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Factors Affecting Exchange Rates Part - 4

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1. Introduction

Many firms are exposed to foreign exchange risk - i.e. their wealth is affected by movements in exchange rates - and will seek to manage their risk exposure. The previous session looked at the different types of foreign exchange risk i.e. transaction risk, Economic risk and translation risk. The Statistical Analysis of these exposures is done using VaR i.e. Value at Risk will also be talked about in this session. Also we were introduced to the methods for hedging that risk. These methods of hedging included internal as well as external techniques of which few external techniques were discussed and we will be continuing with rest of them in today's session.

2. Currency Options

Currency options are a tool for hedging foreign exchange risk.

A currency option is a right, but not an obligation, to buy or sell a currency at an exercise price on a future date. If there is a favourable movement in rates the company will allow the option to lapse, to take advantage of the favourable movement. The right will only be exercised to protect against an adverse movement, i.e. the worst-case scenario.

Different types of currency options

Basics

A call option gives the holder the right to buy the underlying currency.

A put option gives the holder the right to sell the underlying currency.

Options are more expensive than the forward contracts and futures.

A European option can only be exercised on the expiry date whilst an American option can be exercised at any time up to the expiry date.

Over the counter (OTC) options

Currency options can be bought OTC or on major exchanges.

Like forward contracts, the OTC options are tailor made to fit a company's precise requirements. Branches of foreign banks in major financial centres are generally willing to write options against their home currency.

e.g. Australian banks in Chicago will write options on the Australian dollar.

Option sizes are much larger on the OTC market, with most options being in excess of $1 million.

Exchange traded options

Exchange traded options are also available but the OTC market is the larger.

e.g. Euronext.liffe (formerly LIFFE) offers European style dollar:euro option contracts.

Two types of currency option are available:

- Cash options contracting for delivery of the underlying currency.
- Options on currency futures.

Illustration: Currency options

A typical pricing schedule for the US$/€ currency option on the Philadelphia exchange is as follows.

Strike price	CALLS			PUTS		
	Jun	Sept	Dec	Jun	Sept	Dec
115.00	1.99	2.25	2.47	0.64	1.32	2.12
116.00	1.39	2.03	2.28	1.00	1.56	-
117.00	0.87	1.55	1.81	1.43	2.22	-
118.00	0.54	1.08	1.30	-	-	-

- Here, the options are for a contract size of €125,000 and prices (both strike price and premia) are quoted in US$ (cents) per €.
- So to buy a call option on €125,000 with an expiry date of September and at a strike price of €1 = $1.17 would cost 1.55 cents per euro, or $1,937.50.
- Similarly, the premium on a June put at a strike price of 115.00 (€1 = $1.15) would cost 0.64 cents per euro, or $800.

Options hedging calculations

Step 1: Set up the hedge by addressing 4 key questions:

- Do we need call or put options?
- How many contracts?
- Which expiry date should be chosen?
- Which strike price / exercise price should be used?

The decision as to which exercise price to choose will depend on cost, risk exposure and expectations. If you have to choose in an exam then one approach is to consider the cost implications only for calculation purposes: The best exercise price is then the one which (incorporating the premium cost) is most financially advantageous.

Step 2: Contact the exchange. Pay the upfront premium. Then wait until the transaction / settlement date.

Step 3: On the transaction date, compare the option price with the prevailing spot rate to determine whether the option should be exercised or allowed to lapse.

Step 4: Calculate the net cash flows - beware that if the number of contracts needed rounding, there will be some exchange at the prevailing spot rate even if the option is exercised.

3. Forward Contracts

The client can use forward contracts to sell or purchase foreign currency amounts at a future time and a given exchange rate. The settlement takes place at the time and the exchange rate mentioned in the contract, regardless of any fluctuations of the exchange rate on the foreign exchange market.

Benefits

- The risk of exchange rate fluctuations is mitigated
- It increases the management's control over the company's cash-flows and profitability
- The exchange rate used in budgeting is fixed ex ante

This product is suitable for your business if:

- Your incomings are denominated in one currency and your payments are denominated in another currency
- You have a time gap between incomings and the corresponding payments

You use a certain level of the exchange rate when pricing your products

4. Flexible Forward Transactions

A flexible forward transaction has the same characteristics as a forward transaction with only one specific difference, which is that the settlement of the transaction can take place at any time until the maturity of the contract. The client may choose to make partial settlements for his transaction at any time until the maturity of the contract, having the only obligation to exchange the entire notional amount until maturity.

Benefits

- Flexible tenor for the foreign exchange transactions as the settlement may take place at any time until the maturity date, at the same pre-established exchange rate
- Better liquidity management
- Better coordination between incomings and payments

This product is suitable for your business if:

- Your incomings are denominated in one currency and your payments are denominated in another currency
- You have a time gap between incomings and the corresponding payments
- You can anticipate the total volume of you payments but you cannot be certain in what regards the exact moment of your incomings
- You use a certain level of the exchange rate when pricing your products

Currency Swaps

A currency swap transaction represents an agreement to exchange one currency for another at an agreed upon exchange rate. There are two simultaneous transactions, one of buying and one of selling the same amount at two different value dates (usually SPOT and FORWARD) and at exchange rates (SPOT and FORWARD) that are pre-agreed at the moment when the transaction is closed.

In a currency swap, the holder of an unwanted currency exchanges that currency for an equivalent amount of another currency. Thus, the client exchanges his interest and currency rate exposures from one currency to another or benefits of bank financing at a lower rate.

5. Statistical Measurement of Exchange Rate Risk

After defining the types of exchange rate risk that a firm is exposed to, a crucial aspect in a firm's exchange rate risk management decisions is the measurement of these risks. Measuring currency risk may prove difficult, at least with regards to translation and economic risk. At present, a widely-used method is the value-at-risk (VaR) model. Broadly, value at risk is defined as the maximum loss for a given exposure over a given time horizon with z% confidence.

The VaR methodology can be used to measure a variety of types of risk, helping firms in their risk management. However, the VaR does not define what happens to the exposure for the (100 – z) % point of confidence, i.e., the worst case scenario. Since the VaR model does not define the maximum loss with 100 percent confidence, firms often set operational limits, such as nominal amounts or stop loss orders, in addition to VaR limits, to reach the highest possible coverage .

Value-at-Risk calculation

The VaR measure of exchange rate risk is used by firms to estimate the riskiness of a foreign exchange position resulting from a firm's activities, including the foreign exchange position of its treasury, over a certain time period under normal conditions (Holton, 2003). The VaR calculation depends on 3 parameters:

- The holding period, i.e., the length of time over which the foreign exchange position is planned to be held. The typical holding period is 1 day.
- The confidence level at which the estimate is planned to be made. The usual confidence levels are 99 percent and 95 percent.

- The unit of currency to be used for the denomination of the VaR.

Assuming a holding period of x days and a confidence level of y%, the VaR measures what will be the maximum loss (i.e., the decrease in the market value of a foreign exchange position) over x days, if the x-days period is not one of the (100-y)% x-days periods that are the worst under normal conditions. Thus, if the foreign exchange position has a 1-day VaR of $10 million at the 99 percent confidence level, the firm should expect that, with a probability of 99 percent, the value of this position will decrease by no more than $10 million during 1 day, provided that usual conditions will prevail over that 1 day. In other words, the firm should expect that the value of its foreign exchange rate position will decrease by no more than $10 million on 99 out of 100 usual trading days, or by more than $10 million on 1 out of every 100 usual trading days.

To calculate the VaR, there exists a variety of models. Among them, the more widely-used are: (1) the historical simulation, which assumes that currency returns on a firm's foreign exchange position will have the same distribution as they had in the past; (2) the variance-covariance model, which assumes that currency returns on a firm's total foreign exchange position are always (jointly) normally distributed and that the change in the value of the foreign exchange position is linearly dependent on all currency returns; and (3) Monte Carlo simulation, which assumes that future currency returns will be randomly distributed.

The historical simulation is the simplest method of calculation. This involves running the firm's current foreign exchange position across a set of historical exchange rate changes to yield a distribution of losses in the value of the foreign exchange

position, say 1,000, and then computing a percentile (the VaR). Thus, assuming a 99 percent confidence level and a 1-day holding period, the VaR could be computed by sorting in ascending order the 1,000 daily losses and taking the 11^{th} largest loss out of the 1,000 (since the confidence level implies that 1 percent of losses – 10 losses –should exceed the VaR). The main benefit of this method is that it does not assume a normal distribution of currency returns, as it is well documented that these returns are not normal but rather leptokurtic. Its shortcomings, however, are that this calculation requires a large database and is computationally intensive.

The variance – covariance model assumes that (1) the change in the value of a firm's total foreign exchange position is a linear combination of all the changes in the values of individual foreign exchange positions, so that the total currency return is linearly dependent on all individual currency returns; and (2) the currency returns are jointly normally distributed. Thus, for a 99 percent confidence level, the VaR can be calculated as:

$$VaR = -Vp (Mp + 2.33 Sp)$$

Where Vp is the initial value (in currency units) of the foreign exchange position

Mp is the mean of the currency return on the firm's total foreign exchange position, which is a weighted average of individual foreign exchange positions

Sp is the standard deviation of the currency return on the firm's total foreign exchange position, which is the standard deviation of the weighted transformation of the variance -covariance matrix of individual foreign exchange positions (note that the latter includes the correlations of individual foreign exchange positions)

While the variance-covariance model allows for a quick calculation, its drawbacks include the restrictive assumptions of a normal distribution of currency returns and a linear combination of the total foreign exchange position. Note, however, that the normality assumption could be relaxed. When a non-normal distribution is used instead, the computational cost would be higher due to the additional estimation of the confidence interval for the loss exceeding the VaR.

Monte Carlo simulation usually involves principal components analysis of the variance-covariance model, followed by random simulation of the components. While its main advantages include its ability to handle any underlying distribution and to more accurately assess the VaR when non-linear currency factors are present in the foreign exchange position (e.g., options), its serious drawback is the computationally intensive process.

6. Summary

This session looked at the different methods for hedging that risk. These methods of hedging include internal as well as external techniques. The internal techniques included invoicing in home currency, Leading and Lagging, Matching as well as what if company chooses to do nothing of these. The external techniques included Money market hedges, Future contracts, Forwards contracts, Flexible forward Contracts, Currency Swaps and Currency Options. Of all these method in this session we learnt a few of them which included Currency options, Currency Swap, Forward contracts and flexible forward contracts. We also learnt the statistical measurement of exchange rate risk. After defining the types of exchange rate risk that a firm is exposed to, a crucial aspect in a firm’s exchange rate risk management

decisions is the measurement of these risks. This measurement included Value at risk calculation method. I hope this session was helpful to you in understand the factors affecting exchange rates and exposures under international financial management better. Thank You.