DEVELOPMENT OF FINANCIAL MARKETS IN THE XXI CENTURY

РАЗВИТИЕ НА ФИНАНСОВИТЕ ПАЗАРИ ПРЕЗ XXI ВЕК

PRACTICAL ASPECTS OF FIXED FOR FIXED FX SWAP VALUATION

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ПРАКТИЧЕСКИ АСПЕКТИ ПРИ ОЦЕНЯВАНЕ НА ФИКСИРАН ЗА ФИКСИРАН ВАЛУТЕН СУАП

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Abstract: This manuscript focuses on the process of realizing a not so widespread practice of international business activity in our region, but which could contribute to a mutual financial benefit for both parties. The purpose is to presented to the interested parties the technique of constructing, pricing and evaluating a foreign exchange swap. In details are showned the calculation of the swap rates and contractual payments at specified dates in time. The FX swap is evaluated by two methods - the bond approach and as series of forward contracts.

Резюме: Настоящата публикация се фокусира върху процеса за реализация на една не толкова широко разпространена практика от сферата на международния бизнес в нашия регион, но която би могла да допринесе за взаимна финансова полза и за двете страни. Целта е да се представят на заинтересованите страни техниката за конструиране, ценообразуване и оценка на валутен суап. В подробности са показани изчисленията на суап лихвените проценти и договорните плащания към определен момент във времето. Валутният суап е оценен по два метода - облигационният подход и като поредица от форуърдни договори.

1. Introduction

A FX swap is short from forex swap or foreign exchange swap. The currency swap is a contract between two counterparties to exchange a series of cash from one currency to another for a given period at fixed in advance interest rates and exchange rates. A FX swap allows companies to exploit the global capital markets more efficiently and are used for two main purposes:

• hedging of currency risk. (A series of cash flows denominated in foreign currency can be protected from currency risk through hedging). For example, a European company paying the loan in USD can rollover their future payments into equivalent ones in EUR and thus eliminate the risk of devaluing the currency of EUR.

• reducing financial costs. (Some financial costs such as interest payments on loans or bonds transaction, emission costs, etc. could be reduced by the agreed exchange a series of cash payments in one currency against another). For example, due to higher interest rates and weak demand for debt instruments of Bulgarian

financial market company or a bank with a high credit rating can issue bonds abroad and subsequently Swapping contractual cash flows in EUR (lev) and thus secure financing at a lower price.

Construction of FX swap requires calculation of swap rate and estimation of future exchanged cash flows.

The swap rate is calculated from brokers the following formula [4]:

$$R_{Swap} = \frac{1-\frac{1}{(1+R_n)^n}}{\sum\frac{1}{(1+R_i)^i}} = \frac{1-\frac{1}{(1+R_n)^n}}{\frac{1}{(1+R_1)^1}+\frac{1}{(1+R_2)^2}+.....\frac{1}{(1+R_n)^n}}$$

where:

R_{Swap} is swap rate

R_i ,R_1 , R_2 , are actual zero coupon spot rates on the money markets;

R_n - is the current spot rate for the swap maturity on the money market.

The FX currency swap usually involves the following steps [6]:

- ✓ Initial exchange of principal denominated in different currencies;
- ✓ Exchange of interest obligations due for the term of the swap;
- ✓ Feedback exchange of principal.

There may be no initial exchange of foreign principals, if the two countries there is a consensus on this issue. It is quite common when both parties engage swap to hedge the currency risk. Exchange of principal bears no currency risk because realized spot rate. The current spot rate is used to determine an equivalent amount of currency to be exchanged as principal.

The interest-bearing liabilities are calculated by applying an interest rate swap on the principal. In the majority of swaps in the calculation of interest-bearing liabilities used just remuneration.

The reverse exchange of principal at the end of the currency swap is mandatory even if they were not exchanged in the beginning because they are not exchanged at the spot rate, and this carries a risk that needs to be hedged.

The currency swap can be evaluated by estimating the present value of two bonds denominated in a different currency by the following formula:

Swap Value = PV received – Spot . PV paid

$$Swap\,Value = \sum_{i=1}^{n}\frac{CF_R}{(1+R_R)^n} - S.\sum_{i=1}^{n}\frac{CF_P}{(1+R_P)^n},$$

where:

CF_P paid cash in a foreign currency;

CF_R are received cash flows in a foreign currency;

R_P interest rates are zero coupon bonds in the currency of receipt.

R_R rates are zero coupon bonds in the currency of payment.

2. Construction of FX swap

For example an American company was financed by bond emission of 100 000 EUR at a fixed rate of 4.4853% in the European capital market. The maturity of the bond is 3 years. The company wants to swap its debt in USD at a fixed rate. For this purpose it contacts to a commercial bank. The Bank calculates the swap rate

based on interest rates zero coupon in both currencies [8]. Zero coupon bonds interest rates in the Euro zone and USA are given in Table 1.

Table 1. Actual zero coupon bonds interest rates in the Euro zone and USA

years	1	2	3
EUR	4%	4,25%	4,50%
USD	5,50%	5,75%	5,90%

The swap rate for the cash flows in EUR is calculated as follows:

$$R_{Swap}EUR = \frac{1-\frac{1}{(1+0{,}045)^3}}{\frac{1}{(1+0{,}04)^1}+\frac{1}{(1+0{,}0425)^2}+\frac{1}{(1+0{,}045)^3}} = 0{,}0448532$$

The swap rate for the cash flows in USD is calculated as:

$$R_{Swap}USD = \frac{1-\frac{1}{(1+0{,}059)^3}}{\frac{1}{(1+0{,}055)^1}+\frac{1}{(1+0{,}0575)^2}+\frac{1}{(1+0{,}059)^3}} = 0{,}0588657$$

Based on the estimated swap rates and spot rate, (which is EUR/USD 1,3300) the equivalent cash flows are calculated. Table 2 presents the exchange of contractual payments in the currency swap.

Table 2. The exchange of contractual payments in the currency swap

	swap EUR to USD in %		swap EUR to USD	
Maturity	receive EUR	pay USD	receive EUR	pay USD
1	4,4853%	-5,8866%	4485,3	-7829,1
2	4,4853%	-5,8866%	4485,3	-7829,1
3	4,4853%	-5,8866%	104485,3	-140829,1

3. Approaches for currency swap evaluation

The currency swap can be evaluated using two alternative approaches. The first one assesses the swap as the difference between the current value of the two interest bonds. Table 3 illustrates the application of this approach using data from the previous example.

Table 3. Evaluation of the currency swap by the bond approach

Maturity	Receive EUR	Pay USD	EUR	USD	PV EUR	PV USD
1	4485,3	-7829,1	4,00%	5,50%	4312,81	-7420,98
2	4485,3	-7829,1	4,25%	5,75%	4127,06	-7000,88
3	104485,3	-140829,1	4,50%	5,90%	91560,13	-118578
					100000	-133000

As seen from the table 3 if a FX swap is fair the present value of cash flows denominated in both currencies must reproduce the spot rate between them.

The second alternative approach for currency swap valuation is by estimating the present value of a portfolio of forward contracts. Here the currency swap appears as a series of forward contracts for the purchase of EUR with USD (Table 4).

Table 4. Evaluation of a FX swap as series of forward contracts

Maturity	Receive EUR	Forward rates	Payment in USD	% USD	PV of payment in USD
1	4485,32	1,34918	6051,51	5,50%	5736,03
2	4485,32	1,36855	6138,38	5,75%	5489,00
3	104485,32	1,38417	144625,85	5,90%	121774,97
					133000

The forward rate for the first year is calculated as follows:

$$f_{EUR/\text{USD}} = \frac{(1+0{,}055)^1}{(1+0{,}04)^1} 1{,}33 = 1{,}34918$$

for the second year:

$$f_{EUR/\text{USD}} = \frac{(1+0{,}0575)^2}{(1+0{,}0425)^2} 1{,}33 = 1{,}36855$$

and for the third year:

$$f_{EUR/\text{USD}} = \frac{(1+0{,}059)^3}{(1+0{,}045)^3} 1{,}33 = 1{,}38417$$

The value of the currency swap is estimated as the sum of the present value of payments in U.S. dollars at 133 000$. If it is equal to the product of the principal in EUR by spot rate (100 000 EUR x 1,3300) means that the value of a currency swap is 0 i.e. the swap value is fair[3].

The currency swaps can be assessed at any time during the maturity of the transaction. For example, if we want to evaluate the currency swap at the first year and if the spot rates has changed to 1.3450 and the zero coupon interest rates in the money market after the first year have changed to:

Table 5. Zero coupon interest rates at the beginning of next year

years	1	2
EUR	4,15%	4,35%
USD	5,65%	5,80%

Then currency swap at the beginning of the second year can be evaluated by estimating the present value of two bonds denominated in a different currency by the following formula:

$$Swap\quad Value\quad = \left[\frac{4485\ \ ,32}{\left(1 + 0,0415\ \ \right)^{1}} + \frac{104485\ \ ,32}{\left(1 + 0,0435\ \ \right)^{2}} \right] -$$

$$- 0,7435\ \ .\left[\frac{7829\ \ ,1}{\left(1 + 0,0565\ \ \right)^{1}} + \frac{140829\ \ ,1}{\left(1 + 0,058\ \ \right)^{2}} \right] = 1212,54\quad EUR$$

The value of the currency swap, estimated at the end of the first year is 1212,54 EUR in favor of the company not the bank. The positive value of the swap means that the company pays a below-market swap rates with the same maturity. On the other hand, a positive value means a loss for the bank and it will likely rectify the cash flows on the swap.

Conclusion

Currency Swaps allows the firms to switch its loan from one currency to another. They also allow it to choose whether it have fixed- or floating-rate interest. By using FX swap firm could borrow in the currency which will gives it the best terms. They could use it to switch the loan back into any currency it chooses also i.e. it can reduce foreign currency exposures. Currency swaps change the profile of cash flows. The firms could use money it receives in foreign currency to pay off its loans when it switches them. The firms can protect itself against changes in interest rates by creating fixed-rate loans. When constructing swap arbitrage opportunities in Eurobond markets may exist.

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