Exchange Rate Flexibility and Currency Areas

By H. Robert Heller*

I. Introduction

The Second Amendment to the Articles of Agreement of the International Monetary Fund mark a watershed in international monetary affairs in that they allow each country to freely choose the type of exchange rate system that best suits its individuals needs. The freedom of choice is restricted only by the proviso that each member country "collaborate with the Fund and other members to assure orderly exchange arrangements and to promote a stable system of exchange rates" (Revised Article IV, Section 1). The revised Articles of Agreement specifically mention that exchange arrangements may include (1) pegging to an individual currency; (2) pegging to a group of other currencies; (3) pegging of the currency to the SDR or any other denomination other than gold; or (4) other exchange arrangements of a member's choice, (Revised Article IV, Section 2).

There is little historical experience upon which countries can rely in their choice of an exchange rate system appropriate to their needs. While individual countries adopted floating exchange rates for limited periods in the fifties and sixties, generalized floating did not prevail until the early seventies. Several major countries had floating exchange rates for a while in 1971, but the Smithsonian Agreement of December 18, 1971 brought an end to this practice. Not until early 1973 did a significant group of countries again resort to floating.

Other countries have adopted exchange rate systems that resemble currency areas — and were indeed intended as a first step to eventual monetary unification or the formation of a currency area. The European system of narrower margins, generally referred to as the "snake," is the most prominent example of such a currency system. The snake has been in operation since the Basle Agreement of April 10, 1972, although its membership has fluctuated since then.

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This paper is part of a larger project on *The Choice of an Exchange Rate System*. The author is greatly indebted to Mr. *K. Hannah* and Mr. *F. Santos* who carried out the necessary calculations. The opinions expressed are those of the author and should not be interpreted as official Fund views.

A third option open to countries is to let their currency "crawl". The external value of a crawling currency is typically linked to one or more domestic indicators, such as the inflation rate. The set of indicators may also include foreign variables. In such cases the differential movement between the domestic and foreign indicators may form the basis for the crawl. In view of the fact that the value of a crawling currency in the foreign exchange market is allowed to change frequently, it probably resembles a floating currency more nearly than one whose value is maintained in terms of an external standard of value.

A country opting for a pegged currency has to make a choice between a single foreign currency and a composite or "basket" of foreign currencies. A country which decides in favor of a single currency peg has to make a further determination as to the most desirable currency — such as the U. S. dollar, the pound sterling, the French franc, or some other currency. Similarly, a country opting for a basket peg has to choose between available baskets, such as the SDR, and other currency baskets, which are often based on the currencies of the country's most important trading partners. These basic options open to a country under the new international monetary system are delineated in Figure 1.

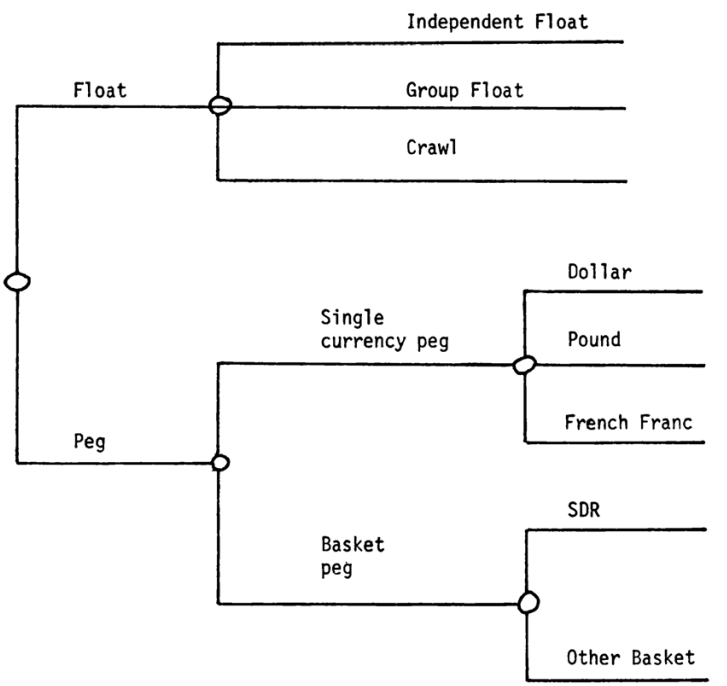

Fig. 1: The Choice of an Exchange Rate System

II. Theoretical Considerations

The policy problem of having to choose between alternative exchange rate systems is relatively new, and consequently economic theoreticians have not analyzed the problem in depth. Conceptually, the proper approach to the problem is clear: One has to determine the costs and benefits associated with each alternative exchange rate system for a specific country and then choose the system which maximizes the benefits (or minimizes the losses) for the country in question.[1]

While no specialized theoretical literature on the choice of an appropriate exchange rate system exists, there is a considerable body of literature concerning a closely related problem: the factors determining the size of the optimal currency area. The formal analogy between these two questions is obvious: both deal with the decision of a country to maintain a pegged or a floating exchange rate. However, certain conceptual differences do exist. Consider, for instance, the difference between joining a currency area, whose members will have immutably fixed exchange rates and the maintenance of an exchange rate value in term of currency basket, such as the SDR. Under both systems the country will be a pegger whose currency value does not change in terms of an average of the currency area or a currency basket. But all the basket currencies may actually be floaters whose currency values change daily vis-a-vis each other. For a country faced with the decision whether pegging to a group of countries is advantageous there may be a considerable difference as for as uncertainty in foreign commerce is concerned between the joining of a currency area of stable currencies or the maintenance of her currency in terms of a currency basket whose component currencies fluctuate widely.

Two recent surveys of the literature on optimal currency areas by *Ishiyama* (1975) and *Tower* and *Willett* (1976) provide a convenient summary of the various arguments why a country might find it advantageous or not to peg the value of its currency in terms of another currency. One of the most remarkable features of these surveys is that they are entirely theoretical in nature. Not a single theory proposed has actually been subjected to empirical testing. The need for empirical work in the field has been pointed out by *Tower* and *Willett* in

[1] In this connection it is interesting to note that the sum of the individual countries' choices does not necessarily yield an optimal exchange rate system for the world as a whole. For instance, it may be true that on the basis of a cost-benefit analysis carried out separately for each country, every nation decides separately to adopt a floating instead of a pegged exchange rate. However, there may be considerable negative externalities — such as greater uncertainty, an increase of resources to be devoted to exchange rate research, risk insurance, and the like — associated with such a system, which would make a pegged exchange rate system superior from a world viewpoint.

their survey of the theory of optimum currency areas and exchange rate flexibility. They conclude that "our theoretical understanding ... and our qualitative analysis of the major relevant factors far exceed our empirical knowledge of the key parameters". (*Tower* and *Willett* 1976, p. 82.)

1. The degree of openness

It has been suggested by *McKinnon* (1963), *Heller* (1966), and *Kreinin* and *Heller* (1974) that the degree of openness as measured by the ratio of traded goods to the total output of the economy plays an important role in the choice between fixed and flexible exchange rates. For instance, in order to eliminate a balance of payments deficit under fixed exchange rates with aggregate demand policies, it is necessary to deflate the economy by an amount which is inversely related to the propensity to import.[2] According to this theory, closed economies, characterized by a small foreign trade sector, will find it relatively costly to adjust to external imbalances via domestic inflation or deflation and will therefore prefer the less costly exchange rate adjustment. Consequently, we might expect that relatively closed economies have an incentive to rely on flexible exchange rates, while relatively open economies with a large foreign trade sector will tend to prefer fixed exchange rates.[3]

A further reason why relatively open economies prefer fixed exchange rates is that exchange rate changes will have an immediate impact on the general price level in the country. A nation desiring to minimize price level fluctuations may find it advantageous to keep the exchange rate fixed so as to avoid the immediate impact of any exchange rate fluctuation on the general price level. Downward rigidity of prices and wages may furthermore place a "floor" under any price increases experienced, thereby promoting a ratchet effect. Consequently, open economies with a large foreign trade sector will find fixed exchange rates relatively more attractive.[4]

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[2] Formally:

$$\Delta GNP = -\frac{1}{m}\Delta D$$

where D denotes the size of the balance of payments deficit to be eliminated, and m is the propensity to import. For a derivation of this relationship see *Heller* (1973), pp. 124 - 139.

[3] For this argument to hold for exchange rate changes in the up or down direction it is necessary to assume that the country is initially at full employment, so that balance of payments deficits call for decreases in real income and balance of payments surpluses for inflationary increases in nominal income.

[4] It should be noted that this argument is particularly relevant in the short run when exchange rate changes may not exactly offset foreign price level changes.

It may be worth noting that *Giersch* (1973) holds the opposite view — namely that open economies should have more exchange flexibility than closed economies. He bases this conclusion on the arguments that: (1) a smaller reduction in real wages is needed in an open economy to correct a given amount of unemployment; (2) that open economies are more exposed to outside disturbances and hence need exchange rate flexibility as a buffer; and (3) that open economies cannot readily use monetary policy to fight inflation under fixed exchange rates and that therefore exchange rate flexibility is needed.

2. The size of the economy

The mere size of an economy may also have a bearing on the choice of the exchange rate system. *Tower* and *Willett* (1976) state the argument that for each governmental activity there is an optimal scale. Up to this point economies may be reaped from combining governmental activities under one decision-making authority. Beyond this optimal size, diseconomies of scale will introduce diminishing returns. This basic proposition may be applied to a wide variety of governmental activities, such as the size of school districts, the provision of defense against external attack, and also to currency areas. Accordingly, we might expect that small countries will find it advantageous to adhere to fixed exchange rates or form a monetary union, while large countries have less to gain from such a step and consequently will find flexible exchange rates relatively more advantageous.

3. Commodity diversification

Kenen (1969) has argued that countries with a high degree of commodity diversification will find it advantageous to maintain fixed exchange rates (or join a currency union), while countries with a low degree of diversification might prefer a flexible exchange rate system. He argues that the overall degree of commodity diversification is likely to be reflected in the degree of export diversification. Furthermore, a highly diversified export sector tends to be less subject to sharp changes in its terms of trade and therefore of the exchange rate. Shocks experienced in one or the other export sector are also likely to be offset by opposite shocks in different sectors. The law of large numbers will therefore help to provide a cushion against excessive fluctuations in total exports. Hence, well diversified economies with a diversified foreign trade sector will find it advantageous to maintain fixed exchange rates, while countries with nondiversified trade patterns will prefer flexible exchange rates.

In contrast to *Kenen* one might argue that well diversified economies will find floating advantageous as the high degree of diversification lessens the nation's dependence on trade in any one commodity group. Hence, price or quantity fluctuations in different commodity groups, might offset each other, thereby resulting in a relatively smooth float. Conversely, a country highly specialized in export may find it advantageous to peg its currency and to finance possible erratic changes in export receipts, so as to cushion the impact of the export fluctuations on the economy.

4. Degree of capital market integration

The degree of the factor mobility was one of the first criteria to be put forth as influencing a country's decision whether to join a currency area or to rely on exchange rate changes as a means of adjustment. *Mundell* (1961) argued that in areas with a high degree of factor mobility, adjustment to autonomous disturbances can take place via factor movements. If factor movements are impaired or not feasible, exchange rate flexibility may be relied upon to bring about the necessary adjustment to exogenous disturbances.

Unfortunately, it is difficult to define labor mobility in an operationally meaningful way. In addition, data on possibly relevant aggregates are not readily available. Consequently, we decided to focus our attention on capital. There is also the consideration that labor moves probably much more slowly in response to international demand shifts than capital, and that therefore a test of the hypothesis can be conducted more readily.

Ingram (1962, 1973) argues explicitly that a high degree of financial integration will bring about equilibrating capital flows if exchange rates are permanently fixed. Hence, we would expect to find an association between the degree of financial integration and the choice of fixed exchange rates.

A rough measure for the mobility of capital or degree of international financial integration may be provided by an index showing commercial bank's foreign assets as a percentage of the money supply. We might argue that a high percentage indicates a high degree of freedom of international capital movements. Appealing as this argument is, it has serious limitations in countries that have restrictions on the convertibility of their own currency. For instance, a country with significant barriers to the convertibility of its own currency may nevertheless be host to a large international banking community, whose transactions are carried out in foreign currency — thereby leaving the international

mobility of capital from the viewpoint of the domestic economy largely unaffected. Let us also note that the index calculated may exceed 100 in those countries that serve as international banking centers.

5. The rate of inflation

Fleming (1971) and *Haberler* (1970) consider the degree of similarity in inflation rates an important factor influencing the choice of an exchange rate system. They argue that countries with dissimilar inflation rates will tend towards exchange rate flexibility, while countries with similar inflation rates will be able to maintain fixed exchange rates between their currencies.

The similarity of inflation rates criterion for a specific country has relevance only with respect to the inflation rates of its trading partners. We might therefore expect that countries with similar inflation rates will peg their currencies in terms of each other by using a joint float or peg in terms of a composite of the currencies of the countries' trading partners.

Here we will modify the *Fleming/Haberler* hypothesis to state that low inflation countries, are likely to peg while high inflation countries are likely to float their currency. In essence, we will argue that low inflation rates tend to be associated with steady inflation; while high inflation rates tend to be variable as well.[5]

III. The Evidence

1. Discriminant analysis

We are not able to analyze the influence of a large number of independent variables at the same time by the use of traditional cross classification tables and associated significance tests. Standard econometric techniques, such as multiple regression analysis, are not amenable to the solution of the problem at hand either. The basic reason is that some of the variables under investigation are of a qualitative nature, and are therefore not suited to regression analysis. This is particularly true for the dependent variable to be studied, namely the exchange system that countries employ.

Discriminant analysis is a statistical technique frequently used in other social sciences where it is necessary to classify a population into certain groups according to some observable criteria. Our problem is to find an answer to the question of what characteristics of countries —

[5] See *Heller* (1976) p. 76 for evidence that high inflation tends to be associated with a greater variance of inflation rates among countries.

such as size, openness, and the like — are associated with peggers on the one hand and with floaters on the other hand. The objective of the analysis is to identify those characteristics that will permit us to *discriminate* most effectively between peggers and floaters. Having determined the discriminant function, we can then determine whether a "new" country not previous classified has the characteristics of a floater or a pegger. Another use of the discriminant analysis lies in the fact that it allows us to see whether any countries are "misclassified" in that they do not use the exchange rate system that most countries with similar characteristics find optimal. In more technical terms, discriminant analysis will classify countries into groups, such that the combined variance of the different characteristics (size, openness) of all members *within* a group (for instance, floaters and peggers) is *minimized,* while the combined variance of the different characteristics *between* the different groups is maximized.[6]

2. The data

We collected first all data pertaining to the actual exchange rate practices of the different countries. The date selected was July 31, 1976. Mexico, which changed its exchange rate system shortly after our cut-off date is listed as a floater. The applicable exchange rate arrangements are shown in Table 1.

The data used to operationalize the economic variables thought to have an influence on the selection of the exchange rate system pertain generally to the year 1974. A detailed description of the data and sources is given in the Appendix. First of all, one may argue that there is a certain lag with which decisions regarding the exchange rate system are made. Second, the variables studies do probably not change much from year to year, so that no sharp differences are expected to exist between our 1974 data base and the 1976 reality. Third, we were interested in studying as wide a variety of countries as possible; we were forced to disregard the 1975 data which were available for a few nations only and concentrate on the broader 1974 data base.

In view of the fact that we have total of eight different exchange rate systems identified in Figure 1, certain data analysis problems emerge. The calculation of a discriminant function requires that there are more observations (countries) in each group (exchange rate system classification) than there are characteristics (size of country, degree of openness, etc.) to be analyzed. Accordingly, we require at least six countries in each exchange system group to be considered. Hence, we

[6] For a technical introduction, see *Dhrymes* (1970) Chapter 2, or *Rao* (1973) Chapter 8.

Table 1: **Actual Exchange Rate Arrangements**[a)]

FLOATING			PEGGING				
Independently	Common margins	Set of indicators	U. S. dollar	Pound sterling	French franc	SDR	Other basket
Canada France Greece Iceland Italy Japan Mexico Nigeria Philippines Portugal Saudi Arabia Spain United Kingdom United States Yugoslavia	Belgium Denmark Germany Netherlands Norway Sweden	Brazil Chile Colombia Israel	Bahrain Barbados Bolivia Costa Rica Dominican Republic Egypt El Salvador Ethiopia Ghana Guatemala Guyana Haiti Honduras Indonesia Iraq Jamaica Korea Libya Pakistan Paraguay Rwanda South Africa Sudan Syria Thailand Trinidad & Tobego Venezuela	Gambia Ireland Sierra Leone	Cameroon Central African Rep. Gabon Ivory Coast Madagascar Niger Togo Upper Volta	Iran Jordan Kenya Malawi Tanzania Uganda Zambia	Austria Cyprus Fiji Finland Malaysia Malta Morocco Sri Lanka Tunisia
Total 15	6	4	27	3	8	7	9

a) As of July 31, 1976 with the exception of Mexico which subsequently floated its currency.

had to drop the sour crawlers and the three pound sterling peggers from our sample, resulting in a truncated sample of 72 countries and six exchange rate systems to be analyzed.

3. The analysis

The estimation of linear discriminant function for our 72 sample countries with 6 exchange rate systems and 5 differentiating characteristics show that the group means for the different characeristics are unequal with a probability of .98 per cent. A chi-square test also shows that the various country characteristics are significantly different for each of the exchange rate groups ($X^2 = 42.9$ with 25 d. f.; significance level = .95).

In Table 2 we summarize some of the results of those obtained in the linear discriminant analysis. The discriminant analysis is carried out for each pair of exchange rate systems to be considered. Our six possible systems result in fifteen pair-wise combinations. For six of the pairs the probability that the means of the characteristics are different exceeds .95. This indicates that our discriminant function permits us to distinguish very effectively between floaters on the one hand and dollar, franc, SDR, or basket peggers on the other hand. The same holds true for the difference between the snake countries and dollar peggers. One may conclude that there are substantial differences between these alternative exchange rate systems.

Between other pairs, such as dollar and SDR peggers; dollar and "other" basket peggers; franc and "other" basket peggers there is not much basis for a sharp differentiation. Hence, the relative appropriateness of these alternative exchange rate regimes for an individual country is open to question.

The discriminant analysis allows use to make a few further observations. First of all it may be of interest to determine the relative importance that each characteristic has in explaining the choice between floating and pegging. Table 2 shows the percentage contribution that each characteristic makes to the explanatory power of each pairwise linear equation. The results show clearly that for the different pairwise discriminant functions, the individual characteristics assume widely changing differences in relative importance. For instance, the degree of openness (IM/GNP) accounts for only 0.3 per cent of the differentiation between dollar and SDR peggers, while it can account for 21.1 per cent of the differentiation between floaters and dollar peggers. It is interesting to observe that for all 15 possible pairs, either the degree of commodity diversification or the inflation rate has the largest

Table 2

Explanatory Power of Pairwise Discriminant Function

Pair	Probability that difference between means exists	Per cent of absolute linear function accounted for by characteristic listed					
		IM/GNP	GDP	CM.D	INFL	FA/M	Constant
Floaters — Snake	.72	9.7	4.1	15.3	31.5	0.5	38.8
Floaters — Dollar ...	.99	21.1	5.9	35.2	14.2	8.5	15.1
Floaters — Franc	.98	11.4	6.1	28.6	32.4	7.1	14.4
Floaters — SDR	.99	13.6	3.4	37.9	6.7	6.2	32.2
Floaters — Basket ...	.98	24.1	6.4	21.5	28.3	9.2	10.4
Snake — Dollar	.98	7.7	1.1	35.2	12.5	5.5	37.9
Snake — Franc	.81	3.4	3.1	53.9	5.1	8.4	26.2
Snake — SDR	.99	5.3	0.5	35.8	10.7	4.3	43.3
Snake — Basket	.70	14.6	2.2	38.8	4.5	9.0	30.1
Dollar — Franc	.35	12.2	1.7	3.9	34.2	0.7	47.3
Dollar — SDR	.17	0.3	1.0	36.6	6.0	1.6	54.4
Dollar — Basket	.18	4.8	0.9	24.2	24.3	1.2	44.6
Franc — SDR	.49	6.1	1.3	19.9	20.5	1.1	50.9
Franc — Basket	.09	28.1	1.5	29.0	22.9	2.9	15.6
SDR — Basket	.58	2.5	0.9	31.1	14.9	0.3	50.3

"explanatory" power. Finally, let us note that for some of the pairs (dollar — SDR peggers; Franc — SDR peggers; SDR — basket peggers) the constant term accounts for over 50 per cent of the "explanatory" power of the discriminant function. In addition to the low probability value discussed previously, this is another indication of the relatively low discriminatory power of the characteristics included in our equation. A search for further factors influencing these choices — and perhaps a return to some of the characteristics excluded because of computational limitations — may therefore be indicated. However, it may well be that for a large number of countries in the opposing groups (dollar — SDR peggers; Franc — SDR peggers; SDR — basket peggers) the choice between these pairwise options is relatively unimportant. Either one of the two exchange rate systems may serve their needs equally well.

Having discussed the pairwise linear discriminant functions estimated, we should note that the covariance equality test indicates that the

Table 3

Quadratic Form of Pairwise Discriminant Equations

	Linear terms	IM/GNP	GDP	CM.D	INFL	FA/M
Pair 1: Floaters — Snake						
Constant	— 155.97255					
IM/GNP	1.00492	— 0.00048				
GDP	0.00031	—3.03291E-06	—3.53598E-10			
CM.D	2.02213	0.04147	8.00398E-06	— 0.14513		
INFL	24.92335	—0.07104	— 0.00003	0.15121	— 1.28226	
FA/M	— 0.14901	0.00688	1.01419E-06	— 0.01995	0.02309	— 0.00162
Pair 2: Floaters — Dollar Peggers						
Constant	9.27432					
IM/GNP	— 0.29951	0.01779				
GDP	0.00063	—9.89591E-06	—2.55288E-08			
CM.D	0.18763	0.00779	—2.37925E-06	—1.31520E-06		
INFL	— 0.39928	— 0.04716	—2.69387E-06	— 0.01387	0.05124	
FA/M	— 0.16979	0.01164	0.00001	— 0.00201	0.00362	— 0.01123
Pair 3: Floaters — French Franc Peggers						
Constant	— 38.41856					
IM/GNP	— 0.09445	0.00488				
GDP	— 0.03214	0.00018	—5.76867E-06			
CM.D	5.54393	— 0.05779	0.00170	— 0.17792		
INFL	— 7.35659	0.24232	— 0.00308	0.88739	— 1.60899	
FA/M	— 0.28516	0.00061	— 0.00010	0.01862	— 0.03385	— 0.00336
Pair 4: Floaters — SDR Peggers						
Constant	— 58.55792					
IM/GNP	2.64553	— 0.01296				
GDP	0.00175	— 0.00004	—1.75689E-08			
CM.D	0.33688	0.00547	2.35781E-06	0.00011		
INFL	— 0.72201	— 0.04323	4.83541E-08	— 0.01491	0.05750	
FA/M	1.56941	— 0.01942	—5.94309E-06	— 0.00734	0.00343	— 0.02882
Pair 5: Floaters — Basket Peggers						
Constant	— 60.89606					
IM/GNP	0.91841	0.01051				
GDP	0.00608	— 0.00008	—1.74216E-07			
CM.D	2.29163	— 0.00730	— 0.00008	— 0.01571		
INFL	— 0.49745	— 0.03032	0.00006	— 0.01754	0.03620	
FA/M	— 1.83090	0.03285	0.000014	0.02112	— 0.03150	— 0.03163

	Linear terms	IM/GNP	GDP	CM.D	INFL	FA/M
Pair 6: Snake — Dollar Peggers						
Constant	165.24687					
IM/GNP	− 1.30443	0.01827				
GDP	0.00032	−6.86299E-06	−2.51752E-08			
CM.D	− 1.83450	− 0.03369	− 0.00001	0.14513		
INFL	− 25.32264	0.02388	0.00003	− 0.16508	1.33349	
FA/M	− 0.04779	0.00475	0.00001	0.01795	− 0.01946	− 0.00900
Pair 7: Snake — French Franc Peggers						
Constant	117.55399					
IM/GNP	− 1.09938	0.00536				
GDP	− 0.03245	0.00018	−5.76831E-06			
CM.D	3.52180	− 0.09927	0.00169	− 0.03279		
INFL	− 32.27994	0.31336	− 0.00304	0.73618	− 0.32673	
FA/M	− 0.13615	− 0.00627	− 0.00010	0.03857	− 0.05694	− 0.00174
Pair 8: Snake — SDR Peggers						
Constant	97.41464					
IM/GNP	1.64061	− 0.01248				
GDP	0.00144	− 0.00004	−1.72153E-08			
CM.D	− 1.68525	− 0.03600	−5.64617E-06	0.14524		
INFL	− 25.64537	0.02781	0.00003	− 0.16613	1.33976	
FA/M	1.71841	− 0.02631	−6.95728E-06	0.01261	− 0.01966	− 0.02720
Pair 9: Snake — Basket Peggers						
Constant	95.07649					
IM/GNP	− 0.08651	0.01099				
GDP	0.00577	− 0.00008	−1.73862E-07			
CM.D	0.26950	− 0.04878	− 0.00009	0.12942		
INFL	− 25.42081	0.04072	0.00009	− 0.16875	1.31846	
FA/M	− 1.68189	0.02597	0.00014	0.04108	− 0.05458	− 0.03001
Pair 10: Dollar Peggers — French Franc Peggers						
Constant	− 47.69288					
IM/GNP	0.20505	− 0.01290				
GDP	− 0.03277	0.00019	−5.74314E-06			
CM.D	5.35629	− 0.06358	0.00170	− 0.17792		
INFL	− 6.95731	0.28947	− 0.00307	0.90126	− 1.66022	
FA/M	− 0.08836	− 0.01102	− 0.00011	0.02062	− 0.03748	0.00787

	Linear terms	IM/GNP	GDP	CM.D	INFL	INFL
Pair 11: Dollar Peggers — SDR Peggers						
Constant — 67.83224						
IM/GNP	2.94504	— 0.03075				
GDP	0.00112	— 0.00003	7.95995E-09			
CM.D	0.14925	— 0.00232	4.73706E-06	0.00011		
INFL	— 0.32273	0.00393	2.74223E-06	— 0.00105	0.00626	
FA/M	1.76620	— 0.03106	— 0.00002	— 0.00533	— 0.00020	—0.01759
Pair 12: Dollar Peggers — Basket Peggers						
Constant — 70.17038						
IM/GNP	1.21792	— 0.00728				
GDP	0.00545	— 0.00007	—1.48687E-07			
CM.D	2.10400	— 0.01509	— 0.00008	— 0.01571		
INFL	— 0.09817	0.01684	0.00006	— 0.00367	— 0.01503	
FA/M	— 1.63410	0.02121	0.00012	0.02313	— 0.03512	—0.02040
Pair 13: French Franc Peggers — SDR Peggers						
Constant — 20.13935						
IM/GNP	2.73998	— 0.01784				
GDP	0.03389	— 0.00022	5.75110E-06			
CM.D	— 5.20704	0.06327	— 0.00169	0.17803		
INFL	6.63458	— 0.28554	0.00308	— 0.90231	1.66649	
FA/M	1.85456	— 0.02004	0.00009	— 0.02596	0.03728	—0.02545
Pair 14: French Franc Peggers — Basket Peggers						
Constant — 22.47750						
IM/GNP	1.01287	0.00563				
GDP	0.03822	— 0.00026	5.59445E-06			
CM.D	— 3.25230	0.05049	— 0.00177	0.16221		
INFL	6.85914	— 0.27263	0.00313	— 0.90493	1.64519	
FA/M	— 1.54574	0.03224	0.00024	0.00251	0.00236	—0.02827
Pair 15: SDR Peggers — Basket Peggers						
Constant — 2.33814						
IM/GNP	— 1.72712	0.02347				
GDP	0.00433	— 0.00004	—1.56647E-07			
CM.D	1.95475	— 0.01278	— 0.00008	— 0.01582		
INFL	0.22456	0.01291	0.00006	— 0.00263	— 0.02130	
FA/M	— 3.40030	0.05228	0.00014	0.02846	— 0.03492	—0.00281

Table 4

Actual and Predicted Exchange Rate System

The following countries were grouped as —	The actual exchange rate practice was —
a) Floaters	
France	Floater
Italy	Floater
Japan	Floater
Philippines	Floater
Spain	Floater
United Kingdom	Floater
United States	Floater
Yugoslavia	Floater
South Africa	Dollar Pegger
b) Snake	
Belgium	Snake
Denmark	Snake
Germany	Snake
Netherlands	Snake
Norway	Snake
Sweden	Snake
Canada	Floater
c) Dollar Peggers	
Bahrain	Dollar Pegger
Barbados	Dollar Pegger
Ghana	Dollar Pegger
Guatemala	Dollar Pegger
Haiti	Dollar Pegger
Indonesia	Dollar Pegger
Pakistan	Dollar Pegger
Paraguay	Dollar Pegger
Rwanda	Dollar Pegger
Sudan	Dollar Pegger
Greece	Floater
Mexico	Floater
Nigeria	Floater
Saudi Arabia	Floater
Tanzania	SDR Pegger
d) French Franc Peggers	
Cameroon	Franc Pegger
Central African Republic	Franc Pegger
Gabon	Franc Pegger
Ivory Coast	Franc Pegger
Madagascar	Franc Pegger
Niger	Franc Pegger
Togo	Franc Pegger
Upper Volta	Franc Pegger
Ethiopia	Dollar Pegger
Malawi	SDR Pegger

The following countries were grouped as —	The actual exchange rate practice was —
e) SDR Peggers	
Iran	SDR Pegger
Uganda	SDR Pegger
Zambia	SDR Pegger
Iceland	Floater
Portugal	Floater
Bolivia	Dollar Pegger
Costa Rica	Dollar Pegger
El Salvador	Dollar Pegger
Jamaica	Dollar Pegger
Libya	Dollar Pegger
Trinidad and Tobago	Dollar Pegger
Venezuela	Dollar Pegger
f) "Other' Basket Peggers	
Austria	Other Basket Pegger
Cyprus	Other Basket Pegger
Fiji	Other Basket Pegger
Finland	Other Basket Pegger
Malaysia	Other Basket Pegger
Malta	Other Basket Pegger
Morocco	Other Basket Pegger
Sri Lanka	Other Basket Pegger
Dominican Republic	Dollar Pegger
Egypt	Dollar Pegger
Honduras	Dollar Pegger
Iraq	Dollar Pegger
Korea	Dollar Pegger
Syria	Dollar Pegger
Thailand	Dollar Pegger
Jordan	SDR Pegger
Kenya	SDR Pegger

covariance matrices are actually *not* equal to each other. This indicates that the discriminant function is not linear, but quadratic in nature. Consequently, we estimated the quadratic discriminant function for the 15 possible pairs of exchange rate systems. The quadratic functions are presented in Table 3. To discuss the quadratic function with its 315 estimated coefficients would be too cumbersome, and we will therefore move to a discussion of some of the results obtained by the analysis of the quadratic functions.

On the basis of the calculated discriminant functions we are able to place each country into an exchange rate system group, which is most appropriate to it according to the analysis. Table 4 groups all countries according to the exchange rate system "most appropriate" to each country according to the discriminant functions calculated. In

each case we also indicate the actual exchange rate practice followed by the country in question. For instance, France is classified as having the characteristics of a floater, a classification which corresponds to her actual exchange rate practice. South Africa is also classified as a floater, when in reality she is a dollar pegger. It is interesting to note that of the nine countries classified as having the characteristics of floaters, eight are actually floaters. Among the seven countries grouped into the snake category, we find the six countries that are actually snake participants. It may be somewhat surprising to see that Canada also has the characteristics of a snake country and is consequently classified into this group by the discriminant function calculated.

The performance of our equations is somewhat less satisfactory for the group of the dollar peggers. However, it may be worth noting that two of the countries classified by the analysis as dollar peggers, namely, Mexico and Saudi Arabia, did in fact peg to the dollar until very recently.

The performance of the function in case of the French franc peggers is again good. All eight countries actually pegging to the French franc are correctly identified as such. In addition, two countries — Ethiopia and Malawi — are classified as having the characteristics of a French franc pegger.

The performance of the functions is least satisfactory in case of the basket peggers. Only three of the eight SDR peggers are correctly identified as such. In addition, there are ten countries identified as falling into the SDR group but which follow in reality other exchange rate practices. In case of the "other" basket peggers we have eight correct idenfications out of a total of nine "other" basket peggers. This is a satisfactory result. In addition, we have ten countries identified as "other" basket peggers that do not follow this practice. However, we should note that basket pegging of a currency is a relatively recent innovation, and countries are still experimenting with this technique. This may account for the relatively large number of misclassifications by the analysis into incorrect groups; alternatively it may be taken as an indication that the countries listed might find the basket pegging technique useful for their particular circumstances.

IV. Summary and Conclusions

In this paper we have analyzed the factors influencing a country's choice between alternative exchange rate systems. The Second Amendment to the Articles of Agreement of the Fund specifies that each country is free to choose the exchange rate system that best suits its

particular circumstances. It is therefore of interest to investigate whether we can identify those economic factors that play an important role in the decision calculi of the monetary authorities faced with the choice between alternative systems. An answer to this question will also help us to determine whether there are any ordering principles or underlying factors at work that influence the behavior of individual countries. In short, we will attempt to find out whether the skepticists are right who argue that the current international monetary system is no system at all, but a haphazard collection of ad-hoc arrangements that have little rhyme or reason to it. Or, whether there exists an underlying order of fundamental regularities that governs the choice by individual countries as to their most appropriate set of exchange arrangements.

We first of all considered the various arguments stated in the literature pertaining to a country's choice between pegged and floating exchange rates. In particular, we considered the degree of openness of a nation's economy, its size, the degree of commodity diversification of its foreign trade, the degree of financial integration with the rest of the world, and the inflation rate.

We used discriminant analysis to explore the different economic characteristics associated with countries that choose floating, group floating (snake), dollar pegging, French franc pegging, SDR pegging, or other basket pegging as an exchange rate system. A high rate of successful classifications indicates that discriminant analysis is a useful tool in determining a suitable exchange rate system for a "new" country heretofore unclassified. Also, the analysis may help to identify countries that currently do not use an exchange rate system best suited to their economic characteristics. Of course, the analysis is based on the crucial assumption that the exchange rate system actually chosen by the vast majority of the countries is in fact the most appropriate one for each particular country, as it is only on the basis of this information that the appropriate exchange rate system for a "new" country can be determined.

In general, the discriminant analysis allowed us to distinguish rather well between the different groupings. In particular, the differentiation between floaters and alternative systems as well as group floaters and alternative systems are successful. However, it is frequently too difficult to differentiate successfully the economic characteristics of the countries employing one or the other pegging technique.

In conclusion, discriminant analysis seems to be a useful tool to investigate the choice of an exchange rate system. By enabling us to identify some of the characteristics of countries that are associated with

the choice of a particular exchange rate system, we were able to discover some of the underlying principles that play a role in determining the new international monetary order.

Appendix I

Data Sources

Variable

EX/GNP — Ratio of exports (IFS, line 90 C) to GNP for 1974 (IFS, line 99 A). Exceptions: The entries of the following countries are the ratios of exports (IFS, line 70) to GDP (IFS, line 99 B).
Bahrain
Barbados
Central African Republic
Dominican Republic
Gabon
Gambia
Ghana
Guatemala
Guyana
Iran
Iraq
Libya
Madagascar
Niger
Nigeria
Rwanda
Sudan
Togo
Uganda
Upper Volta

IM/GNP — Ratio of imports (IFS, line 98 C) to GNP for 1974 (IFS, line 99 A). Exceptions: The entries for the countries listed under EX/GNP are the ratios of imports (IFS, line 71) to GDP (IFS, line 99 B).

CM.D — GDP for 1974 in millions of U. S. dollars. Converted from national currency (IFS, line 99 B), by using annual average exchange rate (IFS, line AF).

R.CUR — Largest export commodity group as percentage of total exports. The "2-digit" commodity breakdown from the *Yearbook of International Trade Statistics*, U. N. 1975, was used to determine the largest export category (in value terms). 1974 data or the most recent year available was used.

R.CAP — Indication of the absence (0) or presence (1) of restrictions on current account movements as shown by the Fund's *25th Annual Report on Exchange Restrictions* (1974).

INFL — Indication of the absence (0) or presence (1) of restrictions on capital account movements as shown by the Fund's *25th Annual Report on Exchange Restrictions* (1974).

Percentage change in PI (IFS, August 1976, pp. 32, 34) averaged over the period 1973 - 75.

Exceptions: Central African Republic — average of 1973, 1974
Cyprus — rate for 1973
Libya — average of 1973, 1974
Uganda — average of 1973, 1974

FA/M — Ratio of commercial bank's foreign assets for 1974 (IFS, line 21) to money stock (IFS, line 34).

CY.D — Percentage of total exports going to the largest trading partner in 1974. *Direction of Trade, 1968 - 1974*, IMF (1975).

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