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INDICES OF EFFECTIVE EXCHANGE RATES: A COMPARATIVE STUDY OF ETHIOPIA, KENYA AND THE SUDAN

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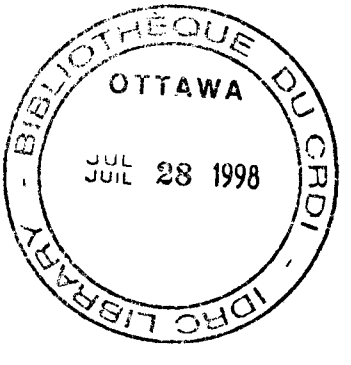
NOMIC RESEARCH CONSORTIUM

POUR LA RECHERCHE ECONOMIQUE EN AFRIQUE

Indices of effective exchange rates: a comparative study of Ethiopia, Kenya and the Sudan



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Indices of effective exchange rates: a comparative study of Ethiopia, Kenya and the Sudan

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Abstract

The paper considers the various indices of effective exchange rate that are applied in many countries to measure the overvaluation or undervaluation of a particular currency compared to the currency of major trading countries. First the conceptual issues of the nominal effective exchange rate (NEER) is considered. In general there are three types of nominal effective exchange rates namely the export weighted, import weighted and trade weighted rates. Other indices may also be developed on the basis of the three indices. The major drawback with these rates is that they do not isolate the effect of overvaluation from possible inflationary differentials between reporting countries and major trading partners. In order to isolate the pure exchange rate effect, the nominal effective exchange rate should be deflated by the ratio of the inflation rate of a reporting country to that of a partner country. This would in turn give us the Real Effective Exchange Rate (REER). There are two problems associated with the conversion of NEER to REER. First, there is an issue of what type of price index to use. There are several indices including the Consumer Price Index (CPI), the wholesale price index (WPI), as well as other related indices. Second, even if a particular index is chosen, that index may not be measured in a similar manner between the two countries. If the Real Effective Exchange Rate (REER) is measured with minimal error then such an index may be a measure of changes in the price of tradables compared to non-tradables. In other words, the REER is akin to the Real Exchange Rate (RER).

I Introduction

This paper looks at the adequacy and consistency of exchange rate indices for African countries. Such indices have been estimated for many developed countries since the early 1970s. The indices are adequate for comparing exchange rate movements between industrialized countries and with comparable economic performances. When one tries to estimate indices of effective exchange rate between a developing country on the one hand and between major trading countries (which are economically more developed) then the adequacy of such indices may come into question. In this paper we will examine the various indices, what they are expected to measure and whether they are adequate for developing countries. Balassa (1987) examines two definitions of the real exchange rate; the traditional and the modern. The traditional approach estimates the nominal effective exchange rate and then deflates it by relative price movement of a given and a partner country, so as to achieve finally the 'pure' exchange rate indicator. The latter is referred to as the real effective exchange rate. The modern version estimates the ratio of price indices of traded and non-traded goods. In the modern version, a simple model is formulated whereby export demand (through foreign and domestic export supply) equations are estimated. A similar formulation may be developed for imports. This is commonly referred to as a multilateral effective exchange rate (MERM). The traditional method seems to be rather simplistic, in other words such indices do not seem to take into account the theoretical macroeconomic issues into explaining the movement of a particular country's exchange rate *vis-a-vis* the major trading partners. Thus a modern and more comprehensive method of estimating and effective exhange rate is developed.[1]

In this study we shall only consider the traditional definition of the exchange rate. Section II reviews various indices of nominal and real effective exchange rate and Section III considers some of the conceptual and methodological issues involved in constructing such indices. Sections IV to VI briefly discuss the real effective exchange rate. Section VII identifies those characteristics of developing countries which may have an effect on exchange rate movements. Sections VIII and IX discuss the results of nominal, real and parallel market exchange rates, while Section X gives some concluding remarks.

II Exchange rate indices: nominal indices

Most African currencies are pegged against one of the major currencies. For example the Ethiopian birr is pegged against the US dollar, while the Kenyan shilling and Sudanese sterling are pegged against the British pound. However, in a world where currency floating is the order of the day, a fixed exchange rate is inappropriate. This raises the question as to the exchange rate of an African currency *vis à vis* the major trading partners of the country under consideration. In order to estimate the exchange rate of an African currency at a given time, one needs to identify that country's major trading partners. Once the major trading partners have been identified the next step is to devise an index that expresses an "average" change in the exchange rate of a particular African currency against the currencies of its major trading partners. The simplest way of doing this would be to calculate the simple arithmetical mean of individual bilateral exchange rates; however, this approach is valid only if each trading partner has the same share of trade with the particular country under study. This is obviously not the case.

The most reasonable approach would be to have a weighted "average" of bilateral exchange rates. The latter method is what is known as an effective exchange rate. Hirsch and Higgins (1970) were among the first to develop this concept of effective exchange rate. They recognised that, for analytical purposes, the exchange rate of a particular currency should "reflect the evolving relationship between that currency and all other currencies". They also identified that the effective exchange rate should be an index and should not be expressed in absolute terms, and that only the currencies of major trading partners (not all the currencies) should be included.

Development of an effective exchange rate

After recognizing that the effective exchange rate should be an index and be expressed in relative terms, Hirsch and Higgins defined an effective exchange rate of any given currency as "the percentage 'direct' change in the numeraire rate

minus the weighted percentage 'indirect' change in the numeraire rates of other currencies". Thus, given n currencies (1,2,...,n) with the currency n as the numeraire, N is the percentage change in the numeraire rate while w_1, w_2, ..., w_n are the relevant weights. The percentage change in the effective exchange rate E, can be expressed as:

$$(1) \quad E' = n' - \sum_{i=2}^{n} W_i N_i$$

Alternatively, Equation 1 may be rewritten as the ratio of the numeraire rate of a given currency to the sum of weighted changes in numeraire rates of other currencies. In other words,

$$(2) \quad E' = n' / \sum_{i=2}^{n} W_i N_i$$

To further clarify the indices in Equations 1 and 2, given a particular currency where the dollar is the numeraire, the exchange rate of that particular currency is equal to the percentage change in its dollar rates of other currencies. In Equation 1, N^1 is known as the direct effect while $\Sigma W_i N_i$ is the indirect effect. If the numeraire rates of other currencies show zero change, the indirect effect will be insignificant. After Equation 1 or 2 has been estimated for each period a base period is chosen and an index is formulated.

Rhomberg (1976) elaborates more on the construction of indices of exchange rate and discusses issues that have to be taken into consideration when constructing effective exchange rates. Like Hirsch and Higgins he confines his analysis to developed western economies. In other words, the unique conditions and characteristics of developing countries are not taken into consideration.

When considering the choice of a base period in the construction of an index, Rhomberg states that the base date should be chosen in such a way that the period is as close to the equilibrium rates as possible.

According to Rhomberg, weighting is an important issue in constructing an effective exchange rate index. The choice of weights is said to depend on the objective of the study or on the economic analysis. One may have as many weights (indices) as the number of policy issues that one wishes to analyze. In Rhomberg's words,

> The proper choice of weights depends, therefore, on the particular policy objective selected as focal point of the index. For different objectives, indices employing different weighting schemes would be appropriate.... (Rhomberg, 1976, p.89).

The most commonly considered issue is the study of the effect of changes in the exchange rate on a given country's balance of payments. In this case, the proper choice of weight could be an average of bilateral export and import weights. If one is to study the effect of exchange rate changes on the cost of imports, the appropriate weight would be the value of imports from major trading partners. This is because the change in the price of foreign currency in terms of the domestic currency based on bilateral import weight measures the effect of a set of foreign exchange changes on the cost of imports in local currency. If one wishes to study the effect of exchange rate changes on the competitiveness of a given country's exports in the world market, the appropriate weight would then be the volume of exports. The reason behind this weighting system is that the change of the domestic currency in terms of currencies of trading partners weighted by the volume (share) of exports would help indicate the cost of the home country's exports to foreign customers. One could give other examples showing the correspondence between a particular policy issue and an appropriate weighting system.

Rhomberg discusses seven indices that are commonly used by various financial institutions. The author states that it is generally difficult to compare the various indices because they may differ on the choice of the sample countries included, the base period and the data inputs. Even though Rhomberg considers seven different indices, there are essentially four, while the other remaining three are simply extensions.

The import weighted index

The import weighted index is defined as the average price of partner currencies in terms of domestic currency relative to the base period, the weights being the partners' share in total imports of the home country. Symbolically this may be written as

$$(3)\quad E\,M_i = \sum_j \frac{M_{ji}}{\sum_j M_{ji}} R_{ji}.$$

where

M_{ji} = imports of country i from country j
ΣM_{ji} = total imports of county i
$1/R_{ji} = R_{ji}$ = price of one unit of currency i in terms of currency j expressed as an index relative to the base period (summation is over all the currency of major trading partners).

The bilateral export weighted index

The bilateral export weighted index is defined as the arithmetical mean of the price of the domestic currency in terms of partner currencies, relative to the base period, and weighted by the partners' share in the total export of the home country. Symbolically, it is expressed as follows:

$$(4)\quad EX = \sum \left(\frac{X_{ij}}{\sum X_{ij}} \right) R_{ij}$$

where

X_{ij} = exports of country i to country j
X_{ij} = total exports of country i

The bilateral trade weighted index

The bilateral trade weighted index is the arithmetical mean of Equation 4 and reciprocal of Equation 3, weighted by the ratio of exports and imports to their sum. This is symbolically expressed as

$$(5)\quad EMX = \frac{\left[M_{.i}\left(\frac{1}{EM_i}\right) + X_{i.}\ (EX_i)\right]}{M_i + X_{xi}}$$

where

$M_{.i}$ = total imports of country i
$X_{i.}$ = total exports of country i to the world market.

The global export weighted index

The global export weighted index is defined as the arithmetical mean of prices of domestic currency in terms of foreign currencies, relative to the base period, and weighted by foreign countries' share in total exports to the world market. The market of the home country is not included. This may be written as

$$(6)\quad EXW_i \geq \sum_{i \neq j} \left[\frac{(X_{i.} - X_{ij}}{\sum_{i \neq j}(X_{i.} - X_{ij})}\right] R_{ij},$$

where $(X_{i.} - X_{ij})$ = total export of country i minus export of i to country j.

The average export weighted index

The average export weighted index is a simple arithmetical mean of the bilateral export weighted index and the global export weighted index and is expressed as

$$(7)\quad EXBW = 0.5\ EX + 0.5\ EMX$$

The average trade weighted index

The average trade weighted index is a simple arithmetical mean of the average export weighted index and the reciprocal of the import weighted index. This may be expressed as

$$(8)\quad EMXBW = 0.5\left[\frac{1}{EM_i}\right] + 0.5\ [EXBW]$$

The last index discussed by Rhomberg is based on the more complex MERM and is not considered here.

Uses of the various indices

The import weighted index EM_i would help studies of the effect of changes in the exchange rate on the cost of imports, while the bilateral export weighted index EX_i may help analysts understand the effect of changes in the exchange rate on the competitiveness of a given country's exports.

The bilateral trade weighted index (*EMX*), which is an average of two indices weighted by bilateral export and import weights, is used as a measure of an overall trade movement. One of the indices (EM_i) is inverted because the export and import weighted indices move in opposite directions as the index is the weighted average of changes in the price of foreign currencies in terms of domestic currency. The other indices are weighted averages of prices of domestic currency in terms of foreign currency. The average trade weighted index (*EMXBW*), which incorporates import weights as well as the two types of export weights, can be regarded as a trade-weighted index. This formula is expected to show the change in one structure of trade as a result of changes in the exchange rate. This formula is also expected to give some indication about price responses to exchange rate changes. This index is closer to the MERM type indices which use the general equilibrium approach to obtain an appropriate weight.

Rhomberg states that the best method of measuring indices is to use the MERM system whereby a general equilibrium model is developed and the effect of

exchange rate change on several economic variables could be studied. The author uses the seven indices to compare movements of effective exchange rates for the developed countries of Western Europe. In order to make a valid comparison, the author chooses the same base period and the same set of exchange rate data. The indices showed general conformity with respect to upward and downward movement over the study period. The MERM indices showed trends that are neither too high nor too low and the author concludes that the MERM weighted index is the better measure.

III Some conceptual and methodological issues

The indices of effective exchange rate, as suggested by Hirsch and Higgins (1970), Rhomberg (1976) and others, does not seem to consider some major methodological and conceptual issues involved in the construction and interpretation of the various indices. More specifically, the informational content of different indices and their interpretation in relation to different market conditions needs to be analyzed. Moreover, the indices already summarized do not seem to differentiate between the nominal and real effective exchange rate. Maciejewski (1983) states that a meaningful interpretation of the various nominal and real exchange rates depends on the combination of four issues, namely the proper choice of a base period; the proper choice of weighting and the policy question being addressed; the plausibility of the relative price or cost indicator; and the mathematical formulation. The author then develops the concepts of nominal and real effective exchange rates and states that an index can only answer one question at a time. More specifically, the index answers the question of the effects of changes in exchange rate relative to the base period. It is confined to a given set of currencies.

One major issue that Maciejewski addresses in appraising various indices is the need to link economic theory as related to exchange rate movements and the process of index construction. Again this link can only be realized by considering one issue at a time. For example, if one wants to assess the impact of changes in the exchange rate on the "competitiveness of exports", the appropriate weight could be the volume of exports and a Laspeyre-type index where constant quantity and constant quality baskets of goods are assumed. The standard Laspeyre price index that is commonly used in the construction of wholesale, retail, cost of living and other indices is given by

$$(9)\quad P_{La}^{01} = \frac{\sum P_1 Q_0}{\sum P_0 Q_0}$$

where P_0 and P_1 are base and current period prices Q_0 is the weight and is nothing but the base period quantity purchased.

By the same logic one may develop a Laspeyre-type exchange rate index. The bilateral export weighted index of Equation 4 may be rewritten so that it looks similar to Equation 9. This is done as follows:

$$(10)\quad NEER = \frac{\sum_j X_0^p \left(\frac{e_1^p}{E_1^r}\right)}{\sum_j X_0^p \left(\frac{e_0^p}{e_0^r}\right)}$$

where

X^p = value of export to the *p*th trading partner in the base period (the value is expressed in partner country's currency);

e_1^p = dollar value (dollar over currency) of one unit of *p*th partner in period 1;

e_0^p = dollar value of one unit of *p*th partner country in the base period;

e_1^r = dollar value of one unit of reporting country's (country under study) currency in period 1;

e_0^r = dollar value of one unit of reporting country's currency in the base period;

NEER = nominal effective exchange rate.

It may easily be noted that X_0^p in Equation 10 plays the role of Q_0 in Equation 9, while e_0^p / e_0^r and e_1^p / e_1^r play the role of P_0 and P_1 in the same equation.

A simple manipulation of Equation 10 yields the following results:

$$(11)\quad E = \sum_{P} \frac{W_0^P}{\sum W_0^P} \left(\frac{e_1^P}{e_0^P} \quad \frac{e_1^r}{e_0^r} \right)$$

where

$$W_0^P = X_0^P \frac{e_0^P}{e_0^r}.$$

One should note that Equation 11 is merely a bilateral export weighted index where

W_0^p / w_0^p	= weight;
e_1^p / e_0^p	= indices of change from base period exchange rate in P's exchange rate;
e_1^r / e_0^r	= indices of change from base period in reporting country's numeraire exchange rate.

Again, Equation 11 is similar to Equation 9 where

$$W_0^p = X_{ij}$$

$$R_{ij} = \frac{e_1^P}{e_0^P} \quad \frac{e_1^r}{e_0^r}$$

The above formula explains how the value of a country's earnings from commodity exports in the current period, with the value of its earnings in the base period, changes as a result of cumulative effects of exchange rate movements. Contrary to the common view, it is not a direct measure of international competitiveness in a given country's export sector because competitiveness is a function of many different economic variables.

It is also possible to change the weights of Equation 11 to find out the effect of exchange rate movement on export earnings. For example, if one wants to study the effect of changes in exchange rate on a country's export earning from a group

of specific commodities, then the weight ought to be the distribution among the principal competitors of specific market shares in the commodities in the base period.

Implications of using Laspeyre-type indices

We have already stated that Laspeyre-type indices of effective exchange rate assume an unchanged product composition as well as unchanged quality of goods. In other words, the above indices require a changing exchange rate policy so as to maintain the *status quo* of the base period. This approach may be unrealistic in a world where the quantity and quality of products and services change. At the same time, developing countries are facing a changing world with deteriorating terms of trade in the export of primary commodities such as coffee and cocoa. The use of Laspeyre-type exchange rate indices within the context of developing countries may thus be questionable.

The second problem with Laspeyre-type exchange rate indices is that such indices are biased downwards compared with other indices such as Paasche. The latter uses the current period as a base. The extent of this downward bias has not been verified, but chances are that they are likely to be substantial.

The preceding paragraphs show that the bilateral export weighted index is similar to a Laspeyre-type index and briefly considered the consequences of using such indices. Similar discussions can be developed for Equations 3 and 6. Equations 3, 4 and 6 are usually referred to as the nominal effective exchange rates. We will now briefly consider the real effective exchange rate. The discussion will continue to be confined to the bilateral export weighted exchange rate.

IV The real effective exchange rate

The nominal effective exchange rate (NEER) is not adjusted or deflated for a corresponding change in relative prices. If the NEER is applied to study the effect of exchange rate policy, then the "real" exchange rate effect may not be isolated. This is because the NEER may also include the effect of inflation differentials between a country under consideration and its partners. Thus, in order to isolate the pure exchange rate effect on export "performance", the NEER may have to be deflated so as to arrive at the EER. Unlike the NEER, the real effective exchange rate (REER) may not be used to measure the effect of undervaluation or overvaluation of a currency.[2] In this particular case, the REER may be interpreted as a gain or loss in international price competitiveness between the current and the base period.

Below we present the corresponding value for the REER for the bilateral export weighted index. If we deflate Equation 4 by a ratio of price changes from the base period in partner countries to the country under consideration, we will get the following result

$$(12) \quad REER = \sum_p Z_p \left(\frac{e_1^{pr}}{e_0^{pr}}\right) \left(\frac{p_1^{pr}}{p_0^{pr}}\right)$$

where

$Z_p = W_0^p / W_0^p$ = bilateral share of export;
$e_0^{pr} = e_0^p / e_0^p$ = bilateral exchange rate of partner countries to home country in the base period;
$e_0^{pr} = e_0^p / e_1^r$ = bilateral exchange rate of partner countries to home currency in the current period;
$p_0^{pr} = p_0^p / p_0^r$ = ratio of export prices of partner countries to home country in the base period;

$p_1^{pr} = p_1^p / p_1^r$ = ratio of export price of partner countries relative to home country in the current period.

Equation 12 is the NEER the same as Equation 4 but with deflated price differentials between reporting and partner countries. Equation 12 can be written more simply as:

$$(13) \quad R = Z_p \left(\frac{r_1^p}{r_0^p} \right)$$

where

$$r_1^p = \frac{e_1^{pr}}{p_1^{pr}}$$

and

$$r_0^p = \frac{e_0^{pr}}{e_0^{pr}}.$$

V Implications of the mathematical formulations

Each of the indices described above includes a relative price or cost component. The method of averaging and the calculation of the relative prices will have an effect on the indices finally calculated. To estimate the real effective exchange rate we may easily estimate two separate indices relative price and exchange rate changes. The same weighting procedure will be used for each and they will then be combined. This approach enables one to decompose the variation in real exchange rate variability into exchange rate change and price change components.

Exchange rate changes are generally easy to obtain or estimate but this is not so for price changes. To find these, one may have to use proxies for price change indices and combine them with the exchange rate indices. This approach is obviously more restrictive and the interpretation of the final indices may not be easy.

The method of averaging may also affect the calculated value of such indices. The arithmetical mean, the geometrical mean and the harmonic mean are most commonly used. Each of these averaging methods has its own biases; however, the geometrical mean seems to work best because it treats appreciating or depreciating values in a symmetrical manner and is not affected by extreme values. In other words, the averaging process is a linear function of the components of bilateral exchange rate indices.

VI Relative price (cost) indices

We have already stated that the NEER should be adjusted by relative price (cost) indices in order to eliminate inflation differentials and to obtain the pure exchange rate change effects. There are different relative price indices that are useful for deflating NEER indices. These indices are widely used in the industrial countries of the West. Below, we consider the most important ones.

Index of export unit values

The index of export unit values compares the value of exports of the home country with those of its competitors. The indices are based on proxies where export unit value is the proxy for prices. They may be easily estimated provided that one obtains data on value and quantities. While it is easy to estimate the unit values, the use of the latter as a proxy for price of exports has been questioned. This is because the changes in the proxy value may be due not only to changes in prices but also to compositional shifts in the selected set of commodities.

Furthermore, indices of export unit values may not be regarded as indices of price competitiveness because export values also include different taxes and export prices may not be increased or decreased in response to competitiveness. In general, the index of export unit values may be regarded as a indicator of price competitiveness of manufactured goods.

Index of wholesale price

The index of wholesale price compares the wholesale prices of the home country to those of competitors. The indices are expected to reflect price developments for "potentially exportable" products. However, they do include non-traded goods as well as imported goods. They may thus incorporate indirect taxes or subsidies

levied on imports. Because of these factors, wholesale price indices may overstate or understate the changes in export prices. In addition, wholesale price indices may temporarily not be comparable because of differences in scope and coverage of the regimes as well as the method of averaging. It may be possible to derive a wholesale price index for the purpose of deflating changes in exchange rates.

Cost indices

Cost indices compare labour costs of the home country to those of competitors and are a measure of profitability of exports. Labour is engaged in both tradable and non-tradable goods and may not be a good indicator of cost-based competitiveness in international trade. The labour cost is normally defined as the ratio of labour costs to the volume of output produced, and when this index is taken as a measure of costs it assumes that labour costs are a major input in the process of production or that other costs are similar across all competing countries. Another problem of the labour-based cost index is that it may incorporate erratic movements and may not give a true indication of cost trends. Such erratic movements may be due to a "lead-lag" relation.

Consumer price indices

Consumer price indices (CPI) measure the consumer price of reporting country *vis à vis* competitors and are used as a proxy for measuring relative total unit producer costs. If the CPI goes up it could imply that the relative cost of production will also go up. This may eventually lead to reduced profits in tradables and reduce supply and market shares. If a CPI is used for measuring producers costs, we are assuming that CPIs are a major determinant of wages as well as other inputs. The problem with the CPI is that it is concerned with inter-country comparisons and is thus flawed when one compares labour-intensive and capital-intensive structures of production, as is the case when one compares a developed country with a less developed country.

The GDP deflator index

The GDP deflator index measures a home country's GDP deflators with the competitors' GDP deflators and is a measure of total unit costs of a country and its partners. If properly measured, it may give a satisfactory indication of the profitability of exported goods of a reporting country against its competitors.

VII Relation between exchange rate indices and macroeconomic performances

Even though the aim here is to empirically estimate indices of the effective exchange rates and interpret the results *vis a vis* the performance in enhancing export earnings, reducing the cost of imports and measuring the international competitiveness of the three countries, it may be in order to briefly consider the macroeconomic structure from which some of the propositions about the relationship between indices and outcomes can be derived.

The three countries under study have faced serious economic crises, over the past 15 years. These crises have manifested themselves in various forms such as low growth rate of GDP, increasing balance of payments deficits, high debt and debt servicing followed by accumulation of arrears. The causes for this poor economic performance are many and varied. Some of these are deteriorating terms of trade, high interest rate and protectionism. By far the most important cause could be overall macroeconomic mismanagement. This is again manifested by lack of appropriate incentive schemes which failed to promote efficiency in the utilization of resources.

One of the consequences of poor macroeconomic management is the overvaluation of a country's currency which discourages export and diversification and makes imports artificially cheap. The quantitative restrictions that are introduced in the allocation of foreign exchange are the result of an overvalued domestic currency. As a result of an overvalued exchange rate a country always faces balance of payment deficits. This is because overvalued exchange rate makes production for exports unprofitable while imports become cheaper. Few individuals or institutions will have access to exchange rates at an artificially low price and privileged importers earn high profits. On the other hand manufactured exports are produced at high cost and this leads to a loss in international competitiveness. Domestic demand for tradables will be high because of low relative prices. On the other hand, prices of tradables will be discouraged because of low prices and lack of competitiveness.

Devaluation of the existing currency is expected to narrow the gap in the current account deficit by increasing the profitability of exports and making the latter more competitive. At the same time, cost of imports will be increasing. The effectiveness of the policy depends on the elasticity of export supply and the demand for imports. On the other hand devaluation may have a short-term inflationary effect. For example, the cost of production of agricultural produce is likely to increase as a result of devaluation and is passed on to consumers. The inflationary effect could be substantial if the fraction of imported inputs is high. Also an overvalued exchange rate implies an implicit tax on exports. Since this implicit tax is not used as a budgetary support but as subsidy to importers, the overvalued currency is likely to lead to a budgetary deficit. Also, an overvalued exchange rate will lead to the emergence of a parallel market. Devaluation is expected to reduce or eliminate the premium and realign the rates. It is with this type of macroeconomic management that we have to estimate various indices of effective exchange rate. One may be able to compare the empirical estimate of each country's indices with the consequences that may emerge.

VIII Empirical estimates of effective exchange rates

In this and subsequent sections, empirical estimates of various exchange rates will be presented for Kenya, Ethiopia and the Sudan.

The choice of these three countries is based on several considerations. First, the required data for each country is available. Second, even though the three countries are within the same region and are classified among the least developed countries, there is substantial variation between them. Out of the three, Kenya has relatively high per capita income; export earning is from more diversified commodities and services, GDP from the industrial sector constitutes a substantial proportion and the latter is more modern with little excess capacity. The government of Kenya is committed to the functioning of a market orientated, relatively free and open economy. Most important the exchange rate policy has been relatively more flexible, exchange controls are less rigid and the list of prohibited import items is not long. Because of this the parallel market is quite thin and the premium very low. On the other extreme, Ethiopia has one of the lowest per capita incomes in the world, more than 80% of the export earnings are from a single primary commodity (coffee), and the industrial sector is both inefficient and highly protected with a large percentage of excess capacity. The reason for the latter is the high dependency on imported capital and intermediate goods. Until 1991 the government had been pursuing orthodox Marxist economic policy whereby most of the major industrial and service establishments have been under state control. In general the incentive structure that is a prerequisite for conducive private investment did not exist. The exchange rate policy has been rigid. Because of declining export earnings and very low aid and capital inflow, the foreign exchange resource is insignificant resulting in strict foreign exchange control with a long list of prohibited import items. Allocation of the available meagre foreign exchange was centralized; in other words it was not based on supply and demand. The official exchange rate of the local currency that has been

pegged to a single currency has been constant throughout. As a result the parallel market began to flourish with a premium reaching as much as 362%.

Compared with these two countries the economic structure of the Sudan is somewhere between the two. Even though the mainstay of the economy is agriculture, the latter seem to be capital intensive and depend on imported inputs; the same may be said of the industrial sector. Like Ethiopia, an appropriate incentive structure does not seem to exist. Past attempts at structural adjustments in general and attempted exchange rate realignment could not be sustained and did not produce the desired result. Even though there were a series of devaluations, the currency was still overvalued and strict exchange control prevails. There is also an ever increasing parallel market, however, the premium was not as high as that of Ethiopia.

In general the choice of the three countries would enable us to construct indices of effective exchange rate for developing economies with different macroeconomic environments.

For each of these three countries, an index of EER movements has been constructed in accordance with the formulae given in Equations 3, 4 and 12. The indices that have been constructed are the nominal and the real effective exchange rates, for both the official and the parallel markets, for each of the three countries. The EERs include:

- export weighed NEER;
- import weighted NEER;
- trade weighted NEER;
- export weighted REER;
- import weighted REER; and
- trade weighted REER.

The estimates were made by assuming two different base periods, 1970 and 1980. In all, we have estimated 24 different indices for each of the three countries. Trend equations will also be estimated for each series.[3] Before going on to examine the empirical results of the various exchange rates, we will consider the official exchange rates of the three countries. Table 1 shows that there is very little variability in the official exchange rate of Ethiopia, while there is substantial variability in Kenya's official exchange rate. Sudan lies somewhere between the two.

Table 1 Official exchange rates for Ethiopia, Kenya and the Sudan

Year	Ethiopia	Kenya	Sudan
1970	2.50	7.14	2.87
1971	2.50	7.14	2.87
1972	2.50	7.14	2.87
1973	2.07	6.90	2.87
1974	2.07	7.14	2.87
1975	2.07	8.26	2.87
1976	2.07	8.31	2.87
1977	2.07	7.95	2.87
1978	2.07	7.40	2.50
1979	2.07	7.33	2.00
1980	2.07	7.33	0.50
1981	2.07	7.57	0.60
1982	2.07	10.21	1.00
1983	2.07	12.72	1.30
1984	2.07	13.79	1.30
1985	2.07	15.78	2.30
1986	2.07	16.28	2.50
1987	2.07	16.04	3.00
1988	2.07	17.70	

Source: International Monetary Fund, Financial Statistics (various issues).
Note: values are expressed in terms of one US dollar.

Some preliminary indicators

A simplified table showing the relationship between export with major trading partners and the corresponding bilateral exchange rate is given for 1970 and 1980 in Appendix 1. In 1970 Ethiopian exports were predominantly to the United States, while the other six partner countries took only 23% of the total. By 1980 the proportion of Ethiopian exports to the US had decreased dramatically while those to Japan, France, Germany and Italy showed a relative increase. This may be explained by the change in the exchange rate of the Ethiopian birr relative to the trading partners. Between the two periods, the Ethiopian birr appreciated by

about 17% relative to the US dollar. On the other hand, the Ethiopian birr depreciated by 71.4, 44.3 and 54.1% against the currencies of Japan, France and Germany.

The distribution of Kenya's exports to the major trading partners is less skewed than for the other two countries. The United Kingdom appears to be the major receiver of Kenya's exports, while between 1970 and 1980, Kenya's exports to Japan, France, Germany and Italy increased. This could be explained by the large percentage depreciation of the Kenyan shilling relative to the currencies of Kenya's trading partners. The Sudan's exports to major trading partners shows a highly skewed distribution in 1980 compared with 1970. The United Kingdom is the most important buyer of Sudan's exports. Unlike Ethiopia and Kenya the variation in the Sudan's exports could not be explained by changes in bilateral exchange rates.

We have also tried to relate the change in imports of 1970 and 1980 to bilateral exchange rate (Appendix 2). In relating changes in imports by partner country to bilateral exchange rate, the latter is measured as the ratio of the partner country's currency over the home currency. With respect to Ethiopia one observes that Japan, Germany, and Italy were the three major sources of Ethiopian imports. There is not much change in the share of imports between 1970 and 1980. On the other hand, the Ethiopian currency shows some appreciation between the two periods suggesting that the change in imports could not be explained by the change in the corresponding bilateral exchange rates.

The distribution of sources of Kenyan imports seems to be similar to that of exports. Britain is the main source even though its share had decreased by 8% between 1970 and 1980. Imports from Germany, Italy and the Netherlands increased considerably in 1980 and this may be explained by changes in the bilateral exchange rates.

The Sudan's imports from its major trading partners shows a less skewed distribution in 1980 compared with 1970, with the United Kingdom becoming a relatively less important source of imports. The increase in imports from Germany and Italy may be explained by the relative appreciation of the Sudanese currency.

The preceding discussion suggests that variation in exports and imports to and from major trading partners may be partially explained by changes in bilateral exchange rate. This is particularly so for Kenya. Given that the data in Appendices 1 and 2 give some indication of the possible relationship between exports, imports and exchange rates, the next step would be to apply the indices of EER, as explained previously, so as to see the patterns of such indices and to give economic interpretation to our results.

Results and economic interpretations

Nominal effective exchange rates

We have already stated that one can develop as many indices as there are policy issues to be answered. In our empirical estimation we have confined ourselves to nominal export weighted and nominal import weighted indices, as well as the average between the two. The empirical results of each of the three indices should give some indication of the effects of changes in exchange rate on the competitiveness of a given country's exports and effects of the cost of imports on the extent of trade movements.

Taking 1970 as a base period, the three indices of the three countries are given in Table 2 as well as in Figures 1, 2 and 3. The export and import weights used in estimating the effective exchange rates are the values given in Appendices 1 and 2. Trend equations of the three indices are also given in Table 3. An increase in the trend value of an export weighted nominal exchange rate implies that a given country's currency has been depreciated over the study period. This is because a bilateral exchange rate is defined as dollar value of a reporting country's currency over dollar value of partner country's currency. The results clearly show that the Kenyan currency has been continuously depreciated; the extent of depreciation seems to be high during the 1980s compared with the 1970s. The result suggests that Kenya's exportables are likely to be competitive and export earning could show some increase. The opposite seems to be true for Ethiopia. The effective exchange rate in Figure 2, as well as the trend equation in Table 3, show that the Ethiopian currency is relatively overvalued, suggesting that the main cause of poor export performance for Ethiopia is the appreciation of its currency compared with those of its major trading partners. Also during the study period the Sudanese currency showed some relative appreciation.

The import weighted indices of the three countries are estimated by defining the bilateral exchange rates as the ratio of those of the partner countries to those of the reporting countries (Kenya, Ethiopia and the Sudan). Because of this the import weighted EER should move in the opposite direction to the export weighted EER. For purpose of comparison the import weighted indices have been inverted. Based on this interpretation, Kenya's cost of imports seems to be lower than that for Ethiopia and the Sudan. Finally, the trade weighted NEER is given in column 3 of Table 2. The results suggest that Kenya has experienced extensive trade movements, while this is not so for Ethiopia and the Sudan.

Table 2 Nominal effective exchange rate for Kenya, Ethiopia and the Sudan, 1970 = 100

Year	Kenya			Ethiopia			Sudan		
	1	2	3	1	2	3	1	2	3
1970	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1971	0.98	1.04	1.04	1.01	1.01	1.01	1.01	0.97	0.99
1972	1.03	1.05	1.04	1.01	1.04	1.02	1.05	1.03	1.04
1973	1.03	1.13	1.09	0.84	0.90	0.87	1.11	1.06	1.08
1974	1.08	1.29	1.19	0.84	0.97	0.91	1.16	1.08	1.12
1975	1.30	1.43	1.38	0.84	0.98	0.91	1.17	1.18	1.17
1976	1.50	1.58	1.53	0.85	1.03	0.94	1.26	1.35	1.31
1977	1.40	1.59	1.48	0.86	1.08	0.97	1.27	1.27	1.27
1978	1.28	1.66	1.47	0.87	1.17	1.02	1.16	1.09	1.13
1979	1.23	1.68	1.46	0.87	1.02	1.02	0.93	0.84	0.88
1980	1.19	1.58	1.38	0.86	1.02	0.98	0.86	0.77	0.82
1981	1.87	1.55	1.71	0.87	1.29	1.08	0.58	0.78	0.68
1982	1.87	1.85	1.86	0.86	1.11	0.98	0.34	0.38	0.36
1983	2.43	2.08	2.25	0.86	1.10	0.97	0.34	0.40	0.36
1984	2.98	2.11	2.54	0.85	1.10	0.97	0.18	0.24	0.21
1985	3.07	2.79	2.93	0.87	1.11	0.99	0.18	0.21	0.20
1986	3.26	3.47	3.36	0.87	1.22	1.05	0.11	0.12	0.12
1987	2.96	3.93	3.45	0.89	1.11	1.10	0.12	0.11	0.11
1988	3.23	4.33	3.79	0.88	1.23	1.05	0.11	0.10	0.10
X	1.86	1.95	1.89	0.88	1.10	6.99	0.73	0.74	0.73
S	0.87	0.98	0.90	0.05	0.11	0.06	0.45	0.43	0.44

Source: author's calculation, based on Table 1.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted.

We also tried to see the movement of the three indices when the base period was changed from 1970 to 1980. The results in Appendices I and II show a major change in the export and import weights of the three countries.

The NEER of the three countries is given in Tables 4 and 5. There seems to be little difference in the export weighted, import weighted or trade weighted indices of Ethiopia and the Sudan when 1980 wight is applied. On the other hand,

changing the base to 1980 has reduced the extent of Kenya's currency depreciation. In other words, by changing the base to 1980, Kenya's competitiveness in exports is lower, the cost of its imports is relatively higher and the extent of trade movements seems to have been reduced.

The results in the tables, as well as the estimated trend equations, can be compared in different ways and one may provide many different interpretations by making several assumptions. When we compare the results in Table 2 with the hypothesized consequences of a misaligned exchange rate as well as the outcomes of the selected but relevant macroeconomic indicators, the relations seems to show some consistency. The relevant macroeconomic indicators for the three countries is given in Appendix 3. The results show significant differences between Kenya on the one hand and Ethiopia and the Sudan on the other. First, the volume of Kenya's exports in is much higher than that of Ethiopia and the Sudan; second, the ratio of imports to exports is lower in Kenya compared with Ethiopia. The rate of inflation seems to be lower in Ethiopia compared with Kenya and the Sudan. The latter statement suggests the expected relation between devaluation and inflation. Even though a properly formulated and empirically estimated macroeconomic model is required to see the impact of devaluation on key macroeconomic variables, our approach, though simple, seems to verify the negative consequences of overvalued exchange rates.

In Section IV we stated that the NEER may not explain export performance, import cost or trade movement unless the index is deflated by a ratio in price of a partner and a reporting country. However, if the nominal exchange rate is deflated so as to give the pure exchange rate effect, then this deflated EER will help us to measure the trend in international price competitiveness between the base and current period.

Figure 1 Nominal effective exchange rates for Kenya, 1970=100

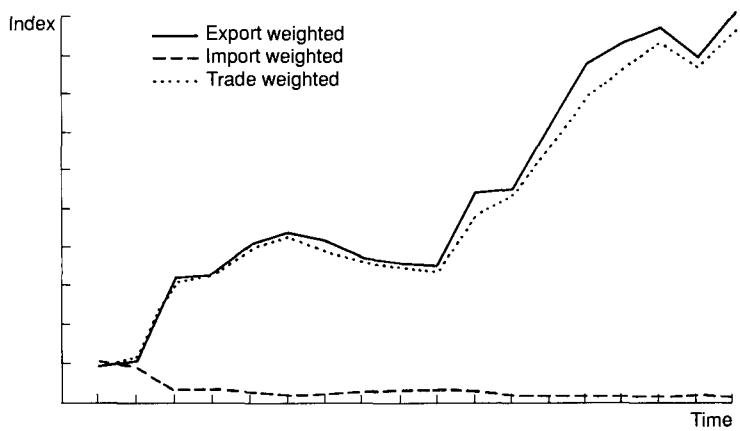


Figure 2 Nominal effective exchange rates for Ethiopia, 1970=100

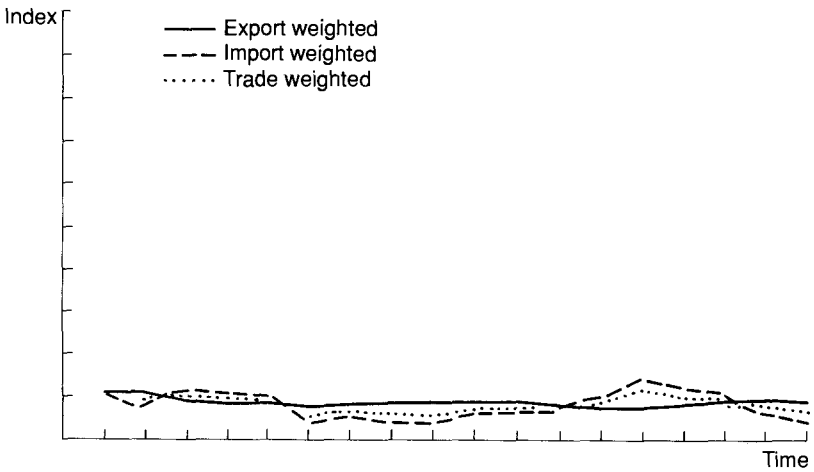
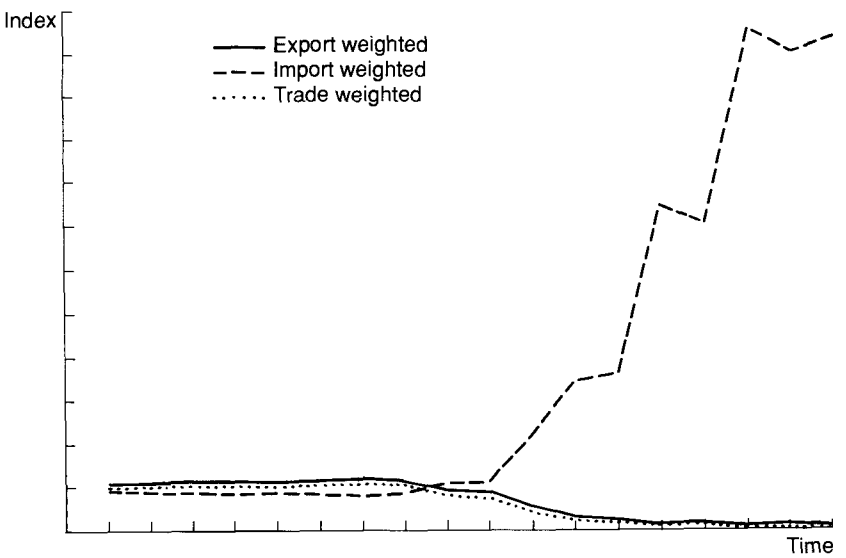


Figure 3 Nominal effective exchange rates for the Sudan, 1970=100



Taking 1970 as a base, the export weighted, import weighted and trade weighted indices are given in Tables 6 and 7 as well as Figures 4, 5 and 6. For the Sudan and Ethiopia there seems to be little difference between the nominal and REER, suggesting that the ability to compete in international trade seems to be low due to overvalued currency. Similar results may also be observed when the base period is changed to 1980. By contrast, Kenya seems to have a relatively more competitive position in international trade even though the extent of competitiveness is reduced when the base period is changed from 1970 to 1980. Maciejweski states that under specific assumptions the real effective exchange rate is akin to the relative price ratio between tradables and non-tradables. The results in Table 6 show a relatively higher price of tradables to non-tradables in Kenya; this does not seem to be the case for Ethiopia and the Sudan.

Table 3 Trend equations for nominal effective exchange rates for Kenya, Ethiopia and the Sudan, 1970=100

Model	Coefficients	Kenya			Ethiopia			Sudan		
		1	2	3	1	2	3	1	2	3
Linear	Intercept	1.42	0.42	0.42	0.93	0.95	0.94	1.44	1.40	1.42
		2.43	1.85	2.45	40.89	27.75	38.32	13.28	13.22	13.41
	Slope	0.14	0.16	0.15	-0.10	0.02	0.01	-0.07	-0.06	-0.07
		9.17	7.63	9.67	-2.42	5.02	2.36	-7.418	-7.16	-7.34
	$\overline{R}^2$	0.82	0.77	0.84	0.21	0.57	0.28	0.75	0.74	0.75
	S.E.	0.36	0.48	0.36	0.05	0.07	0.05	0.27	0.22	0.22
Exponential	Intercept	0.14	0.13	0.14	0.98	0.91	0.94	1.53	1.48	1.50
		0.37	0.02	0.35	38.24	17.27	26.07	6.95	6.95	6.44
	Slope	9.81	0.88	0.85	-0.05	0.09	0.02	-0.38	-0.35	-0.37
		4.83	4.34	4.86	-4.16	4.00	1.43	-3.85	-3.74	-3.82
	$\overline{R}^2$	0.55	0.50	0.56	0.48	0.46	0.05	0.44	0.42	0.44
	S.E.	0.58	0.69	0.60	0.04	0.08	0.06	0.34	0.33	0.33

Source: author's calculations.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted

Table 4 Nominal effective exchange rates for Kenya, Ethiopia and the Sudan, 1980 = 100

Year	Kenya			Ethiopia			Sudan		
	1	2	3	1	2	3	1	2	3
1970	0.74	0.81	0.77	1.03	0.97	0.99	1.32	1.20	1.26
1971	0.75	0.80	0.78	1.04	0.97	1.01	0.27	1.20	1.24
1972	0.78	0.83	0.81	1.06	0.99	1.03	1.36	1.26	1.31
1973	0.88	0.84	0.82	0.90	0.86	0.88	1.40	1.32	1.36
1974	0.87	0.90	0.88	0.93	0.90	0.92	1.41	1.37	1.39
1975	1.03	1.08	1.05	0.93	0.92	0.93	1.57	1.39	1.48
1976	1.14	1.19	1.17	0.95	0.96	0.96	1.81	1.49	1.65
1977	1.09	1.12	1.11	0.99	0.99	0.99	1.68	1.49	1.59
1978	1.06	1.06	1.06	1.03	1.06	1.04	1.43	1.35	1.39
1979	1.05	1.04	1.05	1.04	1.05	1.05	1.09	1.07	1.08
1980	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1981	1.32	1.42	1.37	1.03	1.18	1.01	1.07	0.70	0.89
1982	1.41	1.49	1.45	0.97	1.02	0.99	0.50	0.40	0.45
1983	1.75	1.88	1.82	0.95	1.01	0.98	0.54	0.39	0.47
1984	2.03	2.42	2.14	0.93	1.01	0.98	0.34	0.22	0.28
1985	2.26	2.40	2.33	0.96	1.03	0.99	0.29	0.21	0.25
1986	2.52	2.60	2.56	1.02	1.11	1.06	0.16	0.13	0.14
1987	2.51	2.47	2.49	1.08	1.17	1.12	0.14	0.13	0.13
1988	2.67	2.69	2.68	1.04	1.10	1.08	0.13	0.12	0.13
X	1.41	1.46	1.43	0.99	1.01	0.98	0.86	0.93	0.93
S	0.66	0.68	0.67	0.05	0.08	0.57	0.53	0.55	

Source: author's calculation.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted.

Table 5 Trend equations for nominal effective exchange rates for Kenya, Ethiopia and the Sudan, 1980 = 100.

Model	Coefficients	Kenya 1	Kenya 2	Kenya 3	Ethiopia 1	Ethiopia 2	Ethiopia 3	Sudan 1	Sudan 2	Sudan 3
Linear	Intercept	0.32	0.35	0.34	0.98	0.91	0.95	1.85	1.70	1.78
		2.59	2.68	2.66	38.55	32.56	36.94	13.04	13.75	13.57
	Slope	0.11	0.11	0.11	0.01	0.01	0.01	-0.09	-0.08	-0.09
		10.10	9.63	9.92	0.06	4.23	2.62	-7.03	-7.73	-7.46
	$\overline{R}^2$	0.85	0.84	0.85	-0.04	0.50	0.25	0.73	0.77	0.75
	S.E.	0.26	0.28	0.27	0.05	0.06	0.05	0.30	0.26	0.27
Exponential	Intercept	0.10	0.13	0.16	1.00	0.89	0.94	1.95	1.82	1.89
		0.35	0.45	0.41	28.7	20.53	24.96	6.99	7.09	7.04
	Slope	0.63	0.64	0.64	-0.01	0.06	0.03	-0.47	-0.46	-0.47
		5.00	4.89	4.96	-1.20	3.18	1.76	-3.76	-3.98	3.85
	$\overline{R}^2$	0.57	0.56	0.57	-0.06	0.33	0.11	0.41	0.45	0.43
	S.E.	0.43	0.45	0.44	0.05	0.07	0.06	0.44	0.40	0.41

Source: author's calculations.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted.

Table 6 Real effective exchange rates for Kenya, Ethiopia and the Sudan

	Kenya			Ethiopia			Sudan		
Year	1	2	3	1	2	3	1	2	3
1970	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1971	1.09	1.09	1.09	1.34	1.04	1.02	1.06	1.02	1.04
1972	1.24	1.30	1.27	1.16	1.16	1.15	1.00	1.00	1.00
1973	1.03	1.09	1.06	1.29	1.20	1.18	0.99	1.00	1.00
1974	1.09	1.16	1.13	1.42	1.27	1.23	0.94	0.98	0.96
1975	1.31	1.46	1.36	1.66	1.47	1.44	0.84	0.95	0.89
1976	1.31	1.55	1.43	1.50	1.71	1.68	0.89	0.97	0.93
1977	1.19	1.39	1.29	1.35	1.57	1.53	0.86	0.96	0.91
1978	1.08	1.27	1.18	1.34	1.45	1.40	0.76	0.93	0.84
1979	0.99	1.15	1.07	1.32	1.44	1.39	0.59	0.87	0.73
1980	1.03	1.17	1.10	2.16	1.39	1.36	0.52	0.84	0.68
1981	1.96	2.51	2.24	1.79	2.11	2.13	0.36	0.78	0.57
1982	1.40	1.69	1.55	2.12	1.77	1.78	0.31	0.77	0.54
1983	1.57	1.92	1.74	5.56	2.05	2.09	0.29	0.76	0.52
1984	1.80	2.25	2.02	2.43	2.43	2.50	0.25	0.75	0.50
1985	1.58	1.94	1.76	2.41	2.31	2.37	0.25	0.75	0.50
1986	1.58	1.94	1.76	2.05	2.34	2.38	0.24	0.74	0.49
1987	1.43	1.72	1.57	2.49	2.14	2.09	0.24	0.75	0.49
1988	1.42	1.71	1.57		2.60	2.54	0.24	0.74	0.49
$\bar{x}$	1.32	1.54	1.43	1.69	1.71	1.70	0.61	0.87	0.74
S	0.20	0.42	0.35	0.54	0.50	0.52	0.33	0.11	0.22

Source: author's calculation.
Notes: 1 = Export weighted; 2 = Import weighted; 3 = Trade weighted.

Table 7 Trend equations for real effective exchange rates for Kenya, Ethiopia and the Sudan

Model	Coefficients	Kenya 1	Kenya 2	Kenya 3	Ethiopia 1	Ethiopia 2	Ethiopia 3	Sudan 1	Sudan 2	Sudan 3
Linear	Intercept	0.82	0.88	0.85	1.00	1.00	1.00	1.18	1.06	1.12
		7.29	9.10	8.40	9.47	6.83	7.75	27.14	69.13	38.17
	Slope	0.09	0.08	0.08	0.03	0.05	0.04	-0.06	-0.01	-0.04
		8.76	10.41	9.58	3.48	4.22	3.92	-14.79	-14.07	-14.61
	R^2	0.81	0.86	0.83	0.38	0.48	0.44	0.92	0.91	0.92
	S.E.	0.23	0.19	0.21	0.22	0.31	0.26	0.09	0.03	0.06
Exponential	Intercept	0.56	0.61	0.58	0.89	0.79	0.84	1.25	1.21	1.23
		2.71	3.45	3.07	3.94	3.84	4.73	12.86	30.31	17.49
	Slope	0.55	0.53	0.54	0.21	0.36	0.28	-0.36	-0.12	-0.24
		5.86	6.40	6.26	3.10	3.90	3.57	-7.51	-7.15	-7.41
	R^2	0.65	0.71	0.68	0.32	0.44	0.40	0.75	0.74	0.75
	S.E.	0.31	0.27	0.29	0.23	0.32	0.27	0.16	0.06	0.11

Source: author's calculations.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted.

Figure 4 Real effective exchange rates for Kenya, 1970=100

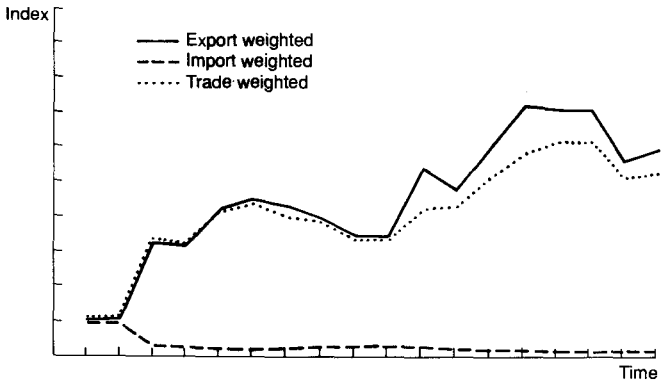


Figure 5 Real effective exchange rates for Ethiopia, 1970=100

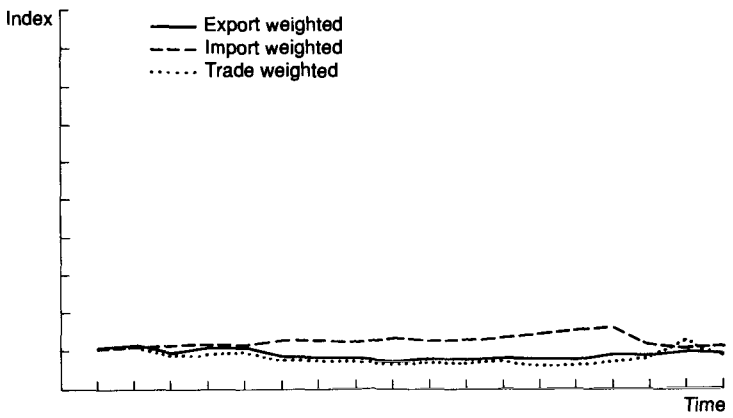
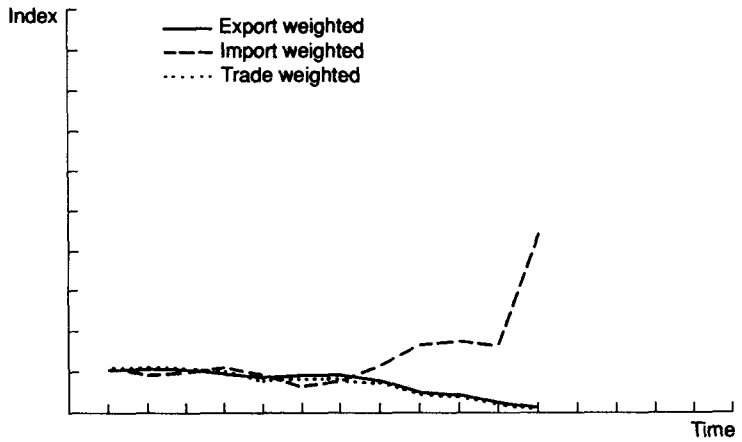


Figure 6 Real effective exchange rates for the Sudan, 1970=100



IX Parallel market exchange rate

In economies where the exchange rate is overvalued there are strict official exchange rate controls. The government resorts to rationing by classifying imported goods as "essentials" or "non-essentials". Restrictions are usually imposed on the latter. Even if one is allowed to import essential commodities, there is a highly bureaucratic application procedure.

These controls lead to corruption within the official government channels and this eventually leads to the development of parallel markets where the foreign currency (usually the US dollar) is sold at a much higher rate than the official rate. Visitors and exporters prefer to use the parallel market. Remittances sent by residents in Western countries are transferred through non-bank intermediaries and this reduces the amount of foreign exchange passing through to national banks or other authorized dealers. The parallel market exchange rate fluctuates according to the rules of demand and supply for the dollar or other currency. In economies where overvalued currency has been in existence for a long period, the parallel market for foreign exchange provides a larger portion of financing for imports.

It is argued that the parallel market exchange rate is an appropriate rate since the parallel market is more or less a floating exchange rate, the value of which is governed by supply and demand. Most nominal and real EERs are estimated using the official exchange rates. In economies with a large parallel market the official nominal and real effective exchange may not show the true picture. One may have also to estimate EER based on the parallel market. If it is possible to estimate the share of the parallel market, then a weighted average of the official and parallel market effective exchange rate would give a better indication of the extent of appreciation or depreciation of a currency. Unfortunately this is not easy to ascertain and time-series data on parallel exchange rates are not easy to obtain.

However, an estimate of parallel market exchange rates was made available by this author covering Kenya, Ethiopia and the Sudan. These results are given in Table 10. As expected, the difference between the official exchange rates and those of the parallel market seem to be low for Kenya and high for Ethiopia. For Ethiopia, the difference between the two rates seems to have

Ethiopia. For Ethiopia, the difference between the two rates seems to have widen in the late 1980s compared with the early 1970s. For the sudan, there is no observable pattern.

Having assembled the estimated parallel market exchange rate we then derived the nominal and real EERs based on parallel markets. The results are given in Table 11 and 18.

When the NEERs based on official rates are compared with those based on parallel market rates, the Ethiopian case seems to show that in the parallel market the extent of overvaluation is much reduced, while for Kenya the opposite seems to be the case. There does not seem to be much difference between the two rates for the Sudan. The trend equations for the parallel exchange rates do not show a trend. Real effective exchange rates have also been estimated for the parallel market. The results for Kenya and the Sudan show little difference between the indices based on the official rates and those based on parallel rates (Tables 15 17). This does not seem to be the case for Ethiopia. In addition, the trend equations for parallel market-based real exchange rates for Ethiopia and the Sudan seem to be highly irregular (Tables 16 18).

Table 8 Real effective exchange rates for Kenya, Ethiopia and the Sudan, 1980 = 100

	Kenya			Ethiopia			Sudan		
Year	1	2	3	1	2	3	1	2	3
1970	0.92	0.85	0.89	0.73	0.75	0.74	1.33	1.88	1.66
1971	1.03	0.93	0.98	0.77	0.77	0.77	1.37	1.98	1.63
1972	1.18	1.05	1.14	0.86	0.86	0.86	1.32	1.89	1.61
1973	1.01	0.92	1.97	0.89	0.87	0.88	1.32	1.87	1.59
1974	1.09	0.99	1.03	0.93	0.90	0.92	1.28	1.78	1.53
1975	1.25	1.25	1.25	1.07	1.07	1.07	1.21	1.60	1.40
1976	1.25	1.33	1.29	1.23	1.25	1.24	1.22	1.61	1.42
1977	1.09	1.08	1.09	1.04	1.02	1.03	1.16	1.43	1.29
1978	1.09	1.08	1.08	1.05	1.02	1.03	1.05	1.13	1.09
1979	1.05	1.22	1.11	1.06	1.20	1.03	1.32	1.60	1.45
1980	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1981	1.74	2.17	1.95	1.51	1.63	1.57	0.91	0.71	0.81
1982	1.26	1.46	1.36	1.27	1.36	1.31	0.87	0.64	0.75
1983	1.37	1.66	1.52	1.47	1.60	1.54	0.85	0.58	0.73
1984	1.54	1.96	1.75	1.74	1.93	1.84	0.83	0.52	0.67
1985	1.36	1.69	1.52	1.69	1.83	1.76	0.83	0.51	0.67
1986	1.40	1.68	1.54	1.72	1.83	1.77	0.82	0.50	0.66
1987	1.38	1.48	1.43	1.52	1.55	1.54	0.82	0.50	0.66
1988	1.36	1.47	1.42	1.82	1.88	1.85	0.82	0.50	0.66
$\bar{X}$	1.23	1.33	1.28	1.23	1.28	1.25	1.07	1.17	1.12
S	0.21	0.38	0.29	0.35	0.41	0.38	0.21	0.59	0.40

Source: author's calculation.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted

Table 9 Trend equations for real effective exchange rates for Kenya, Ethiopia and the Sudan, 1980=100

Model	Coefficients	Kenya			Ethiopia			Sudan		
		1	2	3	1	2	3	1	2	3
Linear	Intercept	0.65	0.62	0.64	0.98	0.88	0.90	1.43	2.19	1.81
		9.98	7.29	8.51	10.74	6.49	11.00	11.00	52.41	34.76
	Slope	0.06	0.07	0.06	0.02	0.05	0.03	-0.04	-0.10	-0.07
		10.16	8.83	9.46	3.61	87.21	3.37	-15.32	-15.06	-15.14
	R^2	0.85	0.81	0.93	0.35	0.44	0.39	0.93	0.92	0.93
	S.E.	0.14	0.18	0.16	0.19	0.15	0.17	0.06	0.16	0.11
Exponential	Intercept	0.46	0.42	0.44	0.88	0.61	0.70	1.55	2.51	2.03
		3.74	2.69	3.16	3.28	3.65	7.01	23.45	13.37	16.00
	Slope	0.37	0.41	0.39	0.17	0.32	0.47	-0.24	-0.65	-0.44
		0.60	2.92	6.24	3.50	3.87	3.25	-7.86	-7.61	-7.68
	R^2	0.70	0.65	0.68	0.38	0.44	0.35	0.77	0.76	0.76
	S.E.	0.19	0.24	0.22	0.16	0.28	0.18	0.10	0.29	0.20

Source: author's calculations.
Notes: 1 = Export weighted; 2 = Import weighted; 3 = Trade weighted

Table 10 Parallel exchange rates for Kenya, Ethiopia and the Sudan

Year	Kenya	Ethiopia	Sudan
1970	9.65	2.93	1.56
1971	9.72	2.92	1.64
1972	9.45	2.61	1.93
1973	10.50	2.20	1.73
1974	6.69	2.49	1.66
1975	8.86	5.07	1.44
1976	9.36	3.76	1.77
1977	8.61	3.98	1.73
1978	8.50	4.05	1.58
1979	8.49	3.10	1.33
1980	8.18	2.80	1.06
1981	11.15	3.04	1.11
1982	15.15	3.34	0.65
1983	16.99	3.54	0.54
1984	16.99	4.13	0.39
1985	17.06	4.71	0.32
1986	15.86	3.85	0.16
1987	18.95	5.50	0.16
1988	20.88	5.70	-

Source: personal communications with Ibrahim Elbadawi.
Note: values are expressed in terms of one US dollar.

Table 11 Parallel effective exchange rates for Kenya, Ethiopia and the Sudan, 1970 = 100

Year	Kenya			Ethiopia			Sudan		
	1	2	3	1	2	3	1	2	3
1970	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1971	1.00	1.01	1.00	1.02	1.02	1.02	1.06	1.01	1.04
1972	0.93	0.97	0.95	1.01	1.01	1.01	1.30	1.28	1.29
1973	0.83	0.94	0.88	1.14	1.12	1.13	1.23	1.18	1.21
1974	0.91	0.99	0.95	0.85	0.87	0.86	1.23	1.15	1.19
1975	1.53	1.35	1.44	1.01	1.02	1.02	1.08	1.08	1.08
1976	1.21	1.19	1.20	1.09	1.07	1.08	1.42	1.53	1.48
1977	1.27	1.25	1.26	1.06	1.04	1.05	1.40	1.41	1.41
1978	1.31	1.30	1.31	1.10	1.08	1.09	1.34	1.27	1.31
1979	1.07	1.17	1.12	1.11	1.10	1.10	1.13	1.02	1.08
1980	0.99	1.08	1.04	1.04	1.04	1.04	0.84	0.75	0.80
1981	1.04	1.08	1.06	1.25	1.22	1.23	1.07	1.44	1.26
1982	1.11	1.12	1.12	1.56	1.50	1.53	0.52	0.58	0.55
1983	1.15	1.12	1.14	1.64	1.56	1.60	0.43	0.51	0.47
1984	1.29	1.20	1.23	1.58	1.50	1.54	0.32	0.44	0.38
1985	1.44	1.31	1.38	1.70	1.62	1.66	0.26	0.31	0.29
1986	1.24	1.25	1.25	1.74	1.65	1.69	0.14	0.16	0.15
1987	1.67	1.63	1.65	1.20	2.05	2.13	0.14	0.14	0.14
1988	1.71	1.61	1.66	2.31	2.15	2.23			
$\bar{x}$	1.19	1.19	1.19	1.34	1.30	1.32	0.85	0.90	0.89
S	0.25	0.19	0.22	0.42	0.37	0.40	0.45	0.45	0.45

Source: author's calculation, based on Table 10.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted.

Table 12 Trend equations for parallel market nominal effective exchange rates for Kenya, Ethiopia and the Sudan

Model	Coefficients	Kenya 1	Kenya 2	Kenya 3	Ethiopia 1	Ethiopia 2	Ethiopia 3	Sudan 1	Sudan 2	Sudan 3
Linear	Intercept	0.68	0.72	0.70	0.90	0.95	0.89	1.54	1.50	1.52
		6.71	8.04	7.33	9.70	13.83	11.61	11.31	9.82	10.68
	Slope	0.07	0.06	0.06	0.03	0.02	0.03	-0.07	-0.06	-0.07
		7.44	7.34	7.34	3.65	4.02	3.89	5.47	4.12	4.99
	R^2	0.75	0.75	0.75	0.41	0.45	0.44	0.63	0.52	0.58
	S.E.	0.21	0.19	0.20	0.19	0.14	0.16	0.28	0.31	0.29
Exponential	Intercept	0.59	0.63	0.61	0.82	0.88	0.82	1.54	1.50	1.52
		2.89	3.56	3.12	6.0	8.69	7.23	11.31	9.82	10.68
	Slope	0.36	0.32	0.34	0.18	0.15	0.16	-0.07	-0.06	-0.07
		3.95	3.92	3.94	2.91	3.33	3.13	-5.47	-4.42	4.99
	R^2	0.45	0.44	0.45	0.29	0.36	0.33	0.63	0.52	0.58
	S.E.	0.32	0.28	0.30	0.21	0.16	0.18	0.28	0.31	0.29

Source: author's calculations.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted.

Table 13 Parallel nominal effective exchange rates for Kenya, Ethiopia and the Sudan

Year	Kenya			Ethiopia			Sudan		
	1	2	3	1	2	3	1	2	3
1970	0.88	0.95	0.92	0.95	0.93	0.94	1.00	1.00	1.00
1971	0.91	0.98	0.95	0.96	0.94	0.95	1.11	1.06	1.08
1972	0.90	0.97	0.94	0.91	0.90	0.91	1.26	1.30	1.28
1973	1.04	1.08	1.06	0.85	0.86	0.86	1.10	1.11	1.11
1974	0.80	0.83	0.82	0.92	0.92	0.92	0.98	0.96	0.97
1975	0.94	0.98	0.96	1.40	1.30	1.35	0.79	0.92	0.86
1976	1.01	1.03	1.02	1.16	1.12	1.14	1.15	1.50	1.33
1977	1.00	1.01	1.01	1.22	1.18	1.20	1.04	1.31	1.68
1978	1.07	1.06	1.06	1.27	1.23	1.25	0.88	1.04	0.96
1979	1.09	1.06	1.07	1.08	1.08	1.08	0.62	0.71	0.66
1980	1.00	1.00	1.00	1.00	1.00	1.00	0.40	0.46	0.43
1981	1.17	1.18	1.18	1.02	1.01	1.02	0.52	0.92	0.72
1982	1.45	1.45	1.45	1.07	1.05	1.06	0.22	0.34	0.28
1983	1.47	1.52	1.50	1.08	1.05	1.06	0.14	0.22	0.18
1984	1.38	1.46	1.42	1.17	1.12	1.15	0.08	0.14	0.11
1985	1.56	1.58	1.57	1.32	1.25	1.29	0.05	0.07	0.06
1986	1.67	1.62	1.64	1.26	1.17	1.19	0.02	0.03	0.02
1987	2.14	2.05	2.12	1.59	1.53	1.56	0.02	0.02	0.02
1988	2.25	2.13	2.20	1.60	1.53	1.56	-	-	-
$\bar{X}$	1.25	1.26	1.26	1.47	1.12	1.13	0.63	0.73	0.69
S	0.44	0.38	0.40	0.22	0.19	0.20	0.45	0.49	0.47

Source: author's calculations.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted.

Table 14 Trend equations for parallel market nominal effective exchange rates for Kenya, Ethiopia and the Sudan, 1980=100

Model	Coefficients	Kenya 1	Kenya 2	Kenya 3	Ethiopia 1	Ethiopia 2	Ethiopia 3	Sudan 1	Sudan 2	Sudan 3
Linear	Intercept	0.59	0.67	0.63	0.89	0.88	0.88	2.02	1.87	1.95
		5.98	7.50	6.74	11.31	12.93	12.08	9.48	11.52	10.53
	Slope	0.07	0.06	0.06	0.03	0.02	0.02	-0.08	-0.08	-0.08
		7.59	7.50	7.59	3.74	3.98	3.86	-4.21	-5.60	-4.89
	R^2	0.76	0.75	0.76	0.42	0.45	0.43	0.49	0.65	0.57
	S.E.	0.21	0.19	0.20	0.16	0.14	0.12	0.43	0.33	0.38
Exponential	Intercept	0.49	0.59	0.54	0.82	0.81	0.88	2.02	1.87	1.95
		2.45	3.24	2.83	0.71	8.00	12.10	9.48	11.52	10.53
	Slope	0.37	0.33	0.35	0.16	0.15	0.02	-0.08	-0.08	-0.08
		4.13	3.99	4.07	3.07	3.26	3.86	-4.21	-5.60	-4.89
	R^2	0.47	0.45	0.46	0.32	0.35	0.43	0.25	0.64	0.57
	S.E.	0.31	0.28	0.29	0.18	0.16	0.15	0.43	0.33	0.38

Source: author's calculations.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted.

Table 15 Parallel real effective exchange rates for Kenya, Ethiopia and the Sudan, 1970 = 100

Year	Kenya			Ethiopia			Sudan		
	1	2	3	1	2	3	1	2	3
1970	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1971	1.05	1.06	1.06	1.11	1.14	1.13	1.11	1.06	1.09
1972	1.10	1.12	1.11	1.08	1.20	1.14	1.26	1.29	1.27
1973	1.26	1.25	1.25	0.96	1.13	1.04	1.10	1.10	1.10
1974	0.93	0.96	0.94	1.08	1.25	1.17	0.99	0.97	0.98
1975	1.05	1.08	1.06	1.90	1.83	1.86	0.79	0.89	0.85
1976	1.13	1.16	1.15	1.31	1.43	1.37	1.15	1.44	1.29
1977	1.07	1.10	1.09	1.27	1.42	1.35	1.04	1.28	1.15
1978	1.07	1.11	1.10	1.23	1.38	1.30	0.87	1.00	0.93
1979	1.11	1.15	1.13	0.99	1.21	1.10	0.61	0.68	0.64
1980	1.07	1.12	1.10	1.02	1.27	1.15	0.39	0.44	0.42
1981	1.21	1.25	1.23	1.10	1.33	1.22	0.51	0.85	0.68
1982	1.24	1.25	1.25	1.20	1.39	1.29	0.22	0.31	0.27
1983	1.17	1.18	1.17	1.28	1.46	1.37	0.13	0.20	0.17
1984	1.09	1.10	1.10	1.36	1.45	1.41	0.07	0.13	0.10
1985	1.06	1.07	1.07	1.54	1.62	1.58	0.04	0.07	0.06
1986	1.01	1.02	1.02	1.35	1.55	1.45	0.02	0.03	0.02
1987	1.20	1.19	1.19	1.78	1.90	1.84	0.02	0.02	0.02
1988	1.37	1.36	1.36	1.77	1.84	1.80	-	-	-
$\bar{X}$	1.14	1.13	1.12	1.28	1.41	1.35	0.67	0.71	0.67
S	0.11	0.10	0.10	0.28	0.25	0.26	0.46	0.48	0.47

Source: author's calculation.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted.

Table 16 Trend equations for parallel market real effective exchange rates for Kenya, Ethiopia and the Sudan, 1970=100

Model	Coefficients	Kenya 1	Kenya 2	Kenya 3	Ethiopia 1	Ethiopia 2	Ethiopia 3	Sudan 1	Sudan 2	Sudan 3
Linear	Intercept	1.04	1.06	1.05	1.01	1.09	1.06	1.39	1.47	1.43
		22.31	24.08	23.27	8.70	12.81	10.52	16.85	11.16	13.60
	Slope	0.01	0.01	0.01	0.03	0.03	0.03	-0.08	-0.08	-0.08
		1.98	1.93	1.97	2.69	4.24	3.38	-10.45	-6.40	-8.11
	R^2	0.14	0.13	0.14	0.26	0.49	0.37	0.86	0.70	0.79
	S.E.	0.10	0.10	0.09	0.24	0.18	0.20	0.17	0.28	0.21
Exponential	Intercept	1.01	1.02	1.02	0.93	0.97	0.95	1.54	1.56	1.55
		15.80	17.31	16.60	5.69	8.11	6.73	8.31	6.39	7.28
	Slope	0.05	0.05	0.05	0.17	0.21	0.19	-0.45	-0.41	-0.48
		1.81	2.02	1.92	2.28	3.98	3.01	-5.26	-3.65	-4.38
	R^2	0.11	0.15	0.13	0.19	0.45	0.31	0.61	0.42	0.52
	S.E.	0.10	0.10	0.10	0.25	0.18	0.22	0.28	0.38	0.38

Source: author's calculations.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted.

Table 17 Parallel real effective exchange rates for Kenya, Ethiopia and the Sudan, 1980 = 100

Year	Kenya			Ethiopia			Sudan		
	1	2	3	1	2	3	1	2	3
1970	0.87	0.89	0.88	0.86	0.81	0.84	2.24	2.51	2.37
1971	0.93	0.95	0.94	0.97	0.92	0.95	2.38	2.76	2.57
1972	0.99	0.99	0.99	0.99	0.95	0.97	2.87	3.17	3.02
1973	1.15	1.13	1.14	0.91	0.90	0.90	2.47	2.77	2.61
1974	0.87	0.85	0.86	1.02	0.99	1.01	2.17	2.46	2.32
1975	0.96	0.96	0.96	1.64	1.50	1.57	2.01	2.01	2.01
1976	1.05	1.04	1.05	1.20	1.15	1.17	3.22	2.92	3.07
1977	1.01	0.99	1.00	1.14	1.10	1.12	2.82	2.63	2.73
1978	1.02	0.99	1.01	1.14	1.10	1.12	2.24	2.21	2.23
1979	1.06	1.03	1.05	0.96	0.95	0.96	1.53	1.55	1.54
1980	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1981	1.10	1.11	1.05	1.05	1.05	1.05	1.91	1.35	1.63
1982	1.10	1.12	1.11	1.12	1.10	1.11	0.71	0.58	0.64
1983	1.01	1.05	1.03	1.18	1.16	1.17	0.46	0.35	0.40
1984	0.92	0.98	0.96	1.21	1.67	1.19	0.28	0.20	0.24
1985	0.93	0.96	0.95	1.37	1.30	1.33	0.16	0.12	0.14
1986	0.92	0.92	0.92	1.26	1.23	1.25	0.06	0.05	0.06
1987	1.11	1.06	1.09	1.61	1.53	1.57	0.05	0.05	0.05
1988	1.25	1.21	1.23	1.58	1.48	1.53	-	-	-
$\bar{X}$	1.01	1.01	1.01	1.17	1.30	1.15	1.59	1.59	1.59
S	0.10	0.09	0.09	0.23	0.21	0.22	1.07	1.40	1.10

Source: author's calculation.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted.

Table 18 Trend equations for parallel market real effective exchange rates for Kenya, Ethiopia and the Sudan, 1980=100

Model	Coefficients	Kenya 1	Kenya 2	Kenya 3	Ethiopia 1	Ethiopia 2	Ethiopia 3	Sudan 1	Sudan 2	Sudan 3
Linear	Intercept	0.95	0.95	0.95	0.91	0.88	0.90	3.24	3.49	3.36
		21.03.	24.02.	22.67	10.25	11.90	11.00	11.91	6.67	14.16
	Slope	0.01	0.01	0.01	0.03	0.03	0.03	-0.17	-0.20	-0.19
		1.73	1.89	1.82	3.30	3.89	3.57	6.92	-10.31	-8.50
	R^2	0.09	0.13	0.11	0.35	0.44	0.40	0.73	0.86	0.81
	S.E.	0.09	0.08	0.08	0.19	0.15	0.17	0.65	0.43	0.49
Exponential	Intercept	0.92	0.91	3.47	0.78	0.80	0.91	3.47	3.87	3.67
		15.15	11.33	16.34	8.57	7.55	7.01	6.69	8.25	7.48
	Slope	0.05	0.05	0.05	0.17	0.17	0.17	-0.93	-1.12	-1.03
		1.93	1.99	1.98	2.96	3.59	3.25	-3.89	-5.28	-4.54
	R^2	0.13	0.14	0.14	3.30	0.40	0.35	0.45	0.61	0.54
	S.E.	0.09	0.08	0.09	0.19	0.16	0.18	0.79	0.72	0.75

Source: author's calculations.
Notes: 1 = export weighted; 2 = import weighted; 3 = trade weighted.

Figure 7 Parallel nomimal effective exchange rates for Kenya, 1970=100

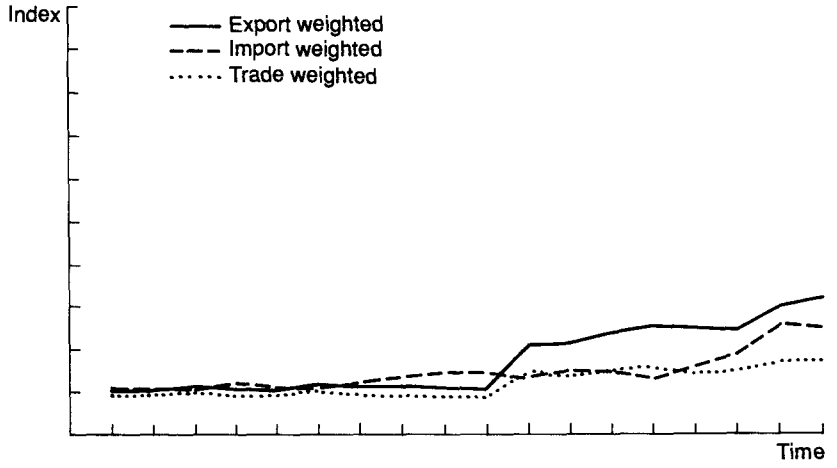


Figure 8 Parallel nominal effective exchange rates for Ethiopia, 1970=100

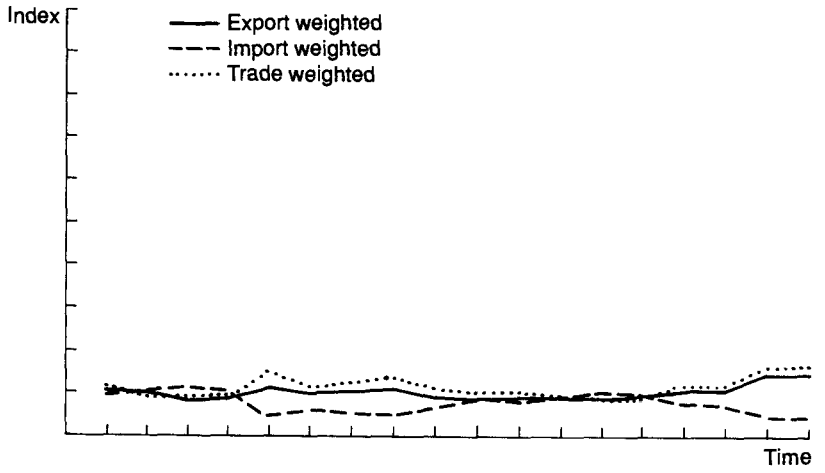
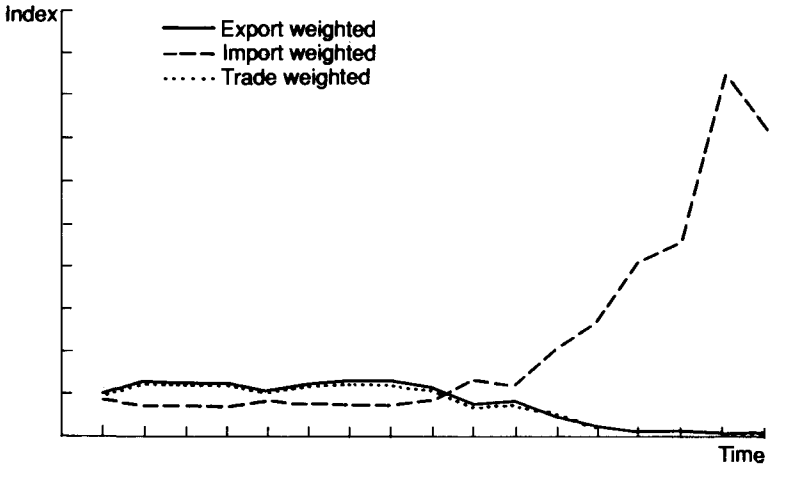


Figure 9 Parallel nominal effective exchange rates for the Sudan, 1970=100



X Conclusions

In this study we have attempted to ascertain whether the standard measures of nominal and real EERs can be applied within the African context by critically analyzing various indices; while the computations are not difficult the interpretations and comparisons are not easy and could be misleading. the contribution of this paper will thus be along these lines. This analysis shows that the measurements of the NEER indices can be readily applied to data collected form Africa. Our results for Ethiopia, Kenya and the Sudan showed that the NEER indices give some indication of the extent of overvaluation of the currency of these countries.

When it comes to measuring REER, the results are not as explicit as those for the NEER. The reason for this is that when the NEER is deflated by inflation differentials between the African countries under study and the corresponding partner countries, the result seems to be less reliable. this is especially so for Ethiopia and the Sudan, while the results for Kenya are still reliable. The measures of inflation of a reporting and partner country are the CPI; for developed countries the CPI is a fairly reliable measure, while for African countries it is not. Furthermore, the CPIs for Kenya, Ethiopia and the Sudan seem to be confined to urban centres. In estimating the parallel nominal and real exchange rates, the nominal rates gave very interesting results, especially for Ethiopia. This indicates that the parallel exchange rate may be a better estimate of the value of the Ethiopian currency and, to some extent, or the Sudanese and Kenyan currency. The indices are also related to key macroeconomic indicators in the three countries.

In general, the selected macroeconomic indicators of the three countries suggest a more realigned exchange rate may lead to higher volume of exports, lower import export ratio, higher ratio of price of tradables to non-tradables and lower budgetary deficit to GDP ratio.

Appendix 1

Distribution of export by partner countries, 1970 and 1980

	Ethiopia's exports*			Bilateral exchange rate		
	1970	1980	1980/70	1970	1980	1980/70
United States	0.77	0.33	0.43	2.50	2.07	0.826
Japan	0.05	0.11	2.20	0.007	0.010	1.429
France	0.02	0.12	6.00	0.318	0.459	1.443
Germany	0.08	0.17	2.13	0.685	1.056	1.541
Italy	0.06	0.19	3.17	0.004	0.002	0.500
Netherlands	0.01	0.4	4.00	0.735	0.972	1.322
United Kingdom	0.13	0.04	1.33	1.046	0.866	0.828
	Kenya's exports*			Bilateral exchange rate*		
United States	0.18	0.10	0.56	7.14	7.57	3.54
Japan	0.03	0.03	1.00	0.01	0.04	4.00
France	0.02	0.04	2.00	0.33	1.68	5.09
Germany	0.19	0.31	1.63	0.59	3.86	6.54
Italy	0.04	0.12	3.00	0.003	0.008	2.67
Netherlands	0.10	0.10	1.00	0.63	3.55	5.63
United Kingdom	0.44	0.30	0.68	0.90	3.17	3.52
	Sudan' exports*			Bilateral exchange rate*		
United States	0.09	0.03	0.33	2.87	2.00	0.70
Japan	0.24	0.12	0.50	0.008	0.01	1.25
France	0.07	0.04	0.57	0.440	0.44	1.00
Germany	0.14	0.07	0.50	0.79	1.02	1.29
Italy	0.24	0.17	0.71	0.005	2.22	4.44
Netherlands	0.08	0.03	0.38	0.84	0.94	1.12
United Kingdom	0.14	0.54	8.86	1.20	0.84	0.70

Source: author's calculation
Notes: *standardized; ** reporting over partner country

Appendix 2

Distribution of import by partner countries, 1970 and 1980

	Ethiopia's imports*			Bilateral exchange rate		
	1970	1980	1980/70	1970	1980	1980/70
United States	0.13	0.19	1.46	0.40	0.48	1.20
Japan	0.22	0.21	0.95	143.20	98.07	0.68
France	0.04	0.03	0.75	3.14	2.18	0.69
Germany	0.21	0.20	0.95	1.46	0.95	0.65
Italy	0.25	0.20	0.80	250.00	500.00	2.00
Netherlands	0.04	0.04	1.00	1.36	1.03	0.76
United Kingdom	0.11	0.13	1.18	1.15	1.21	1.05
	Kenya's imports*			Bilateral exchange rate*		
United States	0.13	0.13	1.00	0.47	0.13	0.28
Japan	0.16	0.19	1.19	100.00	25.00	0.25
France	0.06	0.03	0.50	3.03	0.60	0.20
Germany	0.12	0.17	1.42	1.69	0.26	0.15
Italy	0.07	0.08	1.14	333.33	125.00	0.37
Netherlands	0.04	0.06	1.50	1.59	0.28	0.18
United Kingdom	0.42	0.34	0.81	1.11	0.32	0.28
	Sudan' imports*			Bilateral exchange rate**		
United States	0.06	0.14	2.33	0.35	0.50	1.43
Japan	0.12	0.10	0.91	125.00	100.00	0.80
France	0.02	0.19	9.50	2.27	2.27	1.00
Germany	0.13	0.17	1.31	1.27	0.98	0.78
Italy	0.04	0.07	1.75	200.00	0.45	0.002
Netherlands	0.04	0.09	2.25	1.19	1.06	0.89
United Kingdom	0.60	0.24	0.40	0.83	1.19	1.43

Source: author's calculation
Notes: *standardized; ** reporting over partner country

Appendix 3

Some indicators of macroeconomic performance for Ethiopia, Kenya and the Sudan

	*Export	*Import	Import/ Export	Export/ GDP	Import/ GDP	Deficit/ GDP	CPI
Ethiopia							
1975	478.3	613.1	1.28	0.19	0.25		
1980	879.3	1494.7	1.70	0.21	0.36	0.01	100
1985	332.9	840.5	2.53	0.07	0.18	0.05	144
1986	477.1	932.6	1.95	0.09	0.18	0.09	130
1987	385.2	932.7	2.42	0.07	0.17	0.07	127
1988	429.3	956.7	2.23	0.07	0.17	0.07	136
Kenya							
1975	572.4	814.2	1.40	0.25	0.35	0.03	
1980	1242.6	2396.4	1.93	0.17	0.33	0.02	100
1985	943.2	1269.8	1.35	0.15	0.20	0.03	187
1986	1170.2	12454.6	1.24	0.16	0.20	0.05	194
1987	908.7	1622.6	1.78	0.11	0.20	0.07	204
1988	1017.5	1802.2	1.77	0.12	0.21	0.04	221
Sudan							
1975	407.7	748.3	1.83	0.21	0.40	0.01	
1980	689.4	1127.4	1.64	0.25	0.49	0.02	100
1985	442.2	579.0	1.30	0.07	0.09		398
1986	326.8	633.9	1.93	0.05	0.12		516
1987	265.7	696.6	2.62	0.05	0.13		650
1988	427.0	948.5	2.20	0.06	0.13		965

Note: *Merchandise exports and imports (in U.S. dollars)

Notes

1. Some common traditional methods are provided in the paper by Rhomberg (1976). They are similar to standard price and quantity indexes. On the other hand, the modern method which is commonly referred to as multilateral effective exchange rate (MERM) uses a partial equilibrium anaysis. Empirical studies are available in several publications; for example Belanguer (1976) has developed a MERM for Zaire.

2. The real effective exchange rate (REER) may help us to measure the relative price of tradables and non-tradables; however, such interpretation depends on several critical assumptions.

3. After calculating the indices for the period under consideration, a simple linear ($Y_i = ß_0 + ß_1 X_i + \text{epsilon}_i$) and nonlinear ($\ln Y_i = \ln ß_i + ß_i \ln X_i + \ln \text{epsilon}_i$) are fitted using ordinary least squares (OLS). The aim here is to see if there is periodic fluctuation in the indices. A low R^{-2} and a high standard error of coefficient (especially the seope) may indicate wide and unpredictable fluctuations and vice versa.

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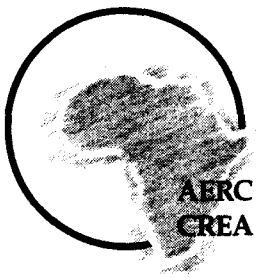

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