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The Real Costs of Hedging in the Forward Exchange Market

Introduction

Since the free floating of exchange rates (March 1973), it has become more difficult to foresee the timing and amount of changes in the rates of exchange. In contradistinction to the Bretton Woods system (1945–1971), central banks do no longer have the obligation to intervene in the foreign exchange market to keep the parity of their currencies with respect to the U.S. dollar within a narrow band. Exchange rates are determined by the market price mechanism of supply and demand. However, central banks might and do actually intervene occasionally to counter speculative pressure on the currency or according to monetary arrangements, such as the E.M.S.-agreement. Central banks might even on purpose intervene in the market place in order to let the exchange rate deviate from its market equilibrium, for example to protect its export business. This is called "dirty floating".

The general floating of all important currencies has created a new kind of risk for companies doing business in more than one currency, i.e. foreign exchange risk, in addition to business and financial risks. The volatility of exchange rates has increased the necessity to protect the company's foreign currency exposure against the unfavorable impact of exchange rate fluctuations.

In this article, we deal with forward market transactions, as an appropriate and heavily used method of hedging foreign exchange risk on commercial transactions. The forward sale and purchase of foreign exchange is a well-known technique of hedging. However, confusion exists among practitioners about the costs of such hedging operations. We therefore concentrate, on the determination of the real costs of forward market transactions.

The Forward Rate as an Unbiased Predictor of the Future Spot Rate

Giddy and Dufey (8) argued that the advent of floating exchange rates has reduced to zero the usefulness of any attempt to forecast exchange rate changes. Exchange rates react to new information in an unbiased and immediate way. The assumption is then often made that new information arrives randomly, so that exchange
rates fluctuate at random. Just like in the stock market, traders and speculators cannot do consistently better than "the market" in predicting exchange rates.

In addition to the random behavior of exchange rates, research by Fieleke (5), Frenkel and Levich (6), Giddy (7) and others has presented evidence supporting the hypothesis of efficiency of the foreign exchange market. While the random walk theory focuses on whether subsequent changes in exchange rates are random, the efficient market theory concentrates on the amount of information that is already reflected in current exchange rates. In fact, only the weak form of the efficient market hypothesis has been tested, i.e. that current foreign exchange rates fully reflect the information implied by the historical sequence of exchange rates. This hypothesis implies that successive changes in exchange rates are independent of the sequence of past changes in exchange rates. This implies that the exchange market is highly efficient in eliminating unexploited profit opportunities—one cannot consistently outsmart the foreign exchange market. In other words, potential gains are immediately arbitraged away since the market reacts extremely fast to new information. From the efficient market hypothesis results that forward exchange rates incorporate all relevant information about the future value of the relative currencies at the end of the period under consideration. Consequently, the forward rate can be considered as the best forecast of the future spot rate available. However, in times of currency turmoil national authorities may intervene directly in the forward market through forward purchase of their own currencies in order to prevent the forward discounts from increasing too much.

The forward exchange rate is determined by supply of and demand for future currencies. The forward premium or discount is, in fact, a reflection of expectations on the future spot rate. Consequently, if expectations are correct then the forward rate will be an unbiased estimator of the future spot rate; if they are incorrect the forward rate will differ from the future spot rate systematically, but only in the short run. For example, if an individual expects that the spot rate in the next period (say 3 months from now) will be lower (higher) than the actual 3 months forward rate, he will have an incentive to sell (purchase) forward exchange and if his expectations are realized, he will make a per-unit profit equal to the difference between the forward and the expected spot rate. The result of these actions in the market is to move the price of forward exchange toward the expected future spot rate. Since, in the absence of exchange controls, the forward market is highly competitive and rational, speculative funds will continue to enter the market until the forward rate approaches the expected future price of the foreign exchange when these forward contracts come due. Consequently, as suggested by C. Hekman (9), the forward exchange rate yields the best prediction of price changes for the contract period as it contains all the information available to the public at any point in time. More precisely, the best estimate of the future spot rate is the current forward rate for contracts maturing on that future date. For example, the best prediction of the rate in one month, three months or one year is the forward rate for contracts maturing in one month, three months or one year. So we can draw the conclusion that the forward market provides a viable alternative to risk-averse traders. This does not mean that there are no deviations between the forward exchange rate and the realized spot rate. It means, however, that these deviations do not follow a pattern that allows to make speculative exchange gains consistently. The forward rate can be a biased estimator because of the thinness of the market or because of the existence of exchange controls.
In order to test the "predictive power" of forward exchange rates, we investigated the relationship between the quoted forward rate and the subsequent actual spot rate for a group of selected currencies. We denote:

\[ f_{i,n} = \text{forward rate quoted at day } i, \text{ i.e. price for one unit of foreign currency for delivery } n \text{ days later.} \]

\[ s_i = \text{spot rate quoted at day } i \]

\[ n = \text{time period (in days)} \]

The difference, \( f_{i,n} - s_{i+n} \), between the forward rate at day \( i \) and the spot rate \( n \) days later is investigated. In order to make a comparison between several currencies, we also define the relative difference,

\[ q_{i,n} = \frac{f_{i,n} - s_{i+n}}{f_{i,n}} \]

The series \( q_{i,n} \) was computed for the following currencies: Belgian franc (BF), Canadian dollar (C$), Danish krone (DK), Deutsche mark (DM), French franc (FF), Italian lire (IL), Norwegian krone (NK), U.S. dollar ($), Swiss franc (SF) and the Swedish krone (SK). The data base consisted of end-of-the-week exchange rates for the period January 1975 - September 1979. Its concerns one-month and three-month forward exchange rates (i.e. \( n = 30 \) and \( n = 90 \)) and the corresponding spot rate of the date of execution of the forward contracts. The table below contains the mean and standard deviation of the relative differences \( (q_{i,n}) \) between the forward rate and the spot rate.

<table>
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<tr>
<th></th>
<th>BF</th>
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<tbody>
<tr>
<td>( m \times 10^5 )</td>
<td>242</td>
<td>-407</td>
<td>-314</td>
<td>-52</td>
<td>13</td>
<td>-23</td>
<td>6</td>
<td>-39</td>
<td>-278</td>
<td>97</td>
<td>-62</td>
</tr>
<tr>
<td>( s \times 10^5 )</td>
<td>588</td>
<td>3099</td>
<td>1078</td>
<td>804</td>
<td>1815</td>
<td>3040</td>
<td>2491</td>
<td>1358</td>
<td>2559</td>
<td>2414</td>
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<tbody>
<tr>
<td>( m \times 10^5 )</td>
<td>587</td>
<td>-1078</td>
<td>917</td>
<td>142</td>
<td>133</td>
<td>244</td>
<td>99</td>
<td>9</td>
<td>-677</td>
<td>432</td>
<td>301</td>
</tr>
<tr>
<td>( s \times 10^5 )</td>
<td>899</td>
<td>5613</td>
<td>1789</td>
<td>1446</td>
<td>3825</td>
<td>5785</td>
<td>5046</td>
<td>2096</td>
<td>4390</td>
<td>5291</td>
<td>2588</td>
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</table>

It follows from this table that the mean-values are very close to zero. The range for the one-month forward rate is determined by the Canadian dollar (\(-4.1\%) and the Belgian franc (+2.4\%). For the three-month forward rate the range is formed by the Canadian dollar (\(-10.8\%) and the Danish krone (+9.2\%). With exception of the Norwegian krone, the mean \( q_{i,n} \)-values are in absolute sense higher for the three month than for the one month period. This means that the "predictive power" of the forward rate decreases with the length of the forecasting period. Nevertheless, it is obvious that the computed values are that small that speculative transactions cannot lead to systematic exchange gains. This empirical research confirms the results of similar tests on the relation between the forward and the spot rate essentially in the American literature.
Real Costs of Hedging in the Forward Exchange Market

Hedging in the forward market consists of buying or selling an amount of foreign currency forward at a price (forward rate) that is fixed at conclusion of the contract. A forward transaction offers a cover against exchange loss by substituting an uncertain future spot rate by a known forward exchange rate. For example, a trade company has accounts receivable in Italian lire outstanding for a period of 60 days. Since the lire exchange rate over two months may deviate from the rate at the date of sale, the company is exposed to an exchange risk equal to the amount in lire times the difference between the exchange rate at the time of the sale and as of the day of receipt. In fact, there are three different exchange rates involved in the hedging decisions, i.e. the forward exchange rate \( (f_{i,n}) \), the current spot rate \( (s_i) \) and the future spot rate at the due date of the forward contract (an uncertain value, \( s_{i+n} \)).

Because hedging in the forward exchange market means replacing an unknown future spot rate \( (s_{i+n}) \) by a known forward exchange rate \( (f_{i,n}) \), most businessmen mistakenly define the costs of a forward hedge as the difference between current spot and forward exchange rates, i.e. the discount or premium on the foreign currency, in addition to transaction costs\(^4\). That is on an annual basis equal to:

\[
\frac{f_{i,n} - s_i}{n} \times 360 \times 100\% 
\]

The use of the premium or discount as a measure of the costs of a forward cover is in agreement with the wide-spread idea that the forward exchange contract can be seen as a kind of insurance contract with the difference between the forward rate and the current exchange rate as the insurance premium to be paid. It is also common business practice to cover only downside exchange risk (i.e. long positions in devaluation-prone currencies and short positions in upvaluation-prone currencies) and to leave upside potential for exchange gains uncovered (i.e. long positions in upvaluation-prone currencies and short positions in devaluation-prone currencies). The difference between the current spot rate and forward rate cannot be the correct definition of the costs of a forward cover because the actual value of the foreign currency \( n \) days later is independent of the hedging decision. The ultimate result of the exposure in a foreign currency will be determined by the difference \( (s_i - s_{i+n}) \) which is only known with certainty \( n \) days from now \( (i) \). Therefore, one can only make predictions about the foreign exchange result\(^5\), that is determined by the difference between the current spot rate and the conditional expectation of the spot rate \( n \) days later, i.e. \( s_i - E(s_{i+n}) \).

In general, the real costs of hedging in the forward market ought to be defined as the difference between the value of the exposure at the end of the period if one did not hedge and the value of the exposure if one did hedge. The cost of hedging in the forward market is, therefore, the difference between the future spot rate and the forward rate plus any transaction costs associated with the forward contract. Since at the time of the hedging decision, the future spot rate is uncertain, the costs of hedging in this way are also uncertain. The estimated costs of hedging on an annual percentage basis can be defined as follows:

\[
\frac{f_{i,n} - E(s_{i+n})}{n} \times 360 \times 100\% + \text{transaction costs} 
\]
If the forward rate, \( f_{i,n} \), is an unbiased estimate of the future spot rate, \( s_{i+n} \), the expected costs of hedging in the forward market are reduced to the transaction costs associated with the forward contract, since \( f_{i,n} = E(s_{i+n}) \). Because of the volatile behavior of flexible exchange rates, it is very unlikely that the future spot rate will exactly equal the forward exchange rate. These minor deviations between the future spot rate and the forward rate (plus transaction costs) are the real costs (ex post) of a forward hedge. However, the mean value of these deviations, has been found to be very close to zero, i.e.

\[
\sum_{i=1}^{N} \frac{(f_{i,n} - s_{i+n})}{N} \approx 0.
\]

Assuming efficient foreign currency markets and ignoring transaction costs, hedging costs equal zero, since either way, with or without hedging, you end up with the same expected result. The company has to take a foreign exchange loss (or gain) whether it engages in forward hedging or not. This statement should of course, be understood in an ex ante sense. "Efficient market conditions rule out unexploited profits" does not imply that ex post foreign exchange transactions can never be profitable. Rather it implies that, ex ante, the market participants behave in such a way as to eliminate all expected profit opportunities. As an example, suppose that the outstanding Italian lire receivable are covered by selling the IL-receivables forward at a 10% discount. The company is sure to collect the receivables at the forward rate if the customer pays on the due date of the invoice. This implies a 10% exchange loss in comparison with the current spot rate. However, if the company chooses not to cover the IL-receivables, it will nevertheless face an exchange loss, estimated at 10% if the forward rate is an unbiased predictor of the future spot rate and ignoring transaction costs. Use of the forward as a predictor of the future spot rate is, however, in practice limited to the commonly traded foreign currencies. In general, we expect the forward rate to be a more accurate predictor the more freely traders and speculators are allowed to enter and exit the market and the more readily relevant information is available to the public. If a manager cannot agree with the idea of the forward rate as a reliable predictor of the future spot rate, he should make explicit his own estimate about the future spot rate and see the difference between that exchange rate and the forward rate as the real costs of a forward hedge (in addition to transaction costs).

Conclusion

Since it is common business practice to cover only downside exchange risk and to leave upside potential for exchange gains uncovered, one has the misleading view that, apart from transaction costs, the discount or premium on the spot rate represents the costs of a forward cover. This is caused by the fact that one only enters on one side of the market, i.e. only covering downside risk. However, the real costs of a forward transaction consist of the difference between the forward rate and the spot rate at the end of the contract period. Since the true costs of the forward transaction will only be known with certainty after realization of the contract, one can only consider "estimated" costs of the forward cover at the time of decision making, i.e. the difference between the
forward rate and the expected spot rate. Empirical research has given evidence of the predictive power of the forward rate. Under the hypothesis of efficient foreign exchange markets, the forward rate is an unbiased predictor of the spot rate. This could induce the manager to consider the forward rate as the best available forecast of the spot rate. Therefore, hedging costs are, at least for the commonly traded currencies, much lower than is often thought. Measuring the costs of hedging incorrectly, i.e. as the spread between the current spot rate and forward rate, and only covering downside risk results in a substantial overestimate of the costs of hedging and subsequently in an underhedging of the company's foreign exchange exposure. When hedging costs are measured correctly, i.e. the sum of transaction costs and the difference between the forward rate and one's forecast of the future spot rate, one could substantially reduce the foreign exchange risk at a low cost. These findings might lead to the conclusion that forward hedging should be used much more extensively than is common practice.

Footnotes

1 In addition to the weak form there also exists a semi-strong and a strong form of the efficient market hypothesis. The semi-strong form asserts that all public information is fully discounted in the prices (exchange rates). The strong form maintains that not only public information but all kinds of information (this is including so-called inside-information) is fully reflected in the prices.

2 The authors are grateful to the Amsterdam-Rotterdam Bank (AMRO) for making the exchange rate data available.

3 The relation between the forward rate and the spot rate has been extensively investigated in the American literature by Fama (4), Ethier (3), Cornell (2), Kohlhagen (12), Kettell (11), Brown (1), Kaserman (10), Solnik and Roll (13).

4 Transaction costs consist essentially of a fee to be paid to the bank for executing the foreign exchange transaction. In the Netherlands, for example, this commission fee amounts to 0.2 % per month of the transaction amount at the forward rate and to be paid at conclusion of the forward contract. Transaction costs might differ depending on the "quality of the client" to the bank, the amount, term and currency of the forward transaction.

5 One of the major problems in foreign exchange management is the determination of the effective exposure in a particular currency. The foreign currency exposure, \( X \), is itself an implicit function of the exchange rate, \( s \), since changes in the rate of exchange might affect future cash flows in the foreign currency. This means that the exposure in a particular currency at the end of a planning horizon is equal to: \( X (s) \times s \).

References


12 Kohlhagen, S., The Forward Rate as an Unbiased Predictor of the Spot Rate, Mimeograph, Univ. of California, Berkeley, 1974.