

The Stabilization of the Effective Exchange Rates of the Less Developed Countries under Alternative Exchange Rate Arrangements

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In the present environment of the floating of the major currencies, if a less developed country's (LDC) preference is to maintain a stable exchange rate, then it may adopt a policy of stabilizing its effective exchange rate. Movements in the effective exchange rate index depend on the degree of the diversification of the country's trade pattern and the standard to which it pegs. If the majority of the country's trade is carried out with one developed country, then movements in the exchange rates of other major currencies will exert little influence on the effective exchange rate index. Consequently, stabilizing the nominal exchange rate with respect to the major trading partner's currency will also stabilize the effective rate. If the LDC trades with several industrialized countries, then the floating of those currencies with respect to one another will cause exogenous movements in the LDC's effective rate. To offset these movements, the LDC can peg its currency to a basket of currencies that reflects the country's trade pattern. The SDR basket of currencies is an example of such a basket that an LDC can peg its currency.

This paper investigated movements in the effective exchange rate indices of a selected number of African LDCs that pegged their currencies to the U.S. dollar. It showed that these countries did experience significant movements in their indices. By pegging to the SDR, they could have theoretically reduced these movements, and maintained a relatively stable effective exchange rate.

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I. Introduction

The adoption of generalized currency floating by the major developed countries has created a number of policy options for the less developed countries (LDC), particularly those with strong trade and payments link with the developed countries. Fluctuations in the exchange rates of the major currencies in the foreign exchange market can arbitrarily change the effective exchange rates of the LDCs and hence affect their trade and domestic economies (Bird; Black; Crockett and Nsouli).

In order to insulate the domestic economy from these exogenous changes in the exchanges rates of the major currencies an LDC can attempt to stabilize its effective exchange rate through an appropriate exchange rate arrangement.

The purpose of this paper is to analyze and investigate which pegging arrangement, that is, pegging to a single major currency, such as the U.S. dollar, or to a basket of currencies, such as the Special Drawing Right (SDR) is the most appropriate policy in stabilizing the effective exchange rate. Section II of the paper discusses the concept of the effective exchange rate and the impact of the floating of the major currencies on the effective exchange rate index of an LDC. Section III applies the material discussed in the previous section by examining the movements in the effective exchange rates of selected LDCs over the period of generalized floating under a dollar pegging policy and an SDR pegging arrangement. A brief summary and conclusions are provided in the last section.

II. The Concept of the Effective Exchange Rate

Because the major world currencies are floating independently, it is difficult to determine by direct inspection the net impact on a country's nominal exchange rate. A common misconception that is prevalent is that a change in the exchange rate of the home currency occurs when the relationship between the home currency and the currency to which it is pegged is formally changed. Yet, in essence, the change in the value of any relevant foreign currency vis-à-vis the home currency, whether it is directly linked to it or not, will exert an economically significant movement in the coun-

try's nominal exchange rate. The nominal exchange rate is therefore an unsatisfactory indicator for policy purposes. The change with respect to the peg currency can only give a partial indication of these economically significant movements in the country's exchange rate. Therefore, it is necessary that the exchange rate of the country should reflect the total relationship between the domestic currency and all other relevant currencies. This widened relationship is referred to as the country's *effective exchange rate*.

The concept of the effective exchange rate cannot be expressed in absolute terms nor does it have any significance at any point in time. It simply expresses the value of the domestic currency in terms of a weighted group of currencies relative to a chosen base period. To express and measure the value of the currency and its changes, an index is constructed which takes into account the foreign trade pattern of the country (Rhoberg; Jeker).

To illustrate this concept consider an LDC such as Egypt that, by assumption, conducts all of her trade with the United States and with Germany. The effective exchange rate of the Egyptian pound can be expressed as:

$$(1) \text{ER} = (\text{Rusp})^{W_{us}} (\text{Rdmp})^{W_{dm}}$$

where:

- ER = Effective exchange rate of the Egyptian pound
- Rusp = dollar/pound rate
- Rdmp = mark/pound rate
- Wus = weight of the U.S. dollar
- Wdm = weight of the German mark

Like price index the effective exchange rate index can change over time if there are changes in the exchanges rates of the home currency with respect to the currencies of its trading partners. In our example, this would mean changes in Rusp and/or changes in Rdmp. The change in Rusp can be due to changes in trade between Egypt and the United States. The change in Rdmp can be due to changes in trade between Egypt and Germany, as well as due to changes in the exchange rate between the dollar and the mark.

To illustrate this point, let R^* be the exchange rate between the dollar and the mark, expressed as marks per dollar,

$$(2) R^* = (R_{dmp})/(R_{usp})$$

and

$$(3) R_{dmp} = (R_{usp}) (R^*)$$

Transforming equations (1) and (3) into natural logarithms:

$$(4) \ln ER = (W_{us}) (\ln R_{usp}) + (W_{dm}) (\ln R_{dmp})$$

$$(5) \ln R_{dmp} = \ln R_{usp} + \ln R^*$$

Thus changes in the effective rate are the results of changes in R_{usp} and/or changes in R_{dmp} , while changes in R_{dmp} are the result of changes in R_{usp} and/or changes in R^* .

Since by assumption $W_{us} + W_{dm} = 1$, then

$$(6) W_{dm} = 1 - W_{us}$$

Substituting equations (5) and (6) into equation (4) yields:

$$(7) \ln ER = (W_{us})(\ln R_{usp}) + (1 - W_{us})(\ln R_{usp} + \ln R^*)$$

$$(8) \ln ER = \ln R_{usp} + (1 - W_{us})(\ln R^*)$$

Thus, according to equation (8), changes in the effective rate are then caused by changes in R_{usp} and/or changes in R^* . Note that while changes in R_{usp} are policy determined, changes in R^* are determined exogenously and are beyond the control of the domestic monetary authorities. This means that the type of exchange rate arrangement that a country pursues also influences the effective exchange rate and becomes important when dealing with policies to stabilize the effective exchange rate (Bautista).

If changes in the effective rate are caused by changes in the R_{usp} , that is the exchange rate between the domestic currency and the peg currency, then stabilizing the effective rate will involve measures that will fix the value of R_{usp} . If, on the other hand, the changes in the effective rate are due to changes in R^* , then in order to keep the effective rate from changing, R_{usp} would have to be changed in an opposite and offsetting direction.

The importance of these exogenous changes in R^* depends on

the weight attached to them. Thus, the larger the weight attached to changes in R^* , the larger the influence of those changes on the changes in the effective rate. On the other hand, if the weight attached to R_{usp} is relatively large, then changes in R^* will have a marginal effect on the changes in the effective rate. The weight attached to R^* depends on the diversity of the country's trade pattern. That is, the more diverse the country's trade pattern, the larger the weight attached to R^* on the changes in the effective rate.

If the objective is to stabilize the effective rate, this implies that larger changes in R_{usp} will be necessary to prevent the effective rate from changing. To avoid or prevent these relatively larger changes in R_{usp} and the instability in the effective rate, the country can seek another exchange rate pegging arrangement that incorporates these exogenous changes in R^* . One such arrangement is to fix the value of the domestic currency to the currencies of its major trading partners. That is, fix the domestic currency to a basket of currencies composed of the currencies of its trading partners (Black). In our example, it would mean fixing the value of the Egyptian pound to the U.S. dollar and the German mark. In practice, this basket of currencies can be either tailor-made, reflecting the country's trade pattern, or it can be an existing basket such as the Special Drawing Right (SDR) basket issued by the International Monetary Fund (Crockett and Nsouli).

III. Methodology and Empirical Study

In order to illustrate the effects of the floating of major currencies and the type of pegging arrangement on the effective exchange rate index (ERI) of an LDC, five countries were selected: Egypt, Ghana, Sudan, Somalia, and Burundi. Each of these countries is small, has a relatively open economy, and possesses a diversified trade pattern. A common characteristic with regard to each country's trade pattern is that the majority of their trade is done with the same group of developed countries, namely, the United States, Britain, France, Germany, Italy, and Japan. Each of these LDCs also pegged its currency to the U.S. dollar for a substantial period of time subsequent to the floating of the major currencies.

For each country an import-weighted effective exchange rate index was constructed based on the following formula:

$$(9) \text{ER}_t = \prod_{i=1}^n (\text{R}_{it})^{W_i}$$

where:

ER_t = The value of effective exchange rate index at time t , relative to base period value of the index.

R_{it} = bilateral exchange rates in units of country i 's currency per unit of the LDC's currency at time t .

W_i = weight of country i 's currency.

Changes in the effective exchange rate index can be expressed as:

$$(10) \ln \text{ER} = \ln \text{Rusp} + [(\text{Wyn})(\ln \text{Ryn}) + (\text{Wdm})(\ln \text{Rdm}) + (\text{Wlb})(\ln \text{Rlb}) + (\text{Wlr})(\ln \text{Rlr}) + (\text{Wfr})(\ln \text{Rfr})]$$

where:

Rusp = dollars per LDC currency

Ryn = yen per dollar

Rdm = mark per dollar

Rlb = pound per dollar

Rlr = lira per dollar

Rfr = franc per dollar

According to equation (10), changes in the effective rate ($\ln \text{ER}$) will come about through changes in the dollar value of the domestic currency ($\ln \text{Rusp}$) and/or changes in the value of the dollar with respect to the other currencies ($\ln \text{Ryn}$, $\ln \text{Rdm}$, $\ln \text{Rlb}$, $\ln \text{Rlr}$, and $\ln \text{Rfr}$).

The weights assigned to each currency are import weights derived as the proportion of each country's total imports from the developed country. The import values, obtained from the IMF's *Direction of Trade Statistics Yearbook* were calculated by taking the average of imports for the years 1978, 1979, and 1980 (See Table 1). The base period of analysis is March 1973, the beginning of the period of generalized floating. To calculate movements in the effective exchange rate index, monthly data on exchange rates of the major currencies were gathered from the IMF's *Inter-*

Table 1
CURRENCIES AND WEIGHTS IN THE ERI

Country	Dollar	Yen	Mark	Franc	Pound	Lira
Burundi	.14	.20	.24	.25	.10	.07
Somalia	.13	.03	.10	.05	.14	.55
Sudan	.16	.10	.20	.12	.33	.09
Ghana	.36	.06	.17	.04	.30	.07
Egypt	.32	.09	.19	.15	.11	.14

national Financial Statistics publication. The variability of the effective exchange rate is defined as the standard deviation of the monthly values of the effective exchange rate index. The period of analysis for each country started with March 1973 and ended with the period in which each country devalued its currency with respect to the dollar. Thus for Burundi it ends with April 1976, for Somalia with April 1982, for Sudan with May 1978, for Ghana with June 1978, and for Egypt with December 1978.

Having kept the value of the domestic currency fixed with respect to the dollar, the results indicate that the changes in the exchange rate exogenous to a given country do influence the effective exchange rate index and contribute to its variance (See Table 2). Standard deviations range from a low of 3.73 for Burundi to a high of 15.32 for Somalia. As previously noted, the importance of these exogenous changes in R^* depend on the weights attached to each of the currencies in the index. The larger the aggregate weight of Ryn, Rdm, Rlb, Rlr, Rfr, the stronger the influence of their changes on the variance of the effective exchange rate index. Looking at Table 1, Sudan and Somalia, which assign a relatively larger aggregate weight to the currencies other than the dollar have relatively higher standard deviations. On the other hand, Egypt and Ghana, which give a relatively lower aggregate weight to the currencies besides the dollar have relatively lower standard deviations.

As noted before, LDCs which have a diversified trade pattern can reduce the variability of their effective exchange rates by pegging their currencies to a basket of currencies such as the SDR. To see whether this is possible, the same methodology has been

Table 2
VARIABILITY OF THE ERI UNDER A DOLLAR PEG

Country	Mean	Standard Deviation	Coefficient of Variation
Burundi March 73 — April 76	100.39	3.73	3.72
Somalia March 73 — April 82	120.18*	15.32	12.76
Sudan March 73 — May 78	106.62*	6.72	6.30
Ghana March 73 — June 78	105.15*	5.43	5.17
Egypt March 73 — December 78	102.5*	4.73	4.78

(*) Asterisk indicates significance at 95 percent level.

Table 3
VARIABILITY IN THE ERI UNDER AN SDR PEG

Country	Mean	Standard Deviation	Coefficient of Variation
Burundi March 73 — April 76	99.78	2.64	2.65
Somalia March 73 — April 82	121.24*	13.63	11.24
Sudan March 73 — May 78	105.25*	4.57	4.39
Ghana March 73 — June 78	103.88*	3.52	3.39
Egypt March 73 — December 78	101.85*	2.32	2.27

(*) Asterisk indicates significance at 95 percent level.

followed under the assumption that these countries fixed the value of their currencies to the SDR instead of the dollar. The SDR basket used is the current five currency basket.

The results indicate that all countries would exhibit a lower standard deviation in their indices by pegging to the SDR. Similarly, countries that assigned a relatively larger aggregate weight to the currencies other than the dollar, exhibited relatively higher standard deviations.

The results of this study are in accordance with the results obtained in other studies. In a study concentrating on four Latin American countries that pegged their currencies to the dollar, the author asserts that fluctuating exchange rates contributed significantly to the variance of the effective exchange rate indices of these countries (Bacha). In a study done by the IMF in which it measured the annual movements in the import-weighted effective exchange rate indices of a number of LDCs over the period 1973 to 1981, concluded that "...nominal effective movements in exchange rates for many countries are influenced by exchange rate developments among the currencies of the major industrial countries" (IMF).

In another study it was shown that most Caribbean countries that fixed their currencies to the U.S. dollar suffered less instability in their indices because the United States was their dominant trading partner, and most Francophone African countries which fixed their currencies to the French franc generated less variance in their indices because France was their major trading partner (Crockett and Nsouli).

To determine the impact of the type of pegging arrangement on the variance of the effective exchange rate index, several other studies arrive at the same conclusions. In one study the author measured the movements in the import-weighted effective exchange rate indices of a number of LDCs during three different periods: the 48 months preceding 1971; the period January 1971 to June 1973; and the period July 1973 to June 1977. By grouping the countries that pegged their currencies to a major currency and countries that pegged their currencies to a basket of currencies, he concluded that all countries experienced an increase in the variance of their effective exchange rate indices when the major currencies began to float and LDCs that pegged their currencies

to a basket of currencies experienced a smaller increase in the variance of their effective exchange rate indices than countries that were pegged to the dollar (Kafka). In another study performed by the staff of the IMF, the results revealed that for a large number of LDCs that were pegging to the dollar, an SDR peg would have resulted in lower variance in their indices (Lanyi and Suss). In a study concentrating on selected Arab countries, the author concluded that the adoption of an SDR peg as opposed to a dollar peg would reduce the instability in the effective exchange rate indices by some one half to two-thirds (Williamson).

IV. Conclusions

In the present environment of the floating of the major currencies, if an LDC's preference is to maintain a stable exchange rate, then it may adopt a policy of stabilizing its effective exchange rate. Movements in the effective exchange rate index depend on the degree of the diversification of the country's trade pattern and the standard to which it pegs. If the majority of the country's trade is carried out with one developed country, then movements in the exchange rates of other major currencies will exert little influence on the effective exchange rate index. Consequently, stabilizing the nominal exchange rate with respect to the major trading partner's currency will also stabilize the effective rate. If the LDC trades with several industrialized countries, then the floating of these currencies with respect to one another will cause exogenous movements in the LDC's effective rate. To offset these movements, the LDC can peg its currency to a basket of currencies that reflects the country's trade pattern. The SDR basket of currencies is an example of such a basket that an LDC can peg its currency.

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