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**DETERMINANTS OF USE
OF SPECIAL DRAWING RIGHTS
BY DEVELOPING NATIONS**

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A.I.D. Discussion Paper No. 27

DETERMINANTS OF USE OF SPECIAL DRAWING RIGHTS
BY DEVELOPING NATIONS

Danny M. Leipziger

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June, 1973

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I. Introduction

Special Drawing Rights (SDRs) are additions to the stock of international liquid reserves, first created by the International Monetary Fund in January, 1970. The initial creation of \$3.5 billion has been followed by subsequent additions of these fixed value assets of U.S. \$3.0 billion each in January, 1971 and January, 1972.

SDRs can either be held as international reserve assets or used to purchase convertible currency within a framework of Fund rules. ¹ Inasmuch as SDRs are presently allocated on the basis of IMF participation quotas, Less Developed Countries (LDCs) obtain 25% of each new total SDR creation. This is slightly less than the 27% LDC quota share, since Ethiopia, Kuwait, Lybia, Saudi Arabia, Singapore, and Taiwan declined to participate.

Considerable interest has been expressed in the use of SDRs by LDCs especially in the light of current discussions on increased allocations of SDRs to LDCs via the "SDR-aid link." An examination of patterns of SDR use and the degree of acceptance of SDRs as a reserve asset is therefore of considerable importance. Specifically,

there has been concern that increased allocations of SDRs to LDCs will lead to a one for one increase in the use of SDRs, having potentially inflationary effects on DCs.

Given the relative magnitudes involved, it is doubtful that any inflationary effect will result irrespective of what the LDCs marginal propensity to use (MPU) SDRs might be [Howe, 1972; and Leipziger and Michalopoulos, 1972]. While discussion of the link commonly assumes that this propensity is one, no estimates of it have, in fact, been attempted. If the MPU is shown to be less than one, the credibility of the inflation argument against higher SDR allocations to LDCs is further weakened.

Opponents of a link between SDR allocations and development assistance have further argued that SDRs are a recently invented reserve asset whose acceptability has not been proven, and hence it is unwise to burden it with a second (i.e., resource transfer) function. This question of the compatibility of SDRs as reserve assets and their potential role as instruments of resource transfer is a larger issue which has been discussed elsewhere [Leipziger and Michalopoulos, 1972]. It is central to this issue, however, to analyze the changing role of SDRs as a reserve asset, vis a vis foreign exchange and gold.

In this study, therefore, we attempt to explore the determinants of SDR use and analyze the role of SDRs in LDC reserve

portfolios. The issues raised by SDR creation constitute a new field² of interest in which not much research has been attempted. We hope this paper will be both timely and useful in the study of the role of SDRs in the developing countries.

II. Patterns of SDR Use

The amount of SDRs used by LDCs has averaged a fairly constant 34% of total allocations during the last three years. It is apparent from Table 1, however, that the various LDC regions have exhibited patterns of SDR use which are quite different. Table 1 reports the total dollar amount of SDR allocations, the proportions used, and the additional use of SDRs from successive allocations, measured six months after the allocation. Although the time period over which observations are available is quite short, Latin America, and to a lesser degree, Africa, exhibit a rising tendency to use SDRs over time, while the Middle East, and to a lesser extent, Asia, exhibit a falling tendency over time.³ While attempting to identify and quantify the economic determinants of SDR use in LDCs, we are especially interested in ascertaining the degree to which demand factors influence SDR use and the extent to which allocations affect SDR use. Furthermore, we wish to test the degree to which LDCs can or cannot be considered as a homogeneous group of SDR users responding to changes in similar economic variables.

Table 1 - SDR Use*

<u>Total LDCs</u>	<u>TOTAL Allocation</u>	<u>% SDRs Used</u>	<u>Additional Use of SDRs from Successive Allocation</u>
July, 1970	\$ 853.1 m	34%	34%
July, 1971	1,600.6 m	36%	38%
July, 1972	2,348.0 m	34%	30%
<u>Latin America</u>			
July, 1970	330.0 m	10%	10%
July, 1971	605.8 m	18%	28%
July, 1972	879.1 m	31%	63%
<u>Middle East</u>			
July, 1970	77.4 m	86%	86%
July, 1971	158.4 m	66%	43%
July, 1972	239.4 m	49%	-116%
<u>Asia</u>			
July, 1970	277.7 m	51%	51%
July, 1971	520.1 m	50%	49%
July, 1972	765.0 m	33%	0%
<u>Africa</u>			
July, 1970	168.0 m	28%	28%
July, 1971	316.3 m	33%	39%
July, 1972	464.5 m	40%	45%

*Source: International Monetary Fund, International Financial Statistics, (September, 1970, 1971, 1972), p. 7.

III. A General Model of SDR Use

The general model we have initially specified postulates that the demand for SDR use is based on balance of payments requirements, B, changes in reserve asset levels, DZ, and reserve asset portfolio composition, E. It can be argued that the use of SDRs is explained by these demand factors, as well as by the supply factor - exogenously determined allocations of SDRs, A. The model can be written as follows:

$$(1) \text{ SDR}^D = F(B, DZ, E, A); F_1 > 0, F_2 < 0, F_3 \approx 0, F_4 > 0$$

The balance of payments variable, B, is the net balance of payments deficit in positive terms lagged one year. The lag is added to reflect the fact that payments follow balance of payments disequilibria with some delay. The explanatory reserve variables are the change in non-SDR reserves over the previous year, DZ, and the foreign exchange to gold ratio in the respective reserve portfolios, E. The former attempts to measure the degree to which SDRs are held as complements with increases in other reserve assets, while the latter attempts to measure the degree to which SDRs are substitutes for foreign exchange or gold. The supply variable in this equation, A, is the total country allocation of SDRs to date. We would hypothesize that balance of payments deficits and increased

allocations would stimulate the use of SDRs, while increasing reserves would indicate that more SDRs will be held rather than used. The foreign exchange to gold ratio measures the extent to which SDRs might be considered substitutes for either gold or foreign exchange.

Inasmuch as SDRs are a recent phenomenon, it is only feasible to test our model on a cross-country sample for 1971 SDR use.⁵ Earlier estimation (i.e., 1970 SDR use) would not be advisable, since 1970 was the first year in which SDRs were allocated. Later estimation is rendered impossible by the lack of balance of payments data for many LDCs for 1971 and indeed for 1970, which constrained our sample size.

The ordinary least-squares regression results confirm our a priori hypotheses for all explanatory variables except E, and the estimated coefficients are statistically significant at an .001 level of confidence.

$$(2) \text{ SDR } 71 = \frac{4.57}{[1.65]} + \frac{.44}{[7.97]} A + \frac{.05}{[3.24]} B70 - \frac{.06}{[-3.91]} \text{ DZ}71 + \frac{.0002}{[.004]} E71$$

$$\bar{R}^2 = .63$$
$$n = 43$$

where SDR 71 = SDRs used in m US \$
A = total country allocations in m US \$ as of 1971
B 70 = net deficit on current account and capital account
in m US \$ for 1970 excluding all balancing items
and errors and omissions
DZ 71 = change in non-SDR reserves (1971-1970) in m US \$
E 71 = foreign exchange to gold ratio in reserve portfolios

\bar{R}^2 is the coefficient of determination (adjusted for degrees of freedom), n is the number of observations, and SSR is the sum of squared residuals. T-values are shown within brackets.

The relevant elasticities indicate that a 1% worsening in the balance of payments will increase SDR use by .16%, while a 1% increase in non-SDR reserves will decrease SDR use by .23%. The elasticity of SDR use with respect to a 1% additional allocation is 1.01%. It is important to note that with other factors remaining constant, SDR use will increase pari passu with allocations; but the marginal propensity to use SDRs is considerably below unity.

IV. A Regional Model of SDR Use

One of the implications of the patterns of use figures is that it may not be desirable to treat the LDC group as a homogeneous sample. Inasmuch as 19 of the observations are from Latin America and the Caribbean and it is this group which has been using SDRs at a seemingly increasing rate (See Table 1), we bifurcated the sample into Latin American and Other LDC subsamples and reran the regressions. We used the Chow Test [Chow, 1960] to determine whether there are statistically significant differences in the determinants of SDR use in the two sets of countries.

(3) Latin America

$$\text{SDR } 71 = .58 A + .06 B 70 + .10 \text{ DZ } 71 + .11 E 71$$

$$\frac{2}{\sqrt{R}} = .89$$

$$n = 19$$

$\frac{11}{\sqrt{1.64}}^{**}$ $\frac{10}{\sqrt{4.63}}^{**}$ $\frac{10}{\sqrt{-8.71}}^{**}$ $\frac{10}{\sqrt{2.45}}^*$

(4) Other LDCs

$$\text{SDR } 71 = 4.74 + .38 A + .04 B 70 + .02 \text{ DZ } 71 - .09 E 71$$

$$\frac{2}{\sqrt{R}} = .70$$

$$n = 24$$

$\frac{11}{\sqrt{1.54}}$ $\frac{11}{\sqrt{6.76}}^{**}$ $\frac{11}{\sqrt{1.73}}^*$ $\frac{11}{\sqrt{1.01}}$ $\frac{11}{\sqrt{-1.33}}$

The relevant F statistic for testing the equality of coefficients for the two groups of countries at a .99 level of confidence is 3.93. The calculated F value is 9.12, which confirms the view that Latin American and Other LDCs should not be treated as members of the same sample. The determinants of SDR use are significantly different for the two groups of countries.

* significant at .95 level of confidence
 ** significant at better than .999 level of confidence
 *** significant at .90 level of confidence
 **** significant at better than .99 level of confidence

A. Latin America

Equation 2, which is consistent with our a priori hypothesis, significantly explains SDR use in Latin America:

$$(2) \text{ SDR } 71 = .58 A + .06 B 70 - .10 \text{ DZ } 71 + .11 E 71$$

The regression results indicate that a 1% increase in the supply of SDRs will increase their use by 1.71%. A 1% worsening in the balance of payments deficit will increase SDR use by 48%, while a 1% addition to other reserve assets will reduce SDR use by .51%. The latter estimate measures the extent to which SDRs are complementary assets with gold and foreign exchange when total reserves are increased. On the other hand, a 1% increase in the foreign exchange to gold ratio in Latin American reserve portfolios will tend to increase SDR use by .19%. This would suggest that in Latin America, SDR assets are primarily substitutes for foreign exchange rather than gold.

An example might serve to illuminate this point. Let us assume that ceteris paribus two countries start with equal stocks and distributions of foreign exchange and gold. If one country A now obtains additional foreign exchange and another country B receives added gold, what does this imply about SDR behavior? All other variables held constant, country A will - if SDRs and foreign exchange are considered substitutions - use relatively

more of its SDRs because it is foreign exchange abundant. In other words, the larger the FX/G ratio, the more likely a country is to use SDRs. Country B, whose foreign exchange holdings are now insufficient, will, ceteris paribus, hold SDRs to substitute for foreign exchange. This implies that the lower the FX/G ratio, the more likely a country is to hold SDRs.

It is clear that this finding, ex post, needs to be explained in greater detail. The finding that a higher FX/G ratio is associated with greater SDR use may reflect in part the fact that Latin American countries with lower relative reserve levels tend to hold a greater portion of their portfolios in foreign exchange (see Part V).

Of the five countries using the largest absolute quantities of SDRs, three - Colombia, Costa Rica, and Dominican Republic - have extremely high FX/G ratios. These three countries also have reserve-import ratios of .20, .08, and .15, respectively, while the Latin American average R/N ratio is .33. More importantly, however, this finding might show that SDRs are more valued at present for their arbitrage possibilities than for their fixed value characteristics. With the advent of greater exchange rate flexibility, this preference on the part of Latin central bankers might change.

B. African, Asian, and Middle Eastern Sample

The model originally postulated did not provide a good fit for the group of LDCs outside Latin America. In this group neither the change in reserves variable, nor the reserve composition variable were statistically significant. This is not surprising in light of the heterogeneity of the countries in this sample and the divergent central bank reserve policies of various LDCs.

Attempts were made to isolate a few countries with highly divergent behavior and drop them from the sample; however, as a result, the reserve composition variable was not significant, while the change in reserves variable was of the opposite sign from that hypothesized. The only explanation for a rise in non-SDR reserves being associated with increased SDR use is the arbitrage argument that some LDCs use their SDRs to purchase other higher interest-bearing assets.

It appears, therefore, that the only substantiable model to posit for this group is one where SDR use is dependent on allocated supply and demand based on balance of payments requirements:

$$(5) \text{ SDR } 71 = .44 A + .04 B 70$$
$$\quad \quad \quad \sqrt{9.53}^{**} \quad \sqrt{1.83}^*$$
$$\bar{R}^2 = .67$$
$$n = 24$$

The regression results indicate that the SDR use elasticity with respect to supply is .87%, approximately half that for the Latin American sample. The SDR use elasticity with respect to the balance of payments variable is also significantly smaller for the Latin American group.

V. Reserve Portfolio Composition

The model estimated in Parts III and IV is only of limited usefulness in evaluating the role of SDRs as reserve assets and in examining patterns of LDC reserve portfolio management. This is a larger and more difficult question which must nevertheless be addressed in any discussion of SDR use. Our analysis into the nature of SDRs as a reserve asset is limited by the rules governing SDR holdings and use. Comparisons over time are further complicated by the yearly additional allocations of SDRs. Although tempered by these constraints, we hope in this section to be able to make some observations on portfolio compositions in LDCs.

Appendix C reports the composition of reserves for our sample of LDCs. The average LDC holdings of gold constituted 18% of reserves in 1970 and 15% of reserves in 1971; average foreign exchange holdings were 74% in both years; SDR holdings were 2% and 6%, respectively. Given the heterogeneous reserve policies of the various countries in each region, it is extremely difficult to try to generalize

portfolio composition differences in terms of averages which are statistically different. We have, therefore, abandoned attempts to answer the question of the fundamental role of SDRs in LDC portfolios via this method.

Another possible approach is to construct a model to explain the foreign exchange to gold proportion, FX/G , in reserve portfolios. One might hypothesize that this ratio is higher for surplus countries and lower for deficit countries, if deficits are primarily financed by changes in the level of foreign exchange, rather than gold. One might similarly hypothesize that the transactions motive forces countries to keep more liquid forms of reserves (i.e., foreign exchange), and that therefore countries with large external payments due will hold more foreign exchange. Furthermore, one might expect LDCs to hold any windfall gains or losses via fluctuating exports receipts in foreign exchange rather than gold. Under current IMF rules, gold cannot be sold below par or be bought above par. Furthermore, since 1968, countries have generally agreed not to sell official holdings on the free gold market. Therefore, one would expect official gold holdings to be rather stable. The role of SDRs is an open question - whether they tend to be viewed as more liquid assets like foreign exchange or more stable fixed assets like gold. Thus, we are interested in seeing whether higher or lower gold proportions are related to higher SDR holdings.

A single equation model can then be postulated as follows:

$$(6) \text{ FX/G} = f (B, \text{DX}, \text{NX}, \text{SDRH})$$

where FX/G = foreign exchange to gold ratio

B = balance of payments deficit as previously defined

DX = change in export earnings over the past year

NX = import/export ratio

SDRH = SDRs held in portfolio

The equation is estimated for the entire sample of LDCs using a one year lag for the import-export and balance of payments variable. The lag is to reflect the time lag between trade flows, and payments and portfolio adjustments.

$$(7) \frac{\text{FX}_{71}}{\text{G}_{71}} = \frac{13}{-2.36}^* \text{B}_{70} + \frac{.08}{1.19} \text{DX}_{70} + \frac{12.84}{2.74}^* \text{NX}_{70} - \frac{.44}{-1.81}^{***} \text{SDRH}_{71}$$

$$\begin{aligned} \bar{R}^2 &= .11 \\ n &= 44 \end{aligned}$$

The results indicate that balance of payments surpluses and the transactions demand of the economy (measured as imports per dollar of exports) increase the proportion of foreign exchange vis a vis gold in LDC reserve portfolios. Increased export revenue seems to be weakly related to foreign exchange holdings, while SDR holdings appear to be negatively related to the foreign exchange to gold ratio. This suggests that SDRs are considered more likely substitutes for foreign exchange than for gold. Such a conclusion would conform to our finding for Latin America in Part I, which indicated that SDR

use was positively related to FX/G. This finding must be tempered with the thought that richer LDCs (measured by the reserve-import ratios) may hold lower FX/G ratios and concomitantly use fewer SDRs. This is to some extent true in Latin America, where the gold proportions are higher for the richer countries when measured in terms of reserves to imports.

An alternative approach which is less rigorous econometrically is to estimate the changes in specific reserve instruments in one year as a function of the balance of payments deficit. This model would simply be:

$$(8) \quad DG = G_1 (B 70); \quad DFX = G_2 (B 70); \quad DSDRH = G_3 (B 70)$$

where DG = gold reserves, 1971 - gold reserves, 1970

DFX = foreign exchange reserves, 1971 - foreign exchange reserves, 1970

$DSDRH$ = SDRs held in 1971 - SDRs held in 1970
(unadjusted for 1971 allocation)

The regression results, while not explaining much of the variation, yield significant results for our LDC sample:

$$(9) \quad DG = -.03 B 70$$

$\sqrt{2.36}^*$

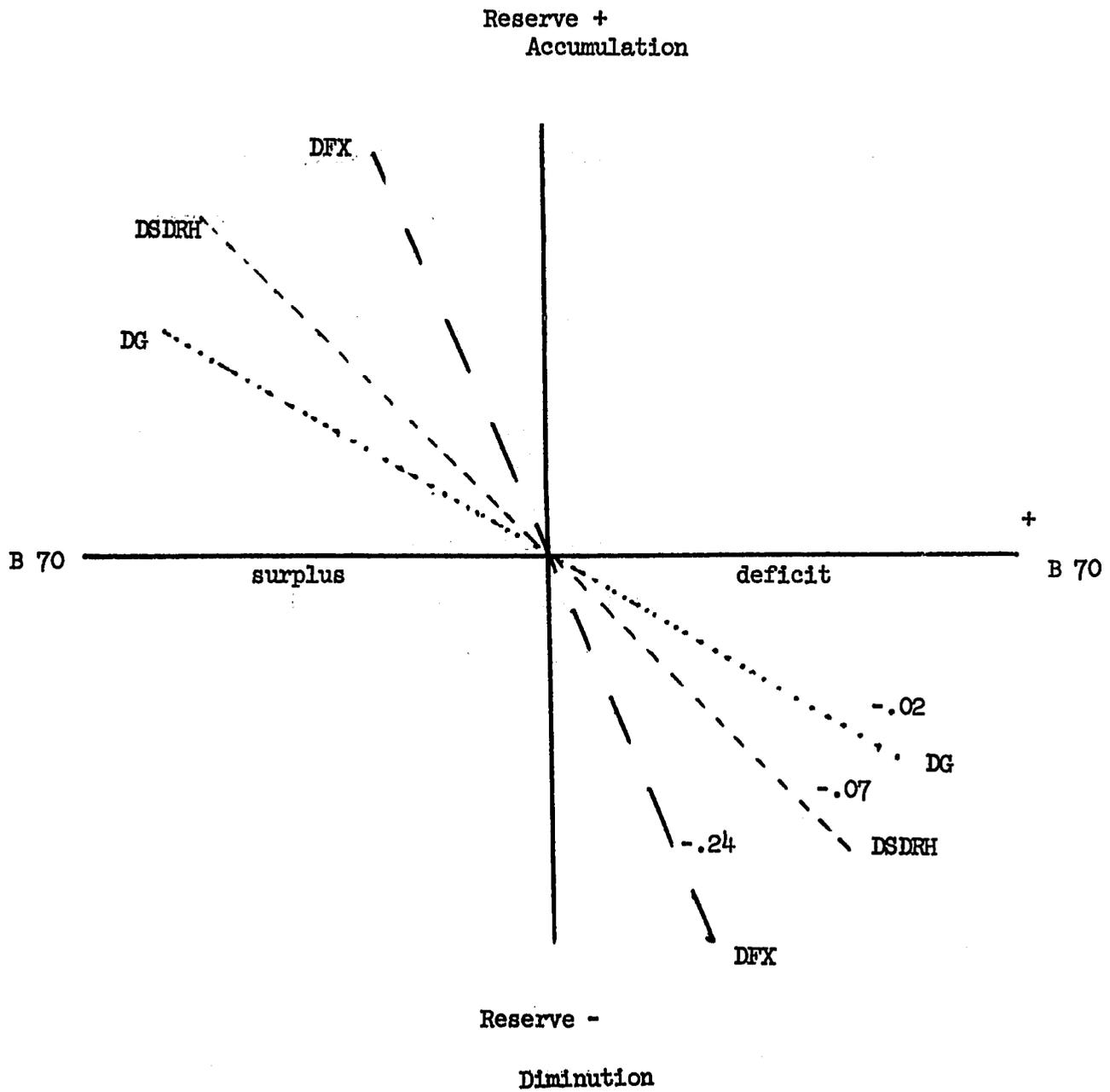
$$(10) \quad DFX = -.24 B 70$$

$\sqrt{1.85}^{***}$

$$(11) \quad DSDRH = -.07 B 70$$

$\sqrt{3.34}^{**}$

Figure 1
Order of Accumulation and Deaccumulation
of Reserve Assets in LDCs



It is clear that this model is only heuristic and does not claim to be either a rigorous or complete economic model; however, the results indicate that the marginal propensity to use foreign exchange to fund a balance of payments deficit is .24, which is higher than the marginal propensities to use SDRs of .07 or gold of .02. The order of reserve diminution and the order of reserve accumulation is foreign exchange first, SDRs second, and gold third (see Figure 1). These findings tend to reflect the fact that SDRs are to some degree viewed as substitutes for fixed value assets and to some degree as substitutes for interest-earning assets.

VI. Summary and Conclusion

The paper first attempts to delineate those economic factors which influence the use of SDRs by LDCs. This is of concern to development economists insofar as one wishes to gauge the extent of resource transfer to LDCs via SDR allocations and the implications for the international monetary system of LDC-SDR use patterns. This issue is complicated not only by the fact that SDRs are a recently invented financial asset, but also by the fact that the international monetary situation in the past two or three years has been extremely turbulent.

We conclude in Parts III and IV that:

- 1) SDR use can be satisfactorily explained by the need to finance a balance of payments deficit and by the supply of SDRs, which positively affect SDR use, and by a change in the holdings of "other official reserves," which negatively affects SDR use;
- 2) the aggregate LDC marginal propensity to use SDRs out of new allocations is .44, significantly below both 1.0, as some suggest, or .70, the allowable long-run SDR use limit set by the IMF;
- 3) one cannot consider LDCs as a homogeneous sample of countries responding identically to the same set of economic parameters;
- 4) in the Latin American sample, the evidence supports a theory that SDRs are considered substitutes for foreign exchange rather than gold.

In Part V, we attempt to explain to some degree the management of reserves by central bankers in LDCs. This task is once again extremely complex, inasmuch as each country responds to a unique set of economic and non-economic factors, especially in light of international financial uncertainties. Our findings indicate that the proportion of foreign exchange to gold in reserve portfolios varies:

1) inversely with the balance of payments deficit which needs to be financed;

2) directly with the import/export ratio, a proxy for the transactions demand for foreign payments; and

3) inversely with the amount of SDR holdings, which may thus be considered substitutes for foreign exchange rather than gold.

An alternative descriptive model also indicates that SDRs are more likely to be spent prior to gold to finance a deficit and more likely to be accumulated than gold in reserve portfolios.

SDRs are at present a credible international reserve asset and their use can be explained by economic phenomena. LDC use of SDRs has not been excessive and there is no evidence that they are viewed as inferior assets. It is possible that at this time they are more valued as an interest earning (perhaps cum arbitrage) than for a fixed value asset. For this reason, the evidence leans toward the fact that SDRs are viewed as foreign exchange substitutes in LDC portfolios.

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APPENDIX A

<u>Latin America</u>	<u>Use of SDRs out of First Allocation</u>	<u>Additional Use of SDRs out of Second Allocation</u>	<u>Additional Use of SDRs out of Third Allocation</u>
Total	.10	.28	.63
Argentina	-.01	.60	1.57
Bolivia	.01	1.05	.84
Brazil	-.05	-.02	-.01
Chile	-.05	.02	3.17
Colombia	1.00	.09	1.02
Costa Rica	.24	1.87	-.12
Dominican Republic	1.00	1.00	.94
Ecuador	.94	.09	.08
El Salvador	0	1.80	.36
Guatemala	.72	-.65	-.13
Guyana	.40	.68	.06
Haiti	.75	.73	.03
Honduras	0	1.10	.04
Jamaica	0	-.17	.05
Mexico	-.04	-.04	-.01
Nicaragua	.04	.78	.09
Panama	.31	1.13	.98
Paraguay	0	0	0
Peru	0	-.09	.05
Trinidad & Tobago	0	1.06	.02
Uruguay	.94	1.54	.33
Venezuela	-.13	0	.01
<u>Middle East</u>			
Total	.86	.43	-1.16
Cyprus	0	-1.54	0
Iran	.95	0	-1.58
Israel	1.00	0	-1.25
Jordan	0	0	0
Syrian Arab Republic	1.00	1.00	-2.50
United Arab Republic	1.00	1.00	.37
Yemen P. D. Republic	-	.70	0
<u>Other Asia</u>			
Total	.51	.49	0
Afghanistan	.31	1.00	.73
Burma	1.00	.96	.16
Sri Lanka	1.00	1.00	-1.27
India	.38	.31	0
Indonesia	1.00	1.00	-1.27
Korea	-.23	-1.34	.07
Laos	.70	.72	.68
Malaysia	-.11	0	0
Pakistan	.64	.88	.15
Philippines	1.00	1.00	-1.98
Viet Nam	0	0	0
Thailand*	-	0	0

*new participants after 1970

APPENDIX A

<u>Africa</u>	<u>Use of SDRs out of First Allocation</u>	<u>Additional Use of SDRs out of Second Allocation</u>	<u>Additional Use of SDRs out of Third Allocation</u>
Total	.28	.39	.45
Algeria	-.12	.01	0
Botswana	0	0	0
Burundi	.11	1.13	.14
Cameroon	0	0	0
Central African Republic	0	1.17	1.01
Chad	.01	2.07	.17
Zaire	-.03	-.01	1.31
People's Rep. of Congo	0	1.17	-2.17
Dahomey	0	0	0
Equatorial Guinea	0	0	0
Gabon	0	0	0
Gambia	0	0	0
Ghana	.26	1.54	.38
Guinea	.63	1.39	-3.35
Ivory Coast	0	-.24	-.05
Kenya	0	-.30	1.54
Lesotho	.99	-.09	1.57
Liberia	.43	.86	-2.36
Malagasy Republic	0	0	.16
Malawi	0	0	2.00
Mali	.99	.47	-1.07
Mauritania	0	1.41	-2.37
Mauritius	.01	.01	2.00
Morocco	.95	.84	0
Niger	0	0	0
Nigeria	0	0	1.5
Rwanda	.99	.32	.01
Senegal	.72	.55	-1.53
Sierra Leone	.81	-.08	.08
Somalia	.36	.49	2.19
Sudan	.98	1.02	.02
Swaziland	.99	.02	.51
Tanzania	0	.78	-.78
Togo	0	0	1.46
Tunisia	1.00	1.00	-3.14
Uganda	0	0	0
Upper Volta	0	0	0
Zambia	-.06	-.26	3.43

Source: International Monetary Fund, International Financial Statistics.

APPENDIX B

Latin America: Argentina, Bolivia, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru, Trinidad and Tobago, Uruguay, Venezuela

Other LDCs:

Middle East: Cyprus, United Arab Republic, Iran, Israel, Syrian Arab Republic, Yemen People's Democratic Republic

Asia: Burma, Sri Lanka, India, Korea, Malaysia, Pakistan, Philippines, Thailand

Africa: Algeria, Ghana, Ivory Coast, Kenya, Morocco, Sierra Leone, Sudan, Tanzania, Tunisia, Zaire

APPENDIX CLatin American Reserve Portfolios

	<u>G/R</u>		<u>SDRH/R</u>		<u>FX/R</u>		<u>FP/R</u>	
	<u>70</u>	<u>71</u>	<u>70</u>	<u>71</u>	<u>70</u>	<u>71</u>	<u>70</u>	<u>71</u>
Argentina	.21	.34	.09	.22	.51	.24	.19	.10
Bolivia	.27	.27	.06	.05	.65	.68	-	-
Brazil	.04	.03	.05	.06	.81	.83	.10	.08
Colombia	.08	.07	-	.04	.92	.88	-	-
Costa Rica	.13	.08	.01	-	.49	.91	.27	-
Dominican Republic	.09	.06	-	-	.91	.94	-	-
Ecuador	.23	.31	-	.05	.77	.63	-	-
El Salvador	.28	.29	-	.03	.72	.67	-	-
Guatemala	.22	.20	.03	.08	.75	.67	-	.05
Honduras	.01	.01	.01	.13	.99	.85	-	-
Jamaica	-	-	.05	.07	.89	.84	.06	.09
Mexico	.24	.21	.06	.09	.52	.58	.18	.12
Nicaragua	.01	.01	.02	.06	.97	.92	-	-
Peru	.12	.18	.04	.12	.84	.69	-	-
Uruguay	.93	.89	-	-	.08	.11	-	-
Venezuela	.38	.28	.05	.05	.46	.58	.11	.09
Guyana	-	-	-	.08	.91	.91	.09	-
Panama	-	-	.01	.01	.99	.98	-	-
Paraguay	-	-	.14	.21	.58	.52	.27	.27
Trinidad & Tobago	-	-	.01	.10	.83	.78	.16	.12
Averages	.16	.16	.03	.06	.73	.71		

G = Gold

R = Reserves

FX = Foreign Exchange

FP = Fund Position

SDRH/H = SDRs held

sums ≠ 1.00 are due to rounding

Source: International Monetary Fund, International Financial Statistics

APPENDIX C

Other LDC Reserve Portfolios

	<u>G/R</u>		<u>SDRH/R</u>		<u>FX/R</u>		<u>FP/R</u>	
	<u>70</u>	<u>71</u>	<u>70</u>	<u>71</u>	<u>70</u>	<u>71</u>	<u>70</u>	<u>71</u>
Cyprus	.07	.06	.02	.03	.88	.89	.03	.02
United Arab Republic	.56	.58	0	.05	.44	.38	-	-
Iran	.63	.23	0	0	.36	.77	-	-
Israel	.10	.06	0	.02	.90	.92	-	-
Syrian Arab Republic	.51	.34	0	0	.49	.66	-	-
Yemen P. D. Republic	.01	.01	.03	.07	.88	.85	.04	.07
Burma	.67	.32	0	0	.33	.68	-	-
Sri Lanka	0	0	0	0	1.00	1.00	-	-
India	.24	.22	.04	.12	.69	.58	.03	.08
Korea	.01	.01	.02	.03	.96	.94	-	.02
Malaysia	.07	.07	.03	.05	.83	.83	.07	.05
Pakistan	.30	.33	.06	.07	.65	.59	-	-
Philippines	.22	.19	0	0	.78	.81	-	-
Thailand	.10	.10	0	.02	.86	.84	.04	.04
Algeria	.56	.41	.04	.06	.29	.46	.11	.08
Ghana	.10	.11	0	.05	.90	.83	-	-
Ivory Coast	0	0	.03	.19	.87	.75	.10	.14
Morocco	.15	.13	.02	.01	.84	.85	-	-
Kenya	0	0	.03	.07	.92	.85	.05	.08
Sierra Leone	0	0	.01	.08	.85	.78	.11	.16
Sudan	0	0	.01	0	1.00	1.00	-	-
Tanzania	0	0	.03	.11	.86	.76	.11	.13
Tunisia	.07	.03	0	.01	.93	.95	-	-
Zaire	.27	.38	.08	.11	.49	.30	.16	.21
Averages	.19	.15	.02	.05	.75	.76		

Source: International Monetary Fund. International Financial Statistics.

Notes

1. The rules governing such transactions are that a country may use up to 70% of its allocation to meet balance of payments needs without reconstituting and must pay $1\frac{1}{2}\%$ per annum interest cost on this used portion. If more than 70% is used, it must be reconstituted, so that the average holdings of SDRs over a five year period are not less than 30% of the total allocation. In exchange for reserve center currencies, SDRs which are used are assigned by the Fund to countries in a stronger reserve position. The country accepting SDRs receives $1\frac{1}{2}\%$ per annum on that portion of its SDR balance which exceeds its allocation, and cannot be assigned to hold more than three times its total allocation.
2. An exception is an attempt by Appleyard and Hughes [1972] to measure the superiority or inferiority of SDRs using correlation analysis on monthly reserve asset compositions of LDCs. Unfortunately, the results are fairly inconclusive and the statistical methodology is not the best.
3. See Appendix A.
4. The balance of payments variable is defined as the sum of the balances on goods and services, private and public transfers, and autonomous capital flows (including long-term capital and private short-term capital). Not included are adjustment accounts such as government short-term capital; gold, foreign exchange, and SDR accounts; and errors and omissions.
5. It is also true that the model is short-run in nature which hampers the applicability of the model for any future year and that the basic nature of a cross-country sample does not predict individual country parameters.
6. While there are more LDCs with the relevant data available, error analysis indicated that inclusion of those LDCs never using SDRs significantly worsens the regression fit. These countries (see Appendix A) were eliminated, since we assumed that institutional rather than economic factors were responsible for the decision never to use SDRs. Non-SDR users are primarily Communauté Financière Africaine countries.
7. This mean value of SDR use is significantly influenced by large SDR use countries, but this need not concern us inasmuch as we are attempting to explain total SDR use and not the percentage of allocation used by any one country.
8. See Appendix B.
9. Tests were also performed to test for the potential existence of 2 multicollinearity between B70 and DZ71. Correlation, regression, and \bar{R} tests proved the independent explanatory power of both variables. A question on the assumption of homoscedasticity was dispelled by bifurcating the sample into large and small observations and showing the variances in each subsample to be equal.

10. The value of E is biased insofar as countries holding no gold whatsoever do not have a defined value of E and a zero is therefore listed in the data files.

11. Procedures were unsuccessfully attempted to isolate deviant observations which might have been influenced by exogenous parameters.

12. The appropriate F statistic is:
$$F = \frac{Q_1/k}{\frac{Q_2}{2(m+n-2k)}}$$

where Q_1 = SSR (Equation 1 - total sample)
 Q_2 = SSR (Equation 2) + SSR (Equation 3)
 Q_3 = $Q_1 - Q_2$
 m = number of observations in Equation 2
 n = number of observations in Equation 3
 k = number of independent variables

13. The parameters do not change significantly dropping DX70, and the correlation among independent variables is negligible. Splitting of the sample into regional samples is not rewarding.

14. Parameter estimates do not sum to one because of the arbitrary time lag assumed, and because of the restrictive definition of balance of payments, among others. Obviously the estimates are seriously biased by the simultaneity problem.

REFERENCES

- Appleyard, D. R. and Hughes, R. L., November, 1972, "The Emerging International Monetary System, Reserve Composition, and the LDCs," (presented at the Southern Economic Association meetings, Washington, D. C.).
- Chow, G, July, 1960, "Tests of Equality Between Sets of Coefficients in Two Linear Regressions," Econometrica.
- Howe, James W., November, 1972, "Let's Spread Them Around," Foreign Policy.
- Johnston, J., 1963, Econometric Methods, McGraw Hill Book Company, New York.
- Leipziger, D. M. and Michalopoulos, C., November, 1972, "The Nature of an SDR-Aid Link," Agency for International Development.