Analysis of Hedging Transaction Exposure Using Financial Contracts in International Financial Market

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Abstract: Since 2008, the sub-prime crisis, which lasted for more than one year has evolved into a global financial crisis, more and more people pay attention to the financial risk management. As one of the foreign exchange risk, or exposure, distinguishing with the economic exposure and translation exposure, the transaction exposure often happens during the course of international trade and international capital flow, but the existence of this risk must meet two conditions in the financial contract agreed by two parities: time and foreign currency. Faced with the transaction exposure, we are apt to adopt the financial hedge approaches to eliminate the uncertainty caused by exchange rate change. This paper focuses on introducing one study case and analyses the financial market technique. By compared three hedge approaches: forward hedge, money hedge and option hedge, we can draw a conclusion: in reality, every hedge method has itself advantages and disadvantages.

Keywords: transaction exposure; exchange rate; financial hedge

1 Introduction

Many international activities lead to money exchanges in the future. This is true of many international trade activities, whose payments are not due until sometime in the future. It is also true of international financial activities, which are specifically designed to create future flows of moneys as returns are received, debts are repaid, or financial assets are sold to others. A major challenge in conducting all of these activities is that we do not know for sure the exchange rates that will be available in the future to translate one country's money into another country's money.

Foreign exchange rate risk, or exposure, as an uncertainty, it concludes three types: transaction exposure, translation exposure, economic exposure. As one of the exchange exposure, distinguishing the economic exposure, the transaction exposure can be defined as the sensitivity of "realized" domestic currency values of the firm's contractual cash flows denominated in foreign currencies to unexpected exchange rate changes. As the most popular and more controlled risk, we have made a series of regular approaches to manage it. After making sure of the existence of the exposure and evaluating the degree of the exposure, we enter into the stage of managing the exposure. Most researchers provide a lot of approaches to eliminate the transaction exposure, such as the choice of currency of the contract, the hedge agreement, the advance of the receipt of foreign currency etc. This paper focuses on introducing one study case, by compared three hedge approaches, we can know that the financial contract agreed is the most effective measures to treat the transaction exposure.

2 Analysis on Study Case

Suppose that an American Corporation exported an airplane to an German Airways and billed ¢10 million payable in one year. The money market interest rates and foreign exchange rates are given as follows:

The U.S. interest rate: 6.10% per annum

The ¢ interest rate: 9.00% per annum

The spot exchange rate: $ 1.50/ ¢

The forward exchange rate: $ 1.46/ ¢ (1-year maturity)

2.1 Approach 1: Forward Market Hedge

Perhaps the most direct and popular way of hedging transaction exposure is by currency forward contracts. Generally speaking, the firm may sell (buy) its foreign currency receivables (payables) forward to eliminate its exchange risk exposure. In the above example, in order to hedge foreign exchange exposure, American Corporation may simply sell forward its ¢ receivable for delivery in one year, in exchange for a given amount of dollars. On the maturity date of the contract, American Corporation will have to deliver ¢10 million to the bank, which is the counterparty of the contract, and, in return, take delivery of $ 14.6 million, regardless of the spot exchange rate that may prevail on the maturity date. American Corporation will use the ¢10 million that it is going to receive from German Airways to fulfill the forward contract. Since its ¢ receivable is exactly offset by the ¢ payable (created by the forward contract), the company's

net ¢ exposure becomes zero.

Since American Corporation is assured of receiving a given dollar amount, $ 14.6 million, from the counterparty of the forward contract, the dollar proceeds from this sale will not be affected at all by future changes in the exchange rate. This point is illustrated in Figure 1. Once American Corporation enters into the forward contract, exchange rate uncertainty becomes irrelevant. Figure 1 also illustrates how the dollar proceeds from the sale will be affected by the future spot exchange rate when exchange exposure is not hedged. The figure shows that the dollar proceeds under the forward hedge will be higher than those under the un-hedged position if the future spot exchange rate turns out to be less than the forward rate, that is, F = $ 1.46/ ¢ , and the opposite will hold if the future spot rate becomes higher than the forward rate. In the latter case, American Corporation forgoes an opportunity to benefit from a strong ¢ .

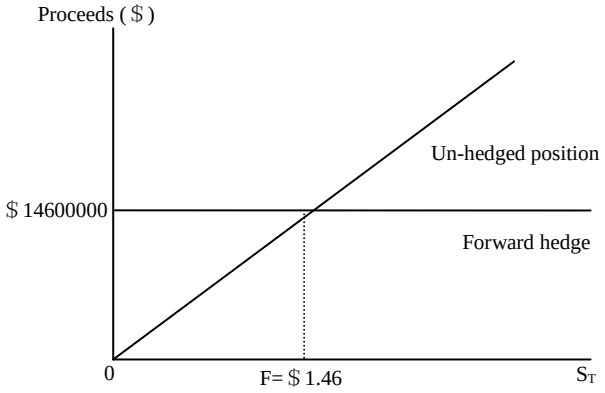

Figure 1. Dollar proceeds from the sale: Forward Hedge VS Un-hedged position

Suppose that on the maturity date of the forward contract, the spot rate turns out to be $ 1.40/ ¢ , which is less than the forward rate, $ 1.46/ ¢ . In this case, American Corporation would have received $ 14.0 million, rather than $ 14.6 million, had it not entered into the forward contract. Thus one can say that American Corporation gained $ 0.6 million from forward hedging. Needless to say, American Corporation will not always gain in this manner. If the spot rate is $ 1.50/ ¢ on the maturity date, then American Corporation could have received $ 15.0 million by remaining un-hedged.

2.2 Approach 2: Money Market Hedge

Transaction exposure can also be hedged by lending and borrowing in the domestic and foreign money markets. Generally speaking, the firm may borrow (lend) in foreign currency to hedge its foreign currency receivables (payables), thereby matching its assets and liabilities in the same currency. Again using the same example presented above, American Corporation can eliminate the exchange exposure arising from the German sale by first borrowing in ¢ , then converting the loan proceeds into dollars, which then can be invested at the dollar interest rate. In the maturity date of the loan, American Corporation is going to use the ¢ receivable to pay off the ¢ loan. If American Corporation borrows a particular ¢ amount so that the maturity value of this loan becomes exactly equal to the ¢ receivable from the German sale, its net ¢ exposure is reduced to zero, and American Corporation will receive the future maturity value of the dollar investment.

The first important step in money market hedging is to determine the amount of ¢ to borrow. Since the maturity value of borrowing should be the same as the ¢ receivable, the amount to borrow can be computed as the discounted present value of the ¢ receivable, that is, ¢ 10 million/(1.09) = ¢ 9174312. when American Corporation borrows ¢ 9174312, it then has to repay ¢ 10 million in one year, which is equivalent to its receivable. The step-by-step procedure of money market hedging can be illustrated as follows:

Step 1: Borrow ¢ 9174312 in the German;

Step 2: Convert ¢ 9174312 into $ 13761468 at the current spot exchange rate of $ 1.50/ ¢ ;

Step 3: Invest $ 13761468 in the United States;

Step 4: Collect ¢ 10 million from German Airways and use it to repay the ¢ loan;

Step 5: Receive the maturity value of the dollar investment, that is, $ 14600918= $ 13761468(1.06)

Table 1 provides a cash flow analysis of money market hedging. The table shows that the net cash flow is zero at the present time, implying that, apart from possible transaction costs, the money market hedge is fully self-financing. The table also clearly shows how the ¢ 10 million receivable is exactly offset by the ¢ 10 million payable (created by borrowing), leaving a net cash flow of $ 14600918 on the maturity date.

Table 1. Cash Flow Analysis of a Money Market Hedge

transaction	Current cash flow	Cash flow at maturity
1.Borrow ¢	¢ 9174312	¢ 10000000
2.Buy dollar spot with ¢	$ 13761468	
3.Invest in the U.S.	¢ 9174312 -	$ 14600918
4.Collect ¢ receivable	$ 13761468	¢ 10000000
Net cash flow	0	$ 14600918

The maturity value of the dollar investment from the

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money market hedge turns out to be nearly identical to the dollar proceeds from forward hedging. This result is no coincidence. Rather, this is due to the fact that the interest rate parity (IRP) condition is approximately holding in our example. If the IRP is not holding, the dollar proceeds from money market hedging will not be the same as those from forward hedging. As a result, one hedging method will dominate another. In a competitive and efficient world financial market, however, any deviations from IRP are not likely to persist.

2.3 Approach 3: Options Market Hedge

One possible shortcoming of both forward and money market hedges is that these methods completely eliminate exchange exposure. Consequently, the firm has to forgo the opportunity to benefit from favorable exchange rate changes. To show how the options hedge works, suppose that in the over-the-counter market American Corporation purchased a put option on 10 million ¢ with an exercise price of $1.46 and a one-year expiration. Assume that the option premium was $0.02 per ¢. American Corporation thus paid $200000 for the option. This transaction provides American Corporation with the right, but not the obligation, to sell up to ¢10 million for $1.46/¢, regardless of the future spot rate.

Now assume that the spot exchange rate turns out to be $1.30 on the expiration date. Since American Corporation has the right to sell each pound for $1.46, it will certainly exercise its put option on the ¢ and convert ¢10 million into $14.6 million. The main advantage of options hedging is that the firm can decide whether to exercise the option based on the realized spot exchange rate on the expiration date. Recall that American Corporation paid $200000 upfront for the option. Considering the time value of money, this upfront cost is equivalent to $212200 (= $200000×1.061) as of the expiration date. This means that under the options hedge, the net dollar proceeds from the German sale become $14387800. since American Corporation is going to exercise its put option on the German whenever the future spot exchange rate falls below the exercise rate of $1.46, it is assured of a "minimum" dollar receipt of $14387800 from the German sale.

Next, consider an alternative case where the ¢ appreciates against the dollar. Assume that the spot rate turns out to be $1.60 per ¢ of the expiration date. In this event, American Corporation would have no incentive to exercise the option. It will rather let the option expire and convert ¢10 million into $16 million at the spot rate. Subtracting $212200 for the option cost, the net dollar proceeds will become $15787800 under the option hedge. As suggested by these cases, the options hedge allows the firm to limit the downside risk while preserving the upside potential. The firm, however, has to pay for this flexibility in terms of the option premium. Note that neither the forward nor the money market hedge involves and upfront cost.

Figure 2 compares the dollar proceeds from forward and options hedges. As indicated, the options hedge dominates the forward hedge for future spot rates greater than $1.48 per ¢, whereas the opposite holds for spot rates lower than $1.48 per ¢. American Corporation will be indifferent between the two hedging methods at the "break-even" spot rate of $1.48 per ¢.

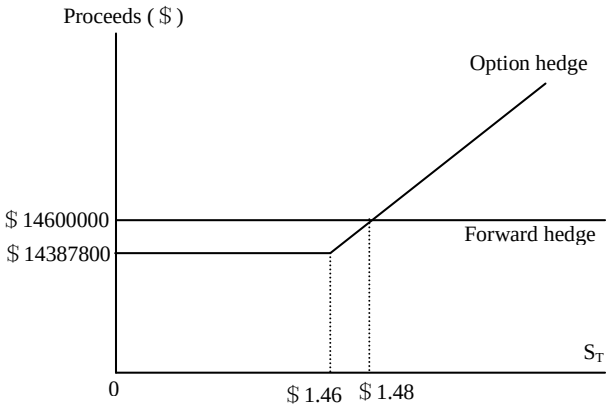

Figure 2. Dollars Proceeds from the Sale: Option VS Forward Hedge

3 Results

Compared with three hedge approaches, Unlike the forward contract, which has only one forward rate for a given maturity, there are multiple exercise exchange rates for the option contract. As a result, the characteristics of the three alternative hedging strategies are summarized as follows:

3.1 Strategy 1: Forward Market Hedge

Transactions includes: 1. sell ¢10000000 forward for U.S. dollars now; 2. in one year, receive ¢10000000 from the German client and deliver it to the counterparty of the forward contract.

Outcomes are that assured of receiving $14600000 in one year; Future spot exchange becomes irrelevant.

3.2 Strategy 2: Money Market Hedge

Transactions includes: 1. borrow ¢9174312 and buy $13761468 spot now; 2. in one year, collect ¢10000000 from the German client and pay off the ¢ loan using the amount. Outcomes are that assured of receiving $13761468 now or $14600918 in one year. Future spot exchange rate becomes irrelevant.

3.3 Strategy 3: Option Market Hedge

Transactions: 1. buy a pot option on ¢10000000 for an upfront cost of $200000; 2. in one year, decide whether to exercise the option upon observing the prevailing spot exchange rate. Outcomes are that assured of receiving at least $14387800 or more if the future spot rate exceeds the exercise rate; Corporation controls the downside risk while retaining the upside potential.

4 Conclusions

With the development of financial globalization, more and more firms find it necessary to pay careful attention to foreign exchange exposure and to design and implement appropriate hedging strategies. Ways of hedging transaction exposure can obe used by various financial contracts and operational techniques: Financial contracts mainly include Forward market hedge, Money market hedge, Option market hedge, Swap market hedge; Operational techniques include Choice of the invoice currency, Lead/lag strategy, Exposure netting and so on. In reality, firms should adopt hedge methods eliminating the foreign exchange rate according to their demand.

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References

[1] Chelo S. Eun & Bruce G. Resnick. International Financial Management.China Machine Press, 2005, P290-354.
[2] Thomas A. Pugel. International Finance (Twelfth Edition). McGraw-Hill Education, 2005, P261-280
[3] Krugman. Paul. Target Zone and Exchange Rate Dynamics. quarterly journal of economics CVI.1991, P669-682
[4] Wang Renxiang & Hu Guohui. International Finance. Press of Wuhan University of Technology, 2005, P330-353 (In Chinese)