Currency Options and Swaps

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1 Introduction

In recent years the growth and evolution of financial markets have led to an expanding role for the development and use of derivative securities. A derivative is an instrument which, as indicated by its name, derives its value from the values of other underlying assets or securities. In international finance two widely used types of derivatives are currency options and swaps. This intent of this paper is to familiarize the reader with these two instruments by providing insight into their structures, valuation and uses.

2 Currency Options

An option can be defined as the right to buy or sell an asset for a limited time at a predetermined price. Thus, in the case of a currency option, it is the right to buy or sell a certain number of units of a given foreign currency. Its name derives from the fact that the owner is not obligated to exercise the right. This implies that the investor can make money when the price of the instrument rises, but does not stand to lose any money in the case of a price decrease. Thus, options are flexible instruments and are often used for speculating and hedging.

Currency options are traded in the United States on the Philadelphia Stock Exchange (PHLX) and on Over-the-Counter (OTC) markets. Options on currencies such as the Canadian dollar, the Australian dollar, the British pound and the Euro trade on the exchange and are cleared through the Options Clearing Corporation (OCC). All options expire on the third Wednesday of March, June, September or December and only the contracts with the three nearest expiration dates are traded. If the option is American then the final date at which the holder can exercise it early is the last Saturday of the option’s life.

\[\text{\footnotesize\textsuperscript{1}}\text{Sercu and Uppal (1995), 165.}\]
2.1 Call and Put Options

The two classes of options that exist are call options and put options. A currency call gives the holder of the option the right to purchase a given number of units of the foreign currency (i.e. the underlying asset) at a specific price (called the strike price) from the writer of the option, until its maturity. In other words, if the strike price is $X$, the option allows the holder of the call to purchase the currency for a price not exceeding $X$, until such time that the option expires. The writer has the obligation to sell the currency at the strike price if called upon by the holder. The holder of the call is said to be long the call. A long position can be defined as taking a position of ownership in the asset. Conversely, the writer of the call is short the call, implying an obligation to sell the currency at the request of the holder. Put options are the converse of call options and give the owner the right, but not the obligation, to sell the currency at the predetermined strike price until the option matures.

2.2 American versus European Options

An important aspect of an option is whether it is European or American. This depends on if the option is exercisable prior to maturity or not. An American option can be exercised at any time during its life, up to and including the expiration date. A European option, on the other hand, can only be exercised at maturity. The value of a currency option can be determined straightforwardly once it is known whether it is American or European. A more rigorous valuation approach for options using the Black-Scholes method can be found in Chapter 13 of Hull (2003). The following method can be found in Sercu and Uppal (1995).

Recall that a call option allows the holder to purchase the foreign currency for a price no greater than the strike price, $X$, until the call expires. Now suppose the option in question is a European call that expires at time $T$. Thus the owner can only exercise the call at time $T$ and not before. The call will have the value:

$$C_T = \max(s_T - X, 0)$$
where $C_T$ and $s_T$ are the value of the call and the spot exchange rate at time $T$ respectively. It is clear that the holder of the call will choose to exercise the option if $s_T - X > 0$. In other words, the owner will profit from buying the call when the current spot rate is greater than the exercise price. If the spot rate is below the exercise price at time $T$, then the holder will choose not to exercise the option.

### 2.3 The Uses of Options

As mentioned above, options are flexible instruments in that the owner is under no obligation to exercise the option in the case of a negative payoff. Furthermore, call options are often likened to insurance contracts that insure against the risk of a high exchange rate. Similarly, puts are said to insure against low spot rates. As with insurance, the price of an option is referred to as the option premium and is usually required to be paid up-front. The premium received by the writer covers the discounted expected exercise value of the claim and can be used to hedge against most of the risk.

### 3 Currency Swaps

A swap is another type of derivative instrument that is prominent in modern financial markets. In general, a swap is an agreement between two parties to exchange future cash flows in accordance with a predetermined formula. A currency swap allows the parties to exchange payments of principal and interest on a coupon loan from one currency to another. In other words, they enable firms to transform the denomination of a loan to a given currency using a single contract. It is important to note that currency swaps have no initial value, as the exchange occurs at the current spot rate and thus the principal amounts have the same market value. Each party is required to pay periodic interest to each other on the amount borrowed. At the end of the contract the principals are returned to the parties.

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3 Hull (2003), 140.
This type of swap is referred to as a fixed-for-fixed currency swap, or sometimes, a modern currency swap. An additional feature of fixed-for-fixed swap contracts is the inclusion of a right-to-offset clause. In the case of a party not fulfilling its obligations this clause allows the other party to ignore any future obligations and sue the offending party for any losses occurred.

The growth of the swap market has led most banks and investment dealers to offer their services to firms seeking currency swaps. In other words, it is no longer necessary for a firm to find a counterparty with a matching offsetting need. The role of the bank or investment dealer is to provide the services required by the firm for a fee, and then hedge any exchange rate risk they may encounter. Table 1 in Appendix A provides some useful insight into the large proportion of spot market transactions that currency swaps comprise.

3.1 The Swap Rate

The swap rate is the interest rate on which the payments are based. It is calculated as the yield at par on a riskless bond with the same maturity as the swap. Following are several reasons why the risk-free rate is used to determine the swap rate rather than a higher interest rate. For one, due to the previously mentioned right-to-offset clause there is a small risk of default. In addition, the clause serves to balance the uncertainty associated with any inflows or outflows of currency to the financial intermediary. Furthermore, banks face lower risk because of the existence of credit trigger clauses. A credit trigger clause states that the bank can terminate a swap contract in the event of a decrease in a clients credit rating. If the clause is invoked then the swap is settled at its current market value. Again, this implies that the bank is in a position to use the risk-free rate to compute interest.

\[\text{\cite{Davis and Pinches(2002), 576.}}\]
\[\text{\cite{Sercu and Uppal (1995), 327.}}\]
3.2 Comparative Advantage and Currency Swaps

Recall that currency swaps are used to transform borrowings in one currency to another. Firms often use currency swaps to exploit a comparative advantage in a given market. For example, suppose Firm A and Firm B wish to enter a swap contract between USD and GBP. Firm A is more creditworthy and pays a lower borrowing rate in both markets, however Firm B has a comparative advantage in the GBP market (i.e. it pays only slightly more than Firm A in the GBP market). In this case A will borrow USD and B will borrow GBP. The swap will then serve to transform each firms borrowings to the currency in which they have a comparative advantage to exploit.

3.3 Valuation

A swap contract can be valued by treating it as a position in two bonds, one foreign and one domestic. Define $V_{\text{swap}}$ as the (domestic) value of a swap where domestic currency is received and foreign currency is paid. The value of the swap will then be:

$$V_{\text{swap}} = B_d - s_o B_f$$

where $B_d$ is the value of the underlying domestic bond, $B_f$ is the value of the underlying foreign bond (measured in foreign currency) and $s_o$ is the spot exchange rate. The value of the swap thus depends on the LIBOR rates in both currencies, the spot exchange rate and the term structure of interest rates in domestic currency.\(^6\) A similar method can be used to determine the value of a swap where domestic currency is paid and foreign currency is received.

\(^6\)Hull (2003), 143.
4 Conclusion

It is evident that currency options and swaps are important aspects of international financial transactions. Currency options allow a party to hedge potential exchange rate risk, while a currency swap contract enables a firm to exploit its comparative advantages. Derivative instruments such as these are large and growing components of modern international financial markets.

A Table Appendix

Table 1: Global Foreign Exchange Market Turnover\(^7\) (billions of US dollars)

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<tbody>
<tr>
<td>Spot transactions</td>
<td>317</td>
<td>394</td>
<td>494</td>
<td>568</td>
<td>387</td>
<td>621</td>
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<tr>
<td>Foreign Exchange Swaps</td>
<td>190</td>
<td>324</td>
<td>546</td>
<td>734</td>
<td>656</td>
<td>944</td>
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<td>Total “traditional” Turnover</td>
<td>590</td>
<td>820</td>
<td>1190</td>
<td>1490</td>
<td>1200</td>
<td>1880</td>
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References


\(^7\)from Galati and Melvin (2004), 68.