

The Hedging of Commercial Transactions Between U.S. and Canadian Residents: A Canadian View

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The literature on the commercial uses of the foreign exchange market, such as it is, finds inspiration for its classifications in analyses of the effectiveness of that market for short and long-term financial operations. It starkly classifies the positions of traders as either open, and therefore speculative, or as covered by a forward transaction that entirely offsets their commercial position. It will be shown below that this simple classification obscures the real nature of an international trader's business. Thus a trader who buys foreign goods today and pays with foreign exchange bought today is considered by the traditional classification not to have a speculative position. However, if he had bought spot or forward exchange earlier in the anticipation of this purchase of goods, or if he delayed purchasing foreign exchange until later, because of a view he held that those were the times at which the rate of exchange was lowest, the traditional view would consider that to be speculation. Yet the motives for the transactions and the type of risk assumed are the same in all three cases and reflect that the trader's function is to buy and sell internationally traded goods on the most favourable terms. If he buys foreign exchange today, yesterday or tomorrow, it is because he believes the rate to be particularly favourable then.

To make speculation refer to any net long or short position in foreign exchange or in a commodity whose price is determined by international conditions and the rate of exchange strains the term. That term should be restricted to net positions in foreign exchange

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taken for gain from changes in the rate of exchange and not to positions taken as a normal incident to commercial transactions. Speculation in foreign exchange is a purely financial transaction. Once a distinction is made between speculation properly defined and risks inherent in trade, the foreign exchange transactions related to international trade are seen to be covering or hedging operations carried out for a variety of purposes.

A distinction between covering and hedging must be made. In the former a trader abolishes risk of exchange rate change by immediately and invariably buying or selling foreign exchange forward to offset any liability he has incurred or asset he has acquired which has a stable value in terms of a foreign currency and a contract with a fixed and known date of maturity.¹ This operation is analogous to covering foreign exchange commitments for the purpose of interest arbitrage and might be carried out to fix the domestic currency cost of a specific payment for imports due on a certain date in the future. Hedging, on the other hand, does not eliminate, though it usually reduces, foreign currency risk. Uncertainty remains because the forward foreign exchange operation and the risk it is designed to offset do not exactly match, because the amount of the foreign exchange asset or liability is not precisely known or the date of maturity of the contract is uncertain. The consequence is that the price of the hedge and of the asset or liability hedged may not change by the same proportion over time.

As an example, a trader might wish to hedge the domestic currency value of a stock of goods whose price was determined in a foreign market and currency by means of offsetting forward currency operations. He would sell the foreign currency forward at the moment at which he wished to hedge the value of the goods he owned. His long commercial position is in effect a long foreign currency position with goods that can be sold spot at any time in the future. When the goods are sold abroad and the foreign currency proceeds are sold spot, the forward hedge would be removed by a forward purchase. The hedge would turn out to be perfect if the price of the forward had moved exactly as the spot foreign exchange rate, that is to say, if the forward margin was unchanged.²

¹A forward contract with an "option" can cover a number of dates. Such technical details complicate the analysis without affecting the principle and are left out of the following discussion.

²This section assumes the rate of interest to be the same in both countries, a simplification that does not reduce the generality of the point made.

A profit would arise if the premium fell or discount increased over the period. An example of a profit would be if a Canadian trader sold forward at a premium for three months a sum equal to the foreign currency value of his inventory of goods. If the forward premium had narrowed when the goods were sold abroad and the foreign currency proceeds disposed of, the profit or loss on the spot value of the goods would exceed or fall short of the loss or profit on the forward operation. To be yet more specific: if the forward were sold at a premium of $\frac{1}{2}$ cent when the spot United States dollar was 101 cents and bought back when the premium was $\frac{1}{4}$ cent, and the spot was 102, the profit on the spot transaction would be 1 cent but the loss on the forward transaction $\frac{3}{4}$ cent. In deciding whether to hedge expected foreign currency earnings, an exporter weighs the risk of unfavourable margin change on hedged transactions against the risk of spot exchange rate changes in unhedged transactions. The former risk exceeds the latter if the forward margin fluctuates more than the spot rate.

The price of a traded commodity may also fluctuate in terms of foreign currency in a matter unrelated to the exchange rate. In this case a Canadian trader would of course have to hedge on a foreign commodity market, if such existed, in addition to his forward exchange operations.

Hedging by the use of the forward market in foreign exchange has the essential characteristic that the forward transaction is only a temporary substitute for a spot transaction that is called for by the ordinary course of commercial transactions.

Three Types of Hedging Operations

Three distinct types of hedging operations can be distinguished. Probably the most common is selective hedging³ when firms which are committed to future foreign exchange earnings or expenditures or which are long or short in stocks of commodities with international prices occasionally seek to protect themselves from expected exchange rate changes. The incidence of such hedging has been especially large in Canada when major rate changes were anticipated, such as in the period when the Canadian dollar was pegged at an evidently undervalued rate in 1950 and 1970, and, in 1961 when

³The term "selective" and "anticipatory" hedging are taken from analogous operations in commodity markets. See Holbrook Working, "New Concepts Concerning the Future Markets" *American Economic Review*, vol. 52, no. 3, June 1962, pp. 440-441.

the Minister of Finance announced that he believed the exchange rate to be too low. In the former cases exporters who normally did not cover did so, and the importers who usually bought foreign exchange forwards ceased to do so and vice versa when the rate was generally expected to rise. Holders of inventories of commodities could sell foreign exchange forward when they expected the price of foreign exchange (and of their inventory) to fall and buy forward when they expected it to rise.

Selective hedging is not strictly designed to reduce the variance in the rate but to anticipate changes in the rate. It would offset losses to the long position from an expected decline in the rate and to a short position from a rise in the rate. The usefulness of the forward market in this and other contexts is that it allows traders to adjust their positions at least cost in the light of their views as to the future course of the rate of exchange. Traders hold long or short positions in contracts, foreign exchange and commodities for trading purposes, because these positions give a convenience yield. They must hold stocks of raw materials and finished goods to supply the unforeseeable needs or timing of the needs of their customers and to reduce transactions costs. The same consideration leads them to hold balances in foreign currency and enter into contracts affecting the future. The point is that these commitments may give rise to long or short positions that conflict with their expectations about the future course of the rate of exchange. For instance, a refiner of copper must hold stocks of unrefined and refined copper even when he expects the price of foreign exchange and hence the value of his inventory to fall. In the absence of a forward market, he would be induced by the foreign exchange risk to reduce his inventory and therefore to raise his costs of doing business by foregoing the convenience yield of the larger inventory. The forward market enables him to maintain his inventory by selectively hedging the stock through a forward sale of foreign exchange when he believes that risk to exist.

Hedging may also be anticipatory. A trader may buy or sell foreign exchange forward in anticipation of a future need when the rate of exchange seems favourable to him. He is taking on a long or short position, but it is nevertheless a hedging operation. It is a substitute for a spot transaction that will be necessitated in any event by a commercial operation. The purchase of forward exchange is part of the normal conduct of a commercial enterprise and is a hedge against an anticipated requirement of that business.

Finally, a particularly knowledgeable and skillful trader might hedge on the basis of the margin. He might decide to hedge or not to

hedge depending on whether he expected the forward margin to move in his favour or not during the life of the contract he was contemplating. For instance, an exporter selling foreign exchange forward to hedge his commodity position might find this hedging sufficiently attractive only if he believed the premium on forward currency would decrease or the discount rise between the time of the hedge and the closing out of his forward exchange positions. By selling forward now to cover his present long position in goods and by buying back the forward later at a smaller premium or greater discount from spot, he would add the changing margin to his profits. A forecast of the margin is, in effect, a forecast of relative interest rates in Canada and abroad because the forward margin normally reflects the international interest differential. A forecast of an unfavourable change in the margin might lead to a decision not to hedge or it might lead to the abandonment of the commercial operation as well.

Effectiveness of Hedging

The effectiveness of the foreign exchange market for hedging commercial transactions, as for covering and speculation, depends chiefly on two characteristics. The first and most obvious is the transactions cost: how much the foreign exchange brokers and dealers charge for performing their function of exchanging one currency for another. The second characteristic is the extent of bias in the market. Bias is the tendency of forward rates to consistently over-value or under-value the spot rate that will actually prevail when the forward contract matures.

Transactions Costs

1. Transactions costs depend on the efficiency with which firms in the industry are organized to achieve lowest average costs and the extent to which competition between them keeps the price of their services to cost. Competition tends to insure that firms are efficient and that the spread between buy and sell prices and the commissions yield only normal profits, so the problem can be approached by an examination of competitive conditions in the foreign exchange business.

It is commonplace that the international foreign currency market in the major traded currencies is highly competitive at the wholesale

level. Banks all over the world are in constant touch with one another and are willing to buy and sell these currencies on margins of 1/50 of a cent or less. Major commercial and financial firms buying and selling large sums have access to the wholesale market. It is claimed that the international market is so competitive that “opportunities for profitable spatial arbitrage are limited and such dealers must therefore realize profits from future exchange fluctuations”⁴ and specifically that in New York it is “impossible for a foreign exchange department of a New York bank to operate profitably without trading on a position. Competition among banks in New York is so keen that trading profits on the daily turnover of commercial transactions are extremely small.”⁵

The fact that the market in large sums is highly competitive does not mean that smaller purchasers or sellers necessarily obtain favourable terms within national foreign exchange markets, because collusion among banks in retailing may raise commissions about competitive levels, but this situation varies from country to country and no general statement is possible.

The picture of a perfectly competitive international wholesale foreign exchange market needs to be modified somewhat for an analysis of the Canadian dollar market because that currency is not a major traded currency. Purchases and sales of Canadian dollars are made by firms needing this currency for commercial or investment purposes and are not the result of active trading in search of a profit from turning over the currency. The number of banks continually active in the Canadian dollar market is much less than for the major international currencies such as the United States dollar, sterling, or the Swiss franc.

The Canadian dollar market is chiefly in Canada between the Canadian chartered banks. The reason is that the overwhelming proportion of Canadian trade, both exports and imports, is invoiced in foreign currencies, chiefly the U.S. dollar and, to some extent, sterling. In consequence it is the Canadian traders who are responsible for foreign exchange operations and they naturally tend to carry them out with the local branch of their Canadian bank with which they have other business dealings.

⁴Helmut Lipfert, “The Psychology of the Exchange Market”, in R.Z. Aliber, *The International Market for Foreign Exchange*, Praeger, 1969, p. 124.

⁵*Ibid.*, p. 202.

The Canadian bank builds up a long or short position as a result of responding to its commercial customers through its various branches and it evens out its position from time to time in larger blocks in the Canadian interbank market or in the international market.

The interbank market consists of salaried brokers of the Canadian Bankers' Association to whom only the chartered banks, the Montreal and District Savings Bank, and the Bank of Canada, have access. This wholesale market has the unique characteristic that the marginal costs of transactions to an individual bank trader are virtually zero because the brokers are salaried rather than on commission as are brokers in other centres. This means that bank foreign exchange traders are willing to engage in more covering operations than they would if the marginal cost of transactions were positive. This may also aid in maintaining in Canada the centrality of the Canadian dollar market because Canadian banks can accommodate foreign requests more cheaply than if a commission had to be paid on each transaction. It is also alleged that the cost of brokerage to the industry is reduced by this system, but this is only an estimate based on assumptions as to the level of commissions that private brokers would charge.

Canadian banks do not deal in large sums only on the interbank market. They also buy and sell with foreign banks, especially in main United States centres, when this is profitable, and also with the commercial and financial firms with the largest volumes.

Small Number of Participants

The relatively small number of participants in the Canadian dollar market makes it possible normally to maintain a larger spread between the buying and selling price in quotations that are given by the central foreign exchange department of banks to their customers. Canadian banks quote a spread of $1/32$ cent on a U.S. dollar to their principal customers, be they firms which purchase in large amounts or foreign banks. In contrast, in the United States and in Europe, quotations on foreign exchange have finer spreads of two points or less. Nevertheless, Canadian banks are responsive to market situations and if large commercial or financial customers, including foreign banks, consistently get better rates abroad, they will quote finer rates to these customers.

The question arises of why foreign exchange business does not gradually move from Canada to other centres when Canadian banks maintain a larger spread between the buying and selling rate than

foreign centres, notably New York, are accustomed to have on important currencies. The reason appears to be that the majority of commercial transactions are not very sensitive to relatively small differences in spread and they give to the Canadian banks a very large volume of transactions. This gives the Canadian dollar market in Canada volume and activity which are also increased by the zero marginal costs of trading in the interbank market to which only they have access, as already noted. This breadth of market is a precondition for effective foreign exchange trading by banks. Banks in other countries where Canadian dollar trading is less active must frequently turn to the Canadian market in Canada to even out their position and are faced there with the wider spread. They must therefore themselves maintain a commensurate spread or cover at a loss. Hence, the relatively wide spread generally maintained by Canadian banks in trade in Canadian dollars in Canada is exported to other centres also trading in Canadian dollars.

The ability of Canadian banks to maintain a relatively wide spread in Canadian dollars in a generally very competitive industry is owing to the fact that Canadian trade is chiefly invoiced in foreign currencies thus keeping the market in Canada, as already noted, but also that the banks are few in number. Nine banks participate in the interbank foreign exchange market. Of these nine, five do the lion's share of the business, but some banks operate two foreign exchange trading departments, one in Montreal and one in Toronto, more or less separately. In any event, the participants in the market are few and interdependent for this reason, in addition to their common membership in the Canadian Bankers' Association.

The fact that Canadian banks individually have considerable market power is indicated by the care traders must take to avoid pushing the rate against themselves. This they do by spreading their large transactions over time and by attempting not to reveal their positions and intentions to the other traders by their market behaviour lest these raise the rate of exchange against them.

Bank traders typically prepare their positions by going exceptionally long or short when they anticipate large transactions from their commercial accounts. They consider accommodating their commercial accounts to be their primary function, a function related to the total of bank relations with these customers, and wish to do this at "reasonable rates," which is to say at the rate of exchange that would prevail without news of that large transaction. If caught unawares by having to meet a large but unforeseen commercial demand, banks may keep an open position for a long time, evening

up their position gradually. In general, banks know that the prevailing rate of exchange is not the one that will clear the market when they have large sums to lay off. They seek to discover how much they can buy and sell at a certain rate of exchange, not the rate of exchange at which they can transact all the business they would otherwise like to do. This concern with quantity as well as price is characteristic of oligopolistic market behaviour. In addition to their own downward sloping average revenue curve is the fact that other traders affect the rate of exchange as well and will respond by causing the rate to move adversely, if these realize from the market behaviour of a bank and from any other information they can glean that the bank has a large outstanding position to cover.

This discussion of the structure of the foreign exchange market in Canadian dollars shows that the spread between the buying and selling price of Canadian dollars is wider than for other currencies important in world trade and investment, and that this is probably the result of concentration of transactions in the market in Canada in which only a few participants are important. It is alleged that profits from foreign exchange transactions of Canadian banks are higher than those of U.S. banks, but this was not verified. However, higher profits would be consistent with the other aspects of the market. The important question is whether the structure and behaviour in the Canadian dollar market reduces the effectiveness of the foreign exchange market for commercial purposes from that which would prevail under perfect competition. No test of this question has been devised, but I am unaware of complaints about the spread and charges and the sums involved are very small as a proportion of the value of commercial transactions, so that it appears that whatever distortion exists is an unimportant impediment to carrying out commercial transactions most effectively.

Bias in Foreign Exchange Market

2. Low transactions costs may not be the only, nor indeed the principal, characteristic of an effective foreign exchange market for commercial purposes. The foreign exchange market may also be biased in such a way as to make hedging consistently too expensive in one direction and too cheap in the other.⁶ Such an artificial

⁶Terms for hedging that lower the net returns of importers and raise them to exporters who hedge as compared to these traders' returns if they do not hedge have the same general equilibrium effects as those of a tax on purchases of foreign exchange and a subsidy on sales at the same flat rate, but which apply only to part of total trade.

obstacle to hedging in one direction and inducement in the other occurs if the forward price of the foreign currency consistently over- or under- estimates the actual spot rate that will prevail when the forward contract matures.

The importance of an unbiased forward foreign exchange market can be illustrated by an example of a Canadian importer who is continuously short in U.S. dollars because of his commercial account and who hedges himself by consistently buying forward U.S. dollars. Suppose that he first buys U.S. dollars forward at a certain rate of exchange and, when the forward contract reaches maturity, he sells it and buys another forward contract. This procedure of hedging by continually turning over his forward contract continues for many years during which the rate fluctuates but has no trend. The operation terminates at a period when the rate of exchange is roughly the same as it had been at first. If, over the entire period, the importer has neither made nor lost much money on his forward operations, except for the spread and commissions, the market would be considered to be unbiased. Another trader hedging in the opposite direction, because he was a Canadian exporter or a U.S. importer, would also have managed to hedge his commercial position costlessly except for the transactions costs.

This type of hedging is not uncommon. "We buy regularly from the United Kingdom and pay in sterling. We usually contract with our bank for sterling futures, equal in amount to about one month's purchases. We try to maintain our position in sterling futures at a reasonably uniform level by contracting for new futures as we reduce our old futures at the time of remitting."⁷

Assuming the transactions costs are zero and that short-term interest rates in the two countries are equal, zero profits and losses on the hedging operations described above could arise as a result of either of two extreme characteristics of the market. One would be a market in which foresight was perfect over the period of the forward contracts. In such a case the forward foreign exchange rate would always exactly predict the spot rate that was going to exist in future when the forward matured and hence the forward rate would neither overestimate nor underestimate the future spot rate. The other case would exist when, at the time of each transaction, the existing spot and forward rates were the same. This would occur if perfect interest

⁷J.H. Young and J.F. Helliwell, *The Effects of Monetary Policy on Corporations*, A Study Prepared for the Royal Commission on Banking and Finance, Ottawa, Queen's Printer, 1964, p. 420.

arbitrage existed. In this latter case, the forward rate of exchange would not predict the spot rate in the future, but the two rates would fluctuate randomly in relation to one another, the differences summing to zero.⁸ Arithmetical examples of the two types of relationship are contained in Tables I and II.

A market guided by perfect foresight over the period equal to the length of the forward contract is effective for hedging a commercial position over any time span, however brief. A market of the second type, that is with perfect arbitrage, is effective for that purpose over a large number of transactions in which random elements can cancel each other out.

Effectiveness of the Market

An attempt is now made to estimate the bias and so test the effectiveness of the Canadian foreign exchange market for hedging commercial transactions, and also to identify whether that market obtains whatever effectiveness it may have from the accurate provision of future spot rates by the forward rate, or rather from effective arbitrage at one time. The first type of market was illustrated in Table I above and the second in Table II.

The model is that of a trader who hedges his short commercial position by a continuous long forward position in the foreign exchange market. He might be an importer who is continually committed to future purchases of U.S. dollars to settle his bills abroad. Each month he buys U.S. \$1.00 90 days forward. Three months later his forward contract matures, and he buys another 90 day forward contract of U.S. \$1.00. Thus, after a preliminary period of three months, he has a continuous long forward position of U.S. \$3.00. The period of his hypothetical operations is from January 1952 to March 1971. Table III below shows the result of the continuous turnover of his forward position. Separate calculations were also made for the result of his operations during the period of flexible exchange rates from January 1952 to June 1961 and for that of the pegged rate from June 1962 to March 1970. The extreme

⁸Perfect foresight of a limited period and perfect arbitrage are inconsistent one with the other because arbitrage in the future means that the spot price at that moment is affected by the forward price and hence the spot price in the yet more distant future. By assumption, the yet more distant spot price is unknown today, so the future spot price is uncertain and therefore today's forward can not predict it exactly.

TABLE I
FORWARD MARKET WITH PERFECT FORESIGHT

Date of Transaction	Three month Forward (Purchase) R90	Spot (Sale) R ₀	Profit or Loss per U.S. \$ $X = R_0 - R90_{.3}$
December 31	102		
March 31	104	102	0
June 30	101	104	0
September 30	102	101	0
December 31		102	0

Sum = 0

$\bar{X} = 0$

TABLE II
FORWARD MARKET WITH PERFECT ARBITRAGE

Date of Transaction	Three month Forward (Purchase) R90	Spot (Sale) R ₀	Profit or Loss per U.S. \$ $X = R_0 - R90_{.3}$
December 31	102		
March 31	104	104	+ 2
June 30	103	103	- 1
September 30	101	101	- 2
December 31		102	+ 1

Sum = 0

$\bar{X} = 0$

months of both these latter periods were omitted because at that time uncertainty and official intervention were especially important.

The statistical test described below is merely suggestive of reality because of shortcomings in the data used, but better estimates are not available. The principal problems in the calculations arise from the fact that average monthly exchange rates were used rather than the actual rates; so that the fluctuations are reduced. Furthermore, the use of monthly averages introduces positive correlation between adjacent monthly values even if the movements of the underlying data follow a random walk.

Table III, Column 1 reveals that when our trader bought forward he contracted prices for his U.S. dollars that averaged .1639 Canadian cents more than they were worth when he actually received them later upon maturity of the forward contract. This was the case for the entire period from 1952 to 1971 that witnessed 231 operations. That a loss from such operations was accidental can be rejected at the 5 percent level of confidence though not at the 1 percent level. The standard deviation of the individual losses was 1.249 cents. Thus the forward market in foreign exchange was probably biased and, in any event, our importing trader would have sustained a loss of about 12 Canadian cents per U.S. dollar hedged over the 19 years included in our experiments. This works out to an insurance premium of two-thirds of a cent a dollar a year.

The relationship between the spot rate and the earlier forward rate for the entire period is maintained for the sub-periods of the flexible and the pegged exchange system, except that no bias is revealed for the pegged rate period of 1962 to 1970. However, the two sub-periods show differences in that the mean difference between the spot and the earlier forward rate was much greater in the period of the flexible exchange rate of 1952 to 1961 than for the pegged rate. The variance of this relationship was also greater under the flexible rate. Thus hedging would have been more costly for our importer in the flexible rate period, costing him 36 cents for the total of his activities or 12 cents a dollar hedged during 9½ years as against 3½ cents or one cent a dollar hedged in the period of the pegged rate which lasted 8 years. In addition, the greater variance under the flexible rate would have required longer continuing operations to escape risk of a given loss.

Column 2 shows the relation of the 90 day forward rate of exchange to the concurrent spot rate. Over the 19 years the forward rate of exchange was above the spot on the average and this was by no means accidental, as shown by the very high t-value for the mean

of the observations. However, the excess of the concurrent forward over the spot rate was less than that of the lagged forward rate. Furthermore, the variance of \bar{X} in column 2 is much lower than the variance in Column 1, the latter being 41 times the former. These differences show that, in so far as the foreign exchange market is effective for hedging, it is owing to forces that maintain a stable relationship between the forward and spot prices prevailing at one time (Column 2), rather than to the predictive ability of the forward rate for the future spot rate.

The difference between the actual forward margin and the forward interest rate parity margin calculated on the basis of the Treasury Bill rates in Canada and the United States is shown in Column 3. This parity calculation explains one-half of the value of \bar{X} in Column 2 and is about one-third of the difference between the spot rate and the earlier forward rate shown in Column 1. The variance remains low compared to that of Column 1 and the difference of \bar{X} from zero is significant. The low variance indicates the presence of a mechanism, undoubtedly interest arbitrage, maintaining a stable relationship between spot and forward rates. But the significant divergence of the forward rate from this forward interest parity needs an explanation which, at the moment, is the guess that \bar{X} differs significantly from zero because the Treasury Bill yields used in the calculation are inappropriate, because interest arbitrage is in fact based on other rates,⁹ but that the variance is low because Treasury Bill rates fluctuate with the appropriate rates, whatever they may be. This has yet to be tested.

The results for the sub-periods are not much different from those for the period as a whole. Under flexible exchange rates, the mean difference between the spot and the concurrent forward rate corrected for interest differential was less than half the difference between the spot and the earlier forward rate and its stability was much greater. In the pegged rate period, the difference of the spot from corrected concurrent forward shown in Column 3 is a discount, whereas it was a premium of the same size for the same period in Column 1, but its variance is also much smaller than in Column 1. With a discount, the bias becomes favourable to hedging importers

⁹Professor Helliwell found that the yield differential on Canadian and U.S. finance paper was a better explanation of the forward differential than that on Canadian and U.S. Treasury Bills for the years 1963 to 1966. John Helliwell, "A Structural Model of the Foreign Exchange Market", *Canadian Journal of Economics*, Vol. II, No. 1, February 1969, pp. 90-105.

TABLE III
HEDGING TRANSACTIONS IN U.S. DOLLARS
(MONTHLY PURCHASES OF U.S. \$1.00 90 DAYS FORWARD IN CANADIAN DOLLARS)
1952 - 1971

Period	1 $X = R_0 - R_{90-3}$	2 $R_0 - R_{90}$	3 $-\left[\frac{R_0 - R_{90}}{4 + rUS} \cdot R_0 \right]$	4 $-\left[\frac{R_0 - R_{90-3}}{4 + rUS} \cdot R_0 \right]$
January 1952 to March 1971 N = 231	\bar{X} -.001639 Var. .0001559 S.D. .01249 t (-.13) t (-1.97)	-.001285 .000003715 .001928 (-.67) (-10.18)	-.0005947 .00000606 .002461 (-.243) (-3.72)	-.0009488 .0001598 .01264 (-.075) (-1.14)
January 1952 to June 1961 N = 114	\bar{X} -.003171 Var. .0001653 S.D. .01286 t (-.25) t (-2.48)	-.002054 .000002996 .001731 (-1.19) (-12.71)	-.001427 .000004743 .00218 (-.654) (-7.15)	-.002544 .0001682 .0127 (-.196) (-2.09)
June 1962 to March 1970 N = 94	\bar{X} -.0003702 Var. .00004673 S.D. .006837 t (-.054) t (-.42)	-.0007851 .00000334 .001828 (-.43) (-4.17)	.0003856 .000003195 .001787 (-.222) (2.026)	.0007613 .00004071 .00638 (.12) (1.24)

Notes: R_0 is the monthly average noon spot rate for the US dollar in Canadian dollars.

R_{90} is the monthly average noon 90 day forward rate; -3 indicates a lag of 3 months

rUS is the monthly average yield on U.S. Treasury Bills

$rCdn$ is the monthly average yield on Canadian Treasury Bills

\bar{X} is the mean of the observations; Var. is their variance; S.D. is their Standard Deviation; t is the t-value of the observations. X ; t is the t-value of the mean of the observations, X .

For a large sample a t-value of 1.95996 corresponds to a probability of .05 and one of 2.57582 to .01.

and a cost to hedging exporters, but this does not add any significant aspect to this investigation.

Column 4 shows the relationship between the spot rate and the forward rate as it prevailed three months earlier corrected for the differential in Treasury Bill rates as they existed in the earlier period. This relationship tests the predictive reliability of the forward rate, taking the interest rate differential into account. The forward rate becomes a better predictor of the spot rate than Column 1, which leaves out the rate differential, but the variance is the same and large, so that the conclusion reached earlier that the forward does not predict spot transactions well is not reversed. Comparing Column 4 to Column 3, we find the difference between the spot and the earlier forward rate corrected for interest differential to have a larger average value and to have a higher variance than the difference between the spot and the corrected concurrent forward rate. This confirms that the relationship of the forward to the spot rate is determined by arbitrage rather than by foresight. Again, in these calculations we find that the divergence of \bar{X} from zero (the bias) and its variance is greater in the period of flexible than of pegged rates.

A trader can use other transactions to accomplish a hedge than the one specified in our definition and example of bias. Instead of buying forward U.S. dollars and turning over his long position continuously, an importer could borrow in Canada, buy U.S. dollars spot and invest the proceeds in U.S. securities, acquiring a long position in U.S. dollars in this way. The cost of this hedge would be the differential in interest rates. If forward interest arbitrage were perfect so that the forward rate was at its interest parity and if the arbitrage was on the basis of the interest rates available to the particular importer in the two financial markets, the two forms of hedging would have the same cost or bias. According to the calculations shown in Column 3, interest arbitrage was not perfect. On the basis of Treasury Bill rates, over the entire period borrowing in Canada, buying U.S. dollars spot and investing in U.S. securities would have cut the cost of the hedge by about one-third. In addition, the lower variance would have made this kind of hedge less risky. However, looking at the sub-periods, this type of hedging would have been cheaper in the flexible rate period, but more expensive in the pegged rate period than simply buying forward. As already noted, these particular results may stem from the use of rates of interest inappropriate to the calculation.

In summary, this preliminary statistical investigation of the Canadian foreign exchange market for commercial hedging purposes has revealed that a substantial bias has existed which has imposed an extra cost on importers who hedged by means of the forward market relative to non-hedgers and has given an extra gain to hedging exporters. This bias was greater in the period of the flexible rate than under the pegged rate when it was quite small. The bias was inherent in the functioning of the market because the mechanism determining the relationship of the spot to the forward rate was interest arbitrage, not correct forecasting of future rates. When rates of interest are at different levels in Canada and the United States, a forward margin arises from interest arbitrage and this introduces a bias whether hedgers use the forward market or borrow and deal spot.

The Actual Behaviour of Firms

So far, the various forms that hedging of commercial transactions for foreign exchange risk might take have been discussed as has the effectiveness of the Canadian market for foreign exchange for hedging purposes. It now remains to examine the extent to which firms in fact wish to hedge and the techniques that they use. Unfortunately, nothing very encompassing can be stated on this question with the information available. Two rather cursory surveys¹⁰ have provided some information. This is supplemented by knowledge of the operations of individual firms responding to one of the surveys.¹¹ In addition, this author has some personal knowledge of the opinions of executives, exchange traders and other banking officials who are in contact with the market as a whole.

The surveys indicate that the majority of commercial firms deal only on the spot market but that the larger firms tend to deal on the forward market more than the smaller firms. Thus, the Royal Commission found in its sample that 76 percent of firms with assets of under \$10 million never use forward facilities, but only 51 percent of firms with assets of \$10 million or more also limited themselves entirely to the spot market.

¹⁰Canada, Royal Commission of Banking and Finance, *Report*, Ottawa, Queen's Printer, 1964, pp. 298-99; Canadian Manufacturers' Association, *Submission to the Royal Commission on Banking and Finance*, 1961, Table 8.

¹¹J.H. Young and J.F. Helliwell, *op. cit.*

My personal limited and unsystematic inquiry of commercial firms indicates a variety of patterns of behaviour even between firms in the same industry and of particular firms over time.

An examination of the relationship between the timing of changes in the balance of merchandise trade and other autonomous items in the balance of payments and of changes in the spot foreign exchange rate for Canada suggests that a substantial part of the payments for these transactions are not covered forward. Payment to the exporter follows the movement of merchandise by one to three months for a large part of international trade. If the importer or exporter does not cover his future payment by a forward exchange transaction, the foreign exchange transactions lag the shipment of the merchandise and its appearance in the trade statistics. Thus the change in the rate of exchange lags the change in the merchandise balance that gave rise to it. If the merchandise transactions are covered by a concurrent forward transaction, exchange rate changes coincide with the changes in merchandise trade owing to the flow of short-term capital through interest arbitrage responding to the increased demand for forward exchange. In fact, rates of exchanges tend to lag changes in the balance of merchandise trade and this evidence supports that of the surveys that Canadian trade is to an important extent not covered or hedged by forward operations.¹²

Despite the lack of systematic information on hedging practices by commercial firms, the information available suggests that the decisions of firms about the extent to which they should cover and hedge their commercial position are affected, first, by the size of the risk and secondly, by the extent to which hedging or covering protect against the risk.

One aspect of the size of the risk is that it increases with increased amplitude of fluctuations in the foreign exchange rate. Thus one would expect increased activity for hedging and covering on the forward foreign exchange market as fluctuations in the spot rate increase. In fact, persons involved in the foreign exchange market claim that the total volume of forward operations by commercial firms are noticeably greater in periods of flexible exchange rates than in periods with pegged rates. This has been the experience in the past year during which Canada has had a flexible rate as compared to the

¹²H.C. Eastman, "Aspects of Speculation in the Canadian Market for Foreign Exchange", *Canadian Journal of Economics and Political Science*, vol. 24, no. 3, August 1958, p. 365ff; William H. Branson, *Financial Capital Flows in the United States Balance of Payments*, Amsterdam, North Holland Publishing Company, 1968.

earlier period with a pegged rate. Forward operations are also very substantial when a general movement in the rate is expected such as usually precedes a change in a country's peg or a change in the exchange rate system. The change to a flexible rate in June 1970 was not very widely expected, at least compared to some other occasions on which the peg was lifted, yet the Exchange Fund Account accumulated a net long forward position of \$360 million resulting from the rush for cover by firms in the last few days of the fixed rate.¹³

The size of the foreign exchange risk incurred by a particular firm, increases which it may wish to avoid, is a function not only of the amplitude of the fluctuations taking place in the exchange rate or expected to take place, but also of the structure of the firm's operations. The structure determines the extent to which a particular firm is exposed to a risk from given exchange fluctuations. This exposure might be measured as the percentage of change in the profits of a firm that would be caused by some change in the exchange rate. Such an exchange risk is a function of two things. One is the extent to which the prices of a firm's output are determined in the international market relative to the prices of its inputs. Obviously, if the prices of both inputs and outputs are fixed in terms of foreign currencies, a fluctuation in the rate of exchange has an effect on its position only proportionate to the rate change. But if the price of its output is determined in the foreign market, and those of its inputs are domestically determined, or vice versa, the firm has a maximum exposure to exchange risk from this factor. Secondly, the exchange risk is also a function of a firm's equity position. The smaller its equity as a proportion of its total assets, the larger in terms of the equity is the effect of a change in the prices of its outputs or inputs caused by exchange rate fluctuations.

Inter-industry and inter-firm differences in the exposure of firms to exchange risks of the nature indicated above go some way in explaining differences in behaviour. Industries such as the grain trade, in which firms are most exposed to exchange risk because they operate on small margins of equity and have costs fixed in Canadian dollars, but quote prices in foreign currency, usually hedge. In industries in which exports or imports are a smaller proportion of sales or costs, the danger to the survival of the firm of a single unfavourable change in the rate of exchange is less and they hedge less.

¹³W. Earle McLaughlin, "The Canadian Dollar - Freely Floating and Well Behaved", *The American Banker*, April 12, 1971.

These factors have been discussed as if they affected separate firms. However, a single firm may hedge different operations differently. One observes that the same firm may display different hedging behaviour with respect to different types of business operations, these differences being related to the factors so far discussed. Thus a firm might buy copper scrap in the United States, refine it in Canada and resell the refined copper in the United States. The fine margin involved in refining induces the firm to be sure of its prices which are assured by hedges. On the other hand, the same firm's normal and continuous copper exports produced from domestic ore may not be hedged, the firm being willing to risk changes in the spot rate of exchange because it knows that no such change is going to jeopardize its existence and that, in the long run, changes in the level of the rate cannot be avoided by a firm that is on a constant export basis and does not forecast.

Along the same line of reasoning, one would expect, and indeed one finds, that a firm hedges only a part of its foreign business even if all that business is undifferentiated with respect to foreign exchange risk. This is because the firm wishes to self-insure a certain level of risk, but cannot wisely afford to self-insure the entire risk. Consequently, it lays off some by hedging a larger or smaller proportion of its total business as the risk of greater rate changes or as the proportion of its total business that is exposed to exchange rates rises or falls.

Hedging or covering are not equally effective in insuring against exchange risk of different commercial operations even when the price of the traded commodity is internationally determined in all cases. This can best be illustrated by the difference between possible exporting and importing situations. An exporter may sell at a U.S. dollar price, sell the expected foreign exchange proceeds forward and be certain of his Canadian dollar return. But an importer may buy goods at a U.S. dollar price, buy U.S. dollars forward to avoid the risk of a change in the rate of exchange, but find that the Canadian dollar price at which he can later sell the goods in Canada has changed if the rate has altered. His hedge is ineffective.

If imports often cannot be as effectively hedged as can exports, this fact would explain the tendency reported by foreign exchange traders that exporters hedge forward more than do importers. However, this fact might also be owing to the normal premium of the forward on the spot U.S. dollar which has in the past given exporters more favourable terms forward than spot and less favourable terms to importers.

It should be noted that firms that can fix the Canadian dollar price of their imports for periods as long as the term of their forward purchases can hedge successfully by forward operations. Indeed, the reason given by some importers who hedge, amongst which automotive firms are very important, is precisely that forward purchasing of U.S. dollars permits them to "fix a Canadian dollar cost" of imported parts or vehicles.

The factors discussed in this section as affecting Canadian commercial hedgers go some way in explaining observed inter-industry and inter-firm differences in foreign exchange practices. However, a good deal of dissimilarity exists between the practices of firms that appear similarly situated. More research would undoubtedly be rewarded by the discovery of other explanatory principles, but it is also the case that differences in experience, interest, temperament and competence of individual executives are an important variable explaining differences in observed behaviour. So is the frequently rather uninformed opinion of boards of directors to which executives would rather explain a foreign exchange loss from a routine spot position than from some unsuccessful forward operation. Rather widespread lack of sophistication can persist in these matters, because, for many firms foreign exchange gains and avoidable losses have, over the long run, not been very large. Canadian firms are generally concerned with their international competitive position as it is affected by the longer term level of the rate of exchange rather than by short-term fluctuations in it.

DISCUSSION

PETER A.T. CAMPBELL

Professor Eastman indicates in his paper that there is a reasonable lack of systematic information on the behavior of users of the foreign exchange market. In this context and for the record, I felt it might be useful to spell out exactly what a firm like Wood Gundy does as a continuous user in the foreign exchange market. This exercise would also serve the purpose of exposing you to the kind of inevitable situation bias you get when someone like myself comments on a paper. As I thought about our operations in the foreign exchange market, I sorted out five aspects.

First of all, we are a broker in what we call the interest arbitrage market. We are involved in north-south and east-west interest arbitrage within North America, and between North America and continental Europe. Essentially, we place as agents, or sell as principals, Canadian commercial paper, to resident corporations of the United States and Europe who choose to deal in Canada. To facilitate our off-shore customer requirements, we usually arrange the foreign exchange aspects of the arbitrage transaction. These foreign exchange transactions are what we call hedges, a slightly different use of the phrase from Professor Eastman's, a simultaneous purchase of one currency spot and its sale forward. The foreign exchange side is done flat; that is to say, we do not attempt to make a profit on the foreign exchange transaction. We rely, for our own sustenance, on the commission generated by the commercial paper side of the transaction.

Second, as a member of the New York Stock Exchange through our American subsidiary, Wood Gundy, Incorporated, and as a member of the principal Canadian Stock Exchanges, a considerable amount of north-south equity volume, which involves foreign

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exchange transactions, is generated. In addition, a sizable amount of east-west equity volume is generated between Europe and Canada through the facilities of our London, England office. This latter volume involves cross-rates between continental currencies including the premium dollar in London, on the one hand, and the US-Canadian dollar market on the other. As a firm, we compute our net position internally at prevailing spot rates. Any surplus or deficit in our foreign exchange position is eliminated on a spot or very short dated-forward basis.

The third aspect of our operation is activity in the over-the-counter debt markets within Canada, the United States, and the Euro-bond market trading out of London, England. A substantial volume of transactions occurs between countries which involves spot foreign exchange transactions.

Fourth, from time to time we position foreign exchange for our own account in anticipation of a favorable move in rates. Such transactions are effected on an open-forward basis. In some markets this tends to be an exercise in self-immolation. Finally, in our function of what we euphemistically describe as a full-service money center, we act as an advisor to corporations with respect to foreign exchange. We do not, however, execute foreign exchange transactions on behalf of corporate customers. Clients are advised to deal directly with their banks when the point of execution is determined.

In summary then, Wood Gundy is thoroughly involved in the Canadian-US foreign exchange market at three levels of execution: spot, forward, and hedge. We regard ourselves as a commercial customer of the foreign exchange market and hence of the foreign exchange banks. In no sense can our participation in the market be regarded as in competition with the exchange banks. I have looked back through our trading blotters to date this year in order to give you a feel for our degree of involvement. Our average juridical day business volume is either side of \$15 million. Slightly more than 50 percent of our business is executed by American foreign exchange banks. We would probably be regarded as a medium-sized commercial customer by the major foreign exchange banks.

Returning to Professor Eastman's paper, I think my comments will be biased by my experience. I found the paper a fascinating analytical piece of work. I group my comments under four subject headings: the forward margin, the location of the market, the structure of the market, and the nature of speculation. A substantial portion of Professor Eastman's paper examines the nature of the forward margin. He arrives at the conclusion that "the mechanism

determining the relationship of the spot to the forward rate was interest arbitrage, not direct forecasting of future rates." From our position in the market, I agree with this. I'd like to elaborate somewhat just to give you a feel for what I think the operational mechanism is.

Three sets of interest rates appear to be most relevant to the interest arbitrage mechanism on a continuing basis in the context of our subject today: good quality commercial paper rates, prime American commercial paper rates, and Euro-dollar interbank rates. When the return to a European or an American investor on Canadian commercial paper is comparable to equivalent credits by them internally, then Canadian paper is regarded as a suitable vehicle for portfolio or cash-flow investment. From a marketing point of view, whenever a yield advantage on Canadian paper can be shown to exist for off-shore investors, funds literally flow immediately to eliminate the advantage. It is fascinating to watch how quickly a good commercial paper trader can fill the Canadian borrower requirements when the yield to the off-shore lender is comparable to the lender's internal return. Because off-shore pools of short-term funds are immensely greater than liquid Canadian funds, the forward margin usually changes quickly to make adjusted yields on Canadian short-term investments equivalent to yields on similar investments in foreign countries. Narrowing this generalization down to what I describe as the normal situation, the forward margin appears to move in such a manner so as to make an American cash flow investor indifferent when choosing between Canadian or U.S. commercial paper from an adjusted yield point of view. Whenever the yield to the U.S. investor favors Canadian paper, a sufficient flow of funds is generated to push the forward margin back into line. Similarly whenever the yield to the U.S. investor favors the American paper on a sustained basis, the forward margin widens out to stem a repatriation of funds from Canada to the United States. Thus, when the Canadian short-term rates are below American rates, as they are now, the U.S. dollar is continuously weak in the forward market and vice versa. It would not appear that the volume of funds that give effect to this little mechanism is very big. Given the extremely small size of the relevant money market magnitudes in Canada as compared to those in the United States, the marginal pool of funds which operates the mechanism is probably not in excess of \$100 million.

Regarding the second point, the location of the market, Professor Eastman suggests that "the Canadian dollar market is chiefly in Canada between the Canadian chartered banks." This has not been

our experience. In addition to Toronto, Montreal, and New York, we have found extremely active participants in Boston, Chicago, Detroit, Seattle, and London, England. As indicated earlier, more than half of our business tends to be transacted in the United States, mostly in New York. As a guess, I would suggest that the vast bulk of commercial transactions do take place within Canada. But from a volume point of view, a significant percentage of the market would appear to exist abroad. This is not surprising to me. Most international corporations have banking connections in both Canada and the United States, in addition to elsewhere, and a key selling point of all major banks is the capacity to provide an efficient foreign exchange service. It is not uncommon for treasury officers in international corporations to request at least two quotes on particular foreign exchange transactions, one from a Canadian bank and one from an American foreign exchange bank.

I have a comment on the structure of the market. Professor Eastman's paper examines at some length the oligopolistic structure of the foreign exchange market in Canada. It is suggested, I think, in his paper that this leads to somewhat wider dealing spreads and to some dressing of the market to accommodate large transactions. I don't think these should be regarded as problems. From a volume point of view, as I've indicated, the vast percentage of the market has the option of dealing with non-Canadian banks. On the large block question, I feel this is a relative situation. I know of no market that does not have inventory problems owing to the nonsimultaneous appearance of buyers and sellers. In the case of the U.S.-Canadian dollar market, block transactions or workout situations appear to be adequately accommodated through a combination of price change and transitory inventory positions. In our own case, as a user of the market, the largest single block that we have put through has been a \$25 million hedge. That was accommodated by a New York bank on a firm bid from a tight inside market. From any point of view, that has to be considered a pretty impressive performance by the New York bank.

I have one last comment on Harry's paper concerning the nature of speculation. I probably lifted something out of context here, quite a common technique. Professor Eastman isolates speculative behavior as a "purely financial transaction." I don't think we should ever quibble about concepts, provided each serves a useful purpose. For what it is worth, I would have described speculative behavior in the foreign exchange market as any set of actions that deviates from the participants' normal routine of activity. Only in this way can you

arrive at a reasonable explanation of the huge flows of funds which are euphemistically described as commercial leads and lags. In the markets that are characterized by routine behavior, I would accept Professor Eastman's structuring of concepts. However, I think the present is characterized by accelerating change. In this environment, most participants in the foreign exchange market are continuously thresholding in a sea of new experience.

I have a few general comments on two aspects of the Canadian-U.S. dollar foreign exchange market that are not touched on in either of the papers: the role of lines of credit and the volume in the market. Most foreign exchange banks grant market users lines of foreign exchange credit. Often these lines are determined without the users' knowledge. It is a little surprising when you suddenly discover you have a lot of credit you didn't know about. It would appear that such lines are based on a variety of criteria analogous to those used to determine suitable lines of credit from a loan point of view. It is often the case that a market user must deal with a different bank from that which he would normally have used, or do what we call a third-party put-through, in order to give effect to foreign exchange desires. It is my impression that the line of credit practice does not materially affect the efficient operation of the foreign exchange market. Indeed it would seem that the operation of the market is probably enhanced by the line of credit practice over the longer pull. Because the practice, in effect, spreads risk, it is unlikely that a major default by a market user would set off a domino effect. This is a very important criterion to think about when dealing with a market such as this, in which the numbers are so big.

Finally, I am not aware of any estimates of the volume of activity that occurs in the U.S.-Canadian dollar market, so I've come up with a ball park guess. If you add together Canadian current account receipts and payments on the balance of payments plus gross capital flows, make allowances for rapid turnover on the interest arbitrage side, net out intra-company book transfers, and acknowledge that a certain amount of inventory musical chairs is played by continuous participants, including Canada's Exchange Fund Account, you come up with a volume around \$50 billion. This estimate is probably subject to a margin of error of 100 percent on the upside.

Given the volume in the market, and the structural and conceptual considerations examined in Professor Eastman's paper, I feel it can be concluded that Canadian and U.S. trading relationships are very well served by the U.S.-Canadian dollar foreign exchange market.