANALYSIS

The econometric procedure that we follow in this study is described as follows:

4.3.1 Stationarity Test

Time series econometric study is not complete without performing stationarity test on variables used for the study. The first procedure that should be performed is testing the stationarity⁵ of data. When one wants to construct an econometric model (or relationship) between economic variables using time series data on the variables, he/she should test the stationarity of each time series variable. In empirical studies with time series data stationarity of the variables under consideration is crucial to avoid problems of spurious regression, which may give very high R^2 value and significant t-ratios even without true relationship among the variables. That is if non-stationary variables were regressed using OLS, the results obtained would be spurious which implies that the variables have common trend in time and they may not have a

⁵ A stochastic process is said to be stationary if its mean and variance are constant overtime and the value of the covariance between the two time periods depends only on the distance or gap between the two time periods and not the actual time at which the covariance is computed (Gujarati, 1995). In other words, If neither the mean μ_t nor the covariance γ_t depend on the date t, then the process Y_t is said to be covariance stationary or weakly stationary:
 $E(Y_t) = \mu$ for all t
 $E(Y_t - \mu)(Y_{t-j} - \mu) = \gamma_j$ for all t and j

long run economic or causal relationship. For the classical regression model to hold all the variables involved in the regression must be stationary.

Most time series macroeconomic variables are non-stationary in which case the variables may have consistent trend relationship rather than true or behavioral relations (Johansen, 1988).

To avoid the spurious regression problem that may arise from regressing a non-stationary time series on one or more non-stationary time series, we have to transform non-stationary time series to make them stationary. The transformation method depends on whether the time series are Difference Stationary process (DSP), which is making a variable stationary by differencing and Trend Stationary Process (TSP) that deals with making a variable stationary by de-trending.

Difference Stationary and Trend Stationary techniques are key concepts in time series analysis. These concepts can be illustrated using the following two regression models.

$$Y_t = \beta_1 + \beta_2 t + U_t$$

Where Y_t is the time series under study and t is the trend variable measured chronologically. The regression represents a TSP if one subtracts the trend, (i.e. $\beta_1 + \beta_2 t$) from the equation i.e. $\hat{U}_t = Y_t - \hat{\beta}_1 - \hat{\beta}_2 t$ will be stationary. \hat{U}_t is known as a (linearly) detrended time series. However, if we take the equation $Y_t = Y_{t-1} + U_t$ (pure

random walk without drift), it is non-stationary. But, if we write as $\Delta Y_t = (Y_t - Y_{t-1}) = U_t$ it becomes stationary. We call such a process difference stationary process.

The Augmented Dickey – Fuller (ADF) Test

To test for unit root of the variables the Augmented Dickey- Fuller (ADF) test procedure is employed as described by Enders (1995). The ADF test compared to the ordinary Dickey – Fuller unit root test, allows the inclusion of lagged dependent variable terms in order to correct for serially correlated residuals. The following equation is used to test for presence of unit root in the series.

$$\Delta Z_t = a_0 + a_1 t + \gamma Z_{t-1} + \sum_{i=1}^p \beta_i \Delta Z_{t-i} + \varepsilon_t \dots\dots\dots(4.15)$$

Where a_0 , a_1 , γ and β_i are parameter estimates, t is a time trend and ε_t is the error term. The number of augmented lags is denoted by p and its order is depend on by minimizing the information criteria, Akaike or Schwarz. The null hypothesis of the ADF in this specification is that $\gamma = 0$ (the data needs to be differenced to make it stationary) and the alternative hypothesis is that $\gamma < 0$ (the data is stationary and does not need to be differenced).

4.3.2 Co integration Test

An $(n \times 1)$ vector time series Y_t is said to be co integrated if each of the series taken individually is $I(1)$, that is, nonstationary with a unit root, while some linear

combination of the series $a'y_t$ is stationary or $I(0)$, (Hamilton James (1994), p-571). When this is the case, a is called a co integrating vector.

Co integration means that although many developments can cause permanent changes in the individual elements of y_t , there is some long-run equilibrium relation tying the individual components together, represented by the linear combination $a'y_t$. Clearly, the co integrating vector a is not unique, for if $a'y_t$ is stationary, then so is $ba'y_t$ for any nonzero scalar b ; if a is a co integrating vector, then so is ba . In speaking of the value of the co integrating vector, an arbitrary normalization must be made, such as that the first element of a is unity.

Engle and Granger (1987) provide the following definitions of co integration⁶ and he notes, " a test for cointegration can be thought of as the pre-test to avoid 'spurious regression'"

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.

⁶ The components of the vector $x_t = (x_{1t}, x_{2t}, \dots, x_{nt})$ are said to be co integrated of order d, b , denoted by $x_t \sim CI(d, b)$ if

- i) All components of x_t are co integrated of order d
- ii) There exists a vector $\beta = (\beta_1, \beta_2, \dots, \beta_n)$ Such that linear combination $\beta_{x_t} = \beta_1 x_{1t} + \beta_2 x_{2t} + \dots + \beta_n x_{nt}$ is integrated of order $(d-b)$, where $b > 0$ The vector β is called the co integrating vector

“ 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 over time and the difference between them will be stable (i.e stationary)” pp. 22).

Making a variable stationary by differencing only gives the short-run dynamics while our interest may be to know also about the long-run parameters. Non-stationary variables can be stationary by differencing but in differencing the variables, there will be loss of considerable long run information. For this reason we appeal to the notion of co integration.

There are two main approaches to test for co integration. These are the Engle –Granger (1987) two-stage procedure and the Johansen maximum likelihood method (Johansen (1988) and Johansen and Juselius (1990)) procedure.

4.3.2.1 The Engel –Granger (EG) Approach

Suppose that two variables – say, Y_t and Z_t are believed to be integrated of order 1 and we want to determine whether there exists an equilibrium relationship between the two. Engle and Granger (1987) propose a straightforward test whether two I (1) variables are co integrated of order CI (1, 1).

Step 1: Pretest the variables for their order of integration. By definition, co integration necessitates that the variables be integrated of the same order. Thus, the first step in the analysis is to pretest each variable to determine its order of integration. If the variables are integrated of different orders, it is possible to conclude that they are not co integrated.

Step 2: Estimate the long-run equilibrium relationship. If the results of step 1 indicate that both Y_t and Z_t are $I(1)$, the next step is to estimate the long-run equilibrium relationship in the form:

$$Y_t = \beta_0 + \beta_1 Z_t + e_t \dots \dots \dots (4.16)$$

In order to determine if the variables are actually co integrated, denote the residual sequence from this equation by \hat{e}_t . Thus, \hat{e}_t is the series of the estimated residuals of the long-run equilibrium relationship. If these deviations from long run equilibrium are found to be stationary, the Y_t and Z_t sequences are co integrated of order (1, 1).

Step 3: Estimate the error correction model. If the variables are co integrated (i.e., if the null hypothesis of no co integration is rejected), the residuals from the equilibrium regression can be used to estimate the error correction model.

If $\{y_t\}$ and $\{z_t\}$ are $CI(1,1)$, the variables have the following error correction model using the saved residuals ($\hat{e}_{t-1} = Y_{t-1} - \beta_1 Z_{t-1}$) from the estimation of the long-run equilibrium relationship:

$$\Delta \mathbf{Y}_t = \alpha_1 + \alpha_y \hat{e}_{t-1} + \sum_{i=1} \alpha_{11}(i) \Delta \mathbf{Y}_{t-i} + \sum_{i=1} \alpha_{12}(i) \Delta \mathbf{Z}_{t-i} + \varepsilon_{yt} \dots \dots \dots (4.17)$$

$$\Delta \mathbf{Z}_t = \alpha_2 + \alpha_z \hat{e}_{t-1} + \sum_{i=1} \alpha_{21}(i) \Delta \mathbf{Y}_{t-i} + \sum_{i=1} \alpha_{22}(i) \Delta \mathbf{Z}_{t-i} + \varepsilon_{zt} \dots \dots \dots (4.18)$$

Where,

β_1 = the parameter of the co integrating vector given by equation (4.17)

ε_{yt} & ε_{zt} = white-noise disturbances (which may be correlated with each other)

$\alpha_1, \alpha_2, \alpha_y, \alpha_z, \alpha_{11}(i), \alpha_{12}(i), \alpha_{21}(i), \alpha_{22}(i)$ are all parameters

Although the Engle and Granger (1987) procedure is easily implemented, it does have several important defects. The estimation of the long run equilibrium regression requires that the researcher place one variable on the left hand side and use the others as regressors. Moreover, in tests using three or more variables, we know that there may be more than one co integrating vector. The method has no systematic procedure for the separate estimation of the multiple co integrating vectors.

Another serious defect of the Engle-Granger procedure is that it relies on a two-step estimator. The first step is to generate the error series e_t and the second step uses generated errors to estimate a regression of the form $\Delta \hat{e}_t = a_1 \hat{e}_{t-1} + \varepsilon_t$, thus the coefficient a_1 is obtained by estimating a regression using the residuals from another regression. Hence, any error introduced by the researcher in step 1 is carried in to step 2. Fortunately, several methods have been developed that avoid these problems. The Johansen (1988) maximum likelihood estimators circumvent the use of two step

estimators and can estimate and test for the presence of multiple co integrating vectors. Moreover, these tests allow the researcher to test restricted versions of the co integrating vector(s) and speed of adjustment parameters.

The Johansen (1988) procedure relies heavily on relationship between the rank of a matrix and its characteristic roots.

4.3.2.2 Johansen Maximum Likelihood Method

The Johansen – Juselius method sets out a maximum likelihood procedure for the estimation and determination of the presence of co integrating vectors in a vector Autoregressive (VAR) system. Suppose the vector of p variables, $Z_t = (Z_{1t}, \dots, Z_{pt})$, is generated by the K-order vector autoregressive process with Gaussian errors.

$$Z_t = A_1 Z_{t-1} + \dots + A_k Z_{t-k} + \mu + \Psi D_t + \varepsilon_t \dots \dots \dots (4.19)$$

Where Z_t is a $P \times 1$ vector of $I(1)$ variables,

A_1, A_2, \dots, A_k are $P \times P$ matrices of estimable parameters

$\varepsilon_1, \dots, \varepsilon_T$ are identically and independently distributed n-dimensional vector with zero mean and variance Σ_ε

μ is a vector of constant

D_t is a vector of nonstochastic variables, orthogonal to the constant term, such as seasonal dummies, 'dummy type' variables, and/or stochastic "weakly exogenous" variables.

Since we want to distinguish between stationarity by linear combination and by differencing, this process may be written in error correction form as

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \dots + \Gamma_{k-1} \Delta Z_{t-k+1} + \Pi Z_{t-k} + \mu + \Psi D_t + \varepsilon_t \quad t = 1, \dots, T$$

.....(4.20) or

$$\Delta Z_t = \sum_{i=1}^{k-1} \Gamma_i \Delta Z_{t-i} + \Pi Z_{t-k} + \mu + \Psi D_t + \varepsilon_t$$

Where $\Gamma_i = -(\mathbf{I} - \sum_{j=1}^{k-1} A_j)$ or $\Gamma_i = -(\mathbf{I} - A_1 - \dots - A_i)$ for $i = 1, \dots, k-1$; and

$$\Pi = -(\mathbf{I} - \sum_{i=1}^k A_i) \text{ or } \Pi = -(\mathbf{I} - A_1 - \dots - A_k)$$

\mathbf{I} = identity matrix

Δ = Difference operator

Estimated coefficients Γ and Π in equation (4.20) respectively represent short-run adjustments and long-run relationship among Z_t variables. Information about the number of co integrating vectors is found in the rank of π . Specifically, the rank of π determines how many linear combinations of Z_t are stationary. If the rank of π is zero,

⁷ In order to derive equation (4.20) from equation (4.19), we use the following technique: subtracting Z_{t-1} from each side we obtain $\Delta Z_t = (A_1 - I) Z_{t-1} + A_2 Z_{t-2} + \dots + A_k Z_{t-k} + \mu + \Psi D_t + \varepsilon_t$. we add and subtract $(A_1 - I) Z_{t-2}$ to obtain $\Delta Z_t = (A_1 - I) \Delta Z_{t-1} + (A_2 + A_1 - I) Z_{t-2} + A_3 Z_{t-3} + \dots + A_k Z_{t-k} + \mu + \Psi D_t + \varepsilon_t$. Continuing in this fashion, we obtain the above equation i.e equation (4.20)

no stationary linear combination can be identified. I.e. no co-integration exists among the variables under consideration. On the other hand if π has full rank, then it means that the variables are stationary in levels. The interesting case is when π has a reduced rank or when r is less than the number of variable in the regression. Thus in the case where $0 < \text{rank}(\pi) = r < p$, π can be factored as $\alpha\beta'$ (or $\pi = \alpha\beta'$) where α (weights or error correction parameters, or speed of adjustment parameters) and β (a matrix of long-run coefficients or co integration vectors) are $(p \times r)$ matrices of rank r .

Hence, the essence of conducting co integration analysis is to (i) test for presence of long-run stationary relationship (s) between variables, (ii) estimate long-run parameters β s (co integration vectors), (iii) estimate long-run adjustments α s (loading coefficients), and (iv) estimate long-run information to estimate Vector Error Correction Models (VECM) which describe short-run dynamics.

We know that the rank of a matrix is equal to the number of its characteristic roots (eigen values) that differ from zero. Suppose we obtained the matrix π and ordered the n characteristic roots such that $\lambda_1 > \lambda_2 > \dots > \lambda_n$. If the variables in Z_t are not co integrated, the rank of π is zero and all these characteristic roots will equal zero. Since $\ln(1) = 0$, each of the expressions $\ln(1-\lambda_i)$ will equal zero if the variables are not co integrated. Similarly, if the rank of π is unity, $0 < \lambda_1 < 1$ so that the first expression $\ln(1-\lambda_1)$ will be negative and all the other $\lambda_i = 0$ so that

$$\ln(1-\lambda_2) = \ln(1-\lambda_3) = \dots = \ln(1-\lambda_n) = 0$$

In practice, we can obtain only estimates of π and the characteristic roots. The test for the number of characteristic roots that are not insignificantly different from unity can be conducted using the following two test statistics: trace and maximum eigen value tests. These statistics are given by the following formula (Harris, 1995)

$$\lambda_{\text{trace}}(\mathbf{r}) = -\mathbf{T} \sum_{i=r+1}^n \ln(1-\hat{\lambda}_i) \dots\dots\dots(4.21)$$

$$\lambda_{\text{max}}(\mathbf{r}, \mathbf{r}+1) = -\mathbf{T} \ln(1-\hat{\lambda}_{r+1}) \dots\dots\dots(4.22)$$

Where $\hat{\lambda}_i$ = the estimated values of the characteristic roots (also called eigen values) obtained from the estimated Π matrix

T = number of observations

The trace statistics, λ_{trace} tests the null hypothesis that the number of distinct co integrating vectors is less than or equal to r against the general alternative.

λ_{max} tests the null that the number of co integrating vector is r against the alternative r + 1

T is the sample size

The Johansen (1988) Maximum likelihood estimation procedure is superior in the sense that it overcomes the limitations of the Engle-Granger (1987) two-stage procedure. The Johansen (1988) Maximum Likelihood estimation circumvents the use of two-step estimations.

Unlike the Engle-Granger procedure, it does not require to establish a priori assumptions of at most one co-integrating vector. It also avoids arbitrary selection of dependent and independent variables. Testing the existence of co-integrating relationship is made on the bases of vector error correction mechanism (VECM). It rests on appropriate statistics for hypothesis testing for the number of co integrating vectors. From these brief descriptions about the two available procedures, it is evident that the Johansen maximum likelihood procedure is superior in testing for co- integration. Therefore, we use this approach in this study.

4.3.3 Vector Error Correction Model (VECM)

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

If variables are co integrated, then tests involving differenced variables will be misspecified and some important information lost unless a lagged error-correction term is included. Therefore, we estimate the error correction model in which the error

correction terms (ECT), derived from long-run co integrating vectors, are included as independent explanatory variables in the estimation process of equation (4.13) in order to recover all the long-run information that was lost in the original estimation process. Assuming that equation (4.14) is co integrated with all its non-stationary variables, the system can be re written as:

$$\Delta \ln(\mathbf{tb})_t = \alpha_1 + \lambda \mathbf{e}_{t-1} + \sum_{i=1}^k \beta_i \Delta \ln(\mathbf{tb})_{t-i} + \sum_{i=1}^l \delta_i \Delta \ln(\mathbf{reer})_{t-i} + \sum_{i=1}^m \gamma_i \Delta \ln(\mathbf{rwgdp})_{t-i} + \sum_{i=1}^m \eta_i \Delta \ln(\mathbf{rgdp})_{t-i} + \mu_t \dots\dots\dots(4.23)$$

Where all the variables in (4.23) remain defined as before. \mathbf{e}_{t-1} is the error-correction term (one lagged error) generated from Johansen multivariate process and μ_t is the disturbance term. The coefficient of the lagged error correction term, λ , is the adjustment coefficient that defines the proportion by which long-run disequilibrium in dependent variable is corrected in a given period of time.

The application of the Johansen method produces two types of relationships; short-run dynamics and long-run causal relationships between the trade balance and the specified set of independent variables. The long-run causal relationship is captured by the coefficients of the lagged value of the error correction term, \mathbf{e}_{t-1} , while the short-run causal effects are implied by the coefficients of the lagged explanatory variables (in first difference). If only the vector error-correction term (ECT) is statistically significant, this implies that the variable is weakly endogenous with respect to the long-run parameters.

Similarly, if only the coefficients of the lagged explanatory variables (in first difference) are statistically significant, this implies that the variable is weakly endogenous with respect to the short-run parameters. Finally, if the lagged explanatory variables and error correction terms are not statistically significant, then the dependent variable is econometrically strongly exogenous.

4.3.4 Generalized Impulse Response Analysis

We use this approach to get answer for the hypothesis stated in section 1.4 as to whether the J-curve exists on the trade balance in Ethiopia or not. Similar to auto-regression, a vector auto-regression can also be written as a moving average representation. In the vector moving average representation, the variables in a given VAR system are expressed in terms of current and past values of their respective shocks. Importantly, the vector moving average representation through the coefficients of the error terms can be used to estimate the interaction between the variables in the dynamic system (Enders, 1995).

The parameters of the error terms are called impact multipliers and they measure the instantaneous response of a given variable to one unit change in a shock. When the impact multipliers are considered over time, they are called impulse response functions and when plotted against time the behavior of the variables in the dynamic system is represented in response to various shocks.

In order to investigate the dynamics of this problem, let us consider the original VAR (1) model as follows

$$\mathbf{Z}_t = \mathbf{A}_1 \mathbf{Z}_{t-1} + \varepsilon_t \dots \dots \dots (4.24)$$

Lagging the above equation as $\mathbf{Z}_{t-1} = \mathbf{A}_1 \mathbf{Z}_{t-2} + \varepsilon_{t-1}$ and substituting for \mathbf{Z}_{t-1} gives

$$\begin{aligned} \mathbf{Z}_t &= \mathbf{A}_1 \mathbf{Z}_{t-1} + \varepsilon_t \\ &= \mathbf{A}_1 (\mathbf{A}_1 \mathbf{Z}_{t-2} + \varepsilon_{t-1}) + \varepsilon_t \\ &= \mathbf{A}_1^2 \mathbf{Z}_{t-2} + \varepsilon_t + \mathbf{A}_1 \varepsilon_{t-1} \end{aligned}$$

Repeating the above n times, that is, successively substituting for \mathbf{Z}_{t-2} , \mathbf{Z}_{t-3} , etc gives:

$$\mathbf{Z}_t = \sum_{i=0}^n \mathbf{A}_1^i \varepsilon_{t-i} + \mathbf{A}_1^{n+1} \mathbf{Z}_{t-n+1} \dots \dots \dots (4.25)$$

If the condition: $\lim_{n \rightarrow \infty} \mathbf{A}_1^n = 0$, called the stability condition, holds, then:

$$\mathbf{Z}_t = \sum_{i=0}^{\infty} \mathbf{A}_1^i \varepsilon_{t-i} \dots \dots \dots (4.26)$$

Such a form representing a process which generates \mathbf{Z}_t as an infinite sum of lagged random errors weighted by generally diminishing coefficients, is called, quite appropriately, a vector moving-average representation, denoted as VMA.

For illustrative purpose, let us use the two-variables first-order VAR model as follows

$$\mathbf{X}_t = \mathbf{a}_1 \mathbf{X}_{t-1} + \mathbf{b}_1 \mathbf{Y}_{t-1} + \varepsilon_{1t} \dots \dots \dots (4.27)$$

$$Y_t = c_1 X_{t-1} + d_1 Y_{t-1} + \varepsilon_{2t} \dots \dots \dots (4.28)$$

Writing equation (4.27) and (4.28) in matrix form, we get

$$\begin{pmatrix} X_t \\ Y_t \end{pmatrix} = \begin{pmatrix} a_1 & b_1 \\ c_1 & d_1 \end{pmatrix} \begin{pmatrix} X_{t-1} \\ Y_{t-1} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} \dots \dots \dots (4.29)$$

Equation (4.29) can be written in the form of equation (4.26) as follows:

$$\begin{pmatrix} X_t \\ Y_t \end{pmatrix} = \sum_{i=0}^{\infty} \begin{pmatrix} a_1 & b_1 \\ c_1 & d_1 \end{pmatrix}^i \begin{pmatrix} \varepsilon_{1t-i} \\ \varepsilon_{2t-i} \end{pmatrix} \dots \dots \dots (4.30)$$

This could have been used for the evaluation of time paths of responses of particular variables to a single unitary shock (and this is what simply policy analysis is about), if not for the unfortunate fact, in general, the error terms ε_{1t-i} and ε_{2t-i} are correlated. In order to make evaluation, we need to undertake orthogonalization:

$$\varepsilon_{2t}^* = \varepsilon_{2t} - \delta \varepsilon_{1t}, \text{ where } \delta = \sigma_{12}/\sigma_{11}.$$

Thus: $\varepsilon_{2t} = \varepsilon_{2t}^* + \delta \varepsilon_{1t}$

Hence, by substituting $\varepsilon_{2t-i}^* + \delta \varepsilon_{1t-i}$ for ε_{2t-i} in the VMA representation of the VAR model, one can write the VMA model as:

$$\begin{pmatrix} X_t \\ Y_t \end{pmatrix} = \sum_{i=0}^{\infty} \begin{pmatrix} a_1 & b_1 \\ c_1 & d_1 \end{pmatrix}^i \begin{pmatrix} 1 & 0 \\ \delta & 1 \end{pmatrix} \begin{pmatrix} \varepsilon_{1t-i} \\ \varepsilon_{2t-i}^* \end{pmatrix} \quad , \text{ or, in a slightly different notation:}$$

$$\begin{pmatrix} X_t \\ Y_t \end{pmatrix} = \sum_{i=0}^{\infty} \begin{pmatrix} \phi_{11}^{(i)} & \phi_{12}^{(i)} \\ \phi_{21}^{(i)} & \phi_{22}^{(i)} \end{pmatrix} \begin{pmatrix} \varepsilon_{1t-i} \\ \varepsilon_{2t-i}^* \end{pmatrix} \dots\dots\dots(4.31)$$

Now consider the VAR (1): $\sum_{i=0}^n A^i \varepsilon_{t-i}$ the vector of variables Z_t can be represented in a

form similar to the VMA:

$$Z_t = \sum_{i=0}^{\infty} \phi_i e_{t-i} \dots\dots\dots(4.32)$$

Where $\phi_i = \begin{pmatrix} \phi_{11}^{(i)} & \phi_{12}^{(i)} \\ \phi_{21}^{(i)} & \phi_{22}^{(i)} \end{pmatrix}$ and $e_t = \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t}^* \end{pmatrix}$

In this model, the residuals are orthogonal and can be used for tracking dynamic responses.

The moving average representation is an especially useful tool to examine the interaction between the $\{Y_t\}$ & $\{X_t\}$ sequences. The coefficients of ϕ_i can be used to generate the effects of ε_{1t} and ε_{2t} shocks on the entire time paths of the $\{Y_t\}$ and $\{X_t\}$ sequences. It should be clear that the four elements of ϕ_i are impact multipliers.

The four sets of coefficients $\phi_{11}^{(i)}, \phi_{12}^{(i)}, \phi_{21}^{(i)}, \phi_{22}^{(i)}$ are called the impulse response functions, since they represent the behaviour of the modelled series in response to shocks (innovations). Vector e_t is called the vector of innovations: this is a vector of impacts induced for particularly variables where these impacts are independent from each other.

More precisely, the interpretation of particular elements of these matrices is the following:

$\phi_{21}^{(0)}$ is the expected instantaneous impact of a one-unit change in ε_{1t} on Y_t

$\phi_{21}^{(1)}$ is the expected one-period response of a one-unit change in ε_{1t-1} on Y_t etc

The cumulated effects of unit impulses in ε_{1t} and/or ε_{2t} can be obtained by the appropriate summation of the coefficients of the impulse response functions. For example, note that after n periods, the effect of ε_{1t} on the value of Y_{t+n} is $\phi_{21}^{(n)}$. Thus, after n periods, the cumulated sum of the effects of ε_{1t} on the the sequence of $\{Y_{t+i}\}$, $i = 0, 1, 2, \dots, n$ is given by:

$$\sum_{i=0}^n \phi_{21}^i \dots\dots\dots(4.33)$$

Plotting the coefficients of matrices ϕ_i against i is a practical way to visually represent the behaviour of the $\{Y_t\}$ and $\{X_t\}$ series in response to the various shocks

In order to discover whether the J-curve effects exist, generalized impulse response functions must be computed and plotted to identify the response of trade balance to shocks in the real effective exchange rate for Ethiopia. This is one way of visualizing the response of endogenous series to various shocks on the variables included in VAR system to be traced out.

4.3.5 Variance Decompositions

The dynamic relationships of the variables with respect to the trade balance are provided in terms of variance decomposition from the generalized approach. One important property of variance decomposition analysis is that it provides some information about the relative importance of random innovations. With variance decomposition, you get some information on the percentage of variation in the forecast error of a variable as explained by its own innovation and proportion explained by innovations in other variables in the system.

The Variance decompositions represent the proportion of total variance of each variable that is attributable to each of the orthogonalized innovations. It measures the overall relative importance of an individual variable in generating variations due to its own shock as well as shocks due to other variables in the system.

CHAPTER FIVE

EMPIRICAL RESULTS AND INTERPRETATION

The empirical analysis is carried out using quarterly data on trade balance (tb), real effective exchange rate (reer), real domestic income (rgdp) and real foreign income (rwgdp) for Ethiopia in the period 1970/71QI – 2005/06QI. The length of the sample period is determined by the availability of the relevant data. Combinations of econometric software packages used for empirical analysis of this study are PCGIVE (version 10), PCFIML (version 9) and EVIEWS (version 3 and 5).

5.1 Unit Root Tests

One popular test of detecting stationarity of variables in time series econometrics is the unit root test. This test helps to detect whether a variable is stationary or not. It also provides the order of integration at which the variable can be stationary. If a variable is stationary in level, i.e. without running any differencing, then that variable is said to be integrated of order zero or I (0). Similarly, if it becomes stationary by differencing once, then the variable is said to be an I (1) variable.

In order to test stationarity of all variables included in our model, we employ the standard Augmented Dickey-Fuller test for all variables at levels and first differences

with constant, trend, constant and trend and without. Table 6 reports the test results for all variables, both in levels and in first-differences.

Table 6: The Augmented Dickey-Fuller (ADF) test results for nonstationarity of variables

Variables	Specification	ADF test	Test Critical Values		
			1%	5%	10%
tb	WC	-0.748296	-3.480038	-2.883239	-2.578420
	WCT	-4.270252	-4.026429	-3.442955	-3.146165
	WOCT	0.646581	-2.582465	-1.943247	-1.615122
reer	WC	-1.710818	-3.477487	-2.882127	-2.577827
	WCT	-2.220061	-4.024935	-3.442238	-3.145744
	WOCT	-0.467762	-2.581584	-1.943123	-1.615200
rgdp	WC	1.536309	-3.482035	-2.884109	-2.578884
	WCT	-1.046254	-4.031309	-3.445308	-3.147545
	WOCT	2.383676	-2.583153	-1.943344	-1.615062
rwgdp	WC	0.068954	-3.477487	-2.882127	-2.577827
	WCT	-3.135276	-4.024935	-3.442238	-3.145744
	WOCT	2.134154	-2.581584	-1.943123	-1.615200
Δtb	WC	-9.128557	-3.480038	-2.883239	-2.578420
	WCT	-9.104498	-4.028496	-3.443961	-3.146755
	WOCT	-9.039807	-2.582465	-1.943247	-1.615122
Δreer	WC	-11.06892	-3.477835	-2.882279	-2.577908
	WCT	-11.03690	-4.025426	-3.442474	-3.145882
	WOCT	-11.10009	-2.581705	-1.943140	-1.615189
Δrgdp	WC	-2.816352	-3.482035	-2.884109	-2.578884
	WCT	-3.322549	-4.031309	-3.445308	-3.147545
	WOCT	-1.604729	-2.583153	-1.943344	-1.615062
Δrwgdp	WC	-11.70326	-3.477835	-2.882279	-2.577908
	WCT	-11.70345	-4.025426	-3.442474	-3.145882
	WOCT	-11.34645	-2.581705	-1.943140	-1.615189

Where WC = with constant

WCT = with constant and trend

WOCT = without constant and trend

Δ = Difference operator

Table 6 reports unit root result of all the variables included in our trade balance equation. The test results at levels indicate that the null hypothesis of a unit root could not be rejected at 1%, 5% and 10% level of significance for all variables except for trade balance with constant and trend specification. While the test results at levels indicate that the null hypothesis of a unit root could not be rejected for all variables, the statistical significance of absolute value of test statistics at 1%, 5% and 10% level indicates that the series are stationary at first differences except for real GDP which is stationary at 10% level of significance with the first two specifications i.e WC & WCT and should be employed in vector autoregressive (VAR)/vector error correction model (VECM) process in their present form.

After confirming the stationarity of the variables at I (1), the Johansen maximum likelihood method (Johansen (1988) and Johansen and Juselius (1990)) is applied to examine the question of co integration among the variables.

5.2 Determination of Optimal Lag length

One of the most critical parts of the Johansen and Juselius approach is determining the rank of matrix π since the approach depends primarily upon having a well-specified regression model. Therefore, before any attempt to determine this rank or to represent any estimation, the empirical analysis begins with specification and misspecification tests. The specification and misspecification tests are based on the ordinary least square (OLS) residuals of the unrestricted model in equation (4.19) for the vector Z_t .

The specification and misspecification tests are used primarily to choose an 'appropriate' lag length for each model. This is one of the important stages in this analysis. Lag lengths have significant influence on the outcome of the results. There is always a trade off between using too many lags and too few lags. Too many lags tend to make the model less parsimonious and reduce the degrees of freedom while using very few lags leads to correlation of the residuals. Therefore, the lag length is chosen according to three criteria: (1) what economic theory would say about the impact and lagged effect of the exchange rate on the trade balance; (2) what model selection strategies would recommend; and (3) that normality and non-serial correlation are satisfied. In this study, we use both criteria and the procedure is given as follows:

The work of information criteria is to compromise between the number of parameters and lag length by minimizing the linear combination of the residual sum of squares and

the number of parameters (Johansen, 1988). We used the Akaike Information Criterion (AIC), Schwartz Bayesian Criterion (SBC) and the Likelihood ratio test to select the optimal lag length. SBC is also called the Bayesian information Criterion (BIC). If P is the total number of parameters estimated, we have

$$\mathbf{AIC (P) = n \log \hat{\sigma}_p^2 + 2P} \dots \dots \dots \mathbf{(5.1)}$$

$$\mathbf{BIC (P) = n \log \hat{\sigma}_p^2 + P \log n} \dots \dots \dots \mathbf{(5.2)}$$

Where n is the sample size. If RSS is the residual sum of squares, $\sum \hat{\varepsilon}_i^2$, then

$$\hat{\sigma}_p^2 = \frac{RSS}{(n-P)} \dots \dots \dots \mathbf{(5.3)}$$

If we are considering several autoregressive moving average (ARMA) models, we choose the one with the lowest AIC or BIC (the two criteria can lead to different conclusions). The goodness of fit criteria is more like R² or minimum $\hat{\sigma}^2$ type criterion.

It is well known that the results of the Johansen-Juselieus procedure are sensitive to lag length. Our choice of the optimal lag length (k) for the VAR model is guided by the need for the model to have desirable statistical properties and also to span the time period in order to capture the effect of devaluation on trade balances. A testing-down type procedure is followed to test the lag significance from a long-lag structure to a more parsimonious one (for further information about test of model reduction using PCGIVE, see annex V).

We started with a vector autoregressive (VAR) of lag length 20 and performed restriction tests to determine the data congruency of the VAR. Having in mind the information criterion of Akaike (AIC) (see table 7), we find that 13 lags make it possible to evaluate a model dynamics parsimoniously. Such lag length is recommended in the literature studying the effects of exchange rates on the trade balance. For example, Bahmani-Oskoei (1985) and Himarios (1989) suggest that if there is an improvement in the trade balance when devaluation exists, a period of at least two years is needed for observable effects to occur.

Table 7: Selection of Number of Lags Using AIC, BIC, HQ and Likelihood Ratio Statistic (EViews result)

Lag Length	LR	AIC	SBC	HQ
1	555.2472	-3.229483	-2.602418	-2.974714
2	111.8850	-3.942040	-2.956652	-3.541689
3	120.6458	-4.767266	-3.423555	-4.221332
4	120.7791	-5.633623	-3.931589	-4.942107
5	61.71899	-5.975106	-3.914750	-5.138008
6	13.90817	-5.862219	-3.443540	-4.879539
7	14.56137	-5.761932	-2.984930	-4.633669
8	13.88366	-5.660872	-2.525548	-4.387028
9	6.457705	-5.482287	-1.988640	-4.062860
10	6.399428	-5.306502	-1.454532	-3.741493
11	16.21476	-5.257218	-1.046925	-3.546627
12	41.32966	-5.549061	-0.980445	-3.692888
13	49.86920*	-5.989720*	-1.062782	-3.987965
14	6.283090	-5.830150	-0.544889	-3.682812

* Indicates lag order selected by the criterion

Where,

AIC: Akaike information criteria

SBC: Schwarz Bayesian criteria

HQ: Hannan-Quinn statistics

LR: sequential modified LR test statistic (each test at 5% level)

Therefore, we select lag length 13 based on AIC and LR for our model. The test of model reduction on annex V also approve that the appropriate lag length for our model is 13. Based on PCGIVE model reduction test, the reduction from lag 20 to lag 13 is not rejected. However, if we could further reduce the lag length to lag 12 and other lags less than 12, the restriction on lag 13 is rejected. Therefore, the appropriate specification of our system is VAR of order 13 and with lag length of 13 our VAR becomes a congruent representation of the data.

5.3 Co integration Analysis

Once we checked the order of integration and set the optimal lag length, we can now move on to test for the existence of co integration among the variables involved in our model. We applied the johansen procedure to test for co integration of the variables in our model. The Johansen method uses the maximum eigen value statistics to determine the rank of co integrating vectors. If computed λ_{trace} and λ_{max} exceed the critical values, we may reject the null hypothesis that co integrating rank = 0. The Johansen test for

existence of co integration from equation (4.20) for quarterly data for the period 1970/71 QI to 2005/06 QI suggest that there are two co integrating vectors which means that in the long run the hypothesis of rank = 0 and rank =1 are rejected. The variables involved are co-integrated means that they have long-run behavioral relationships.

PCFIML test results of rank, β eigen vectors and α coefficients are presented below.

Table 8: Unrestricted co integration Rank Test (Trace)

Eigen value	Null Hypothesis	Alternative Hypothesis	Trace statistic	Critical value (0.05)
0.2586	$r = 0$	$r > 0$	82.72**	53.1
0.175955	$r \leq 1$	$r > 1$	44.42**	34.9
0.0982831	$r \leq 2$	$r > 2$	19.64	20.0
0.0487816	$r \leq 3$	$r > 3$	6.401	9.2

Trace test indicates two co integrating equation at 1% level of significance

** Denotes rejection of the hypothesis at the 1% level

Table 9: Unrestricted co integration Rank Test (Maximum eigen value)

Eigen value	Null Hypothesis	Alternative Hypothesis	Maximum eigen statistic	Critical value (0.05)
0.2586	$r = 0$	$r = 1$	38.3**	28.1
0.175955	$r = 1$	$r = 2$	24.77*	22.0
0.0982831	$r = 2$	$r = 3$	13.24	15.7
0.0487816	$r = 3$	$r = 4$	6.401	9.2

Max test indicates two co integrating equations at 1% and 5 % level of significance.

** Denotes rejection of the hypothesis at the 1 % level

* Denotes rejection of the hypothesis at the 5% level.

Restricted variables: constant, dderp, ddrought

Where λ_{trace} is the stochastic matrix trace test that the number of co integrating vectors is less than or equal to r and λ_{max} is the maximal eigen value statistic for at most r co integrating vectors against the alternative of $r+1$ co integrating vectors.

Table 8 and 9 shows the tests of the rank of matrix π . The first column represents the estimated eigenvalues λ_i . The null hypothesis of $r = 0$ (no co integration) and $r = 1$ (or $r < = 1$ using the λ_{trace} test) is rejected in favor of $r = 1$ and $r = 2$ by both tests at the 1 and 5 level respectively. The null hypothesis of $r = 2, 3$ (or $r < = 2, r < = 3$ using the λ_{trace} test) in favor of $r = 3, 4$ are not rejected by both tests. Thus table 8 and 9 and additional plots, indicates the presence of two co integrating relationships. Therefore, there is a long run equilibrium relationship between the trade balance, real effective

exchange rate, real domestic income and real world income. This would imply that a model that seeks to explain the long-run behavior of the trade balance should include at least the exchange rate, real domestic and foreign income.

Table 10: Standardized Beta Coefficients

tb	reer	rgdp	rwgdp	constant	derp	ddrought
1.0000	1.9100	3.2270	-0.21039	-35.822	0.33114	0.074956
2.0899	1.0000	12.072	-1.4479	-93.439	0.10112	-1.4177
55.082	-2.1025	1.0000	49.907	-652.66	74.374	-8.3496
2.1585	-1.1459	0.78492	1.0000	-14.490	0.33571	1.2270

Table 11: Standardized Alpha Adjustment Coefficients

tb	-1.1007	-0.082657	-0.0032025	-0.011780
reer	-0.13894	0.026526	0.00026569	-0.0071326
rgdp	-0.027328	0.0047431	-0.00038584	0.0042852
rwgdp	0.18788	-0.0092168	-0.0017582	-0.0075208

Table 12: Restricted Standardized eigenvectors (β')

	tb	reer	rgdp	rwgdp	constant	derp	ddrought
β'_1	1.0000	1.9100	3.2270	-0.21039	-35.822	0.33114	0.074956
β'_2	2.0899	1.0000	12.072	-1.4479	-93.439	0.10112	-1.4177

It is not uncommon to find more than one co integrating relationship in a system with more than two variables using the johansen procedure. The existence of many co integrating vectors may indicate that the system under examination is stationary in more than one direction and hence more stable (see Ahmad Zubaidi (2001))

Some authors in this situation revert back to a system with one co integrating vector by choosing the vector corresponding to the largest eigen value or choosing the most theoretically plausible co integrating relationship (Ahmad Zubaidi (2001)). It is also a common practice to normalize on the variables of interest in order to interpret the long run parameters of the model in cases where $r > 1$. Therefore, we choose the first co integrating vector, which is theoretically plausible to show the effect of those specified variables on trade balance and it can be written in the following equation form:

$$\text{tb} = 35.822 + 1.9100 \cdot \text{reer} + 3.2270 \cdot \text{rgdp} - 0.21039 \cdot \text{rwgdp} + 0.33114 \cdot \text{derp} + 0.074956 \cdot \text{ddrought} \dots \dots \dots (5.4)$$

In order to improve the statistical specification of the model tests of exclusion from the co integrating space and tests of weak exogeneity were carried out.

The long run coefficients of the respective variables should be tested for their significance to determine which variable uniquely constitutes the co-integrating vector. Hence a zero restriction is imposed on each coefficient and the vectors for likelihood ratio tests are conducted. The result is summarized in table 13 below.

Table 13: Tests for Zero Restrictions on the long run parameters

Coefficients	tb	reer	rgdp	rwgdp
β	1.0000	1.9100	3.2270	-0.21039
Likelihood Ratio (LR) test	11.714	13.437	9.8004	1.045
Probability	0.0006**	0.0002**	0.0017**	0.3067

** Rejection at 1% significance level

The test result in table 13 indicates that real effective exchange rate (reer) and real domestic income (rgdp) are statistically significant in explaining trade balance in the long run while real foreign income (rwgdp) is not statistically significant in explaining trade balance in the long run.

Weak exogeneity test is also conducted by imposing a zero restriction on the α coefficients of the first column using the Likelihood ratio test. This helps us to write the endogenous variables conditional on other variables in the vector autoregressive (VAR). the test for zero restrictions of α matrix is referred to as the test for weak exogeneity.

Table 14: Tests for Zero Restrictions on Alpha Coefficients

Coefficients	tb	reer	rgdp	rwgdp
α	-1.1007	-0.13894	-0.027328	0.18788
Likelihood	9.1232	3.3638	1.7735	3.932
Ratio (LR) test				
Probability	0.0025**	0.0666	0.1830	0.0685

According to the result reported in table 14, the zero restriction on α coefficients is rejected for trade balance (tb) but not for other variables. Hence from LR test result above, it is evident that we may reject the weak exogeneity hypothesis for trade balance (our dependent variable) and the remaining variables are weakly exogenous. This implies that we have only one equation for our dependent variable conditional on those exogenous variables.

Once we establish the weak exogeneity conditions, we can write the co integrating vector in equation format by classifying the variables in to endogenous and exogenous. Hence, we can condition tb by reer, rgdp and rwgdp as

$$\begin{aligned}
 \text{tb} = & 35.822 - 1.9100*\text{reer} - 3.2270*\text{rgdp} + 0.21039*\text{rwgdp} - 0.33114*\text{derp} \\
 & - 0.074956*\text{ddrought} \dots\dots\dots(5.5)
 \end{aligned}$$

This is the long run equation, which shows the long run relationship between trade balance and other explanatory variables.

In the foregoing discussion of the johansen procedure we saw that long run relationship exists and proved to be significant. The associated long run parameters are also determined and to conclude the empirical analysis of the model, we have to estimate the short run dynamics and obtain the coefficient for Γ 's in equation (4.20) through the estimation of parsimonious vector error correction model (VECM).

5.3.1 Diagnostic Tests for the long run Models

Diagnostic testing in PCGIVE is performed at two levels; individual equations and the system as a whole. The test results for individual equation and for the system are provided in annex VI. We apply portmanteau statistic, LM test for autocorrelated residuals, Autoregressive Conditional heteroscedasticity (ARCH) and normality test. The test results (see annex VI) suggest that the individual variables in our model do not suffer from these problems except for normality test in reer, rgdp and rwgdp where the normality hypothesis is rejected. However econometrics theory states that the existence of normality problem does not affect and distort the estimators' BLUE and consistency property, because the main purpose of normality tests is for testing hypothesis about the population parameter using confidence interval (Enders, 1995). Therefore the in-existence of vector normality in our model doesn't affect the coefficients and t-values. If



the sample size gets larger and larger, we can easily remove the normality problem & the distribution approaches normal.

5.4 Vector Error Correction Model (VECM)

Having established the existence of long-run relationship among the relevant variables by employing the Johansen test, the next task is to set up the vector error correction model (VECM) in which vector error correction terms are included. It is very important to specify how short run adjustment of macroeconomic variables is took place, and it is a fertile ground for policy analysis & implementation (Harris, 1995).

From table 12 we can drive the error correction terms lagged one period in order to analyze the short-term dynamics. Thus, the two co-integrating vectors β'_1 and β'_2 are trade balance and exchange rate can be defined in error correction term (ECT) as follows:-

$$\text{ECT1} = \text{tb} - 35.822 + 1.9100*\text{reer} + 3.2270*\text{rgdp} - 0.21039*\text{rwgdp} + 0.33114*\text{derp} + 0.074956*\text{ddrought} \dots\dots\dots(5.6)$$

$$\text{ECT2} = \text{reer} - 93.439 + 2.0899*\text{tb} + 12.072*\text{rgdp} - 1.4479*\text{rwgdp} + 0.10112*\text{derp} - 1.4177*\text{ddrought} \dots\dots\dots(5.7)$$

There are two equations in the form two-error correction terms and contain restricted long-run stationary relationship. Taking both lagged one period as explanatory variables in the system, we can produce the short-term dynamics, which consists of four equations of changes in tb , $reer$, $rgdp$ and $rwgdp$.

Since our interest is to know the effect of exchange rate changes on trade balance of Ethiopia in the short as well as in the long run, we take the equation of the change in trade balance as dependent variable and regress it on other variables with their respective lags from the whole system (see the result on annex VII). Unrestricted single equation Ordinary Least Squares (OLS), Two Stage Least Squares (2SLS) and Full Information Maximum Likelihood (FIML) can estimate the whole system of the equations. PCFIML provide the same result for the above three methods

Therefore let us set the lag length at twelve (over parameterized equation) and follow the general-to-specific procedure to the most parsimonious dynamic trade balance equation considering t-value and other criteria. Finally it yields the following parsimonious short run dynamics of trade balance, tb .

Table 15: Results of error correction model with trade balance as the dependent variable

Variable	Coefficient	Std. Error	T-value	P-value
Dreer_1	0.84542	0.40561	2.084	0.0400
Dreer_12	1.6275	0.46982	3.464	0.0008
Drgdp_1	0.29791	0.19255	1.547	0.1254
Drgdp_4	-1.4360	0.88844	-1.616	0.1096
Drgdp_8	0.33394	1.0683	0.313	0.7553
Drgdp_12	-0.82772	0.88632	-0.934	0.3529
Drwgdp_12	2.3686	0.41439	5.716	0.0000
Constant	-0.038980	0.037426	-1.042	0.3005
ECT1_1	-0.70906	0.075005	-9.454	0.0000

In general, the results of the diagnostic tests (see annex VIII) indicate that the vector error correction model (VECM) is adequately specified. There is no evidence of autocorrelation in the disturbance of the error term. The autoregressive conditional heteroscedasticity (ARCH) tests suggest that the errors are homoscedastic & independent of the regressors.

5.5. Variance Decomposition

Forecast error variance decomposition is conducted over a twenty-four quarter period to assess the extent to which endogenous macro variables affect trade balance over time.

The procedure involves decomposing the forecast error variance of each of the variables in to the part due to each of the innovations in the system.

Table 16 provides results of the variance decomposition of trade ratio as attributable to its own innovations and to shocks in the other variables for a forecast horizon (quarter) of 1 through 12.

Table 16: Variance Decomposition of Trade Balance

period	tb	reer	rgdp	rwgdp
1	100.0000	0.0000	0.0000	0.0000
2	96.7923	0.0611	0.7810	2.3656
3	93.6556	3.0540	1.0218	2.2686
4	96.6538	3.0510	0.9823	2.3129
5	90.7232	5.7644	0.9507	2.5616
6	89.9683	5.7831	1.3483	2.9004
7	89.1820	6.4314	1.4872	2.8994
8	88.6295	6.6044	1.5390	3.2271
9	86.7721	8.4588	1.6273	3.1419
10	86.1122	8.9415	1.7649	3.1814
11	84.9713	10.0555	1.9219	3.0514
12	83.4829	11.0481	1.8916	3.5774

The results of variance decomposition suggest that the significant source of variation in the trade balance forecast error is its own innovations and declines over time with an average of 89.45 % for the forecast horizon. The real effective exchange rate explains about an average of 6.3% of the variation in the trade balance. The domestic income and foreign income explains as average of 1.4% and 2.86% respectively. In general the results suggest that real effective exchange rate have some influence on the variations in the trade balance.

Approximately 89.45 percent of one-step forecast error variance of the trade balance is accounted for its own innovations and approximately 10.55 percent by the fundamentals.

See the graphical presentation of variance decomposition of all variables in our model on Annex IX.

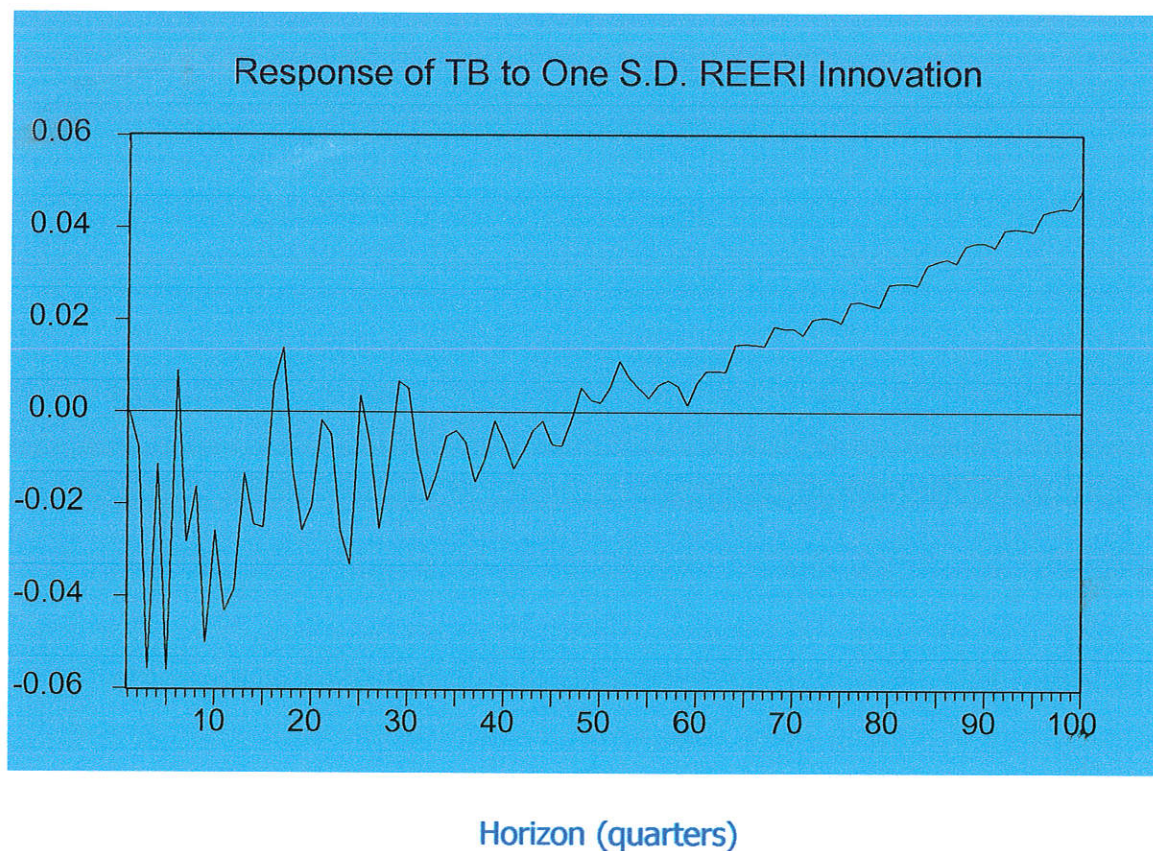
5.6 Generalized Impulse Response Analysis

To provide additional insight in to the dynamic responses pattern of trade balances we used the generalized impulse response functions. Although the test was conducted for all the variables in the system, only the results of the responses of trade balances to innovation in exchange rates are reported here. The main purpose is to discover whether a j-curve exists or not for Ethiopia. If it does, then the response of trade balance to devaluation reflects a j-shape, indicating devaluation at first cause a

worsening of the trade balance and then only after several quarters, the improvement occurs.

In order to establish the existence or absence of a J-curve phenomenon in Ethiopia, we employ impulse response function to trace the effect of real effective exchange rate on the trade balance of Ethiopia. As Impulse response functions are generated from a co-integrated system, a shock in any variable is expected to exert permanent effect on the system, which gradually adjusts to a new equilibrium. The Impulse response function plotted in figure 6 indicates a 100 –quarter response of trade balance to an initial and one-time shock in real effective exchange rate.

Figure 6:The response of trade balance to shock in real effective exchange rate



As the above figure shows, there seem to be no clear evidence of the j-curve phenomenon and the effect of a unit shock in real effective exchange rate can be interpreted as follows: the trade balance declines immediately after the start of the depreciation and then rises after three quarters and then again declines. Generally. It does not show a clear trend until 60 quarters. After 60 quarters, the trend balance increases with a decreasing rate and it never drops down to negative then after. From these we can understand that to get a consistent positive trade balance in Ethiopia, it needs at least 60 quarters (15 years). This is some what reliable in the case of Ethiopian Economy for which a few agricultural commodities dominate the structure of Ethiopia's exports and there would be considerable time lags before exchange rate devaluation or depreciation results a positive supply response. Therefore, at least, in the short run, there would not be a positive supply response such as poor infrastructure and fragmented markets. There may also be unfavorable world price for those commodities. Further, the prospects of diversifying the export structure are even very difficult with in a short period of time.

5.6 Interpretation of Results

Based on the results presented above, we can now interpret both the long run and short run dynamic analysis. The long run model predicts a negative relationship between the trade balance and the real effective exchange rate, with a long run elasticity of -1.91 . This is consistent with the theory that real appreciation deteriorates the trade balance of

Ethiopia in the long run . On section 4.2.2 I, we define nominal exchange rate (E) as foreign currency per domestic currency in which an increase in nominal exchange rate (E) shows currency appreciation and a decline in nominal exchange rate (E) shows currency depreciation. The negative coefficient obtained based on the above methodology revealed that in the long run trade balance will decrease by 1.91 percent if real effective exchange rate appreciated by 1 percent. This implies that real exchange rate depreciation will improve the trade balance deficit and consequently the balance of payment deficit of Ethiopia in the long run.

The short run coefficients of real exchange rate at lag 1 and lag 12 are positive which shows that the immediate effect of real exchange rate appreciation will improve the trade balance i.e the positive sign of $\Delta reer_{-1}$ and $\Delta reer_{-12}$ have been explained in numerous papers examining the short-run and long-run relationship between exchange rate changes and trade balance by existence of the lag in the time during which consumers and producers adjust to a new buying patterns, and asymmetries between the changes in export and import prices. In other words, it can be explained, as real * depreciation of exchange rate cannot improve the trade balance deficit of Ethiopia in the short run due to the following reasons:

Since a few agricultural commodities dominate the structure of Ethiopia's exports, there would be considerable time lags before devaluation results in a positive supply response. Therefore, at least in the short run, there would not be a positive supply response for this policy measure as gestation period of some agricultural export

commodities is relatively long. Moreover, there is a wide range of the supply response such as poor infrastructure and fragmented markets. There may also be unfavorable world price for those commodities. Further, the prospects of diversifying the export structure are even very difficult with in a short period of time.

The coefficient of domestic real income carries correct negative signs, which is consistent to those, predicted by economic theory when demand is the main determinant factor of exports and imports. The negative sign suggesting that a rise in domestic income of Ethiopia encourages its consumers to demand more foreign goods, leading to a deterioration of trade balance in favor of its major trading partners.

Looking at the speed of adjustment parameters (alpha coefficients), their sizes suggest a slow adjustment to a deviation from the long run equilibrium. At conventional significance levels, all variables are weakly exogenous and it is consistent with reality considering that Ethiopia is a small country compared to world economy such that we would expect the world income to be exogenous to this model.

From tests of zero restrictions on the long run parameters, we find that the coefficient of foreign income variable is positive and is statistically insignificant at 1% significance level. The result indicates that a rise in foreign income of Ethiopia's major trading partners does not lead to a significant improvement for trade balance of Ethiopia in the long run. This result supports the view that exports of developing countries like Ethiopia have low-income elasticities and it is also consistent with the hypothesis that exports

from developing countries are supply rather than demand determinant. The world demand for agricultural products (Ethiopia's major export items) is limited due to slow growth of population, low-income elasticity of demand for these goods, the development of agricultural substitutes and synthetic materials in industrial countries. Moreover, the world price of primary products is characterized by price fluctuates and deteriorating terms of trade.

The speed of adjustment, defined by the coefficient associated with the error-correction term, are correctly negative and significant at 1% level of significance. Since this value lies between 0 and -1 , the correction of disequilibrium in the present period is a fraction of the error in the previous period. In this case, the error correction term tends to cause trade balance to converge monotonically to its long run equilibrium paths in relation to change in the exogenous variables. This implies that about 70% of disequilibrium in trade balance of Ethiopia among its trading partners is being eliminated during the study period.

The negative coefficient of the dummy exchange rate policy change (derp) shows the fact that fixed exchange rate policy during the imperial and the derg regime did not improve the trade balance. The sign of dummy for drought is negative implying that trade balance is declining in those years of drought.

CHAPTER SIX

CONCLUSIONS AND POLICY IMPLICATIONS

6.1 Conclusions

This paper examines the short run and long run effects of real effective exchange rates on trade balance of Ethiopia. To this end, the trade balance is used that includes trade ratio (exports/imports), domestic income, foreign income and real effective exchange rates. The study employs the Johansen co integration and error correction model on the quarterly data in the period 1970/71QI – 2005/06I. The main findings are as follows:

The unit root test using the Augmented Dickey-Fuller (ADF) test has shown that all variables used in this study are non-stationary at level, but they are stationary at first differences. This result indicates that there is a long run relationship or co integration between dependent variable and the right side variables.

The λ_{trace} and λ_{max} statistics of the Johansen approach reported that there are two co integrating vectors between the trade balances, real effective exchange rate, domestic income and foreign income. However, we choose the first co integrating vector which is theoretically plausible to show the effect of changes in exchange rate and other specified variables on trade balance. The existence of co integrating vector confirm the

existence of long run causal relationship between trade balance and the set of specified independent variables.

The variable specification of the statistical model showed that real exchange rate appreciation has a long run negative impact on the trade balance. On the other hand, this implies that there is a positive relationship between the real exchange rate depreciation and trade balance in the long run. These findings constitute evidence in favor of the literature claiming that no direct relationship between trade balance and exchange rate exists.

The negative immediate impact of exchange rate depreciation (the positive immediate impact of exchange rate appreciation) of the short run coefficient of real effective exchange rate at lag 1 and 12 can be explained in the same logic as in numerous papers examining the short run and long run relationship between exchange rates and trade balance by existence of the lag in the time during which consumers and producers adjust to a new buying patterns and asymmetries between the changes in export and import prices.

In order to establish the existence of a j-curve phenomenon in Ethiopia, we employ impulse response function to trace the effect of real effective exchange rate on trade balance of Ethiopia. As a result of the unit shock in real effective exchange rate, the trade balance drops after the start of the depreciation and then rises. Again it drops and then rises. In general, the response of trade balance as a result of a unit shock in real

effective exchange rates is inconsistent until 60 quarters. After 60 quarters, the trade balance rises and never drops down then after. From these we can understand that to get a positive trade balance in Ethiopia, it needs at least 60 quarters (15 years). This is consistent in the case of Ethiopian Economy for which a few agricultural commodities dominate the structure of Ethiopia's exports and there would be considerable time lags before exchange rate devaluation or depreciation results a positive supply response. Therefore, at least, in the short run, there would not be a positive supply response such as poor infrastructure and fragmented markets. There may also be unfavorable world price for those commodities. Further, the prospects of diversifying the export structure are even very difficult with in a short period of time.

6.2 Policy Implications

The main objective of this paper has been to empirically test the short run and long run effect of exchange rate changes on trade balance of Ethiopia. The empirical results indicate that, in the long run, real exchange rate depreciation has a positive impact on trade balance of Ethiopia. The policy implication of this finding is that to improve its international competitiveness and its trade balance deficit, Ethiopia can use depreciation based adjustment policy. Competitiveness, however, goes beyond currency depreciation. I.e. currency depreciation alone is unlikely to be able to increase competitiveness. Therefore, Ethiopia has to use also export diversification strategy, which is presented below.

Ethiopia imports essential commodities such as raw materials, semi-finished goods, fuel, capital and consumer goods, which are crucial for production as well as consumption purposes. These goods have to be imported at world prices since they are not sufficiently available domestically. In other words, they are price inelastic. This shows that imports cannot easily substitute while the dominant share of agricultural primary commodities that are sensitive to weather condition and price shocks basically characterizes exports. Therefore, to minimize the adverse effect of external shock and to be competitive, the structure of the external trade, which relies on few primary commodities, has to be changed and the government of Ethiopia has to pursue to diversify export commodities from agriculture to other products both vertically and horizontally. By increasing the number of export sectors, horizontal export diversification can reduce the dependence of Ethiopia on limited number of primary commodities that are subject to extreme price and volume fluctuations. Vertical diversification out of primary into manufactured exports is also useful for Ethiopia if there is a general trend toward declining terms of trade for primary products.

The negative sign of domestic real income indicated that a rise in domestic income of Ethiopia encourages its consumers to demand more foreign goods, leading to a deterioration of trade balance in favor of its major trading partners. In this regard, In order to shift the demand of domestic consumers towards domestic goods, the government has to promote import substitution strategy i.e. substituting the imported goods with the locally produced goods in order to meet the internal demand.

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Annex I

Derivation of Marshall Lerner Condition

Can devaluation improve the trade balance? If so, what are the precise conditions that determine whether such a policy will prove successful? We begin by assuming that capital is completely immobile internationally and we further assume, that net foreign income (NFI) and Net transfer from abroad (NTRA) are each equal to zero, so that $CU = X - M = \text{Trade balance}$.

Let M^* = measurement of imports of goods and services in units of foreign good.

EP^*/P = measurement of prices of foreign goods in units of domestic goods.

Where E = the nominal exchange rate of domestic currency per unit of foreign currency

P^* = foreign price

P = Domestic price

$M = (EP^*/P) M^*$ = the measurement of imports of goods and services in units of domestic good

X_d = measures the demand for domestic good abroad (the domestic country export)

M^*_d = measure the demand for foreign good (import) domestically

$T = X - M = \text{trade balance in units of domestic good}$

$$X_d = X \left[\left(\frac{EP^*}{P} \right), Y^* \right], \frac{\partial X_d}{\partial \left(\frac{EP^*}{P} \right)} > 0, \frac{\partial X_d}{\partial Y^*} > 0 \dots\dots\dots(1)$$

$$M^*_d = M^* \left[\left(\frac{EP^*}{P} \right), Y \right], \frac{\partial M^*_d}{\partial \left(\frac{EP^*}{P} \right)} < 0, \frac{\partial M^*_d}{\partial (Y)} > 0, \dots\dots\dots(2)$$

Where Y = domestic income

Y^* = foreign income

In similar matters further we take X and M^* to be demand determined and write

$$X = X_d = X \left[\left(\frac{EP^*}{P} \right), Y^* \right] \dots\dots\dots(1.a)$$

$$M^* = M^*_d = M^* \left[\left(\frac{EP^*}{P} \right), Y \right] \dots\dots\dots(1.b)$$

Now let $T^* = (PX/E) - P^*M^*$ define the trade balance in units of foreign currency and consider the effect of devaluation on the trade balance. That is, consider whether $\partial T^* / \partial E$ is positive, zero or negative. Differentiating T^* with respect to E we get

$$\frac{\partial T^*}{\partial E} = - \left(\frac{P}{E^2} \right) X + \left(\frac{P}{E} \right) \left(\frac{\partial X}{\partial E} \right) - P^* \left(\frac{\partial M^*}{\partial E} \right) \dots\dots\dots(3)$$

To evaluate this expression the use of the chain rule will prove handy.

$$\text{First: } \frac{\partial(X_d)}{\partial P} = \frac{\partial(X_d)}{\partial(EP^*/P)} \cdot \frac{\partial(EP^*/P)}{\partial P} = \frac{\partial(X_d)}{\partial(EP^*/P)} \cdot \frac{EP^*}{P^2}$$

$$\frac{\partial(X_d)}{\partial P} = - \frac{\partial(X_d)}{\partial(EP^*/P)} \cdot \frac{EP^*}{P^2} \dots\dots\dots(4)$$

$$\text{Second: } \frac{\partial(X_d)}{\partial E} = - \frac{\partial(X_d)}{\partial(EP^*/P)} \cdot \frac{\partial(EP^*/P)}{\partial E}$$

$$\frac{\partial(X_d)}{\partial E} = -\frac{\partial(X_d)}{\partial\left(\frac{EP^*}{P}\right)} \cdot \frac{P^*}{P} \dots\dots\dots(5)$$

From equation (4), we get

$$\frac{\partial(X_d)}{\partial E} = -\frac{\partial(X_d)}{\partial P} \cdot \frac{P^2}{EP^*} \dots\dots\dots(6)$$

Insert equation (6) in to equation (5), we get the following

$$\frac{\partial(X_d)}{\partial E} = -\frac{\partial(X_d)}{\partial P} \cdot \frac{P^2}{EP^*} \left(\frac{P^*}{P}\right) \dots\dots\dots(7)$$

Let us multiply E/X_d in both sides of equation (7)

$$\begin{aligned} \frac{\partial(X_d)}{\partial E} \cdot \frac{E}{X_d} &= -\frac{\partial(X_d)}{\partial P} \cdot \frac{P^2}{EP^*} \left(\frac{P^*}{P}\right) \cdot \frac{E}{X_d} \\ \frac{\partial(X_d)}{\partial E} \cdot \frac{E}{X_d} &= -\frac{\partial(X_d)}{\partial P} \cdot \frac{P}{X_d} = \eta_f \dots\dots\dots(8) \end{aligned}$$

Where $\eta_f =$ is the own price elasticity of export demand.

Hence
$$\frac{\partial(X)}{\partial E} = -\frac{\partial(X_d)}{\partial E} = \eta_f \left(\frac{X}{E}\right) \dots\dots\dots(9)$$

In the same fashion one can show that

$$\frac{\partial(M_d^*)}{\partial P} \cdot \frac{P^*}{M_d} = \eta_h = -\frac{\partial(M_d^*)}{\partial E} \cdot \left(\frac{E}{M_d^*}\right) \dots\dots\dots(10)$$

Where η_h is the own price elasticity of import demand

$$\text{Accordingly } \frac{\partial(M_d^*)}{\partial E} = -\frac{\partial(M^*)}{\partial E} = \eta_h \left(\frac{M^*}{E}\right) \dots\dots\dots(11)$$

Substituting equation (9) and (11) in to equation (3) we get

$$\left(\frac{PX}{E^2}\right)(\eta_f + \eta_h - 1) > < = 0 \dots\dots\dots(12)$$

Next assume that devaluation takes place from a position of equilibrium that is a position where

$$P^*M^* = \frac{PX}{E} \dots\dots\dots(13)$$

Using this condition in the expression given immediately in to equation (12) to substitute out P^*M^* we find that a devaluation will improve, leave unchanged or cause a deterioration in the trade balance i.e.

$$\frac{\partial T^*}{\partial E} = \left(\frac{PX}{E^2}\right)(\eta_f + \eta_h - 1) \dots\dots\dots(14)$$

This is the Marshal-Lerner-Robinson condition

Annex II

Methodology for the Construction of Real Effective Rate indices of the Birr

The real effective rate indices are nominal indices adjusted or deflated for a corresponding change in relative prices. The need for constructing a real effective exchange rate index arises from the fact that the movement indicated by the nominal indices is not only due to a real or pure exchange rate change but also price changes

The Data

The data for this study were obtained from two sources. Exchange rates and price indices were obtained from IFS database, October 2000 and trade weights were computed from direction of trade as reported in the quarterly bulletin of NBE. The nominal exchange rates of the trade partners (currency/USD) obtained from IFS database were converted to Birr per respective currency for each partner.

Choice of Base period

The years before 1992/93 and after 1996/97 are not considered as base year because of the obvious reason of either war or drought and the overvaluation of the currency in the former. Hence, 1996/97 is taken as a base year since it seems to be normal and there is no war or drought in this year.

Weighting Scheme and selection of countries to be included

It is very difficult to include all trading partners of Ethiopia in the study. Therefore, this study uses a threshold of one percent. That is, those partners having trade weights (export plus import to total trade) more than one percent in the selected periods are

included in the study as they show relatively strong trade relation with the home country (Ethiopia). The countries and their corresponding trade weight are presented in the following table.

Table Annex II: Trade weights of selected partner countries

Country	Trade weight
Belgium	0.032102
Kenya	0.023851
France	0.041219
Germany	0.170737
Italy	0.129778
Netherlands	0.038856
Sweden	0.025565
United Kingdom	0.066651
USA	0.103796
India	0.038175
Japan	0.121751
Korea	0.027727
S/Arabia	0.162835
Switzerland	0.016958

Source: National Bank of Ethiopia

The Mathematical formulation of Real Effective Exchange Rate Indices

In order to construct real effective exchange rate, the following formula has been used.

$$REER_t = \sum_{j=1}^N W_j E_{tj} \left(\frac{P_t}{P_{tj}^*} \right)$$

Where REER_t = Real effective exchange rate in period t for the home country (Ethiopia)

E_{jt} = nominal exchange rate defined as foreign currency per domestic currency

P_{jt}^* = Wholesale price indices of partner j in period t

P_t = CPI of Ethiopia in period t

W_{jt} = the trade weight attached to partner j

From above, we can construct real effective exchange rate index (REERI) using the following formula.

$$REER_t = \frac{\sum_{j=1}^N W_j E_{tj} \left(\frac{P_t}{P_{tj}^*} \right)}{\sum_{j=1}^N W_j E_{0j} \left(\frac{P_0}{P_{0j}^*} \right)} * 100$$

Where

REER_t = Real effective exchange rate in period t for the home country (Ethiopia)

P_{jt}^* and P_{0j}^* = Wholesale price index of partner country j in period t and the base period respectively.

E_{jt} and E_{0j} = nominal exchange rate defined as foreign currency per domestic currency in period t and the base period respectively.

P_t and P_0 = CPI of the home country in period t and the base period respectively

W_{jt} = the trade weight attached to partner j.

Annex III

Generating quarterly GDP from Annual GDP

(It is directly taken from Haile Kibret, Monetary Policy and the Monetary Approach to the Balance of Payments, Unpublished Master Thesis)

Since quarterly GDP is not available for the country, quarterly figures are generated using the annual GDP.

According to Bahmani - Oskooee (1986: 123), the generated quarterly data for GDP should be adjusted in such a way that $Q1 + Q2 + Q3 + Q4 = \text{Annual GDP}$

Agriculture Sector

Ethiopia's GDP is believed to be highly affected by seasonality of agricultural harvest. This is mainly due to the fact agriculture is rain fed. The structure of agricultural harvest is divided in to main harvest, which accounts about 95% of the total agricultural GDP, and the belg harvest that accounts for the balance. According to information obtained from CSA, any thing produced between September and January is classified as main harvest; and the rest are belg harvest, Moreover, a survey by CSA has also suggested that about 80% of agricultural GDP are cereals.

Studying the behavior of quarterly contribution of the Agriculture sector to the total GDP is computed based on the amount of labor exerted to each activity in the production of cereals for which data is available. The data and the computed coefficients are presented in the following table.

Labor requirement for different activities for selected cereals (in man-days)

	Barely	Wheat	Teff	Maize	Sorghu m	Average	Ratio
1 st Ploughing	4	4	5	7	5	5	0.075
2 nd Ploughing	4	4	5	7	5	5	0.075
3 rd Ploughing	3	3	5	3	-	3	0.045
Planting Sowing Covering	4	4	6	8	4	5	0.075
1 st Weeding	15	11	22	20	24	18	0.268
2 nd Weeding	-	-	-	24	7	6	0.089
Harvesting	13	18	18	9	9	13	0.194
Threshing, Widowing (shelling)	7	10	17	19	9	12	0.179
Total	50	54	78	88	63	67	1.00

The allocation of each activity to each quarter and the derivation of the coefficient is performed as follows:

July, August & September (QI) = Sowing & 1st weeding

October, November & December (QII) = 2nd weeding & Harvesting

January, February & March (QIII) = Threshing

April, May & June (QIV) = Ploughing (1st, 2nd & 3rd)

For each quarter the coefficients are:

$$QI = 0.075 + 0.268 = 0.343$$

$$QII = 0.089 + 0.194 = 0.283$$

$$QIII = 0.179$$

$$QIV = 0.075 + 0.0754 + 0.045 = 0.195$$

Since the belg season (small rain season) is very small, about 5%, relative to main season, it is ignored.

Industry

For this sector, we found quarterly data (1993/94 - 1999/00) on production of some 28 major public enterprises from MEDAC. This is used to obtain average coefficient for the breakdown of the industrial sector. The value of these productions in Birr and the corresponding coefficient for the quarters is given below.

Quarter	Total	Ratio
QI	1,162,178	0.217
QII	1,385,103	0.259
QIII	1,412,160	0.265
QIV	1,388,841	0.259
Total	5,348,282	1.000

Services

For the distributive service component of GDP (it includes like trade, hotel and

restaurant, transport and communication), data on disbursement from the banking system on quarterly basis are used to obtain coefficients that help to disaggregate the service. The disbursement for this sector is given in table below. And the average ratio is used as coefficient to disaggregate the series. For the other service component of GDP (it includes items like (banking, insurance, real estate, public administration and defense), the ratio is assumed constant for the quarters.

For distributive services the coefficients are

Distributive Services	QI	Ratio	QII	Ratio	QIII	Ratio	QIV	Ratio
Domestic Trade	458	0.164	3351.5	0.377	2705.3	0.304	1368.6	0.154
International Trade	791.4	0.184	1006.4	0.234	1476.2	0.344	1019.8	0.237
Hotels & Restaurant	300.2	0.258	314.7	0.271	247.4	0.212	299.8	0.257
Transport & Communication	459.1	0.198	598.6	0.258	566.4	0.244	693.1	0.299
Average ratio		0.201		0.285		0.276		0.237
Other services		0.25		0.25		0.25		0.25

After getting the coefficients for agriculture, industry and service sectors for each quarter, we multiply the annual GDP by each coefficients to get quarterly sectoral values and then add them to generate the quarterly annual GDP.

Annex IV

Computation of Real World GDP

As I explained in Annex II, 14 countries were selected based on their total trade share (export + import) in order to calculate the real effective exchange rate index of Ethiopia. But for the measurement of RWGDP as a proxy measure for real foreign income, we take only eight Ethiopian's major trading partners (these are U.S.A, U.K, Japan, France, Germany, Italy, Korea and Switzerland) due to availability of quarterly GDP data on the given study period. Countries like S/Arabia, Sweden, India and Kenya do not have GDP data on quarterly basis. However, Netherlands and Belgium have incomplete quarterly GDP data on the study period.

To calculate the weight for each country, the following formula is employed:

$$W_i = \frac{(X + M)}{\sum_{i=1}^n (X + M)}$$

Where W_i is the trade weight for country I ,

X, M is exports and imports respectively

Before calculating RWGDP, we compute first the Nominal weighted GDP (NWGDP) and weighted world price index (WWPI) of the above selected countries as follows:

$$\begin{aligned} \text{NWGDP} = & \text{NGDP}_{\text{USA}} \times W_{\text{USA}} + \text{NGDP}_{\text{FRANCE}} \times W_{\text{FRANCE}} + \text{NGDP}_{\text{GERMANY}} \times W_{\text{GERMANY}} + \\ & \text{NGDP}_{\text{ITALY}} \times W_{\text{ITALY}} + \text{NGDP}_{\text{JAPAN}} \times W_{\text{JAPAN}} + \text{NGDP}_{\text{KOREA}} \times W_{\text{KOREA}} + \text{NGDP}_{\text{SWIZERLAND}} \times W_{\text{SWIZERLAND}} + \\ & \text{NGDP}_{\text{UK}} \times W_{\text{UK}} \end{aligned}$$

$$= \sum_{i=1}^8 \text{NGDP}_i W_i$$

Where $NWGD\bar{P}$ = Nominal Weighted GDP

$NGDP_i$ = Nominal GDP of country i

W_i = Trade weight of country I

$$WWPI = PPI_{USA} \times W_{USA} + PPI_{FRANCE} \times W_{FRANCE} + PPI_{GERMANY} \times W_{GERMANY} + CPI_{ITALY} \times W_{ITALY} + WPI_{JAPAN} \times W_{JAPAN} + PPI_{KOREA} \times W_{KOREA} + PPI_{SWITZERLAND} \times W_{SWITZERLAND} + CPI_{UK} \times W_{UK}$$

Where $WWPI$ = Weighted World Price Index

PPI = Production Price Index

CPI = Consumer Price Index

WPI = Wholesale Price Index

Therefore, $RWGD\bar{P}$ can be obtained using the following formula.

$$RWGD\bar{P} = \frac{NWGD\bar{P}}{WWPI}$$

Annex V

Tests of Model reduction for selection of the optimal lag length

System 8 --> System 9: $F(16, 193) = 3.5123 [0.0000]$ **
System 7 --> System 9: $F(32, 219) = 1.8270 [0.0065]$ **
System 6 --> System 9: $F(48, 213) = 1.3653 [0.0712]$
System 5 --> System 9: $F(64, 201) = 1.2295 [0.1427]$
System 4 --> System 9: $F(80, 187) = 1.1298 [0.2498]$
System 3 --> System 9: $F(96, 172) = 1.1131 [0.2698]$
System 2 --> System 9: $F(112, 157) = 1.0059 [0.4826]$
System 1 --> System 9: $F(128, 141) = 1.1798 [0.1686]$

System 7 --> System 8: $F(16, 180) = 0.34421 [0.9916]$
System 6 --> System 8: $F(32, 204) = 0.44651 [0.9959]$
System 5 --> System 8: $F(48, 198) = 0.58282 [0.9857]$
System 4 --> System 8: $F(64, 186) = 0.63211 [0.9827]$
System 3 --> System 8: $F(80, 172) = 0.71062 [0.9571]$
System 2 --> System 8: $F(96, 157) = 0.67166 [0.9827]$
System 1 --> System 8: $F(112, 141) = 0.88272 [0.7539]$

System 6 --> System 7: $F(16, 168) = 0.55779 [0.9112]$
System 5 --> System 7: $F(32, 189) = 0.70828 [0.8762]$
System 4 --> System 7: $F(48, 183) = 0.73380 [0.8962]$
System 3 --> System 7: $F(64, 170) = 0.80641 [0.8380]$
System 2 --> System 7: $F(80, 156) = 0.74280 [0.9303]$
System 1 --> System 7: $F(96, 141) = 0.97296 [0.5534]$

System 5 --> System 6: F(16, 156) = 0.86421 [0.6111]
System 4 --> System 6: F(32, 174) = 0.82821 [0.7301]
System 3 --> System 6: F(48, 167) = 0.89325 [0.6694]
System 2 --> System 6: F(64, 154) = 0.79683 [0.8487]
System 1 --> System 6: F(80, 140) = 1.0537 [0.3890]

System 4 --> System 5: F(16, 144) = 0.80560 [0.6775]
System 3 --> System 5: F(32, 160) = 0.91375 [0.6041]
System 2 --> System 5: F(48, 152) = 0.78844 [0.8290]
System 1 --> System 5: F(64, 139) = 1.0950 [0.3255]

System 3 --> System 4: F(16, 132) = 1.0222 [0.4377]
System 2 --> System 4: F(32, 145) = 0.79356 [0.7748]
System 1 --> System 4: F(48, 136) = 1.1798 [0.2293]

System 2 --> System 3: F(16, 119) = 0.60312 [0.8761]
System 1 --> System 3: F(32, 130) = 1.2387 [0.2014]
System 1 --> System 2: F(16, 107) = 1.8435 [0.0343] *

Annex VI

Diagnostic tests for the long run models

tb: Portmanteau 12 lags= 7.2022
reer: Portmanteau 12 lags= 3.9611
rgdp: Portmanteau 12 lags= 12.275
rwgdp: Portmanteau 12 lags= 4.3385
tb: AR 1- 5 F (5, 68) = 2.1486 [0.0700]
reer: AR 1- 5 F (5, 68) = 0.52923 [0.7534]
rgdp: AR 1- 5 F (5, 68) = 0.52362 [0.7576]
rwgdp: AR 1- 5 F (5, 68) = 1.4174 [0.2291]
tb: Normality $\chi^2(2)$ = 5.0387 [0.0805]
reer: Normality $\chi^2(2)$ = 74.725 [0.0000] **
rgdp: Normality $\chi^2(2)$ = 16.258 [0.0003] **
rwgdp: Normality $\chi^2(2)$ = 187.44 [0.0000] **
tb: ARCH 4 F (4, 65) = 0.24905 [0.9092]
reer: ARCH 4 F (4, 65) = 0.045329 [0.9960]
rgdp: ARCH 4 F (4, 65) = 0.50998 [0.7286]
rwgdp: ARCH 4 F (4, 65) = 0.012467 [0.9997]
Vector portmanteau 12 lags= 79.356
Vector AR 1-5 F (80,199) = 0.97909 [0.5342]
Vector normality $\chi^2(8)$ = 368.76 [0.0000] **

Annex VII

Short run dynamics

Equation for trade balance (Dtb)

<u>Variable</u>	<u>Coefficient</u>	<u>Std.Error</u>	<u>t-value</u>	<u>t-prob</u>
Dtb_1	0.28055	0.30150	0.931	0.3551
Dtb_2	0.23575	0.29334	0.804	0.4242
Dtb_3	0.00405	0.28125	0.014	0.9885
Dtb_4	0.09154	0.27244	0.336	0.7378
Dtb_5	0.05881	0.25471	0.231	0.8180
Dtb_6	0.07399	0.23934	0.309	0.7581
Dtb_7	0.14400	0.21831	0.660	0.5116
Dtb_8	0.16927	0.19945	0.849	0.3988
Dtb_9	0.18343	0.18044	1.017	0.3127
Dtb_10	-0.05201	0.15897	-0.327	0.7445
Dtb_11	-0.00520	0.13430	-0.039	0.9692
Dtb_12	-0.06292	0.09849	-0.639	0.5250
Dreer_1	2.56640	0.74479	3.446	0.0009
Dreer_2	1.15810	0.72383	1.600	0.1139
Dreer_3	1.55710	0.67828	2.296	0.0245
Dreer_4	0.50564	0.66517	0.760	0.4496
Dreer_5	1.4863	0.66769	2.226	0.0291
Dreer_6	1.2429	0.63161	1.968	0.0528
Dreer_7	1.2629	0.62070	2.035	0.0455
Dreer_8	0.91245	0.61759	1.477	0.1438
Dreer_9	0.67976	0.60018	1.133	0.2610
Dreer_10	0.47410	0.59886	0.792	0.4311
Dreer_11	0.66892	0.55618	1.203	0.2329
Dreer_12	2.4237	0.55499	4.367	0.0000
Drgdp_1	2.1626	1.8362	1.178	0.2427

Drgdp_2	2.5946	1.7366	1.494	0.1394
Drgdp_3	2.0121	1.6327	1.232	0.2217
Drgdp_4	2.0063	1.5900	1.262	0.2110
Drgdp_5	2.8307	1.5348	1.844	0.0691
Drgdp_6	3.2250	1.5148	2.129	0.0366
Drgdp_7	1.3652	1.5332	0.890	0.3761
Drgdp_8	1.8348	1.6298	1.126	0.2639
Drgdp_9	0.6505	1.6750	0.388	0.6989
Drgdp_10	-0.4023	1.6330	-0.246	0.8062
Drgdp_11	0.8004	1.5746	0.508	0.6128
Drgdp_12	-1.1037	1.4807	-0.745	0.4584
Drwgdp_1	0.4905	0.4824	1.017	0.3126
Drwgdp_2	-0.2596	0.4700	-0.552	0.5824
Drwgdp_3	-0.2333	0.4781	-0.488	0.6269
Drwgdp_4	-0.3955	0.4691	-0.843	0.4018
Drwgdp_5	-0.4969	0.4675	-1.063	0.2912
Drwgdp_6	-0.0212	0.4818	-0.044	0.9650
Drwgdp_7	-0.4756	0.4806	-0.990	0.3256
Drwgdp_8	0.0524	0.4834	0.108	0.9140
Drwgdp_9	-0.2292	0.4817	-0.476	0.6355
Drwgdp_10	-0.2532	0.4731	-0.535	0.5941
Drwgdp_11	0.2342	0.4556	0.514	0.6088
Drwgdp_12	2.8471	0.4692	6.068	0.0000
Constant	-0.0121	0.1065	-0.114	0.9098
Dderp	0.0199	0.1189	0.168	0.8670
DDrought	0.0037	0.1574	0.023	0.9816
ECM_1	-1.0836	0.3159	3.430	0.0010
ECM_2	-0.0609	0.0693	-0.880	0.3818

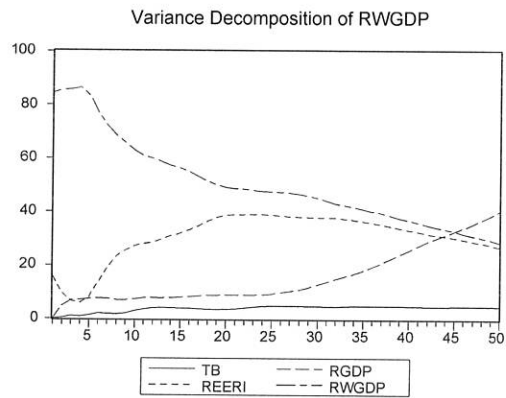
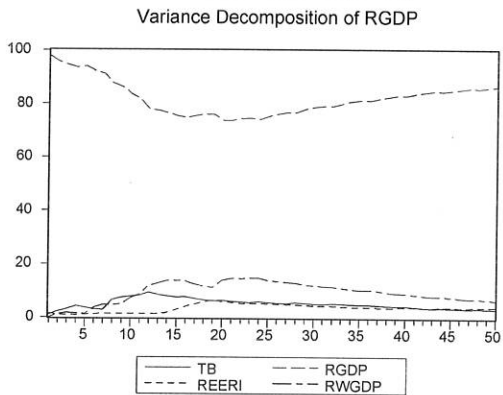
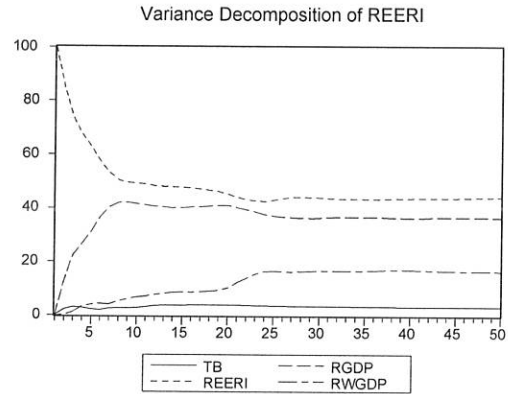
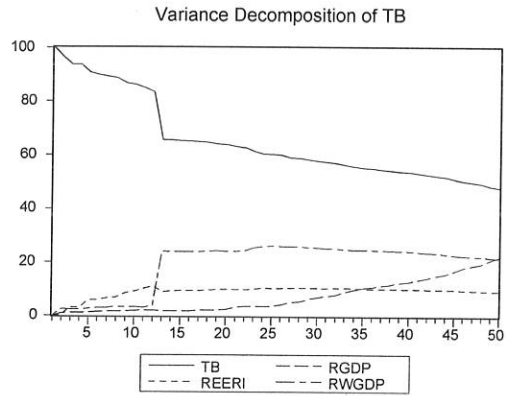
Annex VIII

Diagnostic tests of error correction model with trade balance as the dependent variable

Dtb :Portmanteau 12 lags= 14.834
Dtb :AR 1- 5 F(5,114) = 1.3188 [0.2611]
Dtb :Normality Chi²(2)= 4.9498 [0.0842]
Dtb :ARCH 4 F(4,111) = 0.37204 [0.8281]
Dtb :Xi² F(16,102) = 1.446 [0.1357]
Dreer :Portmanteau 12 lags= 4.058
Dreer :AR 1- 5 F(5, 69) = 0.7295 [0.6037]
Dreer :Normality Chi²(2)= 75.357 [0.0000] **
Dreer :ARCH 4 F(4, 66) = 0.039646 [0.9969]
Drgdp :Portmanteau 12 lags= 10.164
Drgdp :AR 1- 5 F(5, 69) = 0.62577 [0.6806]
Drgdp :Normality Chi²(2)= 16.451 [0.0003] **
Drgdp :ARCH 4 F(4, 66) = 0.5362 [0.7096]
Drwgdp :Portmanteau 12 lags= 4.0376
Drwgdp :AR 1- 5 F(5, 69) = 1.1035 [0.3666]
Drwgdp :Normality Chi²(2)= 159.31 [0.0000] **
Drwgdp :ARCH 4 F(4, 66) = 0.016278 [0.9995]

Annex IX

Variance decomposition Analysis(EViews result)



Annex X

Percentage Share of Major Export items in Total Export Value (1970/71 - 2004/05)

Year	Coffee	Oil Seeds	Hides & Skins	Pulses	Meat & Meat Products	Fruits & Vegetables	Live Animals	Chat	Combined Share
1970/71	42.25	7.17	5.70	4.70	1.96	32.67	0.47	0.53	95.45
1971/72	53.83	12.43	9.80	8.36	4.42	2.08	0.87	1.20	92.98
1972/73	46.48	13.51	15.54	10.01	4.16	2.28	1.34	0.81	94.13
1973/74	30.37	16.58	10.70	21.23	3.18	1.62	0.00	0.88	84.58
1974/75	18.15	13.71	5.75	11.36	1.71	1.51	0.00	0.86	53.05
1975/76	57.09	6.80	8.20	10.13	1.45	1.36	6.02	0.79	91.83
1976/77	60.23	3.95	7.74	7.15	0.80	1.37	7.67	1.17	90.08
1977/78	79.62	1.85	8.97	4.71	0.21	0.63	0.24	0.50	96.73
1978/79	87.94	0.72	7.78	1.34	0.15	0.20	0.12	0.56	98.80
1979/80	73.67	1.58	16.18	3.02	0.63	0.87	0.97	0.49	97.41
1980/81	66.17	1.96	8.00	2.99	0.80	0.68	1.24	2.82	84.65
1981/82	59.04	2.66	14.82	3.26	0.80	1.06	1.09	1.93	84.66
1982/83	19.68	0.61	3.05	1.12	0.41	69.78	0.46	1.45	96.56
1983/84	68.18	3.47	10.81	2.34	0.68	0.74	1.24	3.35	90.81
1984/85	70.16	1.82	11.42	2.06	0.50	0.67	1.37	1.35	89.35
1985/86	74.45	0.86	10.61	1.42	0.43	0.67	2.12	0.95	91.52
1986/87	65.93	1.23	13.62	1.07	0.68	1.62	1.97	3.61	89.71
1987/88	56.86	2.85	17.22	2.07	0.52	1.53	4.19	2.76	87.99
1988/89	69.40	1.22	13.68	1.81	0.23	1.00	2.61	0.88	90.82
1989/90	54.47	1.13	18.03	4.84	0.15	0.55	1.46	2.83	83.44
1990/91	49.70	0.67	17.07	2.91	0.19	2.22	0.96	3.78	77.51
1991/92	60.33	0.14	21.02	0.14	0.01	2.29	0.17	1.82	85.90
1992/93	67.05	0.15	16.80	0.51	0.05	0.34	0.17	8.21	93.27
1993/94	57.56	3.54	16.32	2.22	0.05	0.55	0.86	8.65	89.76
1994/95	65.85	1.83	13.67	3.78	0.22	0.67	0.28	6.31	92.61
1995/96	67.90	1.65	12.20	3.04	0.48	0.83	0.03	6.87	93.00
1996/97	66.20	2.13	10.68	2.52	0.69	1.31	0.32	5.72	89.58
1997/98	69.75	7.60	8.39	2.49	0.71	0.76	0.25	6.57	96.53
1998/99	60.16	7.73	6.92	2.89	0.90	1.16	0.16	12.67	92.60
1999/00	56.82	6.80	7.63	2.13	0.87	1.18	0.38	16.48	92.29
2000/01	44.99	7.98	18.76	2.15	0.43	1.35	0.04	15.11	90.81
2001/02	41.79	8.36	14.22	8.44	0.28	2.40	0.21	12.55	88.25
2002/03	39.88	11.12	12.60	4.81	0.58	2.31	0.12	14.00	85.41
2003/04	41.18	15.23	8.03	4.16	1.43	2.34	0.35	16.22	88.95
2004/05	49.09	14.97	9.62	5.18	2.13	2.35	1.87	14.53	99.75

Annex XI

Export value (in millions) and its contribution to GDP

Year	Export	GDP	Export/GDP(%)
1970/71	425.12	32,292.26	1.32
1971/72	305.92	33,266.72	0.92
1972/73	430.47	34,114.66	1.26
1973/74	546.92	34,839.27	1.57
Average for Imperial Regime			1.27
1974/75	647.45	35,109.69	1.84
1975/76	521.48	35,255.21	1.48
1976/77	683.82	35,549.05	1.92
1977/78	647.45	35,134.47	1.84
1978/79	1,338.53	36,855.30	3.63
1979/80	925.07	38,708.22	2.39
1980/81	830.43	39,095.59	2.12
1981/82	674.54	39,056.37	1.73
1982/83	2,566.42	42,952.08	5.98
1983/84	878.05	40,158.25	2.19
1984/85	751.59	36,054.27	2.08
1985/86	899.11	39,703.73	2.26
1986/87	795.28	45,501.01	1.75
1987/88	772.41	45,304.95	1.70
1988/89	902.72	45,124.31	2.00
1989/90	743.71	46,888.65	1.59
1990/91	542.49	44,827.47	1.21
Average for Derge Regime			2.22
1991/92	279.03	43,237.12	0.65
1992/93	1,601.63	48,468.29	3.30
1993/94	1,247.75	49,071.99	2.54
1994/95	2,732.05	51,633.71	5.29
1995/96	2,539.06	58,110.52	4.37
1996/97	3,485.63	60,247.12	5.79
1997/98	4,142.51	57,582.95	7.19
1998/99	3,511.55	61,517.05	5.71
1999/00	3,754.87	63,809.06	5.88
2000/01	3,378.93	68,837.70	4.91
2001/02	3,335.55	68,793.57	4.85
2002/03	3,556.80	67,171.87	5.30
2003/04	4,678.38	74,692.61	6.26
2004/05	7,331.26	81,218.07	9.03
Average for EPRDF Regime			5.08
Average for the whole period			3.25

Annex XII

The share of import value (in millions) and trade balance (TB) with GDP

Year	Import	GDP	Import/GDP (%)	TB/GDP (%)
1970/71	448.01	32,292.26	1.39	0.07
1971/72	467.13	33,266.72	1.40	0.48
1972/73	412.59	34,114.66	1.21	0.05
1973/74	489.08	34,839.27	1.40	0.17
Average for Imperial Regime			1.35	0.08
1974/75	668.80	35,109.69	1.90	0.06
1975/76	678.09	35,255.21	1.92	0.44
1976/77	749.56	35,549.05	2.11	0.18
1977/78	673.28	35,134.47	1.92	0.07
1978/79	1,192.67	36,855.30	3.24	0.40
1979/80	1,370.63	38,708.22	3.54	1.15
1980/81	1,387.70	39,095.59	3.55	1.43
1981/82	1,680.74	39,056.37	4.30	2.58
1982/83	1,748.40	42,952.08	4.07	1.9
1983/84	2,047.44	40,158.25	5.10	2.91
1984/85	1,768.42	36,054.27	4.90	2.82
1985/86	2,211.19	39,703.73	5.57	3.3
1986/87	2,236.95	45,501.01	4.92	3.17
1987/88	2,228.04	45,304.95	4.92	3.21
1988/89	2,410.35	45,124.31	5.34	3.34
1989/90	1,831.46	46,888.65	3.91	2.32
1990/91	2,131.95	44,827.47	4.76	3.55
Average for Derg Regime			3.88	1.66
1991/92	1,810.90	43,237.12	4.19	3.54
1992/93	3,669.76	48,468.29	7.57	4.27
1993/94	4,739.97	49,071.99	9.66	7.12
1994/95	6,546.27	51,633.71	12.68	7.39
1995/96	7,708.25	58,110.52	13.26	8.9
1996/97	7,379.30	60,247.12	12.25	6.46
1997/98	9,338.46	57,582.95	16.22	9.02
1998/99	11,702.00	61,517.05	19.02	13.31
1999/00	11,438.68	63,809.06	17.93	12.04
2000/01	12,313.96	68,837.70	17.89	12.98
2001/02	14,435.62	68,793.57	20.98	16.14
2002/03	15,936.85	67,171.87	23.73	18.43
2003/04	22,297.69	74,692.61	29.85	23.59
2004/05	31,434.17	81,218.07	38.70	29.68
Average for EPRDF Regime			17.42	12.35
Average for the whole period			9.01	5.76

Declaration

I the undersigned, declare that this is my original work and has not been presented for a degree in any other university, and that all source of materials used for thesis have been duly acknowledged.

Declared by:

Name: ESHETE AMCALU

Signature: 

Date: 26/03/07

Confirmed by Advisor:

Name: _____

Signature: _____

Date: _____