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Pegging to a Basket of Currencies: Conceptual and Operational Issues

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Summary

This paper reviews major conceptual and operational issues that are relevant to the design and implementation of a policy of pegging a country's currency to a fixed nominal composite (or "basket") of foreign currencies. The conclusions of this review may be summarized under three headings:

First, it is argued that a nominal basket peg is most appropriate when the predominant shocks are nominal exchange rate fluctuations in the presence of "sticky" goods prices in the short run. However, as in any nominal peg rule, such a policy inevitably places constraints on the ability of the monetary authorities to pursue discretionary monetary policy over the medium term. In fact, there is evidence to indicate that such a monetary constraint of a nominal peg has been substantial in basket peg countries as well.

Second, as to the design of a basket peg policy, various policy objectives would dictate the appropriate choice of a currency basket to which the home currency is to be pegged. Practical considerations would also determine the choice of a valuation method and a number of currencies to be included in the basket; such considerations may render the SDR basket a reasonably good proxy for the "ideal" basket under certain circumstances. In this context, there is no evidence to suggest that the recomposition of the SDR basket from 16 currencies to 5 currencies materially changed its performance as a proxy basket.

Finally, as to the implementation of a basket peg policy, the authorities are faced with operational decisions as to the frequency of adjustment in the basket, the width of margins, and public disclosure of the composition. It is suggested that, in such operational matters, there is often a trade-off between the short-run gain from discretion and the long-run need for stability and credibility.

1/ The author is indebted to Charles Adams, James Boughton, Malcolm Knight, Peter Quirk, Peter Wickham, and other Fund colleagues for many useful comments. However, the author alone is responsible for the opinions expressed and for any errors that remain.

I. Introduction

Among larger industrial countries, the period following the major realignment of the world's leading currencies in 1973 is characterized as that of generalized floating. From the standpoint of the smaller countries, however, the period is also distinguished by the emergence of a basket peg--an exchange rate arrangement in which the value of the home currency is pegged to some composite of foreign currencies. While a single currency peg continues to be the most common exchange rate arrangement, an increasing number of smaller countries--both developed and developing--have adopted a basket peg during the period 1973-1985. According to the 1985 edition of the Annual Report on Exchange Arrangements and Exchange Restrictions, 42 currencies are currently classified by the Fund as "pegged to a basket". 1/

Along with the spread of such practices, there have emerged considerable theoretical developments in the academic literature on the design of the so-called "optimal" currency basket. At the same time, the Fund has acquired some practical expertise in advising member countries with regard to the possible adoption and implementation of basket pegs. This paper presents a review of major conceptual and operational issues that have emerged in both of these areas. Such a review is needed because, despite the considerable acquisition of theoretical and practical knowledge during the past decade, little systematic attempt has been made to bring them together in a unifying framework. 2/

The remainder of the paper is organized as follows: Section II presents a brief historical review of the basket peg arrangement; Section III discusses the objective of exchange rate pegging policy; Section IV addresses issues relevant to the design of a currency basket; Section V considers the monetary constraints implied by a basket peg; Section VI deals with issues relevant to the design of a basket peg policy, and Section VII those relevant to its administration; and Section VIII presents concluding remarks. Finally, the Appendix contains a discussion on practical considerations relevant to trade statistics.

II. Historical Overview

When a 10 percent devaluation of the U.S. dollar in the major realignment of February 1973 led to generalized floating among the world's major currencies, most smaller economies did not immediately change the

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1/ This compares with 30 currencies that were so classified in the 1978 edition of the Annual Report. In contrast, the number of currencies that are classified as "pegged to a single currency" decreased from 69 in 1978 to 53 in 1985.

2/ Williamson (1982) surveys conceptual issues that have emerged in the academic literature.

central rates at which they pegged their currencies to the intervention currencies. Furthermore, those countries that did change their par values at the time generally continued to peg to the intervention currencies they had used. 1/ A few countries, however, began to reassess their exchange rate arrangements, as they gradually came to recognize the consequences of continuing to peg to a single currency in an environment characterized by generalized floating among major currencies. In particular, it became clear that a single currency peg could result, in practice, in large fluctuations in the effective exchange rate--some relevant average of bilateral exchange rates--of the home currencies. In March 1973, Malta became the first country to experiment formally with the idea of stabilizing the effective exchange rate defined in terms of the currencies of its major trading partners. 2/ Several other countries followed during 1973 and 1974, 3/ including Morocco (May 1973), Finland (June 1973), Cyprus (July 1973), New Zealand (September 1973), Malawi (November 1973), Algeria (January 1974), Mauritania (January 1974), and Australia (September 1974).

As a parallel development, the realignment of major currencies in 1973 also prompted the Fund to reevaluate its method of valuing the Special Drawing Right (SDR). Up to this time, the SDR had been valued in terms of a specified weight (0.888671 gram) of gold--a method of valuation which made it exactly equal to one U.S. dollar until August 1971. Effective on July 1, 1974, the Fund adopted what became known as the "standard basket" method as the basis for valuing the SDR. 4/ Following this change in the method of valuing the SDR, several countries decided to peg their currencies to the newly defined SDR basket during 1975. These countries included Burma (January 1975), Iran (February 1975), Jordan (February 1975), Qatar (March 1975), Malawi (June 1975) 5/, and three East African Common Market countries (October 1975). 6/ As a result, the number of countries that pegged their currencies to a currency basket swelled to 27 by the end of 1975.

1/ A summary of country responses to the realignment of February 1973 is provided in Osunsade (1976).

2/ Malta informally began to follow this practice as a temporary measure in July 1972, when sterling began to float.

3/ The dates refer to the time of a formal action. For example, Finland began the practice of stabilizing the effective exchange rate as a temporary measure at the time of the first realignment in December 1971.

4/ More specifically, the standard basket is a basket consisting of fixed units--as opposed to shares--of component currencies. See a further discussion in Section VI(3) as well as Polak (1974, 1979).

5/ The Malawi kwatcha was repegged to the SDR from the two-currency basket (consisting of sterling and the U.S. dollar) adopted in November 1973.

6/ That is, Kenya, Tanzania and Uganda.

The conception of a basket peg was a forced response of policymakers to the changed world environment; it was thus a product of economic practitioners rather than of economic theorists. An institutional change is often a response to the perceived need. Canada, for example, adopted a similar exchange rate policy during the interwar period when it established the practice of maintaining the average value of its currency in terms of the U.S. dollar and sterling. 1/ At the same time, however, it should also be recognized that the more rigorous conceptual development as well as the wider acceptance of a basket peg in the 1970's were facilitated by the availability of the well-defined concept of an effective exchange rate index. This concept, initially developed in the Fund as an attempt to measure the impact of the devaluations of sterling in 1949 and 1967, was generalized and the basic principle of currency baskets was familiar by as early as August 1971, when the possibility of valuing the SDR in such a manner was actively discussed in the Fund. 2/

The continued refinement of the concept of a currency basket paralleled the conceptual progress that was being made in the Fund to determine the appropriate weights in effective exchange rate indices. A series of theoretical works, including notably Armington (1969a, 1969b, 1970) and Rhomberg (1970), led to the development of the Multilateral Exchange Rate Model (MERM) as presented in Artus and Rhomberg (1973). Much of the subsequent theoretical work on the basket peg can be thought of as a series of attempts to devise a set of appropriate currency weights comparable to the MERM weights that had been developed earlier for selected industrial countries. 3/

III. Objectives of Exchange Rate Pegging

Different sets of objectives assigned to exchange rate pegging inevitably lead to different currency weights in an effective exchange rate index. In this section, we discuss the rationale for pegging policy, the choice of a target variable in the context of that policy, and the objective with respect to that chosen variable.

1/ See Rhomberg (1959).

2/ International Monetary Fund, International Financial Statistics, Vol. 3 (1950), No. 1, pp. 8-9, and Vol. 21 (1968), No. 1, pp. ii-iii; and Hirsch and Higgins (1970), and Polak (1974).

3/ In this context, it is interesting to note that the concept of a currency basket resembles the idea of a commodity-reserve currency developed by Graham (1937) as well as that of the symmetallic standard developed by Marshall (1887); the symmetallic and commodity-reserve standards are analogous to the standard basket, since they fix only an average of the prices of the component metals or commodities (by fixing their physical units in the basket) while allowing the individual prices to vary. It was natural that the concern with the stability of (currency) prices led to the idea of a composite currency in the 1970s as in the earlier periods. See Friedman (1951) and Niehans (1978), Chapter 8.

1. The rationale for nominal exchange rate pegging

As a starting point, it is assumed that the country in question is a price taker in both export and import markets and has made a decision to adopt a basket peg as its exchange rate arrangement. This presupposes that certain characteristics of the economy are conducive to the choice of such a nominal pegging arrangement, 1/ including, perhaps most importantly, the compatibility of the country's financial policies with the declared value of the currency in terms of the chosen nominal standard. 2/ For example, if the country can not realistically accept the monetary discipline implied by a (fixed) nominal peg policy for institutional or political reasons--such that a consistently higher domestic rate of inflation compared with the relevant average rate in its trading partners persistently results in a real effective appreciation of the currency--a more flexible exchange rate policy (such as a crawling peg or free floating) might be preferred.

Assuming that such conditions for a successful implementation of a nominal peg policy are met, the fundamental rationale for a pegging policy is the assumption that over some period relevant to macroeconomic policy formulation and implementation changes in a country's nominal exchange rate may lead to changes in pertinent real variables. Although there are a number of channels through which nominal exchange rate movements can influence those variables, the relative price channel is perhaps the most direct. 3/

This idea can be expressed in a simple framework. Let s_j be the log of the spot exchange rate of the j^{th} country in terms of a numeraire currency, where an increase in s_j indicates a depreciation of the j^{th} currency; and p_j be the log of the relevant price in the j^{th} country, where, at this stage of presentation, the prices can be either general price levels or single commodity prices. Throughout the paper, the variables without the country subscript (such as s and p) refer to those applicable to the home country, and the numeraire currency is, without loss of generality, assumed to be the U.S. dollar. Then the relative price relevant to bilateral trade between the home and the j^{th} countries can be defined as:

1/ There is a large literature on the choice of an exchange rate regime. According to this literature, some of the suggested reasons for favoring pegging might include the presence of "thin" foreign exchange markets, the absence of forward facilities, the lack of capital flows that are motivated by conventional yield considerations, and inelastic (and sometimes seasonal) trade flows. At the same time, there are also reasons against pegging, including the cost of keeping larger reserves and the possibility that the official rate may deviate substantially from the "equilibrium" rate. See Crockett and Nsouli (1977), Wickham (1985), and Williamson (1982).

2/ See a fuller discussion on the monetary constraint of a basket peg in Section V(2).

3/ Other important channels are those through a real balance effect and through a wealth effect both resulting from portfolio re-evaluation.

$$r_j \equiv p - [p_j + (s-s_j)] \qquad (1)$$

where an increase in r_j means an increase in the price of the goods produced in the home country relative to that in the j^{th} country expressed in common currency prices. 1/ Note that $(s-s_j)$ is the bilateral exchange rate between the home currency and the j^{th} currency (e.g., an increase in $(s-s_j)$ indicates a depreciation of the home currency in terms of the j^{th} currency), such that the term in the bracket is the relevant foreign price expressed in home currency terms.

It is clear from this expression that an exchange rate policy that constrains the nominal exchange rate $(s-s_j)$ is effective in influencing the value of r_j only to the extent that prices are less than perfectly flexible. In the absence of real disturbances, price flexibility tends to ensure that (p_j-s_j) be offset by $(p-s)$, such that r_j does not change; in the presence of real disturbances, price flexibility tends to ensure that the resulting value of r_j be the relative price that is consistent with the new equilibrium. On the other hand, if prices are fixed such that $(p-p_j)$ is given, constraining the nominal exchange rate is equivalent to constraining the relative price. This may suggest that a policy of managing nominal exchange rate movements is more effective in maintaining the value of r_j in the short run than in the long run to the extent that, in the short run, nominal exchange rate movements tend to dominate real disturbances and the degree of price "stickiness" tends to be greater.

2. The choice of a target variable

Although different objectives of exchange rate pegging have been suggested by different authors, 2/ they can be conveniently classified into three classes of target variables (Chart 1): the first class of target variables includes those defined as the "ultimate" objective of economic policy; the second includes conventional "proximate" balance of payments and other macroeconomic variables; and the third includes "immediate" relative price variables. Although there is little doubt that the overall objective of exchange rate policy is, in practice, guided by "proximate" balance of payments or other macroeconomic variables, policymakers often do not possess estimates of the elasticities needed to assess the precise quantitative impact of exchange rate changes on these macroeconomic variables. In terms of formulating a specific exchange rate policy, however, it would certainly be more helpful if the precise linkage between the target variable and a particular policy decision were known. It is thus sometimes useful

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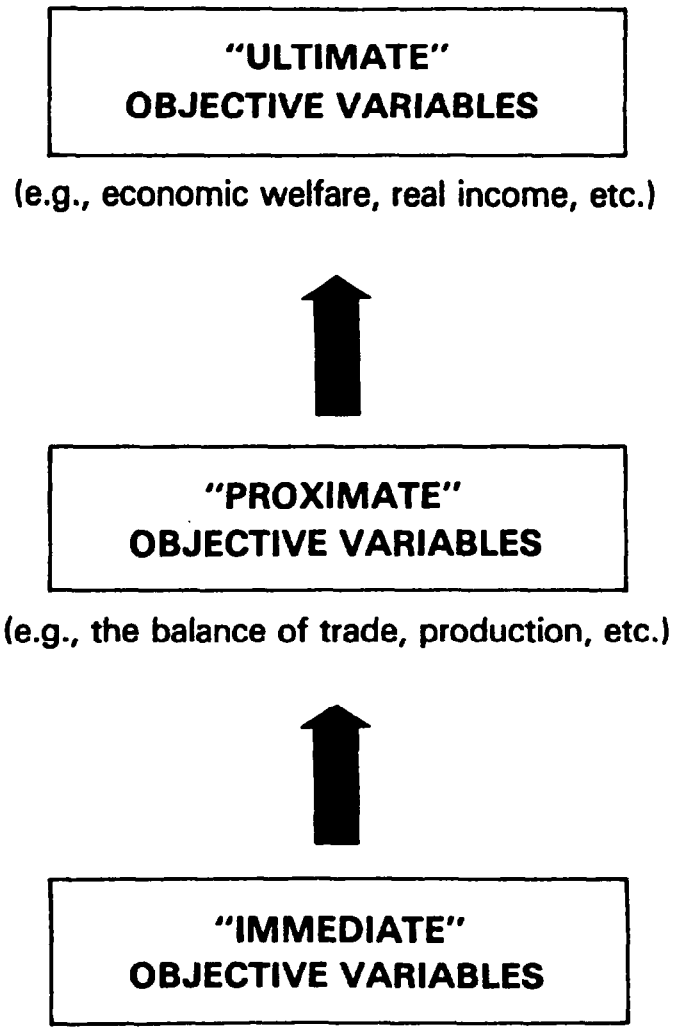
1/ This is sometimes referred to as the real exchange rate. Although such is a widely accepted practice in the Fund, however, this term is reserved in this paper specifically for the relative price of nontraded to traded goods. This seems to be a more prevalent practice in the literature when the small country assumption is made.

2/ See Williamson (1982) for a survey of the literature.

CHART 1

EXCHANGE RATE POLICY: A HIERARCHY OF TARGET VARIABLES



for policymakers to think of the target variable in terms of a more readily observable relative price measure (defined as r_j earlier) in the overall framework of exchange rate policy. 1/

The appropriate choice of p_j and p in equation (1) can be considered, for example, in terms of the following three relative prices, expressed according to the earlier definition: 2/

(i) the relative price of exports to imports (the terms of trade): $p_x - [p_{xj}+(s-s_j)]$

(ii) the relative price of domestic to foreign traded goods 3/ (a measure of competitiveness): $p_T - [p_{Tj}+(s-s_j)]$

(iii) the relative price of nontraded to traded goods (the real exchange rate): $p_N - [p_{Tj}+(s-s_j)]$

where p_x is the price of exports, p_T that of traded goods, and p_N that of nontraded goods. (Note that the "real exchange rate" is used to refer specifically to the relative price of nontraded to traded goods.) In addition to the intrinsic merit of each of these relative prices in the overall framework of macroeconomic policy, two additional criteria can be used to determine the choice of a particular relative price as a potential target variable: first, whether the nominal exchange rate can be used effectively to influence its value; second, whether there exists an alternative--perhaps more potent--policy tool to bring about the intended change in its value.

This choice is further influenced by the time horizon of policymakers in the conduct of exchange rate policy as well as by the productive structure of the economy. It is probably true that the terms of trade are to a large extent beyond the control of most small countries except perhaps during a very short period of time. Similarly, a measure of competitiveness may not be relevant to producers of primary goods whose prices are likely to be determined in the integrated world markets; moreover, even among producers of manufactures, a measure of competitiveness as it applies

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1/ Turnovsky (1982) has argued in this context that the target should be defined not by a "proximate" variable but by the "ultimate" objective variable, namely, economic welfare (or real income). However, pragmatism suggests the course of thinking that is exactly the opposite of that suggested by Turnovsky.

2/ There are potentially other relative price terms that involve cost and wage indices. In this section, however, only those relative price terms that involve price indices are considered.

3/ This definition differs from (i) because, e.g., for the home country it includes both exports and import substitutes, rather than exports alone.

to its real effect may be more relevant over a longer time horizon, as buyers in the world market may not immediately alter their sources of supply in response to (potentially transitory) changes in relative prices. 1/ In contrast, the relative price of nontraded to traded goods is relevant even in a small country both in the short run and over the medium term, to the extent that the degree of substitution (both in production and in consumption) is expected to be small.

The foregoing discussion serves to highlight the role of exchange rate policy in the overall framework of economic policy. Given the spectrum of policy measures available to policymakers, it is unrealistic to assign exchange rate policy alone the task of achieving the ultimate objective--whatever it may be--of economic policy. 2/ Thus defining the target in terms of some readily identifiable relative price may be useful to policymakers who do not possess the knowledge of the elasticities in the reduced-form macroeconomic equation. The targeted relative price can be adjusted from time to time as needed on the basis of the policymakers' assessment of the contribution of such a policy to a more conventional "proximate" macroeconomic objective (e.g., the balance of payments) and, in some cases, to the ultimate social objective itself.

3. Policy objective with respect to the target variable

Theoretical literature has generally suggested that, once the relevant target variable is chosen, exchange rate pegging should be conducted with a view to minimizing the variance. For example, if we assume that a change in the nominal exchange rate approximates a change in the relative price variable during some relevant period of time, this objective can be expressed as that of minimizing:

$$V = \text{Var}\ [\Sigma c_j(s-s_j)] \qquad (2)$$

where c_j is the share of the j^{th} currency in the exchange rate index that is yet to be determined. It should be emphasized that the validity of

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1/ It is interesting to note that MERM weights that are intended to capture a measure of competitiveness were developed to "facilitate the assessment of the trade effects of such changes that would occur after an adjustment period of two to three years" (Artus and Rhomberg (1973), p. 591).

2/ However, this is exactly what the academic literature has done in proposing different ways of deriving the optimal currency basket. (See Williamson (1982).) It is thus no wonder that the so-called optimal weight is typically made up of a complicated set of parameters and elasticities that describe the macroeconomic linkages, reflecting the fact that, as one moves up in the hierarchy of target variables, the reduced form equation that relates the target to exchange rates becomes increasingly more complicated.

this objective is crucially dependent on the assumption that the relative price is somehow maintained at some "appropriate" level. In practice, such an objective is appropriate only if the monetary authorities are pursuing monetary policy that is consistent with a fixed nominal peg and if the dominant shocks are nominal exchange rate fluctuations. Otherwise, minimizing the variance of a target variable may result in an undesirable outcome.

Assuming that the level is maintained appropriately, the stability of the target variable in the short run is important because fluctuations in its value that are caused by nominal exchange rate movements often do not reflect the underlying economic fundamentals; any such deviation involves an economic cost. 1/ Under these circumstances, such relative price changes imply a lack of market clearing and, to the extent that such changes are at least partially misperceived to be permanent, they may result in misallocation of resources. Furthermore, the increased uncertainty reflected in a greater variance of real variables in international transactions may lead to permanently lower economic welfare if the country so affected decides to diversify its production base away from the export good sector (in which it presumably has a comparative advantage). These considerations may be more relevant to smaller countries that are highly undiversified in production and highly dependent on international trade. 2/

IV. Issues in the Design of a Currency Basket

In general, the theoretical literature on currency pegging arrangements has been concerned with deriving "optimal" weighting schemes for the basket to which a country should peg its currency. In this literature, a weighting scheme is generally defined to be optimal if it minimizes the variance of the target variable. In this section, a representative form of

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1/ Some have also argued that such exchange rate fluctuations would present increased risk to economic agents who engage in international trade over time. In order to reduce this type of currency and contract risk, Frankel (1975) suggested the policy of minimizing the "effective variation" of exchange rates, which is defined as a weighted average of the variations of bilateral exchange rates. This can be roughly thought of as minimizing the weighted average of the variances of bilateral exchange rates, i.e., $V = \Sigma c_j \text{ Var}(s-s_j)$, as opposed to minimizing the variance of a weighted average of bilateral exchange rates given by equation (2). See Lanyi and Suss (1982) for a discussion on these two alternative measures of exchange rate variability.

2/ See Helpman and Razin (1978), Chapter 4. It should be noted, however, that empirical work based on industrial countries gives no conclusive support for the adverse impact of exchange fluctuations on international trade. See, for example, Gotur (1985).

the optimal weight is derived and is compared with a simple bilateral trade weight. The purpose of this exercise is to assess the conceptual limitations of simple trade weights and to see under what conditions the use of such weights--a common practice in many countries--can be justified.

1. Derivation of the optimal weight

Assume that h, the log of the target variable, can be expressed as:

$$h_t = \Sigma d_j h_{jt} \tag{3}$$

where h_j is the component of h that is affected by virtue of the country's bilateral relationship with the j^{th} country, d_j is the trade share of the j^{th} country, and Σ is a summation over j (j=1,n) unless noted otherwise. Note that d_j's are predetermined real variables that are based on the country's pattern of trade, 1/ whereas the c_j's in equation (2) are choice variables; the issue here is how to derive the optimal value of c_j from d_j. For simplicity, further assume that each h_j at time t can be expressed as:

$$h_{jt} = \sum_i \eta_{ji}(s_{it}-s_t) \tag{4}$$

where η_{ji} denotes an impact elasticity of h_j with respect to the i^{th} exchange rate in terms of the home currency, $(s_{it}-s_t)$. In fact, equation (4) can be decomposed into the own effect (η_{jj}) of the exchange rate between the j^{th} currency and the home currency, and the third country effect $(\eta_{ji}\ j\neq i)$ of the exchange rate between the i^{th} currency and the home currency. Finally, suppose that the basket peg rule is specified by:

$$s_t = \Sigma c_j s_{jt} \tag{5}$$

1/ Strictly, the argument in Section III(3) suggests that the value of dj may be a function of the choice of an exchange rate arrangement. For the illustrative purpose of this section, however, this possible endogeneity of d_j's is assumed away.

where c_j is the j^{th} currency share in the basket, and the constant scale parameter is normalized to zero. 1/

Substitution of equations (4) and (5) into equation (3) yields the following expression for h_t:

$$h_t = \sum_k [\sum_j d_j \eta_{jk} - c_k \sum_j d_j \sum_i \eta_{ji}] s_{kt} \qquad (6)$$

where the first term in the bracket indicates the real effect of a given change in the k^{th} exchange rate and the second term the (offsetting) exchange rate effect resulting from the inclusion of the k^{th} currency in the basket. Then, the optimal weight for the k^{th} currency can be obtained by differentiating equation (6) with respect to s_{kt} and setting $(\partial h_t/\partial s_{kt}) = 0$. Thus, the optimal weight, $\hat{c}_k$, is found to be:

$$\hat{c}_k = \sum_j d_j \eta_{jk} / \sum_j d_j \sum_i \eta_{ji} \quad \text{(for k=1, n)} \qquad (7)$$

This represents the most general form of the solution for the optimal weight proposed in the literature.

2. The absence of third-country effects

Suppose that third-country effects can be ignored. As Black (1976b) has shown in a simple multilateral trade model, this may be justified when the target variable is the price of traded goods (as a proxy for the real exchange rate if the price of nontraded goods is fixed in the short run). 2/ Then, by setting $\eta_{ji}=0$ (for all $i \neq j$), we obtain for $\hat{c}_k$:

$$\hat{c}_k = d_k \eta_{kk} / \sum_j d_j \eta_{jj} \qquad (8)$$

We can immediately see that the optimal currency share ($\hat{c}_k$) becomes identical to the trade share (d_k) if the own elasticity is constant for

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1/ This exchange rate rule will be referred to as the adjustable basket method in Section VI(3). The general form of the solution obtained under this exchange rate rule will be applicable to other types of basket peg rules.

2/ Black (1976b) has shown that the simple bilateral trade-weighted effective exchange rate proxies for the price index of traded goods if the country is a price taker in both export and import goods.

all k. Otherwise, simple trade weights differ from the optimal weights. 1/ It is certainly more difficult to justify the exclusion of third country effects if the target is a measure of competitiveness, because the concept of competitiveness in itself presupposes the presence of third countries. On the other hand, the use of bilateral trade weights is more appropriate if the target variable is the short-run real exchange rate.

3. Correlated exchange rates

The optimal weight (7) was derived by assuming that the covariances of cross rates were zero. However, if the non-zero covariances are explicitly allowed, i.e., $(\partial s_i/\partial s_j) \neq 0$, for $i \neq j$, the simple optimal weights--and bilateral trade weights--become inappropriate. Turnovsky (1982) and Bhandari (1985a) have pointed out in this context that the optimal weight may become even negative. For example, suppose that the yen depreciates against the pound, such that, if both the yen and the pound are in the currency basket, the domestic currency appreciates against the yen. This will reduce Japanese demand for the home exports and increase British demand. For a sufficiently large elasticity of Japanese demand, the decrease in Japanese demand may become far more than justified by the increase in British demand. In such situations, it may become desirable to depreciate the home currency against the yen whenever the yen depreciates against the pound; this calls for a negative weight of the yen in the basket. 2/

As a practical matter, however, the non-zero covariances of cross rates do not seem to be relevant in designing the currency basket. It may be true that one can always find ex post systematic covariances among third country exchange rate movements and can exploit the structure of those covariances in deriving the optimal weights. However, exchange rate policy is by design prospective. Since we can not know ex ante the covariances that will prevail in the future, there is no other alternative than to assume that exchange rates are exogenous at least at the time when a currency basket is designed.

4. The level of the exchange rate as a target

As Flanders and Helpman (1979) suggested, if the objective is to stabilize the variance of the target variable around the desired trend (rather than around the initial value), an additional adjustment in the

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1/ If the home country has market power vis-à-vis the k^{th} country in the sense of being a price setter, the elasticity term (η_{kk}) may be small, such that the k^{th} currency share should be reduced relative to other currencies. See Branson and Katseli-Papaefstratiou (1981). Thus the possibility of asymmetric market power is another reason to invalidate the use of simple trade weights.

2/ It is interesting to note that, in the MERM, the United Kingdom has a negative weight for the Swiss franc.

currency weight is needed. For example, if the objective is to stabilize the variance of the target subject to the constraint that the balance of trade improves over time, it is necessary to give more weight to those currencies that are expected to depreciate. In general, whenever policy-makers are concerned not only with the variance but also with the level of exchange rates, the simple optimal weight (7) must be adjusted accordingly.

However, it is not known in advance which currencies are going to depreciate over time. Moreover, even if it were, the magnitude of depreciation would be even less likely to be known. Under these circumstances, therefore, it is probably more practical to design a currency basket with the objective of stabilizing the variance of the target variable around the initial value--assuming it is appropriate to begin with--and to adjust the level of the exchange rate from time to time as needed. There is no reason why such an adjustment mechanism should be determined at the time when the currency basket is designed.

V. Policy Constraints of a Basket Peg Rule

As in any exchange rate rule, a basket peg--whether to a country-specific basket or to the SDR--imposes a constraint on the country authorities' pursuit of other macroeconomic objectives over the medium term, as long as the declared par value of the currency in terms of the chosen basket is to be maintained. In this section, the constraints of a basket peg on the price level, and consequently on monetary aggregates, are briefly discussed.

1. Consequences of a basket peg on the price level

The immediate impact of a basket peg policy--as in the case of a single currency peg--comes from its effect on the domestic prices of traded goods as a result of the rule-determined value of the currency basket. To see this, let the log of the domestic price level be given by a geometrically-weighted average of the prices of traded and non-traded goods as:

$$p_t = \Sigma\ \theta_j[p_{jt}+(s_t-s_{jt})] + \theta_o\ p_{ot} \qquad (9)$$

where θ_j and θ_o are, respectively, the consumption shares of the goods directly traded with the j^{th} country and of nontraded goods, p_j is the log of the price level in the j^{th} country, and p_o the log of the price of nontraded goods; the constant is normalized to zero.

Each dollar exchange rate can be expressed as a sum of the PPP term and a deviation from PPP as:

$$s_{jt} = (p_{jt}-p_{1t}) + v_{jt} \qquad \text{(for } j = 2, n\text{)} \qquad (10)$$

where the United States is denoted by j=1, and the constant is again normalized to zero. The relative price of nontraded goods is determined by excess demand conditions, summarized by v_o, given the prices of traded goods. It can be expressed in terms of the domestic price of the goods traded with the United States as:

$$p_{ot} - p_{1t} = s_t + v_{ot} \qquad (11)$$

where once again the constant term is normalized to zero.

From equation (5) and equations (9) to (11), we obtain the following expression for the log of the domestic price level in terms of the foreign price levels:

$$p_t = \Sigma\, c_j p_{jt} + w_t \qquad (12)$$

where w_t is a weighted average of PPP deviations (v_j) plus the expression describing the condition in the market for nontraded goods (v_o), i.e.,

$$w_t \equiv \sum_{j=1} (c_j-\theta_j)v_{jt} + \theta_o v_{ot}$$

Thus, the domestic price level under a basket peg is determined by the currency share-weighted average of the foreign price levels and the extent of real disturbances that are captured by w. There are two relevant questions: first, how large is the extent of disturbances (w_t); and second, whether those disturbances can be systematically exploited by the authorities.

2. Constraint on monetary aggregates

This constraint on the price level movement can be directly translated into a similar constraint on monetary aggregates. To see this, think of a simple money demand function of the following general form:

$$m_t - p_t = \alpha\, \Phi_t + u_t \qquad (13)$$

where Φ is a vector of real variables and interest rates, α a vector of demand elasticities with respect to Φ, and u a velocity shock. Assuming money market equilibrium, the substitution of equation (12) into equation (13) yields the following money supply constraint:

$$m_t = \Sigma c_j p_{jt} + \alpha \Phi_t + z_t, \qquad (14)$$

where $z_t \equiv w_t + u_t$. Equation (14) indicates that, if the par value of the domestic currency is to be maintained, monetary aggregates can deviate from the rule-determined values (i.e., the first two terms) only to the extent of the disturbance terms, w_t and u_t. But this does not mean that monetary discretion is possible, since the monetary authorities are not likely to be able to take advantage of the disturbance terms in a systematic fashion.

If, for example, domestic credit expands too fast, two things will happen: first, the price of nontraded goods will begin to rise; and, second, the demand will shift to traded goods the relative price of which has fallen. The consequence of this is a loss of foreign exchange reserves. 1/ As long as the home country is willing to let go foreign exchange reserves, the par value can be maintained; and during this phase the domestic price level may rise a little faster than the price level constraint (12) dictates. The continuation of such monetary expansion, however, will inevitably result in a breakdown of the regime: changes in the par value or complete abandonment of the (nominal) basket peg arrangement would follow. This means that the monetary constraint of a basket peg is as binding as that of a single currency peg, in the sense that there are limits to the ability of policymakers to fix both the exchange rate and the money supply at the same time. 2/

3. Some empirical evidence

The discussion in the preceding two subsections suggests that, in countries that accept the monetary constraint of a fixed basket peg, there should be observed a close relationship between the movement in the domestic

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1/ The excess money supply can also be adjusted through the asset market. In this case, whether the offset by the reserve flow is complete depends on the substitutability of domestic and foreign bonds. There is a large literature on monetary control under a rule-determined exchange rate regime. See Obstfeld (1982) for a survey of empirical results on industrial countries. Takagi (1985a) provides an empirical work on three Central American countries.

2/ The difference is that, with a basket peg, a country can choose its own desired rate of inflation by the choice of a basket. That is to say, the country does not automatically accept, as in a single currency peg, the inflation rate of one country. Connolly (1982) has emphasized this type of monetary consideration in the choice of a currency basket.

price level and that in the consistent price level (p*), defined as the currency share-weighted average of the price levels in the countries whose currencies are included in the basket (i.e., the first term on the right hand side of equation (12)). In this subsection some empirical evidence is provided to support this hypothesis.

The hypothesis is tested on a group of seven SDR peg countries (i.e., Burma, Jordan, Kenya, Malawi, Mauritius, Seychelles, and Zambia) that are chosen on the basis of their commitment to maintain at one time or another the same par value of their currencies for at least three years. The results based on the following regression equation:

$$p_t = b_0 + b_1 p^*_t + w_t \qquad (15)$$

where b_0 and b_1 are regression coefficients, are summarized in Table 1. Note that the constraint implies that the coefficient of p^*_t (b_1) is not significantly different from unity, provided, first, that there are no exchange and price controls, and, second, that the par value of the currency in terms of the basket does not change frequently. The overall evidence, as reported in Table 1, seems to support the hypothesis that the commitment to maintain the declared par value of the currency in terms of the chosen basket imposes constraints on the price level and money supply. Although the estimates of b_1 for Malawi and Mauritius are significantly greater than unity, this may mean the presence of systematic upward price pressures on nontraded goods 1/ and may further explain why both of these countries were led to devalue their currencies subsequently. 2/ It is also noteworthy that, except in Kenya and Seychelles where price controls were in place during the sample period, over 70 percent of the domestic price movements was explained by the rule-determined price, indicating that the constraint of a basket peg on the price level was substantial.

VI. Issues in the Design of a Basket Peg Policy

Once the currency weights have been derived, a currency basket can be composed and the basket peg policy implemented. In this section we discuss major issues in the design of a basket peg policy.

1/ This is the case because, if p^*_t and w_t (or v_o) are positively correlated, the estimate of b_1 will be biased upward.

2/ See footnotes 4-10 in Table 1 on pertinent facts on the sample countries. A more rigorous investigation of the price determination process under a basket peg is provided in Takagi (1985b).

Table 1

Estimation of the Monthly Price Level
Equation in Selected SDR-Peg Countries 1/

Country	Coefficients		Summary Statistics				Autoregressive Coefficients 2/		
	b_0	b_1	R^2	DW	F	DF	ρ_1	ρ_2	ρ_3
Burma (January 1981-February 1985): 3/4/									
	-1.12	1.22							
	(0.49)	(0.10)	0.76	2.12	142.2	46	1.08	-0.45	—
Jordan (January 1976-December 1980): 5/									
	-0.88	1.19	0.72	1.74	146.2	57	0.75	--	--
	(0.44)	(0.10)							
(January 1981-April 1985): 3/									
	0.51	0.90	0.67	2.00	95.9	48	0.39	0.09	—
	(0.44)	(0.09)							
Kenya (January 1976-December 1980):6/									
	-0.59	1.13	0.32	2.00	26.6	56	0.99	-0.03	—
	(1.00)	(0.22)							
Malawi (January 1976-December 1980): 7/									
	-1.50	1.32	0.74	1.99	164.7	57	0.77	--	--
	(0.46)	(0.10)							
Mauritius (January 1976-August 1979): 8/									
	-0.90	1.14	0.96	1.77	918.7	39	0.96	-0.09	0.28
	(0.16)	(0.04)							
Seychelles (March 1981-April 1985): 3/9/									
	0.91	0.80	0.17	1.62	9.5	47	0.85	—	--
	(1.25)	(0.26)							
Zambia (March 1978-December 1980): 10/									
	-0.01	1.00	0.97	2.11	869.0	29	0.49	-0.03	-0.36
	(0.15)	(0.03)							

Sources: IMF, International Financial Statistics; the prices are monthly consumer price indices; and standard errors are in parentheses.

1/ Using the original 16-currency SDR basket unless otherwise indicated.

2/ Cochrane-Orcutt iteration method was used to correct for the presence of serial correlation.

3/ Using the 5-currency SDR basket.

4/ The Burmese kyat has been pegged to the SDR since January 1975, with one devaluation in May 1977. Burma traditionally had extensive price controls so that the domestic price movement was little affected by foreign price movements for many years; however, the extent of price controls were substantially eased in September 1981.

5/ The Jordanian dinar has been pegged to the SDR since February 1975 continuously at the same parity.

6/ The Kenya shilling has been pegged to the SDR since October 1975; there have been several devaluations, with the first (amounting to 5 percent) occurring in January 1981.

7/ The Malawi kwatcha was pegged to the SDR from June 1975 to January 1984, when it was repegged to a new basket of currencies. A large devaluation of 15 percent occurred in April 1982, followed by two more.

8/ The Mauritian rupee was pegged to the SDR from January 1976 to February 1983, when it was repegged to an undisclosed trade-weighted basket. The period of the SDR peg was characterized by periodic and substantial devaluations, with the first one (amounting to 23 percent) occurring in October 1979.

9/ The Seychelles rupee has been pegged to the SDR since November 1979, with one revaluation (amounting to 15 percent) occurring in March 1981. Although there are price controls in Seychelles (as attested by the low R^2), prices are periodically adjusted so as to reflect the costs of imports. This may explain the consistency of the reported results with the hypothesis despite the presence of price controls.

10/ The Zambian kwatcha was pegged to the SDR from July 1976 to July 1983, when it was repegged to a trade-weighted basket. There was a 10 percent devaluation in March 1978.

1. Real versus nominal peg policy

We have implicitly assumed so far that a currency peg should be designed in such a way as to stabilize the weighted average of nominal exchange rates, i.e., a nominal peg policy. Lipschitz and Sundararajan (1980, 1982) have argued, however, that a peg should be designed in such a way as to stabilize the weighted average of real (price-adjusted) exchange rates, i.e., a real peg policy. According to this view, if purchasing power parity (PPP) holds constantly between the home country and the j^{th} country because of perfectly flexible prices, the j^{th} currency weight in the basket should be zero regardless of the share of that currency in the effective exchange rate index. This suggests that, in general, the currency weights should be adjusted to reflect the extent to which PPP is expected to hold. If a real peg policy is followed, therefore, the currency weights in the basket may not necessarily be the same as the currency weights in the effective exchange rate index relevant to the chosen target variable.

As a practical matter, however, a real peg policy has a feasibility problem in that, if such a policy is to be followed strictly, price indices must be measured and made available on a constant basis not only for the home country but also for its trading partners. Thus, a strict real peg policy is not a feasible option; the most a country can do to approximate a real peg policy is to adjust the nominal exchange rate periodically based on the most recent--albeit lagged--price indices. 1/ 2/

On a conceptual level, moreover, stabilizing the real exchange rate is not a desirable policy when underlying real variables change. When disturbances underlying exchange rate movements are real, a real peg would instead exacerbate the effect of such disturbances; a new equilibrium will require a different set of real values of the underlying variables, including the real exchange rate. 3/ More fundamentally, as Adams and Gros (1985) argue, a policy of strictly maintaining the real exchange rate amounts to a policy of fully indexing both the nominal exchange rate and the money supply to the price level; it could thus result in the indeterminacy of the price

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1/ See Rodrik (1984) on a further discussion on this feasibility issue. However, New Zealand did follow such a modified real basket peg policy between 1979 and 1982 when it adjusted the exchange rate once a month based on inflation differentials vis-à-vis its major trading partners.

2/ Alternatively, Lipschitz and Sundararajan (1980, 1982) proposed that a fixed currency basket be devised based on the historical pattern of PPP deviations among the component currencies. In the light of the evidence that PPP deviations are ex ante unpredictable, however, the historical pattern is likely to be a poor guide to determining a priori the currency weights in the basket. See, for example, Shapiro (1983).

3/ Lipschitz (1979).

level and, under certain conditions, explosive inflation. 1/ Although such a result may not strictly apply to a modified real peg policy, 2/ given this inherent conceptual problem with a real peg policy, crawling peg rules--under which the rate of nominal depreciation is specified--or free floating--under which the nominal money supply growth is a choice variable--should be preferred if it is desired to minimize the link between rapid inflation and a secular appreciation in the real exchange rate.

As for those countries for which a secular appreciation in the real exchange rate is not a problem--i.e., the countries that are pursuing monetary policy consistent with the constraint of a fixed nominal peg rule--one can argue that a nominal peg is a workable policy both in the short run and in the long run. In the short run, when nominal exchange rate movements are the dominant shocks and relevant prices are "sticky", a nominal peg is useful in minimizing fluctuations in the real exchange rate that result from purely nominal exchange rate movements. In the sufficiently long run, when all prices are flexible, nominal exchange rate pegging is irrelevant to the minimization objective. 3/ Moreover, the real exchange rate should not be fixed after all in the long run when dominant disturbances are likely to be real. Meanwhile, over the medium term, the level of the exchange rate can be adjusted from time to time as needed in order to correct for prolonged PPP deviations that are divergent across currencies.

2. Effect of excluding a minor currency

The basket obtained from the procedures outlined in Section IV may include a large number of currencies. Operational considerations, however, may dictate that some currencies be excluded. 4/ Although it is a common practice to exclude some "minor" currencies, the quantitative impact of such a practice is difficult to assess because, first, the "true" optimal weights are not known, and second, the actual (i.e., ex post) effect depends on a complicated interaction of covariances among exchange rates. The discussion in this subsection is therefore limited to a few general observations.

1/ The idea is that the determinacy of the price level requires an exogenous nominal anchor. While the nominal money supply is such an anchor under free floating and the nominal exchange rate under a nominal peg, there may be no such anchor under a real peg. This type of consideration suggests that an exchange rate regime should be strictly a nominal regime.

2/ Because, first, the actual indexation is bound to be incomplete, and second, there can be some goods in the economy whose nominal prices are fixed.

3/ Nominal exchange rate policy is relevant, however, in determining the long-run rate of inflation and other nominal variables.

4/ For example, some currencies may not be actively traded either in the spot market or in the forward market; or some may be too unimportant to the home country.

We first conjecture from equation (6) the following expression for h:

$$h = \Sigma\ (\hat{c}_j - c_j)s_j \tag{16}$$

where h is expressed in terms of the difference between the optimal weights ($\hat{c}_j$) and the actual weights (c_j). The variance of h can be expressed as:

$$Var(h) = Var(\Sigma\ \hat{c}_j s_j) + [Var(\Sigma\ c_j s_j) - 2Cov(\Sigma\ \hat{c}_j s_j,\ \Sigma\ c_j s_j)] \tag{17}$$

where we note that the first term is independent of the choice of currency shares. This means that the effect of a change in the share of the k^{th} currency (i.e., dc_k) on the bracketed expression becomes the relevant issue. This expression ($\equiv$ B) can be expanded to:

$$B = \underset{ij}{\Sigma\Sigma}\ (c_i - 2\hat{c}_i)c_j\ \sigma_{ij}^2 \tag{18}$$

where σ_{ii}^2 and σ_{ij}^2 denote the variance of the i^{th} currency and the covariance of the i^{th} and j^{th} currencies, respectively. The total differential of equation (18) is given by:

$$dB = 2\ \underset{i}{\Sigma}\ [\underset{j}{\Sigma}(c_j - \hat{c}_j)\ \sigma_{ij}^2]\ dc_i \tag{19}$$

The question now is to see the impact of dc_i on dB, i.e., the sign (and preferably the magnitude) of (dB/dc_1). Assuming that the first currency is to be excluded, and making use of the constraint:

$$dc_1 = -\ \underset{j=2}{\Sigma} dc_j \tag{20}$$

we obtain:

$$\frac{dB}{dc_1} = 2\ \underset{i=2}{\Sigma}\ [\underset{j}{\Sigma}(c_j - \hat{c}_j)(\sigma_{ij}^2 - \sigma_{1j}^2)]\ \frac{dc_i}{dc_1} \tag{21}$$

where $(dc_i/dc_1) < 0$. We note from equation (21) that the effect of deleting the first currency on the variance of the target variable has two channels, i.e., one through a lower value of c_1 (captured by $-\sigma_{1j}^2$) and the other through a (potentially) higher value of c_i (captured by σ_{ij}^2).

One would desire that these two effects be of the same order of magnitude and in the opposite directions, if the currency share of the i^{th} currency is to be increased; this condition is more likely to hold if the first and the i^{th} currencies are more closely correlated. On the other hand, if they are negatively correlated, there is a possibility that the adverse impact on the variance of the target variable is large; then, the share of the i^{th} currency should not be increased in response to the exclusion of the first currency, i.e. $(dc_i/dc_1) = 0$. This suggests that the way to adjust the currency shares is not to increase them equiproportionately but to increase the shares of only those currencies that are likely to be positively correlated with the excluded currency.

3. Alternative basket peg rules

The determination of the basket composition, however, does not in itself determine the value of the home currency. In order to do so, the authorities must first determine the appropriate initial level of the exchange rate and then decide on the method of valuing the basket on the basis of that initial value. This subsection discusses this latter question by suggesting three alternative methods of valuation. 1/

The method of valuing the basket given by the exchange rate rule (5) is referred to as the "adjustable" basket method, because as a practical matter the operation of this method requires that the units of each currency in the basket be constantly adjusted such that its share (c_j) remains constant. For example, if the j^{th} currency depreciates against all others, the number of units of that currency in the basket must be increased correspondingly. In practice, a simple way of administering the adjustable basket method is to peg the home currency to a geometrically weighted average of nominal exchange indices as:

$$EX_t = \Sigma\ c_j\ \ln(EX_{jt}) \qquad (22)$$

where EX_j is an index of the level of the j^{th} exchange rate in terms of the U.S. dollar; and increase in EX_j indicates an depreciation of the j^{th} currency. Using the upper-case letter (S) to denote the level of the exchange rate, the dollar value of the home currency is given by:

$$S_t = \bar{S}_o\ [\exp(EX_t)/100] \qquad (23)$$

1/ As Brodsky (1982) pointed out, the choice of a particular method of valuation--which amounts to the choice of a particular technique of averaging--has important quantitative implications for the value of the exchange rate over a period of two to three years.

where $\bar{S}_o$, the initial dollar exchange rate, is a policy variable. The advantage of the adjustable basket method is that the predetermined currency shares can be maintained.

An alternative way of specifying the basket peg rule is to peg the home currency to what is known as the "standard" basket of currencies; the standard basket is a basket in which the units of the currencies are fixed; the SDR and the European Currency Unit (ECU) are both valued in such a manner. Such an exchange rate rule is given by:

$$(1/S_t) = \Sigma\, x_j(1/S_{jt}) \tag{24}$$

where x_j is the fixed units of the j^{th} currency in the basket. With this type of exchange rate rule, it can be shown that the currency shares are variable, i.e.,

$$c_{jt} = x_j S_t/S_{jt} \tag{25}$$

For example, if the j^{th} currency depreciates against all other currencies (a fall in S_t/S_{jt}), its weight in the basket will decline pari passu. Since the currency shares are variable under the standard basket method, the predetermined currency shares can not be maintained; they can be used only as the initial shares. Suppose that they are given by c_j $(j = 1,n)$ and that, on the first day of operation $(t = 0)$, the dollar exchange rates of the component currencies are given by S_{jo} $(j = 1, n)$. Then the fixed currency units of the component currencies are given by:

$$x_j = c_j S_{jo}/\bar{S}_o \qquad (j = 1, n) \tag{26}$$

This means that, under the standard basket method, the determination of the initial level of the exchange rate can not be divorced from the choice of this particular valuation method. Once x_j's are determined, the dollar rate of the home currency at any specified time can be easily calculated by substituting equation (26) into the exchange rate rule equation (24). 1/ Although this method is not capable of maintaining the predetermined currency shares, it has the attraction that, since the

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1/ As will be discussed in Section VII, the standard basket method has the additional advantage that, in a country without forward facilities in its own currency, this method allows the country to conduct forward transactions by purchase or sale of the component currencies.

weights of depreciating currencies decline, there is a built-in anti-inflationary (i.e., appreciation) bias in the system. Moreover, it has a conceptually better defined property as a currency. 1/

Finally, the home currency can also be pegged to an arithmetically weighted average of exchange rate indices as:

$$EX_t = \Sigma\, c_j\, EX_{jt} \qquad (27)$$

According to this method, the level of the exchange rate is calculated as:

$$S_t = \bar{S}_o\ (EX_t/100) \qquad (28)$$

It should be noted that, despite the fact that the arithmetic weights in equation (27) are fixed, this method will place an increasing weight on depreciating currencies because, given the same arithmetic weight (c_j), a hypothetical 10 percent change in the index from 150 to 165, for example, has a greater impact on EX_t than an equal percentage change from 80 to 88. The opposite result will follow, if a higher index value is defined to be an appreciation--the harmonic average method. 2/ While the arithmetic average method shares with the standard basket method the undesirable property of variable currency shares, it does not have the advantages of

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1/ The standard basket of currencies is in itself a currency, since it consists of fixed units of actual currencies. Its ability to enable forward transactions is a by-product of this. In contrast, the adjustable basket does not in itself possess a property of a currency; the basket is used simply as a way of defining the value of a currency. See Polak (1979). This difference resembles that between symmetallism and bimetallism. See Niehans (1978) Chapter 8.

2/ It was precisely for this reason that Norway switched from the arithmetic average method--in reality, the harmonic average method--to the geometric average method in July 1984; under the harmonic average method, the weight of the U.S. dollar, which was appreciating against most major currencies between 1981 and 1984, was increasing. It should be noted that the harmonic average method is equivalent to the standard basket method in terms of the calculated value of the currency, given the same initial level of the exchange rate. Brodsky (1982) further shows that the value based on the geometric average method always lies between those based on the arithmetic and harmonic average methods.

the latter. 1/ Thus, unless there is a compelling reason to incorporate a built-in depreciation mechanism, there is little merit in adopting the arithmetic average method.

4. The SDR basket as a proxy for the ideal basket

It has been suggested on a number of occasions that the currency could be pegged to the ready-made SDR basket instead of a tailor-made basket. Conceptually, the SDR peg is almost always inferior to a peg to the tailor-made basket, since the latter option includes the former as a special case. It is tautologically true that one can always eliminate the variance of any target variable in effective terms by pegging the currency to the index that is used to define the variance. The SDR peg, however, may be attractive to some countries because of its operational simplicity: since the Fund quotes the value of the SDR in terms of most major currencies on a daily basis, little resource is required to administer the SDR peg. Moreover, a simultaneous adoption of the SDR peg by a large number of countries may create a sizable currency area and thus generate additional incentives for intra-regional trade. 2/

a. Comparison with a single currency peg

Although the reason for favoring a peg to the SDR over a peg to the tailor-made basket is likely to be that of operational economy, the SDR peg is dominated by a peg to a single currency (e.g., the intervention currency) in terms of this criterion. Thus, if the SDR peg is to be adopted, the authorities must be confident that the SDR peg dominates an alternative single currency peg in terms of minimizing the variance of an effective exchange rate index. 3/ This subsection proposes a simple methodology to make that comparison and presents some empirical findings.

1/ In one sense, the arithmetic average method is worse than the standard basket (or the harmonic average) method in that the effect of a rapidly depreciating currency explodes faster under the former than it converges under the latter.

2/ This argument was first made by Crockett and Nsouli (1977). There may be other intangible reasons for favoring the SDR peg, such as the increased monetary credibility associated with pegging to a well defined external standard.

3/ In this context, Black (1976a) suggested a useful framework for analyzing this type of policy choices by depicting a "trade-off locus" between resource costs (R) and the variance of EER (V). On this locus, a peg to the tailor-made basket would lie at one end (high R, low V), a peg to the intervention currency at the other end (low R, high V), and a peg to the SDR in an intermediate position.

Let the variance of the target variable be expressed as:

$$Var(h_t) = Var(EER_t) + [Var(CEER_t) - 2Cov(EER_t, CEER_t)] \qquad (29)$$

where EER is the "true" index of effective exchange rates, CEER the index of effective exchange rates weighted by the currency shares of the actual basket (i.e., the SDR), and all exchange rates are expressed in terms of the intervention currency as a numeraire. We note that the first term is independent of a choice of an exchange rate regime. The question boils down to the value of the bracketed expression, [Var(CEER)-2Cov(EER,CEER)]. Since the value of CEER under a peg to the numeraire currency in logarithm is constant, both Var(CEER) and Cov(EER,CEER) are zero. This means that, if the bracketed expression is shown to be negative under the SDR peg, it is more effective in minimizing the variance of the target variable than a peg to the numeraire currency. On the other hand, a negative covariance of EER_t and $CEER_t$ will always make the bracketed expression positive; a negative covariance term is sufficient to conclude that a peg to the numeraire currency dominates a peg to that basket. Thus, this methodology requires only the calculation of this one expression.

The comparison of this nature is an empirical matter. It is, however, generally true that the covariance term will be sufficiently positive for a reasonably sensible currency basket, including the SDR, 1/ so that the bracketed expression $[Var(CEER_t)-2Cov(EER_t, CEER_t)]$ will be negative. This conjecture is verified by the values of the bracketed expression calculated for the same group of seven countries as in Table 1 using the U.S. dollar as the numeraire (Table 2). Although no firm conclusion can be drawn from this exercise because of the arbitrary choice of EER, 2/ the results are indicative of the tendency that a peg to the SDR was (or would have been) more effective in minimizing the variance of EER than a peg to the U.S. dollar as evidenced by the negative values of the bracketed expressions for all seven countries. This result is consistent with those of more comprehensive studies done in the Fund. 3/

1/ This is the case because the SDR includes the five largest trading countries and many currencies are pegged to the U.S. dollar or the French franc.

2/ The weights used in the EER index are those maintained by the Research Department of the Fund. It should be emphasized that the use of these weights is strictly for an illustrative purpose.

3/ See the studies by Gerakis and Roncesvalles (1975) on 19 Middle Eastern countries, by Crockett and Nsouli (1977) on some 100 countries, and by Lanyi and Suss (1982) on 118 countries.

Table 2. Relative Performance of the Five-currency SDR Basket in Selected SDR-Peg Countries 1/

	[Var(CEER) - 2 Cov(EER, CEER)] 2/							Memorandum item:
	Burma	Jordan	Kenya	Malawi	Mauritius	Seychelles	Zambia	Var(CEER)
January 1976 - December 1978	-0.47	-0.33	-0.27	-0.11	-0.19	-0.19	-0.29	0.25
January 1979 - December 1981	-0.24	-0.32	-0.48	-0.40	-0.56	-0.46	-0.48	0.22
January 1982 - December 1984	-0.38	-0.39	-0.65	-0.79	-0.79	-0.69	-0.65	0.23

1/ All expressed in basis points.
2/ The currency shares on January 1, 1981 are used throughout the period; the country weights in effective exchange rate indices are those maintained by the Research Department of the Fund.

b. Effect of the recomposition of the SDR basket

The SDR basket was changed from a 16-currency basket to a 5-currency basket in January 1981. It is thus interesting to assess the impact of this compositional change on the performance of the SDR basket as a proxy for the ideal basket in the context of these countries.

By inspecting equation (29), we again note that the first term is independent of a choice of a particular basket. The comparison can therefore be based only on the respective values of the bracketed term under the two alternative SDR baskets: if the value of the expression is algebraically smaller under one basket, that basket can be said to have been (either actually or counter-factually) more effective in minimizing the variance of the target variable than the other basket, given the particular choice of EER.

Table 3 reports the values of the bracketed expression based on the original 16-currency SDR basket 1/ for the same group of seven countries. A comparison with the corresponding figures for the 5-currency basket reported in Table 2 reveals no evidence that the shift in the composition of the SDR basket in 1981 had any significant impact on the performance of the SDR peg in any of the seven countries.

VII. Issues in the Operation of a Basket Peg Policy

Even if the composition of the basket has been determined and the method of administration decided, there are some operational issues to be resolved. This section reviews some major issues relating to the conduct of the basket peg policy.

1. Public disclosure of the currency basket

The first thing the authorities must decide is whether or not they should disclose the composition of the currency basket. If the composition of the currency basket is known (as in the case of the SDR), there is a possibility for speculative activities in the foreign exchange market. To see this, suppose that the monetary authorities quote the exchange rate once a day. Then if foreign exchange dealers constantly monitor exchange rate developments abroad, they can potentially make profits by engaging in either short selling or short buying based on the exchange rate that is likely to be quoted by the authorities on the next day. It is for this reason that most of the tailor-made currency baskets are publicly undisclosed in practice. 2/

1/ This ignores the minor reconstitution of the original 16-currency basket that took place in July 1978.

2/ Norway and Sweden constitute notable exceptions.

Table 3. Relative Performance of the Sixteen-Currency SDR Basket in Selected SDR-Peg Countries 1/

	[Var(CEER) - 2 Cov(EER, CEER)] 2/							Memorandum Item:
	Burma	Jordan	Kenya	Malawi	Mauritius	Seychelles	Zambia	Var(CEER)
January 1976 - December 1978	-0.39	-0.29	-0.25	-0.13	-0.19	-0.19	-0.25	0.13
January 1979 - December 1981	-0.21	-0.33	-0.53	-0.41	-0.63	-0.51	-0.53	0.33
January 1982 - December 1984	-0.40	-0.40	-0.74	-0.90	-0.92	-0.78	-0.72	0.36

1/ All expressed in basis points.
2/ The currency shares on July 1, 1974 were used throughout the period; the country weights in the effective exchange rate indices are those maintained by the Research Department of the Fund.

Even if the basket is undisclosed, however, it is in principle possible to calculate the currency shares by obtaining a large enough number of observations of the movements in the exchange rate of the home currency against all other currencies. Thus, if the scope for speculative activities is to be eliminated more fully, it is not sufficient to keep the basket undisclosed. It is also necessary to make sure that the systematic functional relationship between the home currency and others is less than exact, so as to prevent dealers from successfully guessing the composition. This can be done by maintaining variable margins on either side of parity in terms of the intervention currency.

Although keeping the basket undisclosed with a margin will minimize speculative activities, however, it may also lead to a loss of monetary discipline and credibility. In contrast, the clearly announced policy of pegging the home currency to a well disclosed currency basket (such as the SDR) will have the benefit of imposing firm monetary discipline and bring credibility to its monetary policy and the value of its currency. This may be a particularly important consideration for a small undiversified economy. 1/ From this point of view, an alternative way of minimizing speculative activity is to disclose the basket but to set a spread between the official buying and selling rates in order to increase the cost of such transactions. However, it should be remembered that such a practice--which amounts to an exchange tax--would result in inefficient allocation of foreign exchange. 2/ In this context, the principles established by the Fund dictate that the spread not be more than 2 percent; otherwise, it constitutes a multiple currency practice. 3/

2. Exchange rate quotations and forward facilities

The only way of completely eliminating speculative activities is to stand ready to support the par value of the currency at the prevailing market exchange rates at all times. Such a practice may turn out to be costly, since it requires constant updating of exchange rate quotations. However, this additional cost may not be justified in some small economies where, because of the limited nature of the foreign exchange market, the monetary authorities can exercise a considerable degree of surveillance.

1/ This line of argument was first given by McKinnon (1963).

2/ This is not to suggest that the optimal spread--reflecting the price of dealer services--that would result under perfect competition is zero (see Demsetz (1968)). However, the spread under perfect competition is likely to be very small, as attested by the average spread of significantly less than 0.1 percent that has been recently observed among major currencies.

3/ Selected Decisions: 11th Issue (1985), International Monetary Fund, (Washington D.C.) p. 273.

Institutionally, the adoption of a basket peg also presents a new environment to a country that is accustomed to a single currency peg. This may pose a new problem to those countries whose currencies are not traded in forward markets if some traders desire such facilities. This environment contrasts with that under a single currency peg where forward transactions could be in principle conducted in terms of the intervention currency (with which the home currency is convertible at a fixed parity). For such a country the standard basket method may prove to be particularly advantageous, since under that method it is in principle possible to hedge against exchange risk by forward transactions in the currencies included in the basket, provided that a well functioning forward market exists for all of them in terms of the intervention currency. One can then purchase or sell the home currency forward against the intervention currency by purchasing or selling the component currencies in their exact composition in the basket, i.e., the hypothetical level of the (nonmarket) forward rate of the home currency at t for a delivery at t + 1 is given by:

$$ {}_tF_{t+1} = \Sigma\, x_j({}_tF_{jt+1}) \qquad (30) $$

where ${}_tF_{jt+1}$ is the level of the jth (market) forward rate at t for a delivery at t + 1 in terms of the U.S. dollar. This can be done by traders themselves or such facilities can be provided at little cost by the monetary authorities. 1/ If there is no uncertainty as to the precommitment of the authorities to the declared par value of the currency in terms of the chosen standard basket, commercial banks may be willing to provide such facilities; such an incentive may be even greater for the SDR basket. This option, however, is not available for the adjustable basket method.

This type of consideration also suggests that the currencies that are included in the basket not only be traded widely but also have active forward markets in terms of the intervention currency. Thus, the number of currencies in the basket may have to be reduced substantially if the provision of forward facilities is one of the essential requirements. The resulting basket may well closely resemble the 5-currency SDR basket in some instances.

3. Width of margins

A minimum margin on either side of parity (defined in terms of the intervention currency) is needed if exchange rates are quoted on a less than continuous basis; otherwise, continuous exchange rate developments

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1/ See Miller (1973) for a discussion on the mechanics of such operations.

in foreign markets will force the quoted rate to differ from the actual exchange rate. Since recent experience with flexible exchange rates among major currencies suggests that the daily percentage change between any two currencies has rarely exceeded 2 percent (except on a few occasions when there was significant "news") a maximum daily percentage change of the average of bilateral exchange rates in terms of the intervention currency under ordinary circumstances is expected to be much smaller than 2 percent. Therefore, a margin of 2 percent should be more than sufficient in this regard.

A country under a basket peg may want to maintain a wide margin for a more substantive reason, namely, in order to retain some degree of monetary discretion. If a margin is explicitly introduced, the exchange rate rule of the type given by equation (5) becomes:

$$s_t = \Sigma\, c_j s_{jt} + \mu_t \qquad (31)$$

where μ_t is the margin. Then the money supply constraint (14) becomes:

$$m_t = \Sigma\, c_j p_{jt} + \alpha\, \Phi_t + z_t + \mu_t \qquad (32)$$

where the last term is a discretionary element of money supply. 1/ To see why such discretion may become desirable, assume that the policy objective is defined by the loss function: 2/

$$L \equiv \lambda\, \mathrm{Var}(EER_t) + (1-\lambda)\mathrm{Var}(Y_t) \qquad (33)$$

1/ Some countries have introduced a much wider margin (of 7-10 percent on either side of parity) for a yet another reason, namely, in order to retain a close currency link with the intervention currency for historical or operational reasons. With a wide margin, the U.S. dollar rate of the home currency, for example, can be kept unchanged for a substantial period of time as long as it is within the prescribed margin on either side of parity; this type of use of a wide margin renders a basket peg arrangement a de facto dollar peg with a built-in automatic adjustment mechanism. The danger is, of course, that such a system is subject to periodic speculative attacks whenever the dollar exchange rate comes close to the margin limit. According to the 1985 edition of the Annual Report on Exchange Arrangements and Exchange Restrictions, the currencies of such countries (e.g., Bahrain, Qatar, Saudi Arabia, and United Arab Emirates) are classified as maintaining "limited flexibility with respect to a single currency."

2/ Bhandari (1985b).

where EER and Y are two target variables, λ indicates the importance the authorities attach to the stabilization of the first and $(1-\lambda)$ the stabilization of the second. Further assume that the second variable (such as output) is subject to the level of money supply during the current period according to:

$$Y_t = Y\ (M_t,\ \ldots) \tag{34}$$

where the ellipses refers to other unspecified variables. Then, provided that $\lambda \neq 1$, the optimization of the objective function (33) will be likely to result in a nonzero optimal value of μ . In the extreme case where $\lambda = 0$, a regime of flexible exchange rates is to be adopted. 1/

4. Discrete adjustments in the basket

Although an overvalued exchange rate can be sustained for a long period of time by external borrowing, use of reserves, or exchange restrictions, it can not continue indefinitely. If the course of monetary policy is not consistent with the monetary discipline implied by a fixed nominal peg, for example, discrete adjustments in the level of the exchange rate will become necessary from time to time. Similarly, when there are fundamental changes in real variables (e.g., a change in competitiveness caused by productivity changes), such discrete adjustments may also become necessary.

Even if underlying conditions do not warrant a change in the level of the exchange rate, its variance structure may need to be changed as the relevant measure of the effective exchange rate is altered by a structural change in the pattern of trade; this calls for adjustments in the currency shares in the basket. 2/ To see this, we can express a change in the effective exchange rate as:

$$d\ EER_t = \Sigma\ (\hat{c}_{jt}-c_{jt})\ ds_{jt} + \Sigma\ s_{jt}\ (d\hat{c}_{jt}-dc_{jt}) \tag{35}$$

The second term in this expression indicates that, for a given level in the bilateral exchange rates, the effective exchange rate will be altered if the actual currency shares deviate from the initial shares (as is likely under the standard basket method) or if the optimal currency shares deviate from their initial values owing to a change in the pattern of trade. It should be noted, however, that this rationale for periodic

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1/ Provided that EER and Y are independent.

2/ For example, Finland and Mauritania make adjustments in the currency weights every three months, and Sweden once a year; similarly, during the real peg policy of 1979-1982, New Zealand made adjustments every three months.

adjustments in the currency basket rests on the crucial assumption that the initial currency shares were somehow close to the optimal currency shares. If this assumption is not valid, a change in the optimal shares or the actual shares may increase or decrease the variance of EER.

5. Stability versus discretion

While the foregoing discussion has pointed out the usefulness of discretion in the conduct of a basket peg policy, its limitations must also be recognized. Recent developments in macroeconomics cast doubt on the effectiveness of discretionary monetary policy in affecting the long-run values of such real variables as output and employment. Moreover, it has been argued that, under conditions of long-run monetary neutrality, rule-governed monetary policy may be superior to discretionary monetary policy, as it could lead to a lower rate of inflation; in this context, the importance of monetary stability and credibility is stressed. 1/ Although the debate on the effectiveness of discretionary monetary policy is still an open issue, it should be recognized that the usefulness of such policy may be particularly limited in small open economies that are typically subject to real and external disturbances. Moreover, the benefit of having a stable store of value defined over foreign goods may become important for such undiversified economies. 2/ Thus, the temporary benefit of using a wide margin in pursuit of discretionary monetary policy should be weighed against the loss of monetary stability and credibility particularly in small countries. 3/

In one sense, a policy of maintaining wide margins can be said to combine the worst features of a rigid peg and free floating without having the benefit of either. Since such a policy leaves the mix of a change in the exchange rate (Δs_t) and a change in the money supply (Δm_t) up to the discretion of the monetary authorities, it introduces uncertainty about both variables and a greater scope for policy errors. Under both a rigid peg and free floating, on the other hand, the monetary authorities have discretion over only one of the two variables: under a rigid peg, once Δs_t is determined, Δm_t becomes endogenous; and under free floating, once Δm_t is determined, Δs_t is left to market forces.

This type of argument can be also made about the wisdom of making discrete adjustments either in the level or in the composition of the basket. The usefulness of such actions must therefore be weighed against the cost of not having a stable external standard. If the country's macroeconomic policy results in frequent devaluations, for example, a basket peg

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1/ See, for example, Barro and Gordon (1983).

2/ McKinnon (1963).

3/ Sweden announced in June 1985 that it had decided not only to disclose the width of margins for the first time but also to narrow the margin from (the previously unannounced) 2 1/4 percent to 1 1/2 with the objective of reducing uncertainty regarding exchange rate fluctuations.

may not be the right exchange rate system for the country; a crawling peg, or free floating might be considered instead. As to adjustments in the composition of the basket, given the nature of any basket as a proxy, a greater weight should be attached to the contribution of a stable external standard to monetary credibility; thus, an adjustment in the composition of the basket should be made as infrequently as possible and only when a substantial structural change has taken place. 1/

VIII. Conclusion

This paper has reviewed major conceptual and operational issues relevant to the choice and administration of a basket peg arrangement. In addressing conceptual issues that are discussed in the theoretical literature, an attempt has been made to emphasize their practical implications; and in addressing operational issues that have emerged in the recent administration of the basket peg arrangement, an attempt has been made to emphasize their theoretical contents. Although it is not possible to summarize the entire paper that is in itself a summary, some of the key points may be briefly highlighted in the following paragraphs.

First, given the inflexibility of relevant nominal prices, pegging the home currency to an appropriately weighted average of nominal exchange rates may be effective in stabilizing fluctuations in a relevant target variable in the short run. Moreover, in making the choice of an appropriate effective exchange rate, policymakers may want to emphasize a simple relative price variable (e.g., the real exchange rate and a measure of competitiveness) among the hierarchy of various macroeconomic target variables because the impact of exchange rate changes on such a relative price variable can be more readily monitored. The contribution of nominal exchange rate pegging based on the relative price variable to the overall exchange rate policy can be reviewed over the medium term on the basis of a more conventional target variable (e.g., the balance of trade).

Second, the use of simple bilateral trade weights in the design of a currency basket, while common in practice, has some conceptual limitations, owing to the possible presence of third country effects and exchange rate movements that are correlated in a systematic fashion. However, as a practical matter, the use of such weights can be appropriate when the target variable is the short-run real exchange rate.

Third, the constraint of a basket peg on the price level and monetary policy over the medium term is as binding as that of a single currency peg. The empirical evidence based on a group of seven countries indicates that a stable basket peg arrangement requires the maintenance of a price

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1/ *The Fund's policy of reviewing the composition of the* SDR basket every five years is consistent with this type of stability consideration.

level that is consistent with the rule-determined price level. In this context, if the financial policies of the country are incompatible with a fixed nominal peg rule, a more flexible exchange rate policy (such as a crawling peg and free floating) may be preferred.

Fourth, a nominal peg policy, i.e., a policy of fixing the nominal effective exchange rate, is preferable to a real peg policy, given the conceptual and practical limitations of the latter. Such a nominal peg policy can be conducted either by the "standard" basket rule or by the "adjustable" basket rule. The advantage of the former is its ability to provide forward facilities, while the advantage of the latter is its ability to maintain the predetermined currency shares indefinitely. In practice, the "adjustable" basket rule can be administered by pegging to the geometrically weighted index.

Fifth, various operational considerations may dictate that the number of currencies in the basket be limited. In situations where some currencies are to be excluded, the shares of the remaining currencies should not be increased equiproportionately, but the shares of only those currencies that are expected to be positively correlated with the excluded currencies should be increased.

Sixth, although an SDR peg is conceptually inferior to the tailor-made basket peg, it may have some operational advantages. The benefit is even greater if many countries simultaneously decide to peg to the SDR and thus create a sizable currency area. In this context, there is no evidence to show that a change in the composition of the SDR basket in 1981 from sixteen to five currencies had any adverse impact, based on a group of seven countries.

Seventh, policymakers may want to retain the benefit of discretionary monetary policy by keeping the basket undisclosed, maintaining wide margins on either side of parity, and making frequent discrete adjustments either in the level or in the composition of the basket. For small undiversified economies, however, the benefit of monetary discretion should be weighed against the cost resulting from the absence of a stable store of value defined over foreign goods and of monetary discipline and credibility.

APPENDIX

Some Practical Considerations on Trade Statistics

Although it was assumed in the text that bilateral trade shares (d_j's), which formed the basis for deriving the currency shares (c_j's), were somehow given, they must be in practice obtained from the actual trade data. The appendix, while not intended to be comprehensive, surveys some practical considerations on a wide range of issues relevant to that process.

1. Special trade items

Since the objective of pegging policy is to minimize the real effect of exchange rate movements, those trade items that are not responsive to exchange rate movements should be deleted from the trade data. Barter trade (Black (1976a)) and imports that are tied to foreign aid are two prime examples of such trade items. Similarly, re-exports and their counterpart imports may be excluded under certain circumstances, to the extent that they involve little domestic content.

2. Hedged trade

Since the short-run currency risk can be eliminated by a forward contract, 1/ Black (1976a) has argued that the portion of trade that is hedged should be excluded from the trade data. 2/ In addition to the feasibility problem resulting from the absence of disaggregated data on forward contracts, 3/ this line of thinking has some conceptual limitations. To see this, think of the forward exchange rate as:

$$ {}_tf_{t+1} = E_t(s_{t+1}) + \psi_t \qquad (36) $$

where ${}_tf_{t+1}$ is the log of the forward exchange rate (in terms of the U.S. dollar) at time t for a delivery at t+1, E_t is a mathematical expectations operator based on all information available at t, and ψ is a risk adjustment term. 4/ Equation (36) says that the forward exchange rate incorporates the expected future spot rate. It is clear from this that,

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1/ Forward transactions can also be replicated by spot transactions with simultaneous operations in the bond market. See Fama and Farber (1979).

2/ It should be recognized that Black (1976a) has also argued that, with respect to the (more important) long-run variance of traded goods prices, hedging is irrelevant.

3/ Little is known about the proportion of covered transactions in total trade flows. According to one estimate based on a few European countries, the proportion was about 7 percent in the late 1960s. See McKinnon (1979), pp. 98-99.

4/ See, for example, Stockman (1978).

although a forward cover will eliminate the currency risk during the contract period, it can not eliminate fluctuations in the forward rate itself. If fluctuations in the spot rate are undesirable for one reason or another, so must be fluctuations in the forward rate. Thus, even if detailed data on forward contracts were available, there would be some reservation about excluding tranactions that are covered in the forward market, unless the concern of policymakers were strictly with the unanticipated short-run currency risk.

3. Homogeneous goods

The treatment of homogeneous goods in the trade statistics presents a unique problem. This is so because the elasticity of substitution among the same class of goods of different origins is large, and consequently there is strong pressure for domestic prices of homogenous goods to be equated across countries once adjusted for the exchange rate. In terms of the earlier notation, we have in the extreme case the following law of one price:

$$(p_j - s_j) = (p_i - s_i) \quad \text{(for all j and i)} \tag{37}$$

where p's are individual commodity prices. In this case, nominal exchange rate pegging has no effect. Although the extreme law of one price may, in practice, be violated to varying degrees, it probably characterizes the general tendency of the prices of homogeneous goods to be equated over time. Therefore, as Crockett and Nsouli (1970) have argued, homogeneous goods should generally be excluded from the trade data. 1/

4. The direction of trade vs. the currency of denomination

It has been a point of major disagreement whether the direction of trade or the currency of denomination should be used to obtain the weight of a particular currency. This disagreement is in part a result of the

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1/ Belanger (1976) and Williamson (1982) have argued that the larger substitution effect present in homogenous goods would result in a more pronounced third market effect, and therefore, that the export (import) shares relevant to homogeneous goods should be based on the share of each importing (exporting) country in the world market. In this context, it is important to distinguish the effectiveness of exchange rate pegging policy from the choice of an appropriate effective exchange rate index. It may be true that a change in a third country's exchange rate has a pronounced impact on an exporter (or importer) of primary goods, and to this extent, that country's exchange rate should be included in the effective exchange rate index. But, to the extent that the law of one price holds, that impact is independent of a choice of a particular pegging arrangement. Hence, homogeneous goods should be excluded, although they are relevant to the choice of an effective exchange rate index.

failure to recognize the currency contract issue as part of a competitive pricing mechanism in the presence of risk. As Magee (1973) pointed out, economic rationality implies that exporters should generally prefer contracting in currencies that are expected to appreciate and importers in currencies that are expected to depreciate. 1/ Once the terms of the contract are determined, however, both importers and exporters must be indifferent between contracts denominated in one currency and those in another; otherwise, the price expressed in a particular contract currency can not be the equilibrium price. For example, if the contract is in a currency that is expected to appreciate, the contracted price must reflect a risk discount if the importer were to accept it willingly. 2/

Abstracting from the pricing of risk, this irrelevance principle can be shown in the following manner. Suppose that, in invoicing a trade contract with the home country, the j^{th} country can use either its own currency or a vehicle currency (e.g., the U.S. dollar). In the first case, the contract price in the j^{th} currency ($\bar{p}_{jt+1}$) is given by:

$$\bar{p}_{jt+1} = \Pi_j(E_t p_{jt+1}) \tag{38}$$

which states that the contract price, i.e., the future delivery price the j^{th} country expects to receive (or pay), is a function of the expected

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1/ A currency of denomination is a concept distinct from that of a currency of payment (or settlement). As Grassman (1973) was the first to point out, most interbank transfers are transacted in U.S. dollars, regardless of whether the United States is directly involved in the transactions or whether the contracts are denominated in U.S. dollars. As Krugman (1980) has shown, this predominance of the U.S. dollar as a currency of payment may be explained by the efficiency of having a single medium of exchange in international transactions, just as the use of a single currency reduces the cost of transactions in the domestic economy. What is instead meant by a currency of denomination is the currency in which trade contracts or invoices are denominated.

2/ This irrelevance principle, first developed in Rao and Magee (1980), implies that one should not, in general, expect a systematic pattern by which the currency denomination of a trade contract is determined. Rao and Magee further argue that this is statistically consistent with Grassman's law, i.e., there is a tendency for trade contracts among industrialized countries to be denominated in the sellers' currencies, as documented by Grassman (1973), Carse, Williamson and Wood (1980), and others. There are, however, specific circumstances under which one currency may be preferred to another, including the existence of a central world market (as in homogeneous goods), non-convertible currencies, and the absence of needed institutions (such as a market for bankers' acceptances) in a particular currency.

future price level in that country. In the second case, the contract price in dollars ($\bar{p}_{1t+1}$) is given by:

$$\bar{p}_{1t+1} = \Pi_j(E_t p_{jt+1}) - E_t s_{jt+1} \qquad (39)$$

which states the idea that, in specifying the contract price in a vehicle currency, the expected exchange rate between that currency and the j^{th} currency is incorporated in such a way as to maintain the desired receipt (or payment) in the j^{th} currency. It can be easily verified that, from the point of view of the home country, the two cases will yield the same expected home currency price.

The irrelevance principle is that, in the absence of risk, the expected future prices in any currency will be invariant to the choice of a particular denomination currency, and that the expected price level in the price setting country will be the dominant determining factor. Thus, the direction of trade is the relevant criterion in determining the relative importance of a currency in external transactions, unless policymakers are once again concerned strictly with the unanticipated currency and contract risk in the very short run.

5. Entrepôt trade

Even if the direction of trade is chosen as the criterion, its application may not be always clear cut. An interesting problem arises when a country imports (or exports) through a third country intermediary, such as a regional trading center or a multinational corporation based in a third country. The question becomes whether the trade share should be based on the intermediary country or on the country of origin (or destination). The crucial issue here is which of the two countries can be considered more appropriately as the price setter; thus, the choice is an empirical matter. 1/

6. Long-term contracts

Some primary producing countries enter into long-term contracts that specify both the volume and the price (in a vehicle currency) of their exports from the following year's crop. The question then becomes whether homogeneous goods should be still excluded and, if not, whether the currency of denomination criterion should be used instead.

1/ Hypothetically, if Fiji imports goods from the Bahamas through the United States, it is probably safe to say that for both the exporter and the importer, the United States is the relevant country.

In the presence of nominal long-term contracts, the law of one price can not be expected to hold as long as those contracts are honored. Moreover, pegging the home currency to the currency in which the long-term contract is denominated would eliminate fluctuations in the export receipts expressed in local currency. Thus, if the primary concern of policymakers is with the unanticipated currency and contract risk in the short run, the share of the country whose currency is used as the vehicle currency should be included.

However, if the concern of policymakers is with the medium-term resource allocation resulting from relative price changes, the expected future price of the export good, which affects production decisions, will become important. Moreover, to the extent that the expected future price is reflected in the current contract price, the law of one price must hold on an expected value basis. Thus, a long-term contract is not effective in influencing either the expected relative prices of homogeneous goods or productions decisions. 1/ Given the medium-term objective, therefore, homogeneous goods should be excluded irrespective of long-term nominal contracts.

7. Tourism

Tourism services differ from other heterogeneous traded goods in that their domestic price has a greater degree of "stickiness" even in a small country, particularly if the substitutability with other countries is low. In this respect, the price of tourism services (p_R) is much like the price of nontraded goods (p_N): p_R is often set in domestic currency prices. Despite this difference, however, tourism can be treated in the same way as any other heterogeneous good whose price is set in foreign currency terms. To see this, we can express the bilateral relative price relevant to tourism as:

$$r_j = [p_R+(s_j-s)] - p_{jT} \qquad (40)$$

where the first term is the foreign price of tourism services (the price of which is fixed in domestic currency) and the second the foreign price of competing traded goods. When both p_R and p_{jT} are fixed in their respective domestic currency prices, this relative price term can be interpreted either as a measure of competitiveness (of the tourism sector) or as the real exchange rate (by replacing p_R with p_N). Thus, the possibility that p_R may be fixed in domestic currency terms is immaterial to the way tourism services should be treated.

1/ Long-term contracting is a scheme to transfer risk from the exporter to the importer. Production decisions may be altered to the extent that second or third moments of the future prices matter.

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