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FINANCIAL ARRANGEMENTS BETWEEN
CENTRAL BANKS IN THE CARIBBEAN

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Within recent years there has continued to accumulate a large body of literature devoted to a consideration of the role of Central Banks in developing economies. The tendency has been to examine the problem in the light of the rudimentary state of the monetary institutions and the attendant lack of sophistication in the relationships among them and between them and the general public. On balance, the result of such analysis seems to have been that within the developed world, Central Banking can afford to concentrate its efforts on performing the role of a monetary stabiliser, mainly by influencing the activities of commercial banks, and through them other credit institutions, and the level, structure and variations of interest rates. On the other hand, the central problem in developing countries is long-term development. Such development requires not only the favourable atmosphere of monetary stability, but also the rather more positive pre-requisite of institutional and general structural change. Central Banks have therefore been enjoined to consider their role as being not only that of controllers in the sense of 'orderliness', but also innovators in the sense of 'premeditated evolution'.

It is within this context of the role of Central Banks in less developed countries, and in particular in the context of their regional role in the Caribbean, that we may consider the recent 'Inter-regional Settlements Agreement' which went into operation among Trinidad and Tobago, Jamaica, and Guyana on 1st December, 1969, and, starting 19th January, 1970, also encompassed Barbados and the Leeward and Windward Islands. The following quote of the press release issued by the Bank of Guyana (similar releases were issued simultaneously by the Central Bank of Trinidad and Tobago, and the Bank of Jamaica on 26th November, 1969) outlines the agreement, and part of its rationale.

The monetary authorities in the CARIFTA countries have enlarged the scope of the arrangements among themselves for dealing in regional currencies. They will in future in dealings with commercial banks, not only exchange each other's currency notes and coin as at present, but also buy and sell each other's currency through bank transfers. The new arrangements will facilitate and reduce the cost of making payments arising from trade between these countries.

Such payments now necessitate final settlements through London as between commercial banks. The monetary authorities in the region will in future through the new arrangements provide the commercial banks with facilities for local settlements. The commercial banks will therefore be able to offer finer rates to the public for these currencies than before.

The new arrangements commenced on 1st December, 1969, as between the three central banks of the region (the Bank of Jamaica, the Central Bank of Trinidad and Tobago and the Bank of Guyana) and will be extended to the Eastern Caribbean Currency Authority by 19th January, 1970!.

In addition to cheapening the cost of transferring funds between Carifta currencies, the arrangement provided the opportunity for a desirable increase in international liquidity by formally endowing the Carifta currencies with convertibility within the Carifta region. As the volume of Carifta trade increases, such a concomitant increase in intra-regional liquidity becomes a necessary development. This bears on a much more far-reaching set of problems which directly result if there are several institutions which have a large degree of autonomy in fixing the margins which

apply to par values of foreign market rates for dealings in foreign exchange. The following simple algebraic excursus focuses attention on arbitrage, but the frame is subsequently used to analyse some other related situations.

Necessary and Sufficient Conditions for Preventing Arbitrage in a system of Foreign Exchange Loadings

The System of Loadings

(1) Body Trading in G\$ and £	Buy £, Give G\$ p	Sell £, Take G\$ q
(2) Body Trading in TT\$ and £	Buy £, Give TT\$ r	Sell £, Take TT\$ s
(3) Body Trading in J£ and £	Buy £, Give J£ a	Sell £, Take J£ b
(4) Body Trading in G\$ and TT\$	Buy G\$, Give TT\$ u	Sell G\$, Take TT\$ v
(5) Body Trading in G\$ and J£	Buy G\$, Give J£ c	Sell G\$, Take J£ d
(6) Body Trading in J£ and TT\$	Buy J£, Give TT\$ e	Sell J£, Take TT\$ f

Note (a)

- G\$ means Guyana dollars
- TT\$ means Trinidad and Tobago dollars
- J£ means Jamaican pounds
- £ means Pounds Sterling

Note (b)

A 'Loading' is defined as the deviation from the par rates of

$$1\text{£} = 1\text{J£} = \text{G\$}4.80 = \text{TT\$}4.80$$

so that if, for example, a customer attempted to exchange G\$ for £, the body trading in G\$ and £ would require that the customer give G\$480(1 + q) for every £100 he received and that the customer would receive G\$480(1 - p) for every £100 he gave.

The following notation will be used to denote the above relationships, and the arrows show the direction of exchange:

$$\begin{array}{ccc} \text{G\$} & \longrightarrow & \text{£} \\ 480(1 + q) & & 100 \end{array} ; \begin{array}{ccc} \text{£} & \longrightarrow & \text{G\$} \\ 100 & & 480(1 - p) \end{array}$$

The above can obviously equivalently be written as

$$\begin{array}{ccc} \text{G\$} & \longrightarrow & \text{£} \\ 1 & \frac{100}{480(1 + q)} & \end{array} \quad \begin{array}{ccc} \text{£} & \longrightarrow & \text{G\$} \\ 1 & \frac{480(1 - p)}{100} & \end{array}$$

The loadings are treated as discount rates from the customer's point of view. Where the loading in fact represents a premium a negative sign must be attached. Later in the development an example will serve to clarify this point.

Also, in what follows constant use shall be made of the fact that for small values of the loadings p, q, r, s and so on, the following close approximations hold:

$$\frac{1}{1 + q} = 1 - q$$

$$(1 - s)(1 - u) = 1 - s - u$$

$$(1 - s - u)(1 - p) = 1 - s - u - p$$

so that

$$\begin{array}{ccc} \text{G\$} & \longrightarrow & \text{£} \\ 1 & \frac{100}{480(1 + q)} & \end{array} \quad \begin{array}{ccc} \text{G\$} & \longrightarrow & \text{£} \\ 1 & \frac{100(1 - q)}{480} & \end{array}$$

will be treated as equivalent to

The Basic Relations of the System

- (1) (a) $G\$ \longrightarrow \pounds$
 $1 \qquad \frac{100}{480} (1 - q)$
- (b) $\pounds \longrightarrow G\$$
 $1 \qquad \frac{480}{100} (1 - p)$
- (2) (a) $TT\$ \longrightarrow \pounds$
 $1 \qquad \frac{100}{480} (1 - s)$
- (b) $\pounds \longrightarrow TT\$$
 $1 \qquad \frac{480}{100} (1 - r)$
- (3) (a) $J\pounds \longrightarrow \pounds$
 $1 \qquad (1 - b)$
- (b) $\pounds \longrightarrow J\pounds$
 $1 \qquad (1 - a)$
- (4) (a) $G\$ \longrightarrow TT\$$
 $1 \qquad (1 - u)$
- (b) $TT\$ \longrightarrow G\$$
 $1 \qquad (1 - v)$
- (5) (a) $G\$ \longrightarrow J\pounds$
 $1 \qquad \frac{100}{480} (1 - d)$
- (b) $J\pounds \longrightarrow G\$$
 $1 \qquad \frac{480}{100} (1 - c)$
- (6) (a) $J\pounds \longrightarrow TT\$$
 $1 \qquad \frac{480}{100} (1 - e)$
- (b) $TT\$ \longrightarrow J\pounds$
 $1 \qquad \frac{100}{480} (1 - f)$

The basic relations may be summarised in a concise matrix form as follows:

$$\begin{array}{c}
 \text{G\$} \\
 \text{TT\$} \\
 \text{J\$} \\
 \text{\pounds}
 \end{array}
 \begin{bmatrix}
 \text{G\$} & & & \\
 & \text{TT\$} & & \\
 & & \text{J\$} & \\
 & & & \text{\pounds}
 \end{bmatrix}
 \begin{bmatrix}
 1 & 1 - u & \frac{100}{480}(1-d) & \frac{100}{480}(1-q) \\
 1 - v & 1 & \frac{100}{480}(1-f) & \frac{100}{480}(1-s) \\
 \frac{480}{100}(1-c) & \frac{480}{100}(1-e) & 1 & (1-b) \\
 \frac{480}{100}(1-p) & \frac{480}{100}(1-r) & (1-a) & 1
 \end{bmatrix}$$

We shall call the above matrix 'the matrix of exchange rates'. A moment's reflection shows its relationship to the basic relations. For instance the entry in the 3rd row and 2nd column which we shall refer to as the (3,2) element gives the amount in TT\$ which would be obtained for 1J\$. The '1' 's in the diagonal indicate that, for instance, Guyana dollars can be exchanged at par for Guyana dollars, and so on.

Arbitrage through Chain Transactions

There are basically two types of arbitrage situations

- (i) The circular type represented by $\text{G\$} \rightarrow \text{TT\$} \rightarrow \text{\pounds} \rightarrow \text{G\$}$ where the customer begins and ends with the same currency, having obtained more of the starting currency at the end of the chain than he began with

and(ii) The 'alternative route' type whereby the customer finds that say, the chain $\text{G} \rightarrow \text{TT} \rightarrow \text{\pounds}$ is better than the straightforward route $\text{G} \rightarrow \text{\pounds}$.

All possible arbitrage dealings can be classified either as 'Circular' or as 'Alternative Route'.

It should be noted that if circular arbitrage is possible, then the system is self perpetuating in the sense that by continuing to go around the circular path ever increasing gains can be made.

The Necessary and Sufficient Conditions

It is possible by working through the algebra of chain transactions to develop a set of rules of thumb which can be applied to check the loading system.

For the situation considered we define a 'loading matrix' as follows:

		Col(1)	(2)	(3)	(4)
		G\$	TT\$	J£	£
Row (1)	G\$	o	u	d	q
(2)	TT\$	v	o	f	s
(3)	J£	c	e	o	b
(4)	£	p	r	a	o

where the entry in row (m) and column (n) is the loading applied if the customer tries to make the transaction Currency m \rightarrow Currency n.

Thus the transaction J£ \rightarrow £ involves the loading b being applied by the body trading in J£ and £.

Now reconsider the notation introduced on page 6, where the element in row (3), column (2) is denoted by (3,2). We can denote each element of the 'loading matrix' by similar notation.

'Circular Arbitrage'

Rule: Circular arbitrage is impossible if and only if all relations of the following type hold:
 (3,1) + (1,2) + (2,4) + (4,3) is greater than or equal to zero.

Note (a): The chain of symbols must end with the same number with which it started, in this case 3. The length of the chain is immaterial.

Note (b): The above chain refers to the following system:

$$J\text{\$} \rightarrow G\text{\$} \rightarrow T\text{\$} \rightarrow \text{\$} \rightarrow J\text{\$}$$

This can be seen by noting that (3,1) refers to the exchange $J\text{\$} \rightarrow G\text{\$}$, (1,2) refers to $G\text{\$} \rightarrow T\text{\$}$ and so on, so that (3,1) + (1,2) refers to the chain $J\text{\$} \rightarrow G\text{\$} \rightarrow T\text{\$}$.

Note (c): Notes (a) and (b) above imply that if, say, we wanted to check whether Arbitrage could be achieved by the transaction

$$G\text{\$} \rightarrow T\text{\$} \rightarrow J\text{\$} \rightarrow G\text{\$}$$

then we should consider the sum (1,2) + (2,3) + (3,1).

If the sum is negative arbitrage is possible. Otherwise it is not.

'Alternate Route' arbitrage

This involves a comparison between transactions like

$$G\text{\$} \quad T\text{\$} \rightarrow \text{\$} \quad \text{and} \quad G\text{\$} \rightarrow \text{\$}.$$

In our notation, this means comparing (1,2) + (2,4) with (1,4).

Rule: Alternate Route arbitrage is impossible if and only if all relations of the following type hold:

$$(1,2) + (2,4) \text{ is greater than or equal to } (1,4).$$

Note (a): The rule implies that if, for instance, our loading matrix had values which allowed the sum (1,3) + (3,2) to be less than (1,2), then an arbitrage transaction is possible.

The relevant transaction is $G\text{\$} \rightarrow J\text{\$} \rightarrow T\text{\$}$ which would be superior to $G\text{\$} \rightarrow T\text{\$}$.

The above two rules, applied to any loading matrix, will immediately identify all those transactions, if any, for which arbitrage can occur.

THE INTUITIVE RATIONALE

Consider the transactions $G\$ \rightarrow J\text{£} \rightarrow TT\$$ which in our notation may be denoted $(1,3) + (3,2)$.

We want to compare this with the transaction $G\$ \rightarrow TT\$$ which we may denote $(1,2)$.

The loading matrix may be considered as a matrix of prices where the entry $(1,3)$ represents the price for going in the direction $G\$ \rightarrow J\text{£}$, and $(3,2)$ represents the price for going in the direction $J\text{£} \rightarrow TT\$$. The rules quoted simply state that the price for $G\$ \rightarrow J\text{£}$ plus the price for $J\text{£} \rightarrow TT\$$ must, for arbitrage to be impossible, exceed the price for $G\$ \rightarrow TT\$$.

For circular arbitrage, the comparable price, for say $G\$ \rightarrow G\$$, is of course zero.

As mentioned previously, the main attraction of the foregoing algebraic framework is not the consideration of arbitrage, although the uncontrolled generation of 'hot-money' flows between Caribbean territories could be a serious impediment to the economic development of individual territories in which development capital is scarce. Equally important is the possible effect which exchange transactions can have on trade, particularly Carifta trade. Put rather simply, to the extent that foreign exchange transactions are made more costly, a constraint shall have been imposed on trade for which payments involve those transactions, through the mechanism of the effective exchange rate and its impact on price levels, and vice versa. Furthermore, to the extent that the effective exchange rate between two Caribbean currencies depends on the London or U.S. market rates for a third currency (generally the £ sterling), trade between the two Caribbean territories may be distorted, again through the mechanism of the effective exchange rate, by the vagaries of the third currency.

Looked at in terms of the foregoing algebraic terminology, for a loading matrix in which no loading is negative, $G \rightarrow TT$ should be less costly than $G \rightarrow \text{£} \rightarrow TT$. If, however, a trading body sets

the rate for $G \rightarrow TT$ by bearing in mind that it needs to cover in £, the resulting rate quoted is derived from a consideration of $G \rightarrow \text{£} \rightarrow TT$, with a perhaps unjustified increase in cost since such an approach takes no account of the fact that transactions of the kind $G \rightarrow TT$ and $TT \rightarrow G$ can be 'married off' and that it is only the net position at the end of a trading period which requires cover. In addition, if the loadings are applied to the market rate of the third currency, the effective exchange rate between the other two currencies fluctuates accordingly, the important point being that such fluctuations shall not have been determined by the economic conditions in the two Caribbean territories.

There is yet a further complication which needs to be considered. Given an international monetary situation in which interest rates, say on sterling, are threatening to result in flows of funds from a Caribbean territory to the U.K., and that there are reasons why the situation should not be handled by generating a matching rise in interest rates by say raising bank rate, the Central Bank involved may choose to skew its exchange loadings and to widen the margin between buying and selling rates with respect to sterling. Such skewing and margin widening would be done so as to make it costlier for a commercial bank to purchase sterling from the Central Bank and cheaper for it to sell sterling, the other currency in the exchange being local currency. In fact, the skewing and margin widening process may be taken to the extent where there is premium (a negative loading) on the selling side.

The skewing approach could, in theory, solve the problem of any individual territory, but there are at least two undesirable effects which might result from the point of view of the Caribbean as a trading region. These are easily ascertainable through a consideration of the algebraic formulation.

Skewing is by definition the creation of an asymmetry in the loading matrix which may be compounded, in widening the margin, by the introduction of negative loadings (premiums rather than discounts).

The negative loadings themselves may, if they are large enough (see necessary and sufficient conditions) lead to arbitrage, and to prevent this, other Central Banks, if we again consider sterling, would be forced to skew so that their rates for selling sterling involve at least as high a discount as the highest premium being offered elsewhere. Further, there is likely to be an immediate impact on the arrangements made for inter-Caribbean payments, since commercial banks use as their reference base the exchange loadings of the Central Bank of their territory.

Thus the varying degrees of asymmetry among Central Banks may imply that for individual customers, $TT\$ \longrightarrow G\$$, given its dependence on $TT\$ \longrightarrow \pounds \longrightarrow G\$$, may be less costly, say, in Guyana than in Trinidad and Tobago; a situation which then prompts the Trinidadian importer to pay the Guyanese exporter in Trinidadian currency.

The foregoing comments have been offered in an attempt to highlight some of the main complexities which tend to arise in a situation where Central Banks unilaterally deal with the problem. It is the recognition of these difficulties, together with the gains achievable by joint action which underlies the Inter-regional settlements agreement. Some idea of the situation prior to the agreement is given in the following table which relates to commercial banks in Jamaica, Trinidad and Tobago, and Guyana in their dealings with the public. The characteristics of asymmetry within and between territories are quite obvious.

COMMERCIAL BANKS' EXCHANGE LOADINGS (%) AS AT
31ST MARCH, 1969.

Currency	JAMAICA ²⁾		TRINIDAD & TOBAGO		GUYANA	
	Buying	Selling	Buying	Selling	Buying	Selling
1) U.S. \$	239.625- 239.75	237.4375	1/16-1/8	15/16	4/16	11/16
1) Canadian \$	258.0625- 258.1875	255.625	1/16-1/8	15/16	4/16	11/16
U.K. £	1/16	12/16	1/16-3/16	13/16	13/16	10/16
J£	-	-	9/16-10/16	10/16	10/16	5/16
TT \$	1/16-2/16	1/160-12/16	-	-	1/16	7/16
BCCB \$	1/16-2/16	1/160-12/16	7/16-8/16	14/16	1/16	7/16
G \$	1/16-2/16	1/160-12/16	4/16-5/16	12/16	-	-

- 1) For these currencies loadings are applied to market rates; for the rest the par value is taken as origin by the commercial banks.
- 2) The U.S. and Canadian loadings for Jamaica are quoted as actual rates rather than percentages since it has not been possible to identify the market rate to which the loading was applied.

The main characteristics of the agreement are itemised below:

(1) Immediate objective

To reduce the cost and provide a uniform rate structure for transferring funds within the Commonwealth Caribbean area.

(2) Basic arrangements

(a) The Central Banks would open reciprocal accounts with each other and would initially exchange at par through these accounts agreed levels of working balances of each other's currencies.

(b) These working balances will be maintained at the agreed levels by periodic replenishments of deficits and clearing of surpluses in sterling.

(c) The working balances will bear interest at uniform rate agreed between the participants.

(d) The exchange risk of holding the working balances will be avoided by making the swap reversible at par in 3 months after its occurrence.

(e) In dealings with commercial banks involving the purchases and sales of each other's currencies, the Central Banks should apply an exchange loading of $1/8\%$ on each side of parity.

(f) In similar dealings between the commercial banks and the public, transactions done by cable transfers should not exceed $\frac{1}{4}\%$ on either side of parity, while a spread of $5/16\%$ below parity and $\frac{1}{2}\%$ above parity should apply respectively to the purchase and sale of demand drafts.

(g) The arrangements hold for exchange rates applicable to the Carifta countries.

(h) These new procedures will be in addition to the previous arrangements whereby the three Central Banks and the Eastern Caribbean Currency Authority return to each other their collections of each other's currency notes and coins.

There are two aspects of the agreement which are worthy of note, not in so far as they relate to the solution of the problems previously outlined, but rather as an indication of future possibilities

for joint action. The first aspect is the provision against the exchange risk of holding another territory's currency. The second is the establishment of agreed control of some particular aspect of commercial banking activity together with the serving of a tie to a third currency. These two aspects assume considerable significance if one considers either the recent Sterling Area Agreement or the possibilities of fostering a regional money market.

From the point of view of the Sterling Area Agreement, there exists the possibility of Central Banks purchasing each other's government's securities. Such purchases, if denominated in sterling, would continue to count as Official Sterling Reserves, thereby permitting the Agreement to apply to them. One possibility is that Caribbean governments could offer securities on the London Market, and by arrangement other Caribbean governments would, through their Central Banks, purchase the securities. If, in addition, the securities are at most medium-term (say two to three years) then there would exist the liquidity which Central Banks require; and since borrowers and lenders would both be in the Caribbean, the arrangement would have the attraction that funds originating in the Caribbean shall have been loaned in the Caribbean. This contrasts directly with the situation where sinking fund portfolios contain, for instance, Australian securities.

Also, if we consider that the underlying seasonalities of foreign payments and receipts within various Carifta territories may be phased differently enough to imply the existence of temporary surplus funds in some territories at the same time that temporary deficits are occurring in others, then the development of a regional money market i.e. a regional market that fosters and facilitates the borrowing and lending of short-term funds (say for periods of up to six months), could serve to cushion the separate economies against violent fluctuations in the timing of external receipts and payments.

There would exist a sort of revolving fund within the region, and the direction of flows would be determined by market considerations of price and profit.

There is obviously a large variety of problems that will arise if any attempts are made to arrange either the purchases of regional Government securities or the development of a regional money market. However, there can be no doubt that the likelihood of success of such attempts would be considerably increased if the arrangements for transactions could be made through some institution like the Central Banks with guarantees against exchange risks and with enough authority to ensure the orderly behaviour of participants. There are several examples of situations where money markets have been officially encouraged and assisted in individual territories (Canada and South Africa being two leading examples) and it may not be too ambitious for us to give some attention to similar action on a regional basis. If we ever do, the precedent of the Inter-regional settlements agreement may well prove to have been the first real step in that direction.