SERIE RESEARCH MEMORANDA

EXCHANGE RATE POLICIES FOR
LESS DEVELOPED COUNTRIES

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Acknowledgments

First of all I would like to acknowledge my gratitude to Professor Hans Linnemann, who stimulated me constantly and whose activity as a 'fund raiser' made it possible to begin and complete this study.

I am also grateful to Professor Hans Visser, who provided me with some valuable advice especially on section 2.

That it is much easier to read English than to write in it became clear after Peter Wilms van Kersbergen corrected and improved my English manuscript.

Finally I would like to thank Hanneke Lambert for typing the manuscript.

The cooperation of those mentioned above as well as of the many others who contributed to this Research Memorandum does not alter the fact that I remain solely responsible for its content.

P.L.C. Hilbers
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1. INTRODUCTION

The main aim of this study is to give a survey of both the theory and practice concerning LDC exchange rate arrangements. In 1973 the last stage of the gold exchange standard of Bretton Woods, the system of fixed parities, ceased to exist. This implied that it was no longer possible for an individual country to fix its exchange rate completely, i.e. to maintain fixed rates expressed in all other currencies. As Branson and Katseli (1981-b) put it: "Thus in the system begun in the early 1970s 'the very concept of a fixed exchange rate is unclear' (p.1).

The monetary authorities can now choose between a number of new forms of exchange rate policy. It turned out that most of the developed countries preferred independently floating exchange rates or a cooperative exchange arrangement (Snake, EMS). Among LDCs these alternatives proved not to be very attractive and most of these countries pegged their currency to a single (key) currency or to a currency basket.

In section 2 we will review the different forms of exchange arrangements after 1973. This will be followed, in section 3, by an analysis of the theoretical arguments concerning the choice of an exchange rate regime. We will not deal with the question of what exchange rate regime, if adopted on a world-wide scale, would provide the greatest benefits. For a single country, the exchange rate policy of other countries is considered as given. This assumption is certainly a realistic one for LDCs. Each LDC must select its own exchange rate policy given the prevailing global system, which can be characterized as generalized floating for the present.

We have also abstracted from the variety of trade and exchange restrictions in LDCs. The result of these restrictions will generally be that the actual impact of an exchange rate regime on the domestic economy will be less than we would expect on purely theoretical grounds. However, this does not imply that economic theory is not of use in the process of selecting an exchange rate regime. On the contrary, restrictions may become less necessary, or even redundant, under a well-selected exchange arrangement.
An increasing number of LDCs peg their currency to a currency basket. Within the category of currency basket pegs, the share of SDR pegs remains moderate. Most LDCs prefer to compile an individual basket instead of using the SDR as a standard for their exchange rates. This is why we put so much emphasis on the composition of an 'optimal' currency basket in section 4. In that section we will present a survey of the ever-growing literature on this subject.

The final section contains a summary and conclusions.
2. EXCHANGE RATE POLICY AFTER 1973

2.1 The breakdown of the Bretton Woods system

During the Bretton Woods era there were in general only two kinds of exchange rate policy possible. A country could either peg its currency to the gold-backed dollar and thereby to all other currencies, or it could decide to float against the bloc of other currencies. Very few countries opted for the latter alternative.

After the 1940s during which a number of currencies devalued against the dollar, a period of relatively stable exchange rates began. In general we can say that interest in exchange rate theory and policy was relatively low in those years. According to the Articles of Agreement of the IMF, the rates could only be changed in the case of a 'fundamental disequilibrium', a concept that was not further specified. In the case of a balance of payments deficit the Fund preferred measures of internal adjustment to exchange rate changes. However, especially LDCs could not always avoid exchange rate adjustments, which gave rise to the opinion that they should be looked upon as 'the poor man's means of adjustment' [Södersten (1981, p. 444)].

At the end of the 1960's it became clear that certain currencies were over(under) valued. Together with some other factors, of which the lack of confidence in the dollar was the most important one, this led to the gradual decline of the gold exchange standard in the years between 1968 and 1973.

In March 1973 the monetary authorities in Europe agreed to cease their systematic dollar interventions at the maximum fluctuation margins. They tried to keep their currencies together by the so-called Snake arrangement. However, it turned out that only the deutsche mark, the Netherlands guilder and the Belgium/Luxemburg franc were relatively stable in terms of each other. The other currencies entered and left the arrangement, sometimes even more than once.

1) The Canadian dollar had a floating rate from October 1950 till May 1962. The Libanon pound, the Mexican peso, the Thai baht and the Philippine peso also floated for some time, Cf. Yeager (1976, pp. 220, 543-565) and Crockett and Nsouli (1977, p. 127).
The exchange rate system prevailing since 1973 is often described as generalized floating, because the main currencies are floating in relation to each other. However, this does not mean that all currencies are floating since that time. In fact, most of the world's currencies and a vast majority of currencies of LDCs are tied to some sort of standard (see Tables 2-A/F). However, an important difference with the situation before 1973 is that nowadays countries must choose their exchange rate policy against a background of floating rates. The rates between the principal currencies (U.S. dollar, yen, deutsche mark and pound sterling) have been very volatile since 1973. Mainly in order to mitigate the effects of these fluctuations on the domestic economy, new forms of exchange rate policy became popular, in particular among developing countries.

2.2 New alternatives

In a world of floating rates there are three basically different ways to fix the exchange rate.

1. pegging to a single currency (single currency standard);
2. pegging to more than one currency simultaneously (or a multiple currency standard);
3. pegging to a composite currency (currency basket standard);

The word Standard refers to the kind of exchange rate policy that is being carried out. Under a single exchange standard the domestic currency is pegged to a standard currency and it floats against all other currencies (with the exception of those currencies that are pegged to the same standard currency).

2) In the past the word Standard meant a fixed measure for determining the value of goods and services. The standard consisted mostly of a fixed quantity of a certain commodity (precious metal), in which case we speak about a commodity standard. Just as there are three different kinds of exchange standards, we can make a similar distinction between the three basic forms of a commodity standard: the single commodity standard (e.g. the gold standard), the multiple commodity standard (e.g. bimetallism) and the composite commodity standard, as e.g. proposed by Hart, Kaldor and Tinbergen for UNCTAD 1964 [For a description, see Johnson (1967, pp. 229-236)]. This shows that both exchange and commodity standards can be divided according to the same principle: pegging to one currency/commodity, pegging to more than one currency/commodity and pegging to a composite currency/commodity.
A somewhat different situation exists in the case of a multiple currency standard. Here, the domestic currency is pegged to different currencies at the same time. This is only possible when all the currencies involved are mutually pegged to each other. An arrangement according to which a group of currencies is connected by a system of bilateral parities is also called a cooperative exchange rate arrangement. A well-known example of such an arrangement is the EMS.

The third type of standard is only relevant in a situation of floating rates. Under fixed rates maintaining a currency basket standard makes no sense, since the value of the basket in terms of the basket currencies is stable in that case. We should keep in mind that pegging to a basket is equivalent to stabilizing an effective exchange rate. We will come back to this later, when we analyze the composition of currency baskets. Within the class of currency basket standards we can make a further subdivision into individual basket standard and official basket standards. In the first case the composition of the basket is determined by an individual country according to its own preferences, while in the second case an official basket, compiled by an international organisation, is used. Examples of official baskets are the SDR and the ECU.

The three basic forms which we have described above refer to the character of the peg. Apart from the character, another important aspect is the rigidity of the peg. In order of decreasing rigidity, we can make a distinction between:

1. complete fixation;
2. limited flexibility;
3. managed floating;
4. independent or free floating;

However, we must keep in mind that the borderlines between the different categories are hard to establish. All three forms of exchange rate pegging can go together with these degrees of fixation. It is obvious, however, that in the case of completely independent floating we can no longer speak of an exchange standard being maintained.
When we now compare the situation before 1973 with the one after 1973 we may conclude that there has been an extension both in the character and in the rigidity of exchange rate arrangements. Before 1973 there existed only one possible kind of peg, i.e. a peg to the key currency (dollar), and the rigidity of this peg was prescribed by the IMF Articles of Agreement (margins of 1 per cent around the dollar parity). The only other possible exchange rate policies were managed or independent floating against the bloc of other currencies.

After 1973 new forms of exchange rate policy became possible, such as cooperative exchange rate arrangements and currency basket standards. The possibilities of varying the rigidity of a peg were widened as well (see Table 1).

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Classification of exchange rate regimes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1973, under the system of Bretton Woods</td>
<td>After 1973, under generalized floating</td>
</tr>
<tr>
<td>kind of fixation</td>
<td>kind of fixation</td>
</tr>
<tr>
<td>1. pegging to the key currency (dollar) or gold</td>
<td>1. pegging to a single currency</td>
</tr>
<tr>
<td>2. joining an exchange rate arrangement</td>
<td></td>
</tr>
<tr>
<td>3.a. pegging to an official basket</td>
<td>3.b. pegging to an individual basket</td>
</tr>
<tr>
<td>rigidity of fixation</td>
<td>rigidity of fixation</td>
</tr>
<tr>
<td>1. margins of 1 percent around the official parity*</td>
<td>1. fixation with very narrow margins</td>
</tr>
<tr>
<td>2. managed floating against the bloc of other currencies</td>
<td>2. limited flexibility</td>
</tr>
<tr>
<td>3. independent floating against the bloc of other currencies</td>
<td>3. managed floating</td>
</tr>
<tr>
<td>4. independent floating</td>
<td></td>
</tr>
</tbody>
</table>

* After a short period of floating the margins were widened to 2.25% by the Smithsonian Agreement that was signed in Washington in December 1971.
2.3 Recent developments and the present situation

In the preceding section we discussed the various possible exchange rate regimes in a world of generalized floating. But how important are these regimes in real life and what developments have taken place since 1973?

In Tables 2-A/F an overview of exchange rate arrangements of IMF member countries is presented for the period 1973-1983. In Tables 2-A/B all countries are classified, while in Tables 2-C/D and 2-E/F we have made a further distinction between LDCs and industrial countries respectively3).

In order to give an idea of the importance of the different exchange arrangements two measures can be used. The first one is the number of countries that maintain a certain exchange standard4). We have used this measure in the Tables 2-A/C/E. However, this measure has two serious drawbacks. It does not make any distinction between the size of countries, nor does it take account of the fact that in the period under examination a considerable number of small LDCs joined the IMF. This is the reason why we have introduced another measure for analyzing developments in the use of exchange arrangements.

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3) We have adopted the classification described in IMF-World Economic Outlook 1983, pp. 168-69.

4) See e.g. recent issues of IMF International Financial Statistics (Table of Exchange Arrangements) and issues of IMF Exchange Arrangements and Exchange Restrictions.
TABLE 2-A Exchange arrangements of IMF member countries 1973-1983 (end of year) (number of countries)

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<td>62</td>
<td>59</td>
<td>61</td>
<td>57</td>
<td>52</td>
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<tr>
<td>of which: U.S. dollar</td>
<td>68</td>
<td>65</td>
<td>62</td>
<td>44</td>
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<td>43</td>
<td>41</td>
<td>40</td>
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<td>42</td>
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<td>11</td>
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<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>French franc</td>
<td>14</td>
<td>13</td>
<td>13</td>
<td>14</td>
<td>14</td>
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<td>14</td>
<td>14</td>
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<tr>
<td>other currencies</td>
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<td>4</td>
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<td>4</td>
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<td>4</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Currency basket pegs</td>
<td>6</td>
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<td>27</td>
<td>10</td>
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<td>8</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>5</td>
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<td>of which: SDR</td>
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</tr>
<tr>
<td>individual baskets</td>
<td>6</td>
<td>13</td>
<td>18</td>
<td>16</td>
<td>18</td>
<td>12</td>
<td>18</td>
<td>13</td>
<td>18</td>
<td>14</td>
<td>18</td>
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</tbody>
</table>

Cooperative exchange arrangement

<table>
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</thead>
<tbody>
<tr>
<td>of which: limited flexibility in terms of a single currency**</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>5</td>
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<tr>
<td>adjusted according to a set of indicators</td>
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<tr>
<td>other managed floating</td>
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<tr>
<td>independent floating</td>
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</table>

Total of all countries: 128

TABLE 2-B Exchange arrangements of IMF member countries 1973-1983 (end of year) (market shares)***

<table>
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<tr>
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<tr>
<td>Single currency pegs</td>
<td>21.2</td>
<td>23.1</td>
<td>15.6</td>
<td>14.2</td>
<td>10.6</td>
<td>9.4</td>
<td>7.8</td>
<td>7.1</td>
<td>6.1</td>
<td>5.3</td>
<td>4.5</td>
</tr>
<tr>
<td>of which: U.S. dollar</td>
<td>19.0</td>
<td>21.3</td>
<td>13.5</td>
<td>13.2</td>
<td>13.5</td>
<td>8.1</td>
<td>7.2</td>
<td>6.5</td>
<td>5.6</td>
<td>4.8</td>
<td>3.9</td>
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<tr>
<td>pound sterling</td>
<td>1.3</td>
<td>1.3</td>
<td>0.8</td>
<td>0.6</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
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<tr>
<td>French franc</td>
<td>0.9</td>
<td>0.8</td>
<td>0.5</td>
<td>0.5</td>
<td>0.6</td>
<td>0.5</td>
<td>0.5</td>
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<tr>
<td>Currency basket pegs</td>
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<td>9.6</td>
<td>9.8</td>
<td>9.3</td>
<td>9.4</td>
<td>9.5</td>
<td>9.5</td>
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<tr>
<td>of which: SDR</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>1.4</td>
<td>1.5</td>
<td>1.2</td>
<td>1.6</td>
<td>1.2</td>
</tr>
<tr>
<td>individual baskets</td>
<td>1.2</td>
<td>5.4</td>
<td>8.4</td>
<td>7.1</td>
<td>8.4</td>
<td>8.9</td>
<td>8.0</td>
<td>9.7</td>
<td>9.8</td>
<td>10.4</td>
<td>10.5</td>
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Cooperative exchange arrangement

<table>
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<tbody>
<tr>
<td>of which: limited flexibility in terms of a single currency**</td>
<td>7.6</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
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<td>other managed floating</td>
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<td>independent floating</td>
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</tbody>
</table>

Total of all countries: 97.1

* From 1973 until 1979 this category refers to the Snake arrangement. In later years to the EMS.
** In practice this currency was the U.S. dollar.
*** The category Flexible Arrangement was split up further in subcategories in 1978 and 1982 as a result of the growing importance of this group.

Sources and explanation:

The data about exchange arrangements were taken from IMF Annual Reports on Exchange Restrictions 1971-1978, IMF Annual Reports on Exchange Arrangements and Exchange Restrictions 1979-1981, and IMF International Financial Statistics February 1984. Included are two non-metropolitan territories (Hong Kong and the Netherlands Antilles) for which the respective members have accepted the Fund's Articles of Agreement. The Belgium-Luxembourg Economic Union (BLEU) is represented by one single entry. For one IMF member state, Democratic Kampuchea, there is no information about its exchange rate regime. For the years between 1973 and 1981 the combined market shares are derived from individual market shares as published in the IMF-International Financial Statistics/Supplement on Trade Statistics-Supplement Series no. 4, 1982. The market shares mentioned in this publication on the same date were defined as export shares expressed as a percentage of world imports, these market shares were multiplied by world imports and divided by world exports. By this procedure the market shares in our tables represent export shares expressed as a percentage of world exports. For 1982 the market shares were obtained from the IMF-International Financial Statistics of February 1984 by striking country exports by world exports. For 1983 the market shares of 1982 were used.

The market shares do not sum up to 100 per cent because not all countries are IMF members, due to rounding off, totals may differ from the sum of individual entries.
### TABLE 2-C  Exchange arrangements of LDCs 1973-1983 (end of year) number of countries

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<tbody>
<tr>
<td>Single currency pegs</td>
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<td>91</td>
<td>77</td>
<td>68</td>
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<td>61</td>
<td>57</td>
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<tr>
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Notes and sources see Table 2-B

### TABLE 2-D  Exchange arrangements of LDCs 1973-1983 (end of year) (market shares)

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Total of all countries: 74.3 67.4 66.5 68.0 67.7 66.0 68.0 65.4 67.1 65.6 65.6

Notes and sources see Table 2-B
In the Tables 2-B/D/F the entries are formed by the combined market shares\(^5\) of the countries which conduct a similar exchange rate policy. In the period 1973-1983 the combined market share of new IMF member countries was relatively small. Therefore, in examining trends in exchange rate policy, the bias resulting from the introduction of new members is much smaller when we use market shares than when we use numbers of countries involved.

Table 3 contains an overview of all exchange arrangements in operation at December 31, 1983.

A few additional remarks may be useful.

Independent floating does not imply that there is no intervention at all, it may be that the monetary authorities, in the case of excessive fluctuations or disorderly market conditions, try to smoothen exchange rate movements by intervening in the currency markets. However, when they start buying and selling at a specified rate we no longer refer to this as independent floating. When the central rate is adjusted frequently (every day, every week) this is called managed floating. We speak of limited flexibility when the margins around the central rate are about 2 1/4 per cent. Under a single currency peg the margins are zero and in the case of a basket peg, they are very narrow (mostly less than 1 per cent)\(^6\).

\(^5\) It should be noted that these combined market shares do not reflect the importance of a certain standard currency in world trade. In order to obtain a proper indication of the relative importance of a currency the trade share of the country that issues the standard currency should at least be included as well. Especially in the case of the U.S. dollar, the difference is considerable.

\(^6\) Cf. IMF Exchange Arrangements and Exchange Restrictions 1983, Table 1, note 1 (p. 8). The rules for classification, which depend, inter alia, on the fluctuations margins, may lead to unexpected results. E.g. Saoedi Arabia has pegged its currency to the SDR from March 1975 on [Yeager (1976), p. 608]. However, because the margins were relatively wide, at 7.25 per cent, the Saoedi Arabian riyal was classified into the rest-category from 1975 until 1981, while it was not classified at all in 1982. Nowadays it is classified in the category 'limited flexibility' because of its stable relationship with the dollar. When the market share of Saoedi Arabia, which is about 5 per cent, were to be added to the combined market share of countries that maintain an SDR-peg, this would lead to a completely different view on the importance of SDR-pegs and basket-pegs in general.
## Table 3 Exchange arrangements of IMF member countries

(As of December 31, 1983)*

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</table>

**Includes exchange arrangements under which the exchange rate is adjusted at relatively frequent intervals, on the basis of indicators determined by the respective member countries.

*** Refers to the cooperative arrangement maintained under the European Monetary System.

**** Exchange rates of all currencies have shown limited flexibility in terms of the U.S. dollar.

***** Includes exchange arrangements under which the exchange rate is adjusted at relatively frequent intervals, on the basis of indicators determined by the respective member countries.


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* Excluding the currency of Democratic Kampuchea, for which no current information is available. For members with dual or multiple exchange markets, the arrangement shown is that in the major market.

** Comprises currencies which are pegged to various baskets of currencies of the members' own choice, as distinct from the SDR basket.

*** Exchange rates of all currencies have shown limited flexibility in terms of the U.S. dollar.

**** Includes exchange arrangements under which the exchange rate is adjusted at relatively frequent intervals, on the basis of indicators determined by the respective member countries.

From Tables 2-A/F and 3 we can draw the following conclusions.

1. The role of the dollar has decreased slowly, especially when we keep in mind that during the system of Bretton Woods all currencies were pegged to the dollar. From 1973 to 1983 the number of countries that peg their currency to the dollar has decreased from 68 to 31, while the combined market share of these countries declined even more sharply from about 19 per cent to 4 per cent. From 1974 on only LDCs maintained a dollar standard.

2. The pound sterling has almost completely disappeared as a standard currency. Only The Gambia still pegs its currency to the pound. Until 1979, when Ireland entered the EMS, the Irish pound was the last and only currency of a developed country that was pegged to the pound sterling.

3. Both the number and the combined market share of the countries that peg their currencies to the French franc have remained stable during the period under examination. It concerns a group of former French colonies, of which 11 countries use the CFA franc7) as their currency.

4. A few, very small LDCs have pegged their currency to other standard currencies as the South-African rand (Lesotho, Swaziland), the Indian rupee (Bhutan) and the Spanish peseta (Equatorial Guinea). In all cases it concerns countries that have a strong historical link with the country that issues the standard currency.

5. When we look at the total of single currency pegs we must conclude that this category lost much of its appeal after 1973. The number of countries with a currency pegged to a single standard currency went down from 96, which was equivalent to 75 per cent of all IMF member states at that time, to 52, which is about 35 per cent of all countries at the end of 1983. The reduction in market shares

7) The CFA (Communauté Financière Africaine) franc is pegged to the French franc at a rate of CFAF 1 = FF 0.02. The CFA franc that circulates as the common currency in Benin, Ivory Coast, Niger, Senegal, Togo, and Upper Volta is issued by the Banque Centrale des États de l'Afrique de l'Ouest (BCEAO), situated in Dakar (Senegal). The CFA franc that circulates in Chad, Cameroon, Central African Republic, Congo, and Gabon is issued by the Banque des États de l'Afrique Centrale (BEAC), situated in Yaoundé (Cameroon). The Mali franc has a fixed rate of FF 0.01 or CFA 0.5, while the Comorian franc is fixed at FF 0.02 (Source: IMF-Exchange Arrangements and Exchange Restrictions 1983 and Lomax (1983)).
was even greater, decreasing from 21 per cent in 1973, to 4 per cent ten years later. From 1979 on, only LDCs maintained a single currency peg.

6. The group of currency basket pegs has gained from the reduction in single currency pegs. The SDR made a quick start as a standard for exchange rate policy. In the period 1975-1977, directly after the SDR value became based on a currency basket, the number of countries with a SDR peg grew to 13, while the combined market share of these countries amounted to 3 per cent. In later years the number of countries that maintain an SDR standard remained stable around 14, but their combined trade share was reduced to about 1 per cent. Until now only LDCs have pegged their currency to the SDR. This last statement does not hold true for other composite pegs. At the moment there are four developed countries that base their exchange rate policy on a composite currency.

Of the centrally planned economies that are member of the IMF, Hungary has also pegged its currency to a basket. The number and combined market share of LDCs with an individual basket peg show a steady growth over the whole period.

7. From the entries in the row of cooperative exchange arrangements it becomes clear once more, that the Snake was not a very solid exchange arrangement. The number of participants changed every year. Since 1979 when the EMS was set up, this instability has disappeared.

During the period under examination the IMF has refined its classification of exchange rate regimes. In 1978 a special category was set up for exchange rates that were adjusted to a set of indicators. In 1982 the category 'limited flexibility to a single currency' was introduced for countries that maintained a loose tie between their currency and a standard currency (the dollar). The rest-category of managed and/or independent floating was split out into two new categories, i.e. 'other managed floating' and 'independently floating'.

This development towards a more detailed classification of flexible exchange rate policies reflects the increasing number of countries that carry out such a policy.

8) Cf. IMF Exchange Arrangements and Exchange Restrictions 1982, p. 58: 'As such a large undefined residual category was unsatisfactory for classification purposes, a revised and amplified method of classification was adopted to reflect the extent and form of flexibility that these arrangements permit'.
At the end of 1973 19 countries had a more or less floating exchange rate, of which 12 were LDCs, while in 1983 47 countries were classified in the categories 'limited flexibility' and 'floating', of which 39 were LDCs. It is remarkable that only 4 LDCs have an independently floating exchange rate.

Although the number of countries with a floating exchange rate grew fast, the combined market share of this group did not change much over the years. Countries with a flexible exchange rate represent about 50 per cent of world trade. This combined market share mainly consists of the market shares of a few very large economies (United States, Japan, United Kingdom and Canada).

We must keep in mind that the classification used in the tables 2-A/F is primarily based on the rigidity of a peg. For the category of pegged exchange rates only, a distinction is made between single currency pegs and basket pegs. For other categories this distinction is not made. A brief explanation may be useful here.

The category 'limited flexibility' concerns in all cases a relation with the dollar. This implies that the role of the dollar as a standard currency is more important than would follow from only examining the number of countries with a strict dollar peg.

The same holds true for basket pegs. Apart from the fact that officially speaking the exchange rate system of the EMS is based on a currency basket, there are quite a few countries with a floating rate that use a basket as their exchange standard. At the end of 1982 seven countries with a combined market share of about 5 per cent adjusted their exchange rate in relation to a basket of currencies. From this we conclude that baskets not only play an important role in fixed exchange arrangements, but also in regimes of managed floating.

After these general remarks about the developments in exchange rate policy, we now focus our attention more specifically on the differences between industrial countries and LDCs in this respect.

9) Officially all central rates are expressed in ECUs, but in practice only bilateral exchange rates play a role. This is why the EMS is listed under cooperative exchange arrangements.

10) These countries were Australia, India, Marocco, New Zealand, Nigeria and Western Samoa, all in the category 'adjusted to a set of indicators'. Source: IMF Exchange Arrangements and Exchange Restrictions 1983, country pages.
A comparison between LDCs and industrial countries

First we will make some remarks about exchange rate policy in industrial countries (ICs). With the exception of the changing membership of the Snake arrangement there have not been many changes since 1975 in the exchange rate regimes of ICs. After the start of the EMS in 1979, only one policy change has taken place. This change concerned Australia which altered its exchange rate regime from managed floating into independent floating in 1983.

From Table 2-E it becomes clear that single currency pegs have never been very popular among ICs. The only form of pegging that is used by ICs nowadays, is that of pegging to a basket. The Scandinavian countries Finland, Norway and Sweden use individual currency baskets as a standard, while Austria has officially stated that its currency follows the EMS-currencies 11).

More important in the case of ICs, however, are two other categories of exchange rate policy. First there is the EMS, belonging to the category of cooperative exchange arrangements, by which seven currencies are linked to each other. These currencies account for approximately 27 per cent of world trade. Even higher, about 32 per cent, is the combined market share of floating currencies. This group consists of eight currencies of which five are independently floating. These five are the U.S., the Canadian and the Australian dollar, the yen and the pound sterling, which accounted for more than 30 per cent of world trade in 1983. The three other countries within this group, i.e. Iceland, New Zealand and Spain, maintain a managed floating rate.

LDCs show a completely different pattern as can be seen in Table 2-C. First of all the majority of LDCs with either a single currency peg or a basket peg has remained fairly stable since 1973. About 90 countries

11) In IMF Exchange Arrangements and Exchange Restrictions 1983 the Austrian exchange rate policy is described in the following way: 'Without assuming any formal obligations in this respect, the authorities aim at maintaining a stable relation with the currencies participating in the EMS' (p. 79). In practice this results in a very stable relationship between the Austrian shilling and the deutsche mark.
fall into this category. From Table 2-D however, it becomes clear that the combined market share of these countries declined from 23 percent in 1974 to about 12 per cent in 1983. This implies that LDCs with a large market share have left this category, while LDCs with a smaller market share have entered.

Within the group of pegged currencies there has also been an important shift from single currency pegs to currency basket pegs. Mainly as a result of the reduction in dollar pegs and the almost complete disappearance of sterling pegs, the number of single currency pegs fell down from 93 in 1973 to 52 in 1983. The combined market share of these countries went down from 22 per cent in 1974 to about 4 per cent in 1983. SDR pegs and other basket pegs gained in popularity. The number of LDCs in these two categories grew from 4 in 1973 to 36 in 1983. The development in the combined market share of these countries, however, was less pronounced. From 1975 onwards this figure fluctuated around 6.5 per cent, but since 1978 there has been a slight upward trend.

The number of LDCs with a floating rate gradually increased from 12 in 1973 to 39 in 1983, 10 of which belong to the category 'limited flexibility', which was introduced in 1982.) In chart 1 we show the relative developments in market shares within the group of LDCs. This makes clear once more the development from single currency pegs to basket pegs and (managed) floating exchange rates. Very few LDCs, which are all relatively wealthy (e.g. Israel and South-Africa) have an independently floating exchange rate.

12) Of the 10 LDCs involved here, in 1981 9 belonged to the category 'rest of floating' and 1 maintained a basket peg. This implies that we can consider the category 'limited flexibility' as a further refinement of the rest-category.
Chart 1. Exchange rate arrangements of LDCs 1974-1983, relative distribution of market shares*)

*) For the end of each year in the period 1973-1983 the combined market share of an exchange rate regime (see Table 2-D) is divided by the total market share of all LDCs and expressed as a percentage. E.g. the combined market share of LDCs with a dollar peg on December 31, 1975 was 13.5, which represented 48 per cent of the total market share of LDCs (28.2) in that year. Sources: see Table 2-B.
So far, we have only compared the situation at different moments in time, but we have not yet analyzed the character of the changes that took place. In Table 4 the movements between different exchange rate regimes in the period 1974-1983 are represented. It becomes clear that there have hardly been any changes from one single currency peg to another: the only off-diagonal element within this group which is not equal to zero, concerns three countries that altered their peg to the pound sterling into a U.S. dollar peg.

<table>
<thead>
<tr>
<th>Exchange arrangements</th>
<th>As of December 31, 1983</th>
<th>(number of countries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>As of December 31, 1974</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. dollar peg</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>pound sterling peg</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>French franc peg</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>other currency peg</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>comp. currency peg</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>rest of floating</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>not yet classified</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>13</td>
</tr>
</tbody>
</table>

1 Each country is placed in the column of its exchange rate regime in 1983, and in the row of its exchange rate regime in 1974, e.g. seven countries that pegged their currency to the dollar in 1974, maintained an SDR peg in 1983. The reason for choosing 1974 instead of 1973 as a base-year is the more detailed classification of exchange rate regimes that is available for 1974.

2 This row contains LDCs that became a member of the IMF in the period 1974-1983.

3 This column contains two LDCs, the Republic of China (Taiwan) and the Khmer Republic.

Only 24 of the original 65 countries that maintained a dollar peg in 1974, continued to do so in 1983. Most of the others went over to a floating rate while 13 pegged their currency to a basket. The growth in flexible and floating arrangements results almost entirely from countries that were pegged to the dollar at an earlier stage.

Finally it may be emphasized that at the end of 1983 19 out of the 20 new IMF members opted for a pegged exchange rate; among these 10 preferred a currency basket peg. In most cases it concerned very small developing countries, which are indeed supposed to be better off with a pegged exchange rate, as we shall see in the section 3.
2.5. Some concluding remarks

In this section we have analyzed developments in exchange rate policy of IMF member states, which we have subdivided into industrial countries and LDCs. There appear to be considerable differences between these two categories.

After our general analysis of exchange rate regimes since 1973, we can draw the following conclusions with respect to industrial countries and LDCs.

- There have been relatively few changes in the exchange rate policy of ICs, especially during the last years of the period under consideration. Within the EC most currencies are linked by the EMS, while the Scandinavian currencies are pegged to a basket, and outside Europe all industrial countries maintain a floating rate of which the most important ones have an independently floating currency.

- Within the group of LDCs several developments have taken place with respect to exchange rate policy. There has been an important shift from dollar pegs to basket pegs and to different forms of (managed) floating. French franc pegs were very stable but pegs to the pound sterling have now almost completely disappeared. New IMF members have shown a preference for dollar pegs and basket pegs. Within the group of basket pegs, individual basket pegs are more popular than SDR pegs. An independently floating exchange rate is not a very popular alternative among LDCs. Although the importance of single currency pegs is declining, especially when measured by the combined market share of the countries concerned, we must realize that as many as 52 currencies still belong to this category.

We have not further subdivided the LDCs. The reason is that a further disaggregation is only useful when it is carried out according to criteria for the selection of an exchange rate regime. In the next section we will concentrate on this issue.
3. THE SELECTION OF AN OPTIMAL EXCHANGE RATE REGIME

Interest in exchange rate theory and policy has been strongly stimulated by the high degree of exchange rate flexibility and volatility since 1973. We would like to stress here that there is an important difference between exchange rate theory and the theory of exchange rate policy. Exchange rate theory tries to explain the behaviour of exchange rates when these rates are flexible\(^1\). The exchange rate is looked upon as a dependent variable which is determined by certain explanatory variables.

On the other hand, the theory of exchange rate policy concerns the question of choosing the best policy for managing the exchange rate. This is done by trying to find the relation between the exchange rate and certain goals of economic policy. Here the exchange rate is considered to be an instrument. Though there certainly is a relation between exchange rate theory and exchange rate policy, in this chapter we will only deal with the latter.

As we have seen in the preceding section, in a world of generalized floating there are a number of possible exchange rate regimes. The decision which one to select can be divided into three stadia.

First, a country has to choose between independent floating and some form of exchange rate management. This choice depends mainly on the economic characteristics of a country. As we shall see, LDCs are generally considered to be peggers. The discussion is largely based on the literature on optimal currency areas dating from the beginning of the 1960s\(^2\).

\(^1\) The three mainstreams in exchange rate theory, in order of a decreasing time-horizon, are the Purchasing Power Parity Theory (PPPT), the monetary approach, and the portfolio approach. According to the PPPT the exchange rate is determined by current account transactions, according to the monetary theory the relative supplies of and demands for money determine the exchange rate (under the assumption of PPP), and the portfolio theory puts the emphasis on factors as interest rates and exchange rate expectations. Surveys are given by Argy (1981, pp. 225-48) and, on monetary models, by Bilson (1979).

\(^2\) The innovative articles were Mundell (1961) and McKinnon (1963). An extensive survey on the theory of optimal currency areas is given by Ishiyama (1975).
If pegging is opted for, or if floating proves not feasible, a choice has to be made between the different forms of pegging. Since 1975 a sizeable literature has emerged on the subject of optimal exchange rate pegs. The main choice here is the one between pegging to a single currency and pegging to a basket of currencies.

When a basket peg is selected, a third choice has to be made, i.e. the choice between an official basket (SDR, ECU) peg and an individual, country-specific basket peg.

The three stages in the process of deciding described above, are shown in figure 1. In the next three subsections we will analyze these choices in more detail.

Figure 1 Structure of exchange rate policies

3.1. Floating vs. pegging

In general floating can be regarded as a 'higher' form of exchange rate policy than pegging. Countries, for which it is feasible to have a floating rate, are in most cases also feasible 'peggers', but the reverse does not hold true.
The main result of a truly floating exchange rate is an automatic equilibrium on the balance of payments, i.e., on the 'overall' balance. This automatic equilibrium has two effects. First, the BOP has no influence on the domestic money supply. This implies that the domestic economy is sheltered from external disturbances. Second, there is no need for international reserves, which saves the cost of holding these (low interest bearing) reserves\(^\text{15}\). An additional advantage is the fact that there is no risk for the monetary authorities to support a wrong (disequilibrium) exchange rate\(^\text{16}\).

We may now wonder why not all countries have a floating rate. This brings us to the classical argument against floating rates: the resulting exchange rate uncertainty hampers international trade and investment\(^\text{17}\). However, this uncertainty only arises when floating rates turn out to be volatile. In general we may say that floating rates are to be preferred to pegged rates, as long as the rates are

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15) This advantage should not be overestimated, viz. the costs of not holding reserves may be high as well. Arguments for holding reserves even under floating exchange rates are given by de Beaufort Wijnholds (1977, pp. 121-31/180-86). First, there is a need to hold international reserves from the contingency motive, viz. as a safeguard for the case of a breakdown of the national or the international monetary system. But more important is the argument that even under freely floating rates the monetary authorities prefer to have the choice between adjustment and financing, because financing (i.e. the use of reserves) may be less costly than adjustment via the exchange rates. 'Window dressing' may also play a role in this respect, especially for LDCs. In that case reserves are kept as a symbol for credit-worthiness.

16) Cf. Grubel (1981, p. 500) and Artus and Young (1979, pp. 660-94). We must realize that these advantages only occur under totally independent floating, i.e. in a situation without any official intervention. In practice such a situation hardly ever occurs, and for this reason the advantages must be seen in relation to the situation under less freely floating rates.

stable$^{18}$). This somewhat paradoxical conclusion forms the basis for most of the arguments that will be used in the following discussion about the choice between floating and pegging.

What are the relevant characteristics of a country with respect to this choice? The most important ones are mentioned below.

1. **Openness**. There are two reasons for combining openness with fixed exchange rates. The first one is, that in an economy with a high (marginal) propensity to import, under fixed rates a relatively small adjustment of aggregate demand is enough to restore the BOP in the case of a disequilibrium. Precisely the opposite holds true for a relatively closed economy. In that case a large adjustment of demand is necessary to cause a small change in the BOP.

A second reason is that in an open economy the effect of exchange rate changes on the domestic price level is much more important than in a relatively closed economy. This implies that erratic short term exchange rate fluctuations, which often accompany a floating rate, are more harmful to open economies. On the other hand, when inflation is high in other countries, an open economy will import this inflation by maintaining fixed rates. Under fixed rates, disturbances generated abroad are transferred into the domestic economy, while flexible rates have an insulating effect$^{19}$). In fact, that open economies should have fixed rates was already a conclusion reached by McKinnon, who mentioned openness as a criterion for optimum currency areas.

2. **Degree of financial integration**. While openness refers to the current account, we will now consider the capital account. If a country has a well-developed financial market, and if this market is integrated in the world financial market, movements in the

$^{18}$ In his classic essay 'The case for flexible exchange rates', Friedman (1953) sees this as the ideal situation: 'The ultimate objective is a world in which exchange rates, while free to vary, are in fact highly stable' (p. 158).

$^{19}$ If, under fixed exchange rates, the disturbances are of a domestic origin, they are mitigated by changes in the amount of international reserves, while under floating rates they are reflected in the exchange rate. Bird (1978) mentions the source of disturbances as a separate factor in selecting an optimal exchange rate regime. However, because the influence of disturbances is directly related to the openness of a country, and because the source of disturbances can hardly be called a country characteristic, we prefer not to treat this factor separately. We may add that in the case of fixed rates foreign disturbances can also be mitigated by parity-adjustments or by maintaining a crawling peg.
Current account can be offset by movements in the capital account, thus stabilizing the overall balance or, in the case of floating rates, the exchange rate. According to the asset market view on exchange rate determination, in the short run the exchange rate is even completely determined by the equilibrium conditions on the financial markets. Therefore, in the case of internationally integrated financial markets, there is less reason for pegging the exchange rate. It could even prove counter-productive, because international capital transactions can easily frustrate domestic monetary policy. For instance, a strict monetary regime aimed at a reduction of the inflation rate and resulting in high interest rates, will, in the case of a fixed rate, lead to capital inflows that increase the money supply.

If there is no integrated financial market, the foreign exchange market is mainly determined by the situation on the current account. Under these circumstances, a floating rate will only be stable if the Marshall-Lerner condition holds even in the short run. This is not a very realistic assumption, and therefore a low degree of capital market integration leads to a preference for pegged exchange rates. In such a case, the international reserves take over the role of the capital account, by softening the impact of current account movements on the exchange rates.

In fact, the criterion of the degree of capital market integration is a variant of the factor mobility criterion for composing optimum currency areas, as favoured by Mundell. This leads to the remarkable conclusion that, though Mundell argued that capital mobility is a condition for optimal currency areas and thereby for fixed exchange rates, in more recent literature, e.g. Black (1976), Branson and Katseli (1981-a) and Crockett and Nsouli (1977), a lack of capital mobility is considered to be an argument for pegging the exchange rate.

This paradox can easily be explained. In both views a high degree of capital mobility or financial integration is supposed to lead to a stable exchange rate. Mundell, however, interpretes this as a reason for pegging the exchange rate, while the others conclude that a floating rate is also feasible under these circumstances.

20) See e.g. Branson and Katseli (1981-a, p. 394). They conclude that in general gross substitutability of domestic and foreign assets in private portfolio's will suffice for maintaining stability, which is the essence of the portfolio approach to exchange rate determination (see also fn. 13).
3. **Market power.** The influence that a country can exercise on the prices of its imports and exports is called the market power. If a country has little market power, this means that it acts as a price-taker in the world markets. There is a direct link between the value of the trade elasticities and the market power. The higher the elasticities of demand for exports, the lower the market power on the export side, and the higher the elasticities of supply of imports, the lower the market power on the import side\(^{21}\).

If the market power of a country is low, the monetary authorities can hardly influence the terms of trade\(^{22}\). In that case a floating rate has little effect in sheltering the economy from disturbances abroad, which is an argument for pegging the domestic currency to a single currency; individual basket pegs are less useful in this case, as will be made clear in the next two sections. Because the influence that can be exercised on prices expressed in foreign currencies is often related to the size of a country, some authors also consider size as a determining factor in selecting an exchange rate policy\(^{23}\). We, however, prefer to look upon size as a proxy for the market power and not as a separate factor.

4. **Structure of trade.** As we have seen, floating is only feasible if the exchange rate remains stable. This stability depends, among other factors, on the structure of trade. Disturbances are more likely to appear if trade is concentrated in a few sectors and directed at a few countries, than when it is well diversified with respect to commodity groups and geographic origin or destination.

In Table 6.1 we have put the four characteristics together. More criteria are mentioned in the literature, but these four are the most

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\(^{21}\) Exact formulas are given by Branson and Katseli (1980). They also demonstrate that if both market power on the export and on the import side are nil, the terms of trade are affected only by shifts in world market prices. For the relation between trade elasticities and market power, see also Appendix 1.

\(^{22}\) Lipschitz demonstrates that if purchasing power parity holds, the terms of trade are even completely fixed, see Lipschitz (1979, p. 427).

\(^{23}\) Heller even defines the size of a country as the degree of being able to influence the world market prices either as a buyer or as a seller, see Heller (1979, p. 309, nt.2). According to this definition the size of a country is completely equivalent to its market power.
important ones\(^{24}\). There is one characteristic, which we have not yet taken into consideration, although it is often mentioned i.e. the level of inflation\(^{25}\). A high inflation rate causes difficulties in pegging the exchange rate. Therefore, it is not surprising that Heller (1978) finds that countries with high inflation rates tend to adopt a floating rate. This, however, does not imply that it is desirable for these countries to have floating rates. Often exactly the opposite holds true. A pegged exchange rate would stimulate an anti-inflationary policy, though perhaps in the beginning some adjustments may be needed in order to compensate for inflation rate differentials.

\(^{24}\) Branson and Katseli (1981-a) only mention openness and international financial integration as feasibility conditions for floating exchange rates. On the other hand, Bird (1978) gives a list of no less than 11 characteristics: a) source of disturbances, b) openness, c) commodity diversification of trade, d) geographical concentration of trade, e) capital market integration, f) relative rate of inflation, g) trade elasticities, h) effect of exchange rates on absorption and money supply, i) demand and cost management policies, j) level of international reserves and k) preference for income stability as opposed to income level. However, a, h, i and k can hardly be regarded as economic characteristics of a country, while j concerns only a practical detail.

Heller (1978), in his empirical study, makes a distinction between size, openness, degree of financial integration, relative rate of inflation and foreign trade pattern as factors that determine the choice of a particular exchange rate regime.

Friedman (1953) discusses the trade-off between price and wage rigidity on the one hand, and exchange rate rigidity on the other hand (pp. 164-66). The more flexible prices and wages are, the more stable a floating exchange rate will be. On the other hand, rigid prices and wages may cause difficulties under a fixed exchange rate regime. We may expect a positive correlation between price/wage rigidity and market power. Countries with a high degree of market power can more easily afford the luxury of a certain degree of rigidity in prices and wages. However, these rigidities are hard to estimate which makes them unsuitable as yardsticks for exchange rate policy.

\(^{25}\) See e.g. Heller (1978, p. 311) and Bird (1978, p. 284). The authors put that a high rate of inflation in comparison to the world average (Heller) or trading partners (Bird) will cause difficulties in pegging the exchange rate and will therefore stimulate exchange rate flexibility.
This brings us to an important distinction which must be made with respect to exchange rate policy. Apart from choosing an exchange standard, which is the fundamental issue in exchange rate policy, it is also necessary to determine at what moment the parity should be changed. This second element, which is not often mentioned separately, is especially relevant in the case of inflation rate differentials. It is possible that a country prefers a certain peg, but does not want to accept the resulting rate of inflation. In such a case it can regularly or continuously adjust the official parity between the domestic currency and the standard currency or currency basket, i.e. it can maintain a 'crawling' peg. Because of this possibility we do not include the inflation rate under the characteristics that should play a role in making a choice between floating and pegging.

It will be clear from this general discussion that for most LDCs floating is not feasible. Often these countries are open, they have poorly integrated financial markets, little market power, and a concentrated trade structure, especially with respect to exports. Therefore we cannot expect a floating rate to be very stable.

An additional argument is that, in the case of a fixed exchange rate, international reserves can ease the burden of real shocks. They can have a cushioning effect. This may be an important advantage to LDCs, as the impact of real shocks (e.g. harvest shortfalls due to bad weather conditions) on these countries can be considerable. Such shocks easily lead to expensive real adjustments in the case of a floating, and therefore under these shocks sharply fluctuating, exchange rate.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Pegging</th>
<th>Floating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of openness</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Degree of financial integration</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Market power</td>
<td>Low¹</td>
<td>High</td>
</tr>
<tr>
<td>Trade structure</td>
<td>Concentrated</td>
<td>Diversified</td>
</tr>
</tbody>
</table>

¹ With the exception of (individual) basket pegs

26) One of the few exceptions is Williamson (1981, p. 52).
On the other hand, for most industrial countries floating is feasible according to the characteristics mentioned above. As we already emphasized before, this does not imply that these countries should all maintain a floating exchange rate, but only that in general floating is a feasible alternative. In this respect it should be emphasized that the exchange rates of the currencies of the major industrial countries have in fact turned out to be very volatile since they started floating in 1973. Therefore, according to the criterion that a floating rate should be stable, a return to a system of less flexible exchange rates should be considered seriously.

Pegging the exchange rate can be done in many different ways. We will now analyze the criteria upon which the choice between single currency pegs and currency basket pegs is dependent.

### 3.2. Single pegs vs. basket pegs

In this section we will first review the advantages and drawbacks of a single currency peg, after which we will make a few remarks about the selection of the most appropriate standard currency.

#### 3.2.1 Relevant criteria

There are several arguments in favour of a single currency peg. The main one concerns the reduction of uncertainty in bilateral trade between the country that pegs its currency (pegging country) and the country that issues the standard currency (standard currency country). The higher the share of the standard currency country in the international trade of the pegging country, the stronger this effect will be. We must also take into account the trade shares of other countries that peg their currencies to the same standard currency. The combination of these trade shares and the trade share of the standard currency country, gives a good indication of the percentage of trade that does not suffer from exchange rate fluctuations. The relevant trade share may even be bigger than this combined share. Such a situation occurs when certain commodities are denominated in the standard currency on the world market. However, care should be taken, because prices may be expressed in a standard currency, while being determined by other currencies. The currency denomination of trade is therefore very hard to establish.

Apart from 'real' arguments, which refer to international trade, there are also reasons of a more monetary character, which argue for pegging to a single currency. First of all, we must realize that pegging to a standard currency implies the adoption of the monetary policy in the
standard currency country. We here assume that there are no restrictions on international trade and payments. But even if there are, in the longer run the growth of the money supply in both countries must converge, thereby leading to converging inflation rates\(^{27}\). Pegging to a stable standard currency and the resulting adoption of the monetary policy of the standard currency country increases confidence in the domestic currency. This increased confidence may facilitate access to international capital markets. Pegging to a single standard currency may also lead to the introduction of certain financial services, as e.g. a forward exchange market.

There are also drawbacks to single currency pegs. In a world of floating rates, pegging to one currency means floating with respect to all the other currencies that are not linked to the same standard currency. This implies uncertainty in international trade\(^{28}\). We must also realize that this kind of floating is different from independently floating, because the currency floats together with the standard currency. This means that, in comparison with independent floating, BOP difficulties are much more likely to occur. The parity with the standard currency may very well lead to an effective exchange rate that results in a BOP disequilibrium. Third currency exchange rate movements, i.e. movements in the exchange rates of currencies other than the home currency and the standard currency, can be responsible for these problems. Therefore, there may be a relatively large need for reserves under a single currency peg.

Apart from problems with respect to the BOP, a single currency peg may also result in an exchange rate that is incompatible with other aims of economic policy as e.g. stable terms of trade, or - especially in the case of LDCs - a stable development of production and employment. A number of these drawbacks are avoided by pegging to a basket. On the other hand, some of the advantages of a single currency peg are lost in such a case.

The main advantages of a currency basket peg are a stable effective exchange rate and the possibility of pursuing an additional target by selecting the appropriate currency basket. Both advantages are related to each other, as we will see in the next section.

27) See e.g. Connolly (1981), who demonstrates that those Latin American countries that maintained a dollar peg, had much lower inflation rates, i.e. closer to the U.S. inflation rate, than countries that maintained other exchange arrangements (p. 58/59).

28) This may be especially harmful to intra-regional trade between small LDCs that maintain different single currency pegs, as Crockett and Naouli (1977, p. 150) have pointed out.
The main drawback of a basket peg is that none of the bilateral exchange rates is really fixed. Even the value of the currency of the main trading partner fluctuates. Therefore, it is harder to obtain a clear insight in the development of the exchange rate. When a country pegs its currency to an individual basket and especially when it frequently changes the composition of this basket, the predictability of the exchange rate decreases. This may hamper international trade and investment, just as in the case of a floating exchange rate. However, this effect can be reduced substantially by pegging to a well-known official basket as the SDR (see section 3.3).

An additional drawback of basket pegs is that intervention cannot take place in the basket-unit itself. Even official baskets as the SDR or the ECU cannot yet be used as a means of intervention. This implies that intervention must be carried out in key currencies. However, the value of the basket in terms of a key currency varies from moment to moment, thereby making it impossible to maintain a rigid basket peg. The technical aspects of pegging to a basket will be treated more extensively in Appendix 2. The fact that intervention cannot take place in the standard unit itself, however, does not lead to serious problems in practice.

In table 6 we present a short summary of the arguments mentioned above.

We can now draw two conclusions with respect to the choice between single currency pegs and currency basket pegs.

1. If there is one dominating trading partner and if this partner happens to be an important industrial country with a solid monetary image, pegging to the currency of this trading partner reduces uncertainty in international trade and investment to a large extent, while increasing the confidence in the domestic currency. This latter aspect may be of special importance to LDCs.

2. When the trade pattern is fairly diversified or when the country suffers from the effects of third currency exchange rate movements, pegging to a basket is preferable. Though the first condition may not apply to many LDCs, the second certainly does.

29) A rigid standard is a standard under which the rate of the domestic currency in terms of the standard unit (here: the currency basket) is completely fixed by guaranteed convertibility at the official parity. Because the monetary authorities cannot yet intervene in currency baskets themselves, it is not yet possible to maintain a rigid currency basket peg.
TABLE 6  Single pegs vs. basket pegs; a summary of arguments

<table>
<thead>
<tr>
<th>SINGLE CURRENCY PEGS</th>
<th>CURRENCY BASKET PEGS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ADVANTAGES</strong></td>
<td><strong>DRAWBACKS</strong></td>
</tr>
<tr>
<td>1. Reduction of uncertainty in bilateral trade and investment</td>
<td>5. Pegging to one currency means floating with respect to all other currencies</td>
</tr>
<tr>
<td>2. Fixed rates in terms of other currencies that are pegged to the same standard currency.</td>
<td>6. The resulting effective exchange rate may lead to BOP problems and may conflict with domestic aims.</td>
</tr>
<tr>
<td>3. 'Import' of financial services</td>
<td>7. To maintain a single currency peg, a high level of reserves may be needed.</td>
</tr>
<tr>
<td>4. Increased confidence by adoption of the monetary policy of the standard currency country</td>
<td></td>
</tr>
<tr>
<td><strong>ADVANTAGES</strong></td>
<td><strong>DRAWBACKS</strong></td>
</tr>
<tr>
<td>8. A stable effective exchange rate.</td>
<td>10. None of the exchange rates is constant.</td>
</tr>
<tr>
<td>9. Possibility of pursuing an additional target.</td>
<td>11. Currency baskets can not be used as a means of intervention</td>
</tr>
<tr>
<td></td>
<td>12. Insight into the development of the exchange rate becomes less clear.</td>
</tr>
</tbody>
</table>
3.2.2 Selection of a single currency standard

In fact there are two candidates for the role of standard currency: the currency of the main trading partner and an international key currency\(^{30}\). When the currency of the main trading partner happens to be a key currency, there is no further problem. However, such a situation does not always occur. What criteria are relevant when we have to choose between the two alternatives?

From Table 6.2 it is clear that the first argument favours the choice of the main trading partner, while arguments two, three and four are more relevant in the case of a key currency. On the other hand, in the case of a key currency standard, the arguments against a single currency peg carry a somewhat greater weight than in the case of a peg to the currency of the main trading partner.

With respect to key currency standards one additional argument needs mentioning. As noted already, the importance of a key currency for the domestic economy of the pegging country not only depends on the trade share of the key currency country, but also on the combined share of all trade denominated in the key currency and the currencies that are pegged to the key currency. This combined trade share may very well be much larger than just the trade share of the key currency country itself.

We may conclude that when the difference between this combined trade share and the trade share of the main trading partner is small, pegging to the key currency is to be preferred.

When the difference is large, the choice depends on the weight attached to arguments two, three and four. It is obvious that the less developed an economy is, the more weight such arguments will carry, and therefore the more appropriate a key currency peg will be.

\(^{30}\) It is hard to give a proper definition of what is exactly meant by a key currency. In practice, currencies that are important on an international level, both in the private sector (international trade and financial markets) and in the official sector (reserve currencies, standard currencies and intervention currencies) are considered to be key currencies.
The choice between different key currencies should also be determined by the differences with respect to these three aspects\(^{31}\). This implies that the desired rate of inflation may be relevant as well (aspect 4). In order to avoid regular parity adjustments, a country may select a standard currency with a rate of inflation equal to the (desired) domestic rate of inflation.

We must keep in mind that often non-economical arguments also play a role, especially in the case of former colonies. As Lipschitz (1979) put it: "In many cases, for historical reasons a small country will peg its currency to that of a major trading partner like the United States or the United Kingdom, although it neither trades much with that country nor experiences a similar pattern of price inflation" (p. 441-42). According to Branson and Katseli (1981-a) political alliances and historical antipathies can be relevant as well. As an example they mention a few Asian countries that have pegged their currency to the dollar, though they trade more with Japan than with the United States. However, the fact that the dollar is internationally a more important currency than the yen, may also have been an important factor in this respect.

The former colonial link between the pegging country and the standard currency country is especially clear within the group of French franc pegs and other single currency pegs (see column 2 and 3 in Table 3).

### 3.3 Official basket pegs vs. individual basket pegs

Basket pegs can be divided into two categories: individual country-specific basket pegs, which will be discussed in more detail in section 6.3 and pegs to an official basket as the SDR or the ECU. Tailor-made baskets only fit one individual country. Different countries will need different baskets according to the country's characteristics and the preferences with respect to the development of the exchange rate. As we will show in section 6.4, the bilateral exchange rate between

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\(^{31}\) Black (1976) explicitly pays attention to argument two, by introducing a variance/covariance matrix of exchange rates for the determination of an optimal standard currency. He is one of the few authors who clearly specifies his aim in the process of selecting a standard currency. His aim is a stable domestic price level of tradable goods. In fact, he argues for a stable relation between the price levels of tradable and non-tradable goods (see his footnote 6). Important is his conclusion that pegging to the main trading partner may not be optimal if the exchange rate of the partner's currency is negatively correlated to the exchange rates of other important trading partners (p. 17).
two currencies that are pegged to a different basket is determined by a complicated function of all the bilateral rates between the currencies in both baskets. Another drawback of individual baskets is their relative obscurity. It is not easy to predict the future value of a currency that is pegged to an individual basket, especially not when the composition of this basket is changed regularly as a result of changing circumstances.

Thus, a number of countries have opted for a peg to a common basket. It is clear that such a common basket cannot be optimal for all the countries involved. However, the advantage of having fixed rates with a number of trading partners may outweigh the drawback of pegging to a suboptimal basket. How should such a common basket be composed? International agreement on the basket composition will not be reached easily. Some countries will always profit more than others from pegging to a common basket. Therefore, a more practical solution is a common peg to an already existing official basket. Such a peg also increases confidence in the currencies involved.

The only official basket that is used as a standard for exchange rates at this moment is the SDR, and therefore our arguments with respect to official basket pegs are all based on SDR pegs. Pegging to the SDR has a number of advantages in comparison to individual basket pegs. First, it implies fixed rates between all the currencies that maintain an SDR peg. By pegging to the SDR a country joins the SDR bloc. This may have important advantages for international trade and investment between the countries within such a bloc. For this reason a common SDR peg may be advocated in order to stimulate intra-LDC trade.

Second, the composition of the SDR is relatively well-known to the financial markets. Its value is expressed daily in the main international currencies. This implies that financial agents are able to predict the value of currencies that are pegged to the SDR in a relatively accurate way, which will facilitate financial transactions in these currencies.

A third advantage of SDR pegs is related to the different functions of the SDR. Apart from being a currency basket, the SDR also plays the role of international reserve unit and, to a moderate extent, it serves as a unit of account on international financial markets. Though the role of the SDR within the international monetary system is still very limited, it may increase and in such a case an SDR peg may have additional advantages.

In this respect we may think about the possibility of using SDRs as a means of intervention, as a denominator for international trade, and as a unit of account for international financial transactions. In the latter case, under an SDR peg, the value of debts would be constant in terms of the home currency, which may be considered as an important advantage as compared to the situation in which debts are denominated
the important effects:

The export structure of exports is less revealing than the trend in world markets more than on domestic markets. This has two

levels of IC, LDCs imported and of IC exporters.

an exchange standard, especially insofar as it will effect the price. We will now demonstrate that on SP bears may stabilize the exchange standard by the importance of the relative composition of the dollar.

On the other hand we must add that the recent composition of the dollar

will be.

xtant and the actual weights will be.

the composition of the dollar is not constant and is dependent on the exchange rates. The longer an exchange rate is fixed the more likely exchange rates are determined by the composition of the dollar.

the recent composition of the dollar is not constant. The change in the composition of the dollar and the relative value is not constant.

the composition of the dollar as well as the relative value and the relative exchange rate. The other hand they resemble the exchange standard. The dollar bears the characteristic of a basket of 9.8. a relatively stable exchange rate.

the relative composition of the dollar is not constant.

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the relative composition of the dollar and the relative exchange rate.
(b) International trade is often denominated in a third (key) currency instead of in the currency of the exporting or importing country.

This last aspect may lead to the conclusion that an LDC should peg to such a key currency in order to stabilize export revenues in terms of the home currency. However, we need to be cautious here. The prices of traded goods, though denominated in terms of a key currency, will generally depend on the currency of the buyer as well. When this is the case, the prices in terms of the key currency will rise/fall when the key currency itself depreciates/appreciates. Together with aspect (a) mentioned above, this is an argument to maintain an SDR peg instead of key currency pegs or individual export weighted basket pegs, at least with respect to a stable value of exports in terms of the home currency.

We now turn to the import side of LDCs. It is clear that in general the imports of LDCs will be more diversified than the exports. We may now wonder to what degree an SDR peg would differ from an import weighted basket peg. For the 'old' (1974) SDR basket, Crockett and Nsouli (1977) conclude that for most LDCs the SDR peg deviates very little from the import weighted basket peg (p. 133). As Black (1976) has illustrated, in comparing trade structures with the SDR composition we must account for the fact that the combined trade share of a currency in the basket together with the trade shares of all other currencies pegged to this basket currency, should be compared to the weight of this specific basket currency in the SDR. This corresponds nicely with the fact that the weight of the dollar in the SDR is considerably greater than the relative weight of U.S. trade.

The fact that the SDR basket reflects both the structure of the imports of many LDCs, and the currency-mix that is relevant for LDC-exports, gives an indication of the fact that under an SDR peg the EER, when defined as a function of trade weights, will be relatively stable. Williamson indeed concludes from recent research that '...for the vast majority of developing countries, the SDR would have produced less instability of the EER than any single currency peg or than the ECU' (p. 58). In addition, Connolly (1983) finds that an SDR peg, just as a basket peg based on trade shares, leads to approximately the same variance in the imported inflation as a special variance minimizing basket (p. 70).

A short summary of the arguments mentioned above is presented in Table 7.
TABLE 7  Official baskets vs. individual baskets

<table>
<thead>
<tr>
<th>Advantages official basket pegs</th>
<th>Drawbacks official basket pegs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fixed rates with all other currencies that are pegged to the same basket. This stimulates trade and investment within the basket-bloc.</td>
<td>5. No possibility of pursuing an additional target.</td>
</tr>
<tr>
<td>2. A clearer insight in the development of the exchange rate which promotes confidence in the local currency.</td>
<td>6. Decisions with respect to the composition of the basket may conflict with the interests of the countries that maintain a basket peg.</td>
</tr>
<tr>
<td>3. Possibility of concluding (financial) transactions in the basket unit of account.</td>
<td>7. If no adjustments take place the weighting structure of the basket will soon deviate substantially from the initial situation in the case of exchange rate volatility.</td>
</tr>
<tr>
<td>4. (Future) possibility of using a means of intervention based on the same basket.</td>
<td></td>
</tr>
</tbody>
</table>

3.4 Practice compared with theory

Although many authors have analyzed the possible determinants of exchange rate policy, little empirical research has been undertaken to quantify the impact of these determinants. An important consideration has certainly been that it is not very easy to model exchange rate policy as a function of the characteristics of a country. If only one determining factor is taken into account, the problem is a relatively easy one. For each exchange rate regime the mean value (and variance) of the variable that is assumed to determine the exchange rate 'policy' can be calculated. If there is a significant difference between the average values of the explanatory variable under different exchange rate regimes, this variable is supposed to be of importance for the choice between these regimes. This method has been followed by Branson and Katseli (1980). For different exchange rate regimes they
calculate the net market power\textsuperscript{32}) of the countries involved (p.67). Their conclusions are in accordance with theoretical observations. Net market power is low among LDCs that maintain a single currency peg and high in the case of basket pegs and limited exchange rate flexibility. In another article, Branson and Katseli (1981-a) follow a similar strategy with respect to the GDP. Using data from 1975 they conclude that both mean GDP per capita and mean GDP in absolute terms are highest among the group of countries with a floating exchange rate and lowest among countries that maintain a single currency peg. We will come back to these results later in this section.

The method described above is only possible in the case of one explanatory variable. When we want to measure the impact of different variables simultaneously, other methods are needed. The main problem is that exchange rate policy is not a continuous variable. It cannot be measured in units. It can only be classified according to certain criteria (see e.g. Table 3). This precludes the use of 'classical' econometrics. However, there are different econometric methods to solve this problem. We will shortly review two alternative solutions that have been introduced.

Dreyer (1978) uses probit analysis\textsuperscript{33}). He makes a distinction between three categories: pegged, flexible and floating exchange rates. His estimation is based on a cross-section analysis for 88 developing countries. He concludes that the size of an economy hardly influences the choice of an exchange rate regime. His other explanatory variables

\textsuperscript{32}) The net market power is the difference between market power on the export side and market power on the import side (see also Appendix 1). However, for calculating market power price-elasticities in international trade must be used. These data are not readily available, especially not for LDC's, and therefore Branson and Katseli use approximations of market power. They approximate market power on the export/import side by summing up the country's export/import share of a commodity in world trade weighted by the relative importance of this commodity in the country's exports/imports. However, this measure is not very reliable for industrial countries, which often combine a diversified trade pattern with a relatively high degree of market power.

\textsuperscript{33}) The essence of this method is to look upon the dependent variable as a probability, which implies that it is a figure between 0 and 1. By applying a transformation with the inverse of the cumulative distribution function of standard normal variables as a transformation function, the interval is transformed from (0,1) into (-\infty, +\infty). For a further description of this technique, see Theil (1971, pp. 628-31).
do have a significant effect. Openness has a positive influence on the degree of fixation, just as geographical and structural diversification of trade. However \( R \) (=coefficient of determination adjusted for the number of explanatory variables) equals 0.611 which means that there are probably other factors that have a substantial influence on the choice of an exchange rate regime.

A different approach is followed by Heller (1978). He uses discriminant analysis for a cross-section study of the exchange rate arrangements as of July 1976. He only makes a distinction between countries with a floating rate and countries with a pegged rate. Included are 86 countries of which 77 have a pegged rate and 9 have a floating rate. Not included are the snake countries and countries that maintain a crawling peg policy. His explanatory variables are the size of a country, the degree of openness, the degree of financial integration, the relative inflation rate and the geographic concentration of trade. All the estimated parameters fit in with the a priori expectations. An interesting conclusion resulted from applying the estimated equation to the Snake countries. All these countries are supposed to have a pegged exchange rate, with the exception of the Federal Republic of Germany. This leads to the conclusion that the Snake arrangement can be regarded as a Deutschemark bloc.

Heller also estimates equations for the choices between a dollar peg and a French franc peg, a dollar peg and a basket peg, and a French franc peg and a basket peg respectively. It appears that trade shares are the determining factor. Countries that have important trade-relations with the United States often peg to the dollar, countries that trade intensively with France are more apt to peg to the French franc and countries with a diversified trade pattern most often peg to a basket.

In examining these results one important aspect should not be forgotten. Both authors measure the determinants of actual exchange rate practices, not of optimal exchange rate regimes. What they measure is 'revealed preference'. In most cases, however, it appears that actual behaviour as revealed by econometric analysis is in line with theoretical arguments.

We will conclude this section with a brief study on the relation between GNP and exchange rate policy. In Table 8 LDCs have been

34) The aim of this technique is to form an equation that separates the data in different groups, so that within a group the variance of different explanatory variables is minimized, while between groups the variance is maximized.
subdivided into four categories. A distinction has been made between low-income, middle-income, upper middle-income and high-income LDCs. This classification was derived from the World Development Report 1984.

The reason for relating per capita GNP to the different types of exchange rate regimes has been the following: In the three sections on the selection of an exchange rate regime we noted that an important determining factor was confidence. Single currency pegs and official basket pegs may be preferred to individual basket pegs for reasons of confidence. In spite of the fact that a dollar peg or an SDR peg will generally not be optimal from a purely theoretical point of view, i.e. the optimization or stabilization of a target variable will generally favour an individual basket peg, these pegs may nevertheless be selected because they provide confidence in the domestic currency. We can expect this argument to be more relevant in the case of a weak economy than in the case of a strong economy.

In fact, a foreign currency can be regarded as a claim on a foreign economy. The stronger this foreign economy is, the higher the confidence will be in the value of such a claim. Therefore, weak economies will generally profit more from a key currency peg or an official basket (SDR) peg than strong economies.

From Table 8 we can deduce that this theoretical statement is in line with practice. Of the low-income economies 62 percent maintain a single currency peg or an SDR peg. For middle-income, upper middle-income and high-income LDCs these shares were respectively 52, 35 and 29 percent.

On the other hand, the relative share of more flexible arrangements increases with income. Of the low-income LDCs only 22 percent maintained such an arrangement, while this percentage increases to 57 for high-income LDCs. This is in accordance with our earlier conclusion that the more developed an economy is, the more feasible a flexible exchange rate will be.

### Table 8: Exchange arrangements and GNP per capita of IMF member countries

<table>
<thead>
<tr>
<th>Exchange arrangements</th>
<th>Low-income economies</th>
<th>Middle-income economies</th>
<th>Upper middle-income economies</th>
<th>Rest of LDCs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single currency peg</td>
<td>52</td>
<td>44</td>
<td>42</td>
<td>39</td>
<td>41</td>
</tr>
<tr>
<td>Dollar</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>52</td>
<td>44</td>
<td>42</td>
<td>39</td>
<td>41</td>
</tr>
<tr>
<td>Currency basket peg</td>
<td>8</td>
<td>9</td>
<td>12</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>SDR</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Individual basket</td>
<td>13</td>
<td>13</td>
<td>13</td>
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<td>13</td>
</tr>
<tr>
<td>Flexible arrangement</td>
<td>Limited flexibility</td>
<td>Adjusted managed floating</td>
<td>Other independent floating</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10.9</td>
<td>10.9</td>
<td>10.9</td>
<td>10.9</td>
<td>10.9</td>
</tr>
</tbody>
</table>

1. Not included are Hong Kong and the Netherlands Antilles. The figures on per capita GNP and the classification of economies are both derived from the World Development Report 1984 of the World Bank (pp. 218-19, 276). Figures for 1983. Addendum information on the classification of exchange rate regimes can be found in the footnotes under Table 3. In some cases the relative importance of an exchange arrangement within a certain category of economies is put between brackets.

2. Included are the East-European non-market economies (Hungary and Romania).

3. Includes numismatics with a population of less than 1 million in mid-1982. For which no data on per capita GNP were available (Bhutan, Equatorial Guinea, Maldives, Suriname, Swaziland, Western Samoa, Zaire).
It is also interesting to note that individual basket pegs are somewhat more popular among upper middle-income economies than under middle and low-income economies. We may conclude that the more developed an economy is, the less important the role of confidence in the selection of an exchange rate regime will be, and that, as a result, a well-known currency or currency basket will less frequently be chosen as a standard for the exchange rate.

The fifth row in Table 8 contains the average GNP per capita of the LDCs that maintain a similar exchange arrangement. LDCs for which no per capita GNP was given in the World Development Report were excluded from the computation. Our earlier conclusions are completely in line with the figures in this row: low values for single currency pegs ($1.2 thousand) and SDR pegs ($0.4 thousand) and relatively high figures for individual basket pegs ($2.3 thousand) and flexible arrangements ($3.4 thousand). The difference between SDR pegs and individual basket pegs is striking. Mean GNP per capita is about six times as high in LDCs that have pegged their currency to an individual basket than among LDCs that maintain an SDR peg. This again supports our conclusion that SDR pegs are mainly attractive for weak economies while stronger economies prefer to compile an individual basket.

In a similar study carried out by Branson and Katseli (1981-a) for the year 1975, the authors exclude the OPEC-members and Bahrein "on the ground that their recent jump in income was not matched by an equally rapid development of industry and financial markets" (p. 396).

In our opinion this argument is less relevant nowadays. Nevertheless, we have also included a row in which high-income oil exporting LDCs are excluded. Especially in the category 'limited flexibility' this results in a sharp reduction in per capita GNP. However, our conclusions do not alter because of this. Strong, non oil-exporting LDCs appear to prefer a flexible arrangement or an individual basket peg, and the weaker LDCs prefer a single currency peg or an SDR peg.

When we compare oil exporting countries to industrial countries there is a remarkable difference with respect to exchange rate policy. While none of the industrial countries have pegged their currency to the dollar, all but one of the high-income oil exporting countries maintain a dollar peg or have limited the flexibility of their currency in terms of the dollar. This implies that the exchange rate risk on their export (oil) revenues is low, which may have been an important reason for selecting a dollar peg.

Finally, Table 8 shows that within the group of industrial countries there is little difference in per capita GNP between the different exchange arrangements.
4. THE COMPOSITION OF A BASKET

4.1. Introduction

When a decision is taken in favour of a basket peg, the composition of the basket must be determined next. First, it is necessary to select the currencies that are to take part in the basket. In general we may say that a small number of currencies should be preferred to a large number. First, because it gives a clearer insight to market participants how the exchange rate behaves and second, because it is easier for the monetary authorities to maintain a basket peg with respect to a few currencies than with respect to many different currencies.

The best method is to determine the number of currencies in the basket once the weighting scheme has been formulated. In that case, all the currencies with a weight below the chosen threshold value are eliminated from the basket. The resulting gap is afterwards filled by a proportional increase of all weights over the threshold value. When two currencies have about the same weight, the threshold value should be determined in such a way as to avoid that only one of these currencies enters the basket.

After these general considerations with respect to the number of currencies represented in the basket, we will now turn to the subject of this section which is the weighting structure within the basket. As we will demonstrate in Appendix 2 a basket peg implies a stable average or effective exchange rate. In section 4.2 we will give a definition of effective exchange rates and discuss the relationship with currency baskets more extensively. It appears that an effective exchange rate can only be defined in relation to a target variable.

In section 4.3 we will discuss the transmission process from instrument to target, while in section 4.4 different targets and the accompanying currency basket pegs are reviewed. A special and very popular type of basket is the trade-weighted basket, which will be discussed in more detail in section 4.5. Trade-weighted basket pegs can be distinguished from other individual basket pegs by the fact that often

35) An important exception to this rule for the determination of a basket concerns the composition of the ECU. In the case of this basket, currencies were selected according to the criterion of EC membership. This resulted in very small weights for certain currencies. Political arguments, more than economic arguments, determined the composition of the ECU. We may add that, as already noted in section 2, the role of the ECU as a standard basket in exchange rate policy is still very limited.
a clearly defined target of exchange rate policy is lacking. Therefore, we can subdivide individual basket pegs into optimal basket pegs, which do imply the existence of a well-defined target variable, and trade-weighted basket pegs. This division is shown in Figure 2, which can be regarded as a further refinement of Figure 1.

Figure 2  Individual basket pegs

4.2 Basket pegs and effective exchange rates

Pegging to a basket is equivalent to the stabilization of an effective exchange rate\(^36\). Both expressions mean that the monetary authorities fix an average exchange rate, i.e. a weighted average of bilateral exchange rates. We often encounter the expression 'the effective exchange rate' which suggests that there is a unique concept of this variable. This, however, is not true. There exist an infinite number of effective exchange rates\(^37\).

The key to what is meant by an effective exchange rate lies in the word effective. An effective exchange rate measures the effect that the exchange rate exerts on a chosen economic variable. For every economic variable that is dependent on the exchange rate, a different

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\(^36\) For a technical analysis see Appendix 2-III-2/4.

\(^37\) In economic literature, effective exchange rates often refer to trade-weighted combinations of bilateral exchange rates, see e.g. Black (1978, p. 10), Crockett and Nsouli (1979, p. 13) and Williamson (1982, p. 52). The exact interpretation of these rates is not always completely clear.
effective exchange rate can be composed. When the effective exchange rate remains constant, this implies that the combined effect of all bilateral exchange rate changes on the chosen target variable, is nil. But we should be careful here. A zero change in the effective exchange rate does not imply that there have not been any changes in the bilateral exchange rates, or that these changes have had no effect on the target variable, but only that these (bilateral) influences have cancelled each other out.

Nor does a zero change in the effective exchange rate mean that the target variable has remained constant. This variable may very well have changed under influence of explanatory variables different from the exchange rates.

What does it mean when an effective exchange rate decreases by one percent? The answer to this question depends on the target variable that is chosen. A one percent decrease of the effective exchange rate has the same effect on the target variable as a simultaneous one percent decrease of all the bilateral exchange rates. Again we stress the fact that only the effect on the chosen target variable must be the same.

An example may illustrate the definition presented above. If we choose the value of exports (expressed in the home currency) as our target variable, this implies that the effective exchange rate must show the effect of exchange rate changes on the value of exports. Now let us assume that the exporting country is a price taker on its export markets, and that the supply of exports is completely inelastic. It is easy to see that in this case the weights for the determination of the effective exchange rate must be equal to the export trade shares. E.g. a one per cent decrease of the exchange rate between the home currency and the currency of a trading partner with a trade share of 10 per cent, has an effect on the total value of exports equal to a uniform decrease of all bilateral exchange rates of 0.1 per cent.

It will be clear that it is not the level of the effective exchange rate that counts, but only the rate of change.

In his authoritative article on effective exchange rates, Rhomberg (1976) distinguishes between seven possible methods of composing an effective exchange rate. Six out of these seven are based on trade shares and will be discussed in section 4.5. The highly restricted relevance of effective exchange rates based on trade shares, was one of the reasons why members of the IMF staff constructed a model in which the effect of exchange rate changes on trade flows was given more attention. This model resulted in the seventh effective exchange
rate referred to above. We will briefly discuss the main characteristics of the so-called Multilateral Exchange Rate Model or MERM\(^{38}\). The model is set up to study the effect of exchange rate changes in the medium term (two to three years). Twenty countries and groups of countries\(^{39}\) are examined, as well as six commodity classes. A commodity produced by a certain country is called a product, which implies that there are 120 products. Demand and supply equations for all products are derived, partly by a priori judgement on parameter estimates and partly — especially with regard to price elasticities of demand — by obtaining parameters from econometric studies\(^{40}\).

Apart from measuring the effects of exchange rate changes on trade flows, the model can also be used to calculate exchange rate changes that are necessary to achieve certain BOP targets, and to derive the effects of diverging inflation rates on the trade balance in the case of fixed exchange rates. The effective exchange rate that can be derived from the model, is described in the following way: "The effective exchange rate of a currency can be defined as the change that would induce the same alteration in its trade balance expressed in the numeraire currency as that brought about by a given realignment of all exchange rates\(^{41}\). In fact, the MERM was one of the first models that produced an effective exchange rate that was determined by a well defined economic target variable (the trade balance).

38) For an extensive description of the fundamentals, see Artus and Rhomberg (1973). A revised and extended version of the model, MERM-2, is presented in Artus and Muguirk (1981). This second version is discussed here. The effective exchange rate derived from the MERM is published monthly in the IMF/International Financial Statistics for all the individual countries that are represented in the model.

39) Included are all industrial countries (also Switzerland) except Iceland and New-Zealand, the group of oil exporting countries and a rest category of other countries.

40) In general it is very hard to obtain reliable data on price elasticities in international trade, especially with respect to LDCs. For this reason individual LDCs are not represented in the model. However, a special multilateral exchange rate model for primary producing countries was developed by Feltenstein, Goldstein and Schadler in 1979.

41) Artus and Rhomberg (1976, pp. 606/607)
What implications do these remarks about effective exchange rates have for currency basket pegs? As we have seen, effective exchange rates are helpful in measuring the overall effect of bilateral exchange rate changes on a chosen economic variable. Pegging to a basket implies the stabilization of an effective exchange rate, and thus it is a form of exchange rate policy whereby the effects of bilateral exchange rate changes on a chosen variable are minimized.

### 4.3 Instruments and targets

Pegging to a basket means that the value of the home currency is pegged to a basket of other currencies. In order to measure the value of currencies, a numeraire must be chosen. Our numeraire will be the intervention currency. This implies that the value of the home currency expressed in the intervention currency is kept equal to the value of the currency basket in terms of the intervention currency. In Appendix 2-III-1 we will demonstrate that the character of a basket peg does not depend on the intervention currency that is selected. The formula for a currency basket peg now becomes:

\[
e ON^t = \sum_{i=1}^{N} n_i e_i^n
\]

(For a list of symbols see Appendix 2-I)

The numbers \( n_i \) can be derived from the desired weighting structure by the formula:

\[
n_i = w_i e_i^0
\]

Equation (1) represents an absolute basket, i.e. a basket consisting of a number of currencies. A basket peg can also be formulated in relative terms. In that case the basket consists of a weighted average of proportionate changes of the exchange rates.

\[
e ON^t = \sum_{i=1}^{N} w_i \delta_i^n
\]

The main difference between both baskets is that under a relative basket peg the weights of the currencies in the basket are fixed, while under an absolute basket peg these weights depend on the exchange rates. A detailed discussion on the differences and similarities between absolute and relative basket pegs will be presented in Appendix 2-II/III-3.
Both under an absolute and a relative basket peg the instrument is the bilateral exchange rate between the home currency and the intervention currency, i.e.:

\[ e^t_{ON} \text{ and } e^t_{ON} \]

The indicator for this bilateral exchange rate is the effective exchange rate. Under an absolute basket peg, the effective exchange rate that is kept constant, is:

\[ \sum_{i=1}^{N} n_i e^{t}_{10} = 1 \quad (4) \]

while under a relative basket peg a weighted average of proportionate changes in the exchange rates is set equal to zero\(^{42}\).

\[ \sum_{i=1}^{N} w_i e^{t}_{10} = 0 \quad (5) \]

In order to determine the weights \( w_i \) an operational target variable\(^{43}\) has to be selected. This target variable must be a function of all the (proportionate charges in) bilateral exchange rates \( e^{t}_{10} (e^{t}_{10}) \). Optimizing or stabilizing the target variable, under the ceteris paribus condition with respect to other exogenous variables, leads to a relation that can be rewritten in the form of equation (1) or equation (2).

In most cases the operational target variable is not the final aim, but it is a variable that is optimized or stabilized in order to reach a final target. These final targets are often difficult to express in terms of bilateral exchange rates.

Examples of operational target variables are the domestic price level, the terms of trade and the ratio of the price level of tradables and non-tradables. This last ratio is also called the internal terms of trade or the internal price ratio.

\(^{42}\) For a proof, see Appendix 2-III-1. As we shall demonstrate, relative basket pegs are not equivalent to absolute basket pegs. Nor is the proportionate change in the EER as defined in (4), equal to the left-hand side of equation (5).

\(^{43}\) These terms are derived from the analysis of monetary policy, for which a similar distinction between instruments, indicators, operational (intermediate) targets and final (ultimate) aims can be made.
Most of the operational target variables are a function of price levels, which are in turn determined by exchange rates. Final aims may be the level and/or stability of real income, output or employment, as well as equilibrium on the balance of payments. The rate of inflation may be considered as an operational target variable and a final aim at the same time. The course from instruments to final targets is presented in Figure 3.

Figure 3  Instruments and targets under as basket peg

<table>
<thead>
<tr>
<th>INSTRUMENT</th>
<th>INDICATOR</th>
<th>OPERATIONAL TARGET VARIABLE</th>
<th>FINAL AIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>bilateral exchange rate</td>
<td>effective</td>
<td>e.g. price level, terms of trade, international terms of trade</td>
<td>e.g. real income output, employment, equilibrium on the BOP</td>
</tr>
<tr>
<td>between home currency and</td>
<td>exchange rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>intervention currency</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To clarify the actual derivation of the weights, we will conclude this section with an example, based on the derivation of basket weights in Branson and Katseli (1981, pp. 405-414).

We assume that the final aim is stability in the output structure. This stability is, inter alia, influenced by the internal terms of trade. If the internal terms of trade are stable there is no incentive to change the allocation of resources. Therefore, the internal terms of trade (ITOT) may very well serve as an operational target variable in this specific case. The ITOT are defined as the ratio of the price level of traded goods ($P_T$) and the price level of non-traded goods ($P_{NT}$).

$$ ITOT = \frac{P_T}{P_{NT}} $$

Stabilizing the ITOT implies that $ITOT = 0$, or that $P_T = P_{NT}$. 
Both price levels can be expressed in terms of the bilateral exchange rates $e_{01}^{t}$ ($i=1...N$), and two vectors $v_1, v_2$ of other exogenous variables:

$$P_T = P_T^{t}(\sum_{i=1}^{N} a_i e_{01}^{t}, v_1) ;
$$

$$P_{NT} = P_{NT}^{t}(\sum_{i=1}^{N} b_i e_{01}^{t}, v_2) ;$$

Under the ceteris paribus condition we can set $v_1 = v_2 = 0$.

Using equation (6) and rewriting the exchange rates in terms of the intervention currency, we obtain the following basket peg equation:

$$e_{01}^{t} = \sum_{i=1}^{N} w_i(a_i, b_i) e_{01}^{t} ;$$

with weights $w_i$ that are a function of both $a_i$ and $b_i$.

### 4.4 Target variables

As we have seen, pegging to a basket is only possible after a target variable has been chosen. However, care should be taken not to confuse two different aspects of exchange rate policy, i.e. the policy directed at the level of the exchange rate and the policy directed at the stability of the exchange rate. We already encountered the difference between these two aspects in our discussion on the influence of the inflation rate in exchange rate policy.

The level of the exchange rate can be chosen independently of the composition of the currency basket to which the home currency is tied. In the case of an absolute basket peg the level can be adjusted by a uniform change in the numbers of currencies in the basket. The formula for a relative basket peg does not even change when the level of the peg is adjusted.

The reason for putting so much stress on the difference between the desired level of the exchange rate and the movements around this equilibrium rate, is the frequent confusion over this matter. Pegging to a basket does not necessarily include a decision on the level of the exchange rate. Therefore, exchange rate targets should also be divided into two categories: a category of long run optimization targets and a category of short run stabilization targets. The first category should determine the level of the exchange rate in the longer run, while the second category should lead to an optimal short-term behaviour of the exchange rates.
In fact, there is only one long term target that dominates all other targets in this category, i.e. BOP equilibrium. A disequilibrium of the BOP cannot last for long and therefore in the long run the BOP position mainly determines the exchange rate\(^1\). Though capital transactions certainly do have a considerable influence on the BOP in the short run, in the long run it is the current account that matters most. For this reason, equilibrium on the current account, also called external balance, is an important target in the longer term, but it is not necessarily a short-term target.

We will now turn to short run target variables. In the short run stabilization is more important than optimization. Under the system of Bretton Woods an exchange rate could well be stabilized. It simply had to be pegged to the dollar/gold and all bilateral exchange rates would automatically be fixed. As already noted, this is no longer possible in a world of floating exchange rates. In such a world pegging to one currency means floating with respect to the others. The main source of instability comes from third currency exchange rate movements. This instability cannot be taken away by a single currency peg, but the effect of it on the domestic economy can be reduced substantially by pegging to a currency basket. As Lipschitz and Sundararajan (1980) have pointed out: "The composition of the basket is generally related to the stability objective of minimizing the effects of exchange rate fluctuations on the economy" (p. 82).

We may add that in the case of a basket peg there is an additional 'degree of freedom' in comparison to the case of a single currency peg. This 'degree of freedom' refers to the possibility of selecting a tailor-made basket peg that neutralizes the effects of third currency movements on a chosen target variable.

A brief survey of the targets mentioned in the literature on currency baskets is presented below\(^4\). Not always is a distinction made between final aims and operational targets, see e.g. the study by

\(^4\) An exception is formed by countries that issue the standard currency. These countries can afford BOP deficits for longer periods, as other countries are generally willing to hold certain stocks of the standard currency. The direction of the relation between the exchange rate and the BOP depends on whether the exchange rate is fixed or flexible. If it is fixed, the exchange rate determines the BOP and if it is floating freely, the situation on the BOP determines the exchange rate.

\(^4\) For a more detailed description, see Williamson (1982).
Flanders and Helpman (1979) in which only a final aim, i.e. the level of real income, is specified\(^46\). Their general equilibrium model leads to very complicated formulas for the basket weights. These weights are, inter alia, a function of the variance/covariance matrix of exchange rates. In addition to the data problems involved in their calculation, Williamson remarks that the stabilization of real income is not a very proper target, because it implies the loss of temporary gains in real income, for which there is no clear reason. He suggests the stabilization of real expenditure instead.

The operational target variable associated with the stabilization of real income is the terms of trade\(^47\). Thus, it is not surprising that Williamson also rejects this target. Apart from his fundamental criticism, it must be remembered that stabilizing the terms of trade is only possible for large developed countries. As we have noticed, because of their low degree of market power LDCs have very little influence on their terms of trade.

Connolly (1983) proposes a target variable that is strongly related to the inflation rate. The objective of his basket peg is to minimize the variance of the inflation rate. In his model this variance is a function of the variances of the inflation rates of the basket currencies, the variances in the deviations of the different exchange rates from PPP\(^48\), and the trade weights. Minimizing the variance of the domestic inflation rate results in a weighting structure that is a function of the same variances and trade weights. However, it is doubtful whether a stable (imported) inflation rate is important enough to be the sole target of exchange rate policy. It will also be hard to collect adequate data for the determination of the basket, especially with regard to the deviations of the exchange rates from PPP.

---

\(^{46}\) This was the second target chosen by Flanders and Helpman. Their first target was the trade balance. In both cases the objective was to minimize the variance in the target variable subject to a desired development of its level. In this respect the authors refer to an efficiency frontier, that shows the trade-off between the variance and the expected rate of increase in the target variable (pp. 535, 538-39).

\(^{47}\) This was one of the objectives chosen by Branson and Katsell (1980, 1981-a).

The balance of trade or the current account has also been proposed as a target variable\(^1\)). We already saw that the level of the current account can best be influenced by the level of the peg and not by its character. With respect to fluctuations in the trade balance it may be better to adjust for these changes by financing, i.e. the use of reserves, than by exchange rate policy. Certainly in the short run there is little reason for aiming at a (continuous) current account equilibrium. For Williamson this is the reason to reject all basket pegs aimed at external equilibrium and to concentrate fully on internal equilibrium, i.e. the stabilization of output and employment, in compiling currency baskets.

What is the effect of exchange rate movements on the internal equilibrium, and how can this equilibrium be sheltered from exchange rate movements? It is clear that internal equilibrium is a final aim. The internal terms of trade are a suitable target variable. A change in this variable will lead to a change in the allocation of resources. A decrease in the internal terms of trade will result in a shift from the production of tradables to the production of non-tradables. An increase has exactly the opposite effect. It is clear that (reversible) changes in the internal terms of trade can be very harmful to the economy because of these shifts in the allocation of resources. Therefore, stabilizing this variable can be considered as an important objective of short term exchange rate policy. This holds true especially for LDCs that are unable to influence their (external) terms of trade. As Black (1976) has pointed out: '... the main channel through which exchange rates affect the economy is the ratio of traded goods prices to non-traded goods prices' (p. 37).

A somewhat different approach was chosen by Lipschitz and Sundararajan\(^50\)). They discuss real instead of nominal basket pegs.

\(^{49}\) See e.g. Branson and Katseli (1981—a, p. 413) and Flanders and Helpman (1979, pp. 534-35). Crockett and Nsouli (1977) mention the BOP as their target without any further specification.

\(^{50}\) See Lipschitz and Sundararajan (1980). The authors published a short summary of their article in Finance and Development, volume 17 no. 2 (June 1980), pp. 25-28. In Lipschitz and Sundararajan (1982) they combine their model with the weighting structures derived by Branson and Katseli (1981) for the terms of trade and the trade balance objective. In contrast with Branson and Katseli, who assumed that prices are constant (see p. 411), Lipschitz and Sundararajan rewrite the formulas for the weights in terms of exchange rates and prices.
Under a real basket peg a real effective exchange rate is stabilized. The word 'real' refers to an adjustment for inflation rate differentials. Unfortunately, real effective exchange rates are hard to stabilize, because of the lack of recent data on changes in general price levels. Such data are only available with some delay. Lipschitz and Sundararajan try to overcome this problem by the introduction of a second step, that succeeds the determination of the weights in the real effective exchange rate. In fact, they transfer the real basket, which is based on elasticity weights derived from the MERM, into a nominal basket by adjusting the elasticity weights for the variance/covariance structure of the price levels and the exchange rates. This adjustment takes place by minimizing the variance in the real effective exchange rate.

The final result of this method is that the more the bilateral exchange rate between a currency and the home currency deviates from its PPP level, the higher the weight of this currency in the basket will be. On the other hand, if PPP holds exactly for a certain currency, the weight of this currency is set at zero. A few critical remarks can be made with respect to this approach.

As the authors notice themselves, their method is only feasible under the condition that variances and covariances are stable over time (p. 96). However, even if this condition is fulfilled in the past, this does not imply that it will also be fulfilled in the future. Especially when the exchange rate is pegged to a basket according to the method described above, this may very well lead to a changing pattern of variances and covariances.

One further study needs to be mentioned because of its special character. Turnovsky (1982) set up a general equilibrium macro model in order to derive optimal weights for a currency basket. His approach differs from the one chosen by other authors with respect to capital flows. Turnovsky assumes perfect capital mobility while in former studies capital flows were almost completely neglected. The reason for this neglect may have been the fact that the degree of capital mobility in LDCs ---- most other studies deal especially with LDCs ---- is low. Exchange rates are endogenous and mainly determined by interest rates in Turnovsky's model. His target is the stabilization of domestic real income, which is the same target that was chosen by the only other authors who used a general equilibrium model to derive optimal weights, i.e. Flanders and Helpman.

Until now we have only considered target variables that bear indirectly relation to the bilateral exchange rates, often through the
channel of price levels. For an illustration we may refer to the example given in section 4.3. The resulting calculations often lead to cumbersome formulas for the optimal weights. Even negative weights are very well possible. Though certainly valuable from a theoretical point of view, the practical application of basket pegs based on such weighting schemes may be difficult.

First it may be hard to find suitable data on elasticities (especially for LDCs), on variance/covariance matrices of exchange rates, and on prices. Often these data are only available at some delay.

An alternative would be to use data from previous years but in that case we must assume that these exogenous variables are stable, which is not always a realistic assumption. It may even be doubtful whether certain data that are readily available, are stable enough to be used for exchange rate policy. In this case we refer to the variances and covariances of exchange rates.

A second drawback concerns the predictability of exchange rates. The choice for a basket peg already implies the acceptance of a certain loss in predictability of the exchange rate in comparison to the alternative of a single currency peg. This drawback is certainly aggravated by the use of complex basket formulas, especially when these have to be adjusted frequently as a result of changing data.

We may conclude that there is a certain tension between theory and practice. Baskets that are optimal from a theoretical point of view, may be suboptimal in practice. On the other hand the call for clarity from the exchange markets, may conflict with economic aims. A compromise may be found in baskets based on trade weights. These baskets will be discussed in the next section.

4.5 Baskets based on trade weights

Trade weighted baskets certainly deserve our attention as most LDCs that maintain a basket peg, do so in terms of a basket based on trade shares.52)

In this section we will primarily deal with the interpretation of trade-weighted basket pegs. Pegging to a basket that is based on trade shares is equivalent to the stabilization of an effective exchange rate (EER) that is based on these trade shares.

When we now define:

\[ a_{ij} = \text{exports from country } i \text{ to country } j; \]
\[ b_{ij} = \text{imports of country } i \text{ coming from country } j; \]

the following weighting structures53) can be compiled:

<table>
<thead>
<tr>
<th>Weighting Structure</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export weights</td>
<td>( w^e_j = \frac{a_{0j}}{\Sigma a_{0j}}; )</td>
</tr>
<tr>
<td>Import weights</td>
<td>( w^i_j = \frac{b_{0j}}{\Sigma b_{0j}}; )</td>
</tr>
<tr>
<td>(Total) trade weights</td>
<td>( w^t_j = \frac{(a_{0j} + b_{0j})/\Sigma (a_{0j} + b_{0j})}{j} )</td>
</tr>
<tr>
<td>World trade weights</td>
<td>( w^w_j = \frac{\Sigma a_{ij}}{\Sigma j}; )</td>
</tr>
</tbody>
</table>

All these weighting structures correspond to a target variable, i.e. a variable that is kept constant when the exchange rate is pegged to a basket based on one of these weighting structures. It can easily be verified (see Appendix 2) that for an export weighted basket the target variable is the price level of exports, or in the case of inelastic supply and perfectly elastic demand, the value of exports.

52) Cf. IMF-Exchange Arrangements and Exchange Restrictions Annual Report 1984. A description of the individual baskets used by LDCs in their exchange rate policy can be found in part two (country pages) under the heading 'Exchange Arrangements' (Position on December 1983). A few countries not only use trade shares but also incorporate capital transactions (Algeria) or currency denomination of trade (Malaysia) in the derivation of the weights. Botswana has pegged its currency to a basket consisting of SDRs (50 per cent) and South-African rands (50 per cent), which can be regarded as a combination of an official basket peg and an individual basket peg. In practically all cases the dollar is used as the intervention currency.

53) For a more detailed discussion of EERs based on trade weights see Rhomberg (1976, esp. p. 95). Apart from the basic types of EERs mentioned above, Rhomberg also distinguishes combinations of these basic types. However, it is very hard to give an economic interpretation to EERs based on such "combined" weights.
Similarly, it can be derived that the target variable corresponding to import weights is the price level of imports. The target variable corresponding to (total) trade weights is the arithmetic average of the price levels of imports and exports. It is obvious that the more the distribution of exports over countries of destination differs from the distribution of imports over countries of origin, the more the average price level will differ from both constituent price levels.

In all three cases mentioned above we have implicitly assumed that there is no inflation. This assumption is only realistic in the short run, when exchange rates are generally more flexible than prices.

Pegging to a basket based on world trade weights implies the stabilization of the purchasing power of the home currency in terms of all the goods that are traded, assuming that prices are constant and only exchange rates can fluctuate. World trade weights may provide a better approximation of the relevant combination of exchange rates than export weights in the case that exports are sold on world markets more than on national markets (see also section 4.3).

Apart from the fact that trade shares are relatively easy to derive, their stability is also a positive factor. This reduces the bias resulting from the use of less recent data for the compilation of trade-weighted currency baskets. It also implies that once the weights have been determined, they are valid for some period. On the other hand, the assumptions made above with respect to the elasticities are more likely to be correct in the short run than in the longer run.

In this section we have implicitly assumed that trade is denominated in the currency of either the exporter or the importer. It is also possible that a third currency is used as a denominator. In such a case a correction in the weighting structure would be necessary. However, it is very difficult to determine exactly in which currency a trade-transaction is denominated. It may very well be that the currency in which a transaction is effected, is not the currency that really determines the price. As noted already in section 3.3 on SDR pegs, this is an argument for preferring trade-weighted baskets to baskets based on the currency denomination of trade.
(b) Pages to the pound sterling have almost completely disappeared.

easiest to adopt a basket peg or, preferably, a managed floating. France
maintained a dollar peg until the end of 1993, while the others
also had pegs, but only one third of these pegs still
the majority of pegs continued the link between the currency

4. Directly after the breakdown of the system of Bretton Woods,
we will now give a summary of the main results:

Our analysis of the pegged (bargaining) pegs in a certain exchange rate policy,
important developments have taken place with respect to exchange
some important developments have taken place with respect to exchange
the pound sterling. In the period of 1971-1983 some
In fact, most of these currencies are pegged, whether to a simple

3. However, the currencies of today's proponents do not generally do that.

the situation.

view of 1983, this expression provides an adequate description of
determined, and the (floating) exchange rate is often

the expression for the present system of exchange rates. It often
currencies (dollar, mark, yen and pound sterling) are floating,
the exchange rates between the most important
fluctuating rate, the exchange rate has been the most
important currencies have an independent

only a few of the industrial countries have a floating

more successful. EMS, a third category of countries, was succeeded by the
suffered from frequent changes in exchange rates. Within Europe, the
The major advantage of the new exchange rates is the most
important, within the ESCU, which the United States is the most important
currencies of the central member states, it is the most important, with a large

Within the group of industrial countries we can make a distinction

have a tendency to link the exchange rates within Europe, to which the
have been a tendency to link the exchange rates within Europe, to which the
contain many members of exchange rate regimes. A few large

Since 1973 it is no longer possible to maintain a fixed exchange

SUMMARY AND CONCLUSIONS
(c) A group of former French colonies in Africa have linked their currencies, in most cases the CFA, to the French franc.

(d) A considerable number of LDCs have adopted a more flexible arrangement. However, only 4 (high-income) LDCs went over to an independently floating exchange rate. The others preferred a managed floating rate or limited the flexibility of their currency in terms of a single standard currency (dollar).

(e) There has been an important shift from single currency pegs to currency basket pegs. At the end of 1983 more LDCs had pegged their currency to a basket (36) than to the dollar (34). This development from single currency pegs to currency basket pegs is even more pronounced when we consider the combined market shares. LDCs that maintain a currency basket peg represent about 25 per cent of total LDC exports, while the export share of LDCs that maintain a single currency peg is only 15 per cent.

3. In section three we analyzed the selection of an optimal exchange rate regime. The selection can be divided into three steps. First, a country must choose between a floating and a pegged exchange rate. The fundamental criterion is the (potential) stability of the exchange rate. There is no need to peg the exchange rate when we can expect a floating rate to be stable. Therefore, the characteristics of a country that are relevant with respect to the choice between floating and pegging, all refer to the (potential) stability of the floating rate.

According to the main criteria (openness, degree of financial integration, market power and trade structure) LDCs should generally peg their exchange rates. An additional argument is the cushioning effect of international reserves in the case of real supply shocks. These theoretical considerations accord well with the situation in practice, as only a few relatively well-developed LDCs have adopted an independently floating exchange rate.

4. However, pegging the exchange rate in a world of 'generalized floating' is not as easy as it was during the Bretton Woods era. There are two different alternatives: pegging to a single currency and pegging to a currency basket. In fact, these two categories are not disjunct, but single currency pegs can be regarded as a special case of currency basket pegs, in which all but one of the weights are equal to zero. In mathematical terms this means that the set of single currency pegs is a subset of the set of currency basket
pegs. This implies that optimization of a target variable, which is discussed in section 4, will generally result in a currency basket peg. Single pegs are mostly inferior from a purely theoretical point of view.

Nevertheless, at the end of 1983 52 LDCs had pegged their currency to a single standard currency. The main reason for maintaining a single currency peg refers to confidence. Pegging to a single strong (key) currency increases confidence in the local currency, which may stimulate international trade and investment in an indirect way. This is a long-term argument. On the other hand, pegging to the currency of a main trading partner will stimulate bilateral trade and investment between the two countries in a direct way, by reducing (exchange) rate uncertainty.

An additional argument in favor of a single currency peg is that a fixed rate in terms of a single (key) currency will generally induce fixed rates in terms of a number of other currencies that are pegged to the same standard currency. This argument is certainly valid for pegs to the dollar and the French franc.

5. With respect to basket pegs we must make a clear distinction between official basket pegs (e.g. SDR pegs) and individual basket pegs. In fact, an official basket peg combines certain characteristics of a basket peg with characteristics of a single currency peg. It resembles a basket peg because the home-currency is not pegged to a single standard currency but to a combination of currencies. However, the composition of this currency basket is not determined by the pegging country itself, but by an international institution. This implies that, from a purely theoretical point of view, an official basket will hardly ever be optimal for an individual country.

The reasons for pegging to an official basket are, to some extent, similar to the reasons for choosing a single currency peg. In the first place, official baskets are well-known on financial markets and therefore an official basket peg promotes confidence in the local currency. Second, when different countries peg to the same official basket, their bilateral rates are fixed, which may stimulate trade and investment, just as in the case of a single currency bloc. For instance, a common SDR peg among LDCs would certainly have a positive effect on intra-LDC trade.

A third argument may be relevant in the future. If the SDR were to become more important on international trade and financial markets,
an SDR peg might lead to more stable export revenues for LDCs, while the (future) possibility of borrowing in SDRs might have the additional advantage of a debt that is stable in terms of the domestic currency.

An additional argument for maintaining an SDR peg differs from the arguments in favour of a single currency peg: an SDR peg will generally lead to a more stable trade-weighted effective exchange rate than a single currency peg.

6. Maintaining a basket peg is equivalent to the stabilization of an effective (average) exchange rate. It is necessary to emphasize that there is no such thing as the effective exchange rate. An effective exchange rate indicates the effect that the exchange rate exerts on a chosen variable, and every target variable corresponds to a different effective exchange rate. This implies that every basket peg corresponds to a target variable as well.

7. Under a currency basket peg the connection between instrument and target is not a direct one, but involves various intermediate relations. As currency baskets can not yet be used as a means of intervention, a basket peg can only be maintained after selection of an intervention currency. The effective exchange rate serves as an indicator that is determined by the instrument of the bilateral rate between the home currency and the intervention currency.

The final aim of exchange rate policy, e.g. the level of real income or employment, is often difficult to express directly in terms of the bilateral exchange rates. Therefore, an operational target variable is selected that is closely related to the final aim, and that can be written as a function of all bilateral exchange rates.

8. With respect to exchange rate targets, it is useful to make a distinction between long term and short term targets. In the long run the exchange rate should correspond to BOP equilibrium. This can be achieved best by adjustment of the peg in the case of a (potential) deficit or surplus. In this respect, the level of the peg is more important than the character of the peg.

However, in the short run the main target of exchange rate policy is to take away the effects of exchange rate fluctuations on the domestic economy. BOP deficits can be financed by using reserves and/or borrowing. Equilibrium on the BOP is not a proper short-term target.
Neither is the rate of inflation a proper target of exchange rate policy in the short run. The desired rate of inflation should not determine the character of the peg, but only its level. An undesired rate of (imported) inflation can be cured by maintaining a crawling peg. This also implies that in the short run it is the nominal effective exchange rate which should be stabilized, and not the real effective exchange rate.

Another target that is often mentioned in the literature on optimal basket pegs are the terms of trade. This target is connected with the final aim of a stable real income. However, apart from the question whether a stable real income is a proper aim, most LDCs are hardly able to influence their terms of trade.

When internal equilibrium is the final aim, the internal terms of trade (i.e. the ratio of traded goods prices to non traded goods prices) are an acceptable target variable. Stable internal terms of trade prevent the occurrence of sudden shifts in the allocation of resources in the case of exchange rate instability.

In the literature on optimal basket pegs all the targets mentioned above have been proposed. In most cases the result is a complex formula for the basket weights. These weights are, inter alia, based on elasticities, prices and variance/covariance matrices of exchange rates. Such weighting structures have two serious drawbacks. First, the underlying data are generally not very stable and therefore regular basket adjustments will be necessary. In the second place, complex basket formulas imply a reduction in the predictability of the exchange rate, that may very well offset the theoretical advantages of such a peg. This aspect is often neglected mainly because the capital account is not incorporated in most of the models.

9. As an alternative for the optimal basket weights derived from well-defined target variables, weights based on trade shares can be used. Because of the drawbacks associated with 'optimal' baskets and because of the frequent use of trade weights in exchange rate policy, trade-weighted basket pegs certainly deserve our attention as well. Pegging to a trade-weighted basket has a certain intuitive appeal: the more important the trade relations with a certain country, the closer the connection between the currency of the trading partner and the home currency. Under rigid assumptions with respect to elasticities and prices, which are only probable to hold in the short run, the value of trade is stabilized by pegging to a trade-weighted basket.
The main advantages of trade weights in comparison to 'optimal' weights are that they can be derived simply and that they are relatively stable. Moreover financial markets will generally be more impressed by a trade-weighted basket peg than by a peg to a basket based on complicated theoretical formulas. This may explain the popularity of trade-weighted basket pegs among LDCs. Practically all LDCs in the category 'other composite pegs' have pegged their currency to a trade-weighted basket of the currencies of their major trading partners. In all of these cases the dollar is used as intervention currency.

Little empirical research has been undertaken on the factors determining the selection of an exchange rate regime. The existing studies generally support the theoretical arguments. Our main observations in this respect are summarized below.

a) The theoretical notion that in general LDCs should peg their exchange rate is amply justified by their behaviour in practice. Only a very small number of high-income LDCs have an independently floating exchange rate.

b) When an LDC decides to peg its exchange rate, it can choose between three alternatives: a single currency peg, an official basket peg and an individual basket peg. Theoretical considerations generally favour an individual basket peg. However, as we have concluded above, single currency pegs and SDR pegs have two advantages that individual basket pegs do not have.

First, pegging to a single currency often implies fixed exchange rates in terms of a bloc of currencies, which may facilitate trade within such a bloc. This aspect is certainly relevant for the African countries that have pegged their currencies to the French franc (CFA-zone). However, also historical motives have played a role here, just as in the case of other non-dollar single currency pegs.

A second and more important argument in favour of single currency pegs and official basket pegs (SDR pegs) is that such pegs increase confidence in the domestic currency. This argument is especially relevant for weak economies. Indeed, in practice we see that single currency pegs and SDR pegs are most popular among low and middle income LDCs.
c) With respect to individual, tailor-made basket pegs there is a certain distinction between practice and theory. In recent literature most authors compile baskets by optimizing or stabilizing a well-specified target variable. This often results in complex basket formulas and sometimes even in negative weights. However, in practice the majority of countries that maintain an individual basket peg prefer a simple trade-weighted currency basket. This supports our earlier argument in favour of trade-weighted basket pegs.

d) High-income oil exporting LDCs, for which on the basis of their economic power a floating rate would be feasible, have all pegged their currency in a more or less rigid way to the dollar. This preference for dollar pegs can be explained by the fact that their main export commodity, i.e. oil, is priced in dollars.
References


APPENDIX 1 MARKET POWER

A very clear explanation of the phenomenon 'market power' can be found in Branson and Katseli (1980). Starting from log-linear demand and supply equations they derive formulas for the domestic price level of exports and imports expressed as a function of the exchange rate and the domestic and foreign supply and demand conditions. The only parameters in these formulas are $k$ in the export equation and $k'$ in the import equation.

If these parameters are equal to one, the price levels of exports and imports are completely determined by foreign market conditions and the exchange rate. Domestic market conditions are irrelevant in this case, which implies that the market power is minimal. On the other hand, if $k$ and $k'$ are equal to zero, this implies that the price levels are completely determined within the domestic economy, in which case the market power is maximal. Therefore, both $k$ and $k'$ are inverse indices of market power. Both indices are functions of demand and supply elasticities. The exact formulas are:

For market power on the export side $k$:

$$ k = \frac{1}{1 - s_x(d_x)} \text{ with } s_x(d_x) = \text{price elasticity of export supply (demand)} $$

and $s_x \geq 0$; $d_x \leq 0$; $0 \leq k \leq 1$;

and for market power on the import side:

$$ k' = \frac{1}{1 - d_m(s_m)} \text{ with } s_m(d_m) = \text{price elasticity of import supply (demand)} $$

and $s_m \geq 0$; $d_m \leq 0$; $0 \leq k' \leq 1$.

From these formulas it becomes clear that:

1- The higher (lower) the elasticity of demand (supply) for (of) exports $d_x(s_x)$, the higher $k$ will be and therefore the lower the market power on the export side.

2- The higher (lower) the elasticity of supply (demand) of (for) imports $s_m(d_m)$, the higher $k'$ will be and therefore the lower the market power on the import side.

In general LDCs will have little market power. There are different ways to arrive at this conclusion. Crockett and Naouli (1977) emphasize the inelastic nature of the demand for imports and the supply of exports (p. 126). On the other hand, Branson and Katseli (1980, p. 56-
57) and Black (1976, p. 4) put emphasis on the high elasticities of the demand for exports and the supply of imports. However, both sets of assumptions lead to the same conclusion that LDCs will generally have little market power. We may add that, because in general exports of LDCs are less diversified than imports, market power is more likely to be on the export side than on the import side ($k < k'$).
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I List of symbols

The subscript i(j) refers to country/currency i(j). In general the currency basket consists of the currencies 1 ... N, while the home currency carries the subscript 0 (zero); intervention takes place in currency N, which also functions as the numeraire currency.

\( e_{ij} \) = exchange rate of currency i expressed in units of currency j at time t;

\( n_i \) = number of units (amounts) of currency i in the basket;

\( w_{ji} \) = weight of currency i in the basket to which currency j is pegged at time t;

\( w_i \) = weight of currency i in the home country's basket at time t;

\( w_i^0 \) = initial or desired weight of currency i in the home country's basket;

\( \exp(x) = e^x \);

\( \dot{x} = dx/x = d\ln x \);

\( \sum_{i=1}^{N} x_i \) = sum over i of the first N terms of \( x_i \), excluding \( x_k \);  

\( \prod_{i=1}^{N} x_i \) = product over i of the first N terms of \( x_i \);

For exchange rates, the following relations hold true of all i, j, t:

\( e_{ij} = e^{-1}_{ji} \);  
\( e_{ik} \cdot e_{kj} = e_{ij} \);

\( \dot{e}_{ij} = - \dot{e}_{ji} \);  
\( \dot{e}_{ik} + \dot{e}_{kj} = \dot{e}_{ij} \).
II Assumptions and definitions with respect to absolute and relative basket pegs

To obtain a formula for a basket peg it is necessary to take a decision on:

a) The initial value of the basket
b) The weighting structure of the basket
c) The intervention currency
d) The character of the basket

sub a) We will assume that the initial value of the basket is equal to the initial value of the home currency. If this is not the case, the home currency must first be brought at the right level before pegging it to a basket (e.g. by using a crawling peg formula)

sub b) The desired weighting structure of the basket is given by

$$w_i \ (i=1...N) \text{ with } \sum_{i=1}^{N} w_i = 1 \text{ and } w_i \geq 0 \text{ for all } i.$$

sub c) With respect to the intervention currency there are two possibilities. This currency may or may not take part in the basket. In the first case it is given the subscript N and in the second case it carries the subscript N+1. As we will demonstrate there is no fundamental difference between both cases and therefore currency N will generally play the role of intervention currency.

sub d) In the case of an absolute basket peg, the value of the home currency is pegged to a basket of other currencies. A relative basket peg implies that the proportionate rate of change in the home currency's exchange rate is equal to a basket of proportionate changes in the exchange rates of other currencies.

We can now derive the formulas for absolute and relative basket pegs. In order to obtain the numbers $n_i$ of currencies in the basket, we must multiply the weights by the initial exchange rates.
This leads to the desired result, i.e. the value of the basket expressed in the home currency is now equal to one:\footnote{Flanders and Helpman (1979) do not choose numbers that have this property, but prefer to divide their numbers by the initial value of the basket in terms of the home currency, when they formulate their basket peg equation (p. 534). This clearly leads to equivalent results.}

\[ n_i = w_i \cdot e_i^0 \quad (1) \]

When currency \( N \), which takes part in the basket, is chosen as the intervention currency, the formula for an absolute basket peg becomes:

\[ e_{0N} = \sum_{i=1}^{N} n_i e_{iN} = n_N + \sum_{i=1}^{N-1} n_i e_{iN} \quad (2) \]

From this equation it becomes clear that, in order to maintain a basket peg, information is necessary about the exchange rates of the basket currencies in terms of the intervention currency. In the case the intervention currency is not represented in the basket, we obtain:

\[ e_{0N+1} = \sum_{i=1}^{N} n_i e_{iN+1} \quad (2') \]

The equations (2) and (2') are formulated in the levels of the exchange rates. A drawback of this method is that the numerical values of the exchange rates as well as the amounts of the currencies in the basket can show large differences. We can avoid this drawback by rescaling the exchange rates. A common method is to divide the exchange rates by their initial values. When the absolute basket peg equation (2) is rescaled we obtain the following result:

\[ e_{0N}/e_0^0 = \sum_{i=1}^{N} n_i e_{iN}/e_{0N} = \sum_{i=1}^{N} n_i e_{i0}^0 e_{IN}/e_0^0 = \sum_{i=1}^{N} w_i (e_t^e/e_0^0) \quad (2'') \]

We can also formulate a basket peg in relative terms, i.e. in first differences of the logarithms of exchange rates. For small values this can be regarded as a relation between the proportionate changes in the exchange rates:

\[ e_{0N} = \sum_{i=1}^{N} w_i e_{iN} = \sum_{i=1}^{N-1} w_i e_t \quad (3) \]
or, for a non-basket intervention currency:

\[ \epsilon_{0N+1} = \sum_{i=1}^{N} w_i \epsilon_{iN+1} \]  
\[ (3') \]

We can rewrite equation (3) in the form:

\[ \ln(\epsilon_{0N}/\epsilon_{0N}) = \sum_{i=1}^{N} w_i \ln(\epsilon_{iN}/\epsilon_{iN}) \]  
\[ (3'') \]

which is the log-linear function used by Lipschitz and Sundararajan (1980, p. 83). In (3) the weight \( w_N \) has disappeared. However, because of the linear dependency of the weights \( w_N = 1 - \sum_{i=1}^{N-1} w_i \), no information is lost and there is no essential difference between (3) and (3') in this respect. We will now derive some properties of absolute and relative basket pegs.
III Properties of basket pegs

1. The choice of the intervention currency does not play any role in the character of the peg

First we will show that any other currency may be substituted for the intervention currency $N$ in the basket peg equation. Suppose we choose currency $N-1$ as our new intervention currency. The formula for an absolute basket peg now becomes:

$$\frac{e_{ON-1}}{e_{ON}} \cdot \frac{e_{NN-1}}{e_{NN}} = \left( \sum n_i e_i \right)/\left( \sum n_i e_i \right) \cdot \frac{n_i e_{IN-1}}{n_i e_{IN-1}}$$

and, for a relative basket peg:

$$\frac{e_{ON-1}}{e_{ON}} + \frac{e_{NN-1}}{e_{NN}} = \sum w_i (\frac{e_i}{e_{IN}} + \frac{e_i}{e_{IN}}) = \sum w_i e_i$$

Equation (4) is equivalent to (2) and equation (5) is equivalent to (3). Exactly the same derivation can be used to demonstrate that the formulas for a non basket intervention currency are equivalent to the formulas for intervention currencies that take part in the basket. Instead of currency $N-1$ we must substitute currency $N+1$ as a numeraire in the equations presented above. Because of this equivalence and for the sake of simplicity, from now on we will assume that interventions take place in the basket currency $N$.

One assumption is crucial in the proof presented above, i.e. that the weights $w_i$ or, equivalently, the amounts $n_i$ do not depend on the choice of the intervention currency. Especially when variances and covariances of exchange rates play a role in the determination of the exchange rates, this condition may very well not be fulfilled.

2. Maintaining an absolute basket peg is equivalent to the stabilization of an effective exchange rate

An effective exchange rate is an average of the bilateral exchange rates of the home currency. Under an absolute basket peg the effective exchange rate that is kept constant is $\sum n_i e_i$.

$$\text{EER} = \sum n_i e_i = \sum n_i e_i e_{NO}/e_{ON} = \left( \sum n_i e_i \right) e_{IN}/e_{IN} = 1$$

If the value of the basket is not equal to one unit of the home currency, but when e.g. the basket value is equal to $b$ units of currency 0 (which implies that the home currency is pegged to $b^{-1}$ times the basket, see also footnote 1), the EER in equation (6) is equal to $b$. 
Obviously, this still implies a constant EER. The EER can also be expressed in terms of the initial weights \( w_1 \):

\[
\text{EER} = \sum_{i=1}^{N} n_i e_{i10}^e = \sum_{i=1}^{N} w_i e_{i10}^e = \sum_{i=1}^{N} w_i \left( \frac{e_{i10}^e}{e_{010}^e} \right) = E \left( \frac{e_{10}^e}{e_{010}^e} \right)
\]  

(6')

3. Absolute and relative basket pegs are essentially different

This difference will be demonstrated in three ways, viz. by proving three different (although related) propositions.

(a) Under an absolute basket peg the numbers of currencies in the basket are fixed but their weights depend on the (bilateral) exchange rates.

Proof: \( w_k^t = \left( \frac{n_k e_{k10}^e}{\sum_{i=1}^{N} n_i e_{i10}^e} \right) = \left( \frac{n_k e_{k10}^e}{\sum_{i=1}^{N} e_{i10}^e} \right) = n_k e_{k0}^t \)  

Because the numbers \( n_k \) are fixed, \( w_k^t \) is dependent on the bilateral exchange rate between currency \( k \) and the home currency \( 0 \). In fact, this equation looks very much like equation (1). The difference between both equations lies in the direction of the causality. In (1), \( w_1 \) is the exogenous variable that determines \( n_1 \), while in the equation presented above, \( w_k^t \) is determined by the (exogenous) variable \( n_k \) and the exchange rate \( e_{k0}^t \). We can also express \( w_k^t \) in terms of the initial weights 2) \( w_k \).

\[
w_k = \frac{n_k e_{k10}^e}{e_{k0}^t} = n_k \cdot \left( \frac{e_{k0}^t / e_{k0}^e}{e_{k0}^t} \right) = w_k \cdot \left( \frac{e_{10}^e / e_{10}^e}{e_{010}^e / e_{010}^e} \right)
\]  

(9)

This equation makes clear that if currency \( k \) appreciates (depreciates) in terms of the home currency, the weight of currency \( k \) in the basket increases (decreases) proportionally.

2) The initial weights are the weights on which the composition of the basket is based, i.e. the weights \( w_1 \) that determine the amounts \( n_i \) according to equation (1). In order to emphasize the predetermined character of the initial weights, we have omitted the superscript \( 0 \). However, it is clear that \( w_1 = w_1^0 \).
It is also interesting to know what happens when currency $k$ appreciates or depreciates in terms of the numeraire currency $N$. Such an appreciation (depreciation) implies a uniform change against all other currencies in the basket. In the following equations this proportionate change equals $a$:

$$\frac{e^t_{kN}}{e^0_{kN}} = e^0_{kN} \text{ for } i=1\ldots N \text{ and } i=k, \text{ and}$$

$$e^t_{kN} = e^0_{kN} \cdot (1+a)$$

We can now express $w^t_k$ in terms of $w_k$ and $a$:

$$w^t_k = w_k \left( \frac{e^t_{kO}/e^0_{kO}}{e^0_{kO}} \right) = w_k \left( \frac{e^t_{kN}/e^0_{kO}}{e^0_{kO}} \right) = w_k (1+a) \cdot \frac{(e^0_{kN}/e^0_{kO})}{e^0_{kO}}$$

$$= w_k (1+a) \cdot \frac{e^t_{kN}/e^0_{kO}}{e^0_{kO}} = w_k (1+a) \cdot \frac{e^0_{kN}/e^0_{kO}}{e^0_{kO}} \left( \frac{\sum_{i=1}^{N} e^t_{kO}/e^0_{kO}}{\sum_{i=1}^{N} e^0_{kO}/e^0_{kO}} \right)$$

$$= w_k (1+a) \cdot \frac{e^0_{kN}/e^0_{kO}}{e^0_{kO}} \left( 1 + \frac{\sum_{i=1}^{N} e^t_{kO}/e^0_{kO} \cdot (1+a) \cdot e^0_{kN}/e^0_{kO}}{\sum_{i=1}^{N} e^0_{kN}/e^0_{kO} \cdot (1+a) \cdot e^0_{kN}/e^0_{kO}} \right)$$

$$= w_k (1+a) \cdot \frac{e^0_{kN}/e^0_{kO}}{e^0_{kO}} \left( 1 + \frac{\sum_{i=1}^{N} e^t_{kO}/e^0_{kO} \cdot (1+a) \cdot e^0_{kN}/e^0_{kO}}{\sum_{i=1}^{N} e^0_{kN}/e^0_{kO} \cdot (1+a) \cdot e^0_{kN}/e^0_{kO}} \right)$$

$$= w_k (1+a) \cdot \frac{e^0_{kN}/e^0_{kO}}{e^0_{kO}} \left( 1 + \frac{\sum_{i=1}^{N} e^t_{kO}/e^0_{kO} \cdot (1+a) \cdot e^0_{kN}/e^0_{kO}}{\sum_{i=1}^{N} e^0_{kN}/e^0_{kO} \cdot (1+a) \cdot e^0_{kN}/e^0_{kO}} \right)$$

For small values of $a$, this can be approximated by:

$$w^t_k = w_k (1+a-w_k a) = w_k (1+a(1-w_k)) \text{ or } w^t_k - w_k = aw_k (1-w_k) \quad (11)$$

This result shows that if currency $k$ appreciates (depreciates) by a proportion $a$ with respect to the numeraire and thereby with respect to all other currencies, its weight in the basket increases (decreases) by approximately $aw_k(1-w_k)$, which reaches its maximum value for $w_k = 0.5$ (see figure A-1). It can easily be demonstrated that this result is also valid for groups of currencies that simultaneously appreciate or depreciate by the same percentage. In that case these currencies can be considered as one currency with a weight equal to the sum of the weights of the participating currencies. This also explains the symmetry of equation (11) around the value 0.5. If currency $k$ appreciates (depreciates) by 100a per cent, this implies that all the other currencies depreciate (appreciate) by the same 100a per cent (on the assumption of a being relatively small). The increase (decrease) in the weight of currency $k$ must be equal to the decrease (increase) in the aggregated weight of all other basket currencies.
Figure A-1 Change in basket weight of a currency that appreciates by p percent

(b) Only in the initial situation is the differentiated version of an absolute basket peg equal to the corresponding relative basket peg equation.

Proof: Starting out from (2), we obtain the following equation for $\dot{e}_{ON}^t$:

$$\dot{e}_{ON}^t = \frac{d\ln e_{ON}^t}{dt} = e_{NO}^t \cdot \sum_{i=1}^{N} w_i \frac{d}{dt} \ln e_{iN}^t = e_{NO}^t \cdot \sum_{i=1}^{N} \Delta \ln e_{iN}^t = e_{NO}^t \cdot \sum_{i=1}^{N} w_i \frac{d}{dt} \ln e_{iN}^t = \sum_{i=1}^{N} \left( \frac{e_{iN}^t}{e_{NO}^t} \right) w_i \frac{d}{dt} \ln e_{iN}^t$$

Only in the initial situation is (12) equal to (3). Equation (3') can be derived from the differentiation of (2') in a completely similar way. Also this derivation is only valid in the initial situation.

(c) A relative basket peg is equivalent to a geometrically weighted basket in the levels of the exchange rates.

Proof: Integration of (3) yields the following result:

$$e_{ON}^t = \exp(\ln e_{ON}^0) = \exp(\int e_{ON}^t dt) = \exp(\int_{1}^{N} w_i \frac{d}{dt} \ln e_{iN}^t dt)$$

$$= \exp(\sum_{i=1}^{N} w_i \ln e_{iN}^t + c_0) = \exp(c_0) \cdot \prod_{i=1}^{N} \exp(w_i \ln e_{iN}^t)$$

$$= c_1 \prod_{i=1}^{N} (e_{iN}^t) = c_1^{N-1} \prod_{i=1}^{N} (e_{iN}^t)$$

with $c_0 = \ln c_1 = \text{constant of integration.}$
We can determine $c_1$ by substitution of the initial values of the exchange rates in equation (13).

$$c_1 = \frac{e_{iN}^0}{\prod_{i=1}^{N-1} (e_{iN}^0 w_i)}$$

(14)

When we substitute (14) in (13) and rearrange the terms, we obtain the following equation:

$$\frac{e_{iN}^t}{e_{iN}^0} = \prod_{i=1}^{N-1} (e_{iIN}^t/e_{iIN}^0) w_i$$

(15)

This equation is equivalent to the log-linear formula (3'').

The linear equation (2) and the multiplicative equation (13) are equivalent only when the exchange rates $e_{iN}^t$ are close to the initial values $e_{iN}^0$. The difference between both equations is most striking when one of the exchange rates $e_{iN}^t$ becomes zero. Such a situation may occur (theoretically) in the case of hyperinflation in country $i$.

According to (13) $e_{iN}^t$ would also become zero, while according to equation (2) $e_{iN}^t$ would fall by the amount $n_i e_{iN}^0$ in comparison to the initial value.

There is only one case in which an absolute and a relative basket peg are completely identical, i.e. in the case of a 'degenerated' basket consisting of only one currency. We then have a single currency peg, with only one weight, which is equal to one. The equations for a single currency peg are:

$$e_{i0}^t = e_{i0}^0 \text{ or, equivalently } e_{i0}^t = 0$$

4. **Under a relative basket peg a geometric effective exchange rate is stabilized**

We will first demonstrate that under a relative basket peg a weighted average of the proportionate changes in the exchange rate is stabilized.

$$\sum_{i=1}^{N} w_i \delta_{i0}^t = \sum_{i=1}^{N} w_i (\delta_{iIN}^t + \delta_{iNO}^t) = \sum_{i=1}^{N} w_i \delta_{iIN}^t + \delta_{iNO}^t = \sum_{i=1}^{N} w_i \delta_{iIN}^t - \delta_{iNO}^t = 0$$

(16)

Only in the initial situation is the proportional change in the EER equal to the weighted average $\sum_{i=1}^{N} w_i e_{i0}^t$ presented above. The reason is that the weights of the currencies in the EER, which are equivalent to the weights in the (absolute) basket, are not constant (see 4-a).
As we have seen in 4-c a relative basket peg can be considered as an absolute basket peg with a geometric structure. When we now define our geometric effective exchange rate (GEER) as

\[ \text{GEER} = \prod \left( \frac{e_j^0}{e_0^0} \right)^{w_j}, \]

the proposition above can easily be proved by using (15)

\[ \text{GEER} = \prod \left( \frac{e_j^0}{e_0^0} \right)^{w_j} = \prod \left( \frac{e_j^0}{e_0^0} \right)^{w_j} = \left( \frac{e_j^0}{e_0^0} \right)^{\sum w_j} \]

GEERs, though at first sight certainly less appealing than (arithmetrical) EERs, have an important property that EERs must lack. A proportionate change in one of the exchange rates always has the same (proportionate) effect on the GEER.

5 A three currency example

Let us assume that there are three currencies: HFL, BFR and DM. The home currency 0 (HFL) is pegged to a basket consisting of the currencies 1 (BFR) and 2 (DM), of which the latter acts as the intervention currency. The following table of initial exchange rates is given.

<table>
<thead>
<tr>
<th>Table A Initial exchange rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>$e_{ij}^0$</td>
</tr>
<tr>
<td>i=0 (HFL)</td>
</tr>
<tr>
<td>i=1 (BFR)</td>
</tr>
<tr>
<td>i=2 (DM)</td>
</tr>
</tbody>
</table>

The desired weighting structure is: $w_1 =$ weight of BFR $= 0.3$ ;
$w_2 =$ weight of DM $= 0.7$.

The numbers in the absolute basket can now be derived:

$\begin{align*}
n_1 &= w_1 e_{01}^0 = (0.3) \cdot 20 = 6 ; \\
n_2 &= w_2 e_{02}^0 = (0.7) \cdot 0.8 = 0.56 ;
\end{align*}$
This implies that the basket consists of 6 units of BFR and 0.56 units of DM. The absolute basket peg equation now becomes:
\[ e_{\text{HFL/DM}}^t = 6e_{\text{BFR/DM}}^t + 0.56 e_{\text{DM/HFL}}^t. \]

With the result that the corresponding effective exchange rate equals one: \( \text{EER} = 6e_{\text{BFR/HFL}}^t + 0.56 e_{\text{DM/HFL}}^t = 1. \)

We now turn to the relative basket peg equation. Substitution in (3) gives:
\[ e_{\text{HFL/DM}}^t = 0.3 e_{\text{BFR/DM}}^t; \]

with the result that \( 0.3 e_{\text{BFR/HFL}}^t + 0.7 e_{\text{DM/HFL}}^t = 0. \)

As we have seen in equation (13) a relative basket peg can also be written as a geometrically weighted absolute basket peg.
\[ e_{\text{HFL/DM}}^t = c_1 e_{\text{BFR/DM}}^t, \text{ with } c_1 = \left( e_{\text{HFL/DM}}^0 / e_{\text{BFR/DM}}^0 \right)^{0.3} = 0.8 / (0.04)^{0.3} = 2.1. \]

We can now also give the formula for the geometric effective exchange rate (see (17)).
\[ \text{GEER} = \left( e_{\text{BFR/HFL}}^t \right)^{0.3} \cdot \left( e_{\text{DM/HFL}}^t \right)^{0.7} \cdot 2.1 = 1 \]

Without further comment we will now give the formulas for the case of a non-basket intervention currency ($): 

absolute basket peg: \[ e_{\text{HFL/\$}}^t = 6 e_{\text{BFR/\$}}^t + 0.56 e_{\text{DM/\$}}^t; \]

relative basket peg: \[ e_{\text{HFL/\$}}^t = 0.3 e_{\text{BFR/\$}}^t + 0.7 e_{\text{DM/\$}}^t. \]
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