

1 Characteristics and applications of the FX swap transaction

1.1 DESCRIPTION OF THE FX SWAP TRANSACTION

An FX swap transaction may be classified among foreign currency market transactions, as it practically corresponds to the swap of cash flows denominated in different currencies. In the framework of the transaction, the parties agree to swap the currency they hold (at time T_0) with another currency at a spot exchange rate and swap it back at a later date (T_1), at a forward exchange rate that also involves the prevailing yield spread (Table 1).¹ Thus, the FX swap consists of a spot currency sale-purchase transaction (spot leg) and a forward transaction (forward leg): after settlement of the spot leg, the counterparty risk of the transaction equals that of the forward transaction.

Table 1
Cash flows of the FX swap transaction in the original currency

(foreign currency purchase in the spot leg, HUF purchase in the forward leg)

	Deal date	Maturity
FOREIGN CURRENCY	+1	-1
FORINT	$-S_0$	F

Note: S_0 indicates the spot exchange rate at the time of conclusion, while F indicates the forward exchange rate at the time of conclusion.

The FX swap transaction can be understood as borrowing in one currency, with concurrent depositing in the other currency, where the receivable arising in one currency serves as collateral for the liability outstanding in the other currency. Thus, the advantage of the FX swap over an uncovered interbank transaction (deposit) is that – due to the very nature of the transaction – it is covered, and therefore the limits of market participants vis-à-vis each other in relation to FX swaps are wider in the normal operation of markets than counterparty limits relating to traditional, uncovered interbank lending.² In general terms, the FX swap is not a financing instrument, but a derivative product enabling the swap of the currency of a given financing instrument (e.g. credit, deposit); it therefore carries a lower credit risk than uncovered interbank lending.

The spot leg of the FX swap transaction affects the *on-balance sheet* items of domestic banks, and in parallel, the forward leg of the transaction at the time of conclusion appears as an *off-balance sheet* item; thus the whole foreign currency position of the bank (balance sheet+off-balance sheet) remains closed as a result of the transaction (Chart 1). In the spot leg, for a transaction resulting in currency liquidity, the balance sheet foreign currency account increases (DEV_0)³, while the forint account decreases (HUF_0) with the amount equalling the principal of the transaction; the off-balance sheet foreign currency liability (DEV_0) and forint receivables (HUF_{0T}) simultaneously increase. The amount of forint receivables is determined according to the forward exchange rate. This also means that the FX swap transaction can in itself modify the on-balance sheet foreign currency position of domestic banks (the difference in the forint amount of on-balance sheet foreign currency assets and foreign currency liabilities expressed with the exchange rate of the reference date) with the currency amount appearing in the balance sheet. In parallel with the above, the off-balance sheet position⁴ of the bank expands by the same amount, with an opposite sign (expressed in foreign currency). Thus, the total foreign currency

¹ See Mák and Páles (2009) for more details.

² Contrary to currency repo transactions, however, the collateral function of the other currency is generally not supported with more refined collateral management instruments applied in connection with repo transactions in the normal operation of the markets (Csávás et al., 2006). In fact, the crisis strengthened the application of collateral management instruments.

³ Throughout the whole paper, the notation DEV in the formulas refers to the foreign currency (currency other than HUF).

⁴ Difference in the value of foreign currency receivables and foreign currency liabilities expressed in forints.

Chart 1

The FX swap transaction shown through the stylised bank balance sheet

(foreign currency purchase in the spot leg, HUF purchase in the forward leg)

FX SWAP TRANSACTION Deal date (0. point in time)				Swap counterparty	
	ASSETS	LIABILITIES			
1a. Spot leg of FX swap	-HUF ₀ +DEV ₀		1a. Spot leg of FX swap	}	ON-BALANCE SHEET
ON-BALANCE SHEET	-HUF ₀ +DEV ₀	0			
OFF-BALANCE SHEET	+HUF _{0T}	+DEV ₀			OFF-BALANCE SHEET
1b. Forward leg of FX swap	+HUF _{0T}	+DEV ₀	1b. Forward leg of FX swap		
	ASSETS	LIABILITIES			

Note: In the chart, HUF and DEV indicate the currency of the balance sheet items, while the lower indices of forint items indicate their amount. Of the above, the first numeral indicates the determination date of the amount, while the second one indicates the maturity date. If the date of determination and maturity corresponds, the lower index is only one numeral.

position of the bank (*on-balance sheet + off-balance sheet*) does not open *solely* as a result of the FX swap transaction. The on-balance sheet and off-balance sheet forint amounts (HUF₀, HUF_{0T}), however, do not offset each other: the two amounts differ by an amount corresponding to the yield spread priced in the forward exchange rate (forint-foreign currency).⁵

The FX swap transaction does not in itself result in foreign exchange rate exposure. Considering the total cash flow, the market value of the transaction is independent of changes in the foreign exchange rate due on the principal during the full term. The market value of the spot leg (due on principal) changes as a result of changes in the exchange rate by a rate equal to the change of the market value of the forward leg – during the full term of the transaction (Table 2). The market value of the forward leg depends on the relationship between the spot exchange rate of the forint at maturity (S_T) and the forward exchange rate (F). If the exchange rate weakens by a rate larger than the value determined by the yield spread ($r_{HUF} - r_{DEV}$) (i. e. $F < S_T$), the transaction produces a loss, otherwise it is profitable (in the case of a HUF purchase in the forward leg). This is why the forward transaction is adequate for assuming an exchange rate position (Annex 1). For determining the market value of the entire FX swap transaction at maturity, it is necessary to consider the total cash flow, that is, the future value of the spot leg's cash flows, in addition to the value of the forward leg expressed in forints. (The trader needs to draw a forint loan to cover the forint amount paid in the spot leg, while he may lend the received amount of foreign currency. In other words, the trader could have deposited the forint amount paid at the initial leg of the transaction as a forint deposit, he would have had to draw a foreign currency denominated loan on the foreign currency amount received. Thus, the difference between the forint and foreign currency yields constitutes the opportunity cost of spot cash flows from an economic point of view.)

Table 2

Market value at maturity of the total cash flow of the FX swap transaction receiving foreign currency liquidity in the spot leg

(cash flows at conclusion are expressed in future value)

Currency	Deal date	Maturity	Total
FOREIGN CURRENCY	$+1 \cdot (1 + r_{DEV}) \cdot S_T$	$-S_T$	$r_{DEV} \cdot S_T$
FORINT	$-S_0 \cdot (1+r_{HUF}) = -F \cdot (1+r_{DEV})$	F	$-r_{DEV} \cdot F$
Total	$(1+r_{DEV}) \cdot (S_T-F)$	$F-S_T$	$r_{DEV} \cdot (S_T-F)$
			Exchange rate risk due on foreign currency rate

⁵ In certain transactions, it is the forint amounts and not the foreign currency amounts of the spot and forward leg that correspond. In such case, the foreign currency amounts of the spot and forward legs differ by an amount equalling the yield spread.

For typical FX swap transactions, only the exchange rate risk linked to the foreign currency interest remains. Due to the yield spread between the two currencies, the swapped back quantity of one currency differs from the quantity swapped in the spot leg (in relation to forint/foreign currency transactions, the quantity of swapped and swapped back forints frequently differs, but remains the same in foreign currency). Thus, the total amount of the yield spread is payable in one of the currencies (forints). By contrast, for a forint/foreign currency swap transaction concluded by a domestic bank, in the event of the lending of the (other) currency received in the spot leg, the interest income actually arises in the original currency, and its value in forints is not known in advance. The value of interest payable in foreign currency, expressed in forints at maturity, may vary from the value corresponding to the forward exchange rate determined at conclusion.⁶

Owing to the structure of the FX swap transaction, it enables the swap of liquid assets (cash, account money) in different currencies through the spot leg and concurrently the hedging of the resulting change in the foreign currency position through the forward leg. As a result of the above, the transaction facilitates liquidity in the necessary denomination without a change in the original foreign currency position. In other words, the application of a currency swap transaction allows a financing instrument's currency to be changed and the financing instrument of a given currency may be synthetically replicated (credit/deposit + currency swap). At the same time, by jointly applying FX swap and spot transactions, market participants can assume a synthetic forward foreign currency position and can thereby close their existing exchange rate exposure; in such a case, the spot leg of the FX swap transaction and the spot transaction of an opposite direction neutralise each other and the residual forward leg is equivalent to a forward transaction (Annex 2).

In the course of analysing changes in the swap stock, in addition to FX swap transactions, we also examine cross-currency swap transactions. In economic terms, the general difference between these transactions and the above described FX swap transactions is that the former are typically concluded with longer maturities (FX swap transactions generally have a maturity of up to one year, while cross-currency swap transactions have a maturity of over one year). In addition, the cash flows of cross-currency swap transactions also involve the swap of interest payments in different currencies (thus, it may also be understood as a swap of bonds in two different currencies). The FX swap and cross-currency swap transactions will be denoted collectively as currency swap transactions in the remaining parts of the study.

Box 1

Pricing of FX swap transactions: within what limits should implied yields move? What levels do these approximate?

On effectively functioning markets, the forward exchange rate priced in FX swap transactions depends on three factors: the initial exchange rate, maturity and the yield spread between the two currencies and the risk premia priced in these. On the basis of the principle of covered interest rate parity, the forward exchange rate can be calculated as follows:

$$F_{HUF/EUR} = S_{HUF/EUR} \cdot \frac{1 + r_{HUF} \cdot \frac{t}{360}}{1 + r_{EUR} \cdot \frac{t}{360}},$$

where S is the HUF/EUR initial (spot) exchange rate, F is the HUF/EUR forward exchange rate, r_{HUF} is the uncovered forint interest rate, r_{EUR} is the uncovered annual euro interest rate, and t ($t = T_1 - T_0$) indicates maturity measured in days.

The value of the $F_{HUF/EUR} - S_{HUF/EUR}$ difference expressed in forints is multiplied by 100 and given in swap points. If upon quotation, the interest rate of the basic currency (EUR in this case) is lower than the interest rate of the counter-currency (HUF in this case), the swap points have a positive value (a negative value in the opposite case). On the FX swap market, the swap points expressing the yield spread are typically used (and not the forward exchange rate priced in the transaction).

⁶ This risk can (could) be avoided if the accumulated values in both currencies are (would be) swapped in the forward leg.

On the one hand, the development of swap point reflects the yield spread between the two currencies. The implied yield spread between the two currencies can be calculated from the swap point quoted for the given maturity by rearranging the above identity, which, in the case of an effectively operating FX swap market, approximates the difference between the interbank yields of the two countries with the appropriate maturities.

$$(r_{\text{HUF}} - r_{\text{EUR}}) \cdot \frac{t}{360} \approx \frac{F - S}{S}$$

If supply contracts in one of the currencies of the transaction, its yield increases, and this is also manifested in a change in the swap points. Thus, the implied foreign currency interest rate can be approximated through the difference between the domestic interbank yield with the appropriate maturity and the implied yield spread. If this were not possible, arbitrage would be possible on effectively operating markets, as the FX swap can also be synthetically produced through the combination of a loan and a deposit.⁷

In relation to transactions providing HUF liquidity in the spot leg, the difference between the priced forint deposit and the foreign currency loan interest rate is required from the (non-resident) bank which provides the EUR liquidity. Quotation of the forward exchange rate priced in this type of transaction, derived from the bid and ask yield quotations, is expressed as follows:⁸

$$F^{\text{ASK}} \leq S \cdot \frac{1 + r_{\text{HUF}}^{\text{ASK}} \cdot \frac{t}{360}}{1 + r_{\text{DEV}}^{\text{BID}} \cdot \frac{t}{360}}$$

This forward exchange rate shows the forint amount asked for by the bank quoting the FX swap (providing HUF liquidity in the spot leg) upon maturity in exchange for one euro.

In relation to transactions providing HUF liquidity in the spot leg, it pays the difference between the interest rate of the forint loan and the foreign currency deposit to the swap counterparty. Quotation of the forward exchange rate of this type of transaction from the bid and ask yield quotations is expressed as:

$$F^{\text{BID}} \geq S \cdot \frac{1 + r_{\text{HUF}}^{\text{BID}} \cdot \frac{t}{360}}{1 + r_{\text{DEV}}^{\text{ASK}} \cdot \frac{t}{360}}$$

This quotation shows the forint amount offered by the bank quoting the FX swap (acquiring HUF liquidity in the spot leg) in exchange for 1 euro.

Under normal circumstances, the forward exchange rate and swap points priced in the actually concluded transactions lies within the band between the above bid and ask quotations. The width of the band depends on the difference between the ask and bid yields prevailing on the market, which is typically determined by the liquidity of the given markets and institutional characteristics. Therefore, the band of the yield spreads derived from quotations expressed in swap points is determined by the difference between the (lowest) forint bid yield quotation and the (highest) ask euro yield quotation and the difference between the (highest) forint ask yield quotation and the (lowest) bid euro yield quotation. Otherwise, arbitrage would be possible even with price quotations.

$$r_{\text{HUF}}^{\text{ASK}} - r_{\text{DEV}}^{\text{BID}} \geq r_{\text{HUF}} - r_{\text{DEV}} \geq r_{\text{HUF}}^{\text{BID}} - r_{\text{DEV}}^{\text{ASK}}$$

For transactions with short maturity (one day and one week), this also means that the implied forint interest rates are typically found within the interest rate corridor, as under normal circumstances this corridor basically determines the lower and upper limit of the

⁷ See Mák and Páles (2009).

⁸ The market-maker bank asks for the ask (higher) forint yield on the lent forint deposits and pays the bid foreign currency yield on the foreign currency denominated loans.

yield quotations. Rearranging the above inequality to the amount of the implied yield spread and the appropriate foreign currency yields:⁹

$$\begin{aligned} r_{HUF}^{ASK} &\geq r_{HUF} - r_{DEV} + r_{DEV}^{BID} \approx r_{HUF} \\ r_{HUF}^{BID} &\leq r_{HUF} - r_{DEV} + r_{DEV}^{ASK} \approx r_{HUF} \end{aligned}$$

During normal operation of the markets, the interest rate corridor commonly defines the approximate band of short maturity (1 day – 1 week) bid and ask yield quotations, and thus the short maturity derived implied yield typically moves within the interest rate corridor.

1.2 MANAGEMENT OF COUNTERPARTY RISKS IN CONNECTION WITH FX SWAP TRANSACTIONS – LIMIT SYSTEM AND MARGINING IN GENERAL

Similar to other financial market transactions, the counterparty risk of FX swap transactions is that the bank concluding the transaction suffers a loss upon default by the counterparty, if – upon the date of the default event – the market value of the transaction is positive for the bank, i.e. it claims a receivable vis-à-vis the defaulting customer (BIS, 1998).

In terms of counterparty risk, the FX swap functions identically to a forward transaction, in view of the fact that after payment of the transaction's spot leg, the parties do not have further claims vis-à-vis each other in relation to the spot transaction. The market value of the FX swap transaction is zero at the moment of conclusion, similarly to forward transactions. The market value of the forward transaction continuously changes over the term, depending on the development of the prevailing spot exchange rate and the interest rates used for the pricing of FX swaps. On the date of maturity, for example, the value of the forward transaction corresponds to the difference between the forward exchange rate and the prevailing spot exchange rate.

If it becomes clear before maturity that the counterparty will not be able to fulfil its future obligation arising from the forward transaction, the bank must conclude the forward transaction on the market again. In certain cases, conclusion of the new transaction is only possible under less favourable market conditions, and thus the bank suffers a loss.¹⁰

We will demonstrate with the following simple example how the amount of loss arising from default depends on the forward exchange rate. Let us assume that a non-resident bank holds a short forward forint (long foreign currency) position vis-à-vis a resident bank and the resident bank files for bankruptcy before maturity. If on the date of default, the prevailing market forward forint exchange rate is stronger than the forward exchange rate priced in the transaction, the market value of the transaction for the non-resident bank is negative (Chart 2). In such a case, the non-resident bank pays the market value of the transaction to the resident bank. The non-resident bank, however, does not suffer a loss solely on the basis of the bankruptcy, as its transaction would be unprofitable even without the counterparty's bankruptcy. If, however, the prevailing forward exchange rate is weaker than the forward exchange rate of the transaction, and the transaction would hence be profitable for the non-resident, it will lose this profit and suffer a loss corresponding to the difference between the two forward exchange rates.

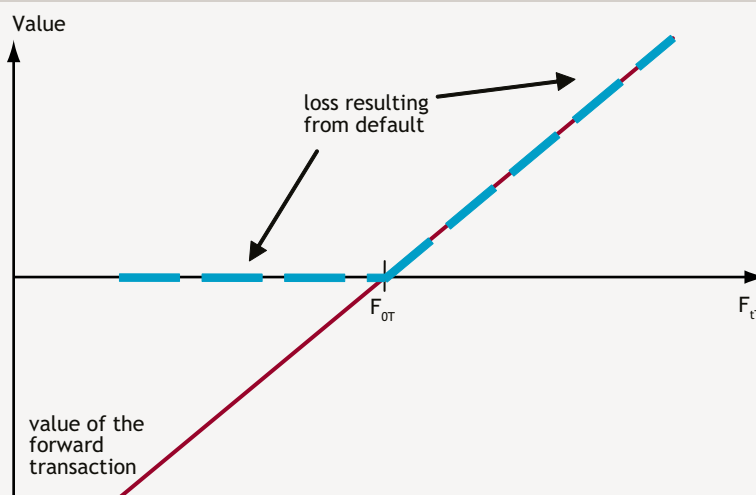
The amount of potential loss resulting from default by the counterparty is basically determined by three factors: the credit exposure amount, the probability of default and the fraction of the obligation which can be recovered from the counterparty (recovery rate). The credit exposure also depends on several factors: the *potential highest future exposure* is added to the *current exposure* (BIS, 1998).

⁹ On the basis of the above formulas, it is possible that if the average interbank euro yields exceed the bid euro yields or the euro interbank yield is less than the ask euro yields, the implied forint interest rate may move out of the band limited by the bid and ask yields. The extent of the above, however, is negligible and the moves outside the band are not typical under normal circumstances.

¹⁰ This is the so-called replacement cost risk or pre-settlement risk (BIS, 1998). This is distinguished from the settlement (Herstatt) risk, which arises if – following the transfer of one leg of the spot or forward transactions – a participant does not receive the currency to be settled at the other leg due to default of the partner (for details see Tanai, 2006).

Chart 2

Market value of the forward forint sale transaction and loss arising upon default by the counterparty as a function of the forward exchange rate



F_{0T} : forward forint/euro exchange rate determined upon conclusion of the transaction, relating to time T ; F_{tT} : forward forint/euro exchange rate at time t , relating to time T .

The current exposure reflects the amount of loss the bank would suffer if the default of the counterparty were to occur immediately. In an FX swap, this amount can be determined as the market value of the forward transaction if it is positive. Quantification of the future potential exposure is more complex; its magnitude is generally determined on the basis of statistical methods (e.g. the amount of maximum potential loss arising during the transaction with 99 per cent probability).

The most common method of reducing counterparty risk is the application of *counterparty limits*. The counterparty limit defines the upper limit that may not be exceeded by the combined current and future exposure of all instruments (including FX swaps) carrying credit risk vis-à-vis the given counterparty. In determining such limits, banks take into account the risk linked to the counterparty, e.g. on the basis of its credit rating. In addition, the country in which the counterparty bank or its owner operates may also be a factor. Banks generally set counterparty limits for each customer, but they also limit the amount of total exposure vis-à-vis counterparties belonging to the same bank group. Banks conducting risk management at the group level also take into account the consolidated exposure of a given customer vis-à-vis all members of the bank group. Banks belonging to the same bank group, however, typically do not set counterparty limits vis-à-vis each other. It is possible to apply a further breakdown of the counterparty limit of a given customer, depending on maturity. The distinction by maturity serves the purpose of preventing the absorption of most of the counterparty's total limit in connection with the conclusion of a larger transaction with long maturity (Ramaswamy, 2004).

The other method of reducing counterparty risk is for the customers to ask for collateral from each other (*collateralisation, margining*).¹¹ The rules relating to the management of collateral are generally set out in the CSA (credit support annex) attached to the ISDA master agreement which defines the cases, frequency and form of collaterals requested and also sets out the legal background for collateral management. In international practice, the use of cash collateral is most common in OTC transactions; the use of securities is less common due to various technical and institutional limitations.¹² The application of margining is less common in relation to foreign currency market derivative transactions, including FX swaps, than in the case of other derivatives (interest rate derivatives), due to their shorter maturity. Margining was primarily applied by market participants before the emergence of the subprime crisis in 2007, in relation to FX swap transactions with longer maturity and cross-currency swap transactions, although it was gradually used for shorter maturity transactions as a result of the crisis. During the crisis, without exception all central

¹¹ In addition to the partner limit system and margining, other techniques exist to reduce the partner risk, such as the netting of payments per transaction, or in the case of default, so-called close-out netting.

¹² For example, collateral received in cash is easier to mobilise and transfer for the fulfilment of collateral placement obligations vis-à-vis other customers than collateral pledged in the form of securities (BIS, 2007; ISDA, 2009).

banks maintained the collateralisation of FX swap transactions with daily margining (or, equivalently, that of covered foreign currency denominated loan transactions). Similarly to counterparty limits, margin call agreements are not concluded on transactions concluded within a bank group.

Upon a major shift in foreign exchange rates and yields, the market value of the forward leg of FX swap transactions also changes significantly. The amount of the collateral is commonly determined on the basis of the transaction's market value (mark-to-market). The current market value of a short forint forward transaction can be expressed with the following formula:

$$(F_{tT} - F_{0T}) \cdot \frac{1}{1 + r_{HUF}^{tT}}$$

where F_{0T} is the exchange rate set upon conclusion of the transaction, relating to time T , F_{tT} is the forward exchange rate at time t , relating to time T , and r_{HUF}^{tT} is the forint yield on the period between times t and T .

During the term, with changes in the exchange rate, the transaction may produce a net positive present value for one party. If the amount thereof exceeds a limit, the counterparty is required to provide extra collateral to the in-the-money position party. Commonly, the positive present value expressed in foreign currency should be deposited with the counterparty.

In defining the additional collateralisation obligation, basically three types of approaches can be distinguished:

- initially there is a (initial or maintenance) margin deposit of a *smaller amount* (which, for example, may be approximated with a maximum 1 day exchange rate change observed in the past) and this is adjusted in accordance with the daily current change of the exchange rate;
- initially there is the collateralisation of a *larger amount* (which, for example, may be approximated with the extreme values of exchange rate changes relating to longer periods observed in the past) and this is subsequently topped up or reduced only upon extremely large fluctuations in the exchange rate;
- initially *there is no* collateralisation, and subsequently collateral is required only upon extremely large fluctuations in the exchange rate.

The first method is generally considered to be more conservative (e.g. applied by central banks), while market participants frequently applied the third approach.

The application of the limit system and the practice of collateral requests represent counterparty risk management techniques that do not preclude each other. Upon their simultaneous application, the two types of risk management methods are interacting with each other, as well. If a counterparty puts up collateral in the transaction, the transaction basically does not utilise the limit that it faces, as it constitutes a covered transaction in terms of counterparty risk. And this enables the conclusion of a transaction even if the credit risk of the counterparty's transactions approximates or possibly reaches the limit. On the other hand, the contractual regulation of cases in which collateral is requested in the future reduces the amount of future credit exposure underlying the transaction. And this can further reduce the amount by which the given transaction utilises the limit of the counterparty (BIS, 1998).¹³

1.3 APPLICATION AND RISKS OF FX SWAP TRANSACTIONS

In this chapter, we examine in detail the characteristics and underlying risks of the hedging of foreign currency lending and foreign currency *based* lending with currency swap transactions and alternative strategies based on the use of swap transactions. The term net swap stock refers to the difference in the stock of outstanding transactions involving a HUF

¹³ In the turbulent period caused by the crisis, however, banks vis-à-vis which the partner limits were substantially reduced, even to zero, were not able to conclude new transactions even with the placement of collateral. That is, the practice of collateral request functioned less effectively during the crisis.

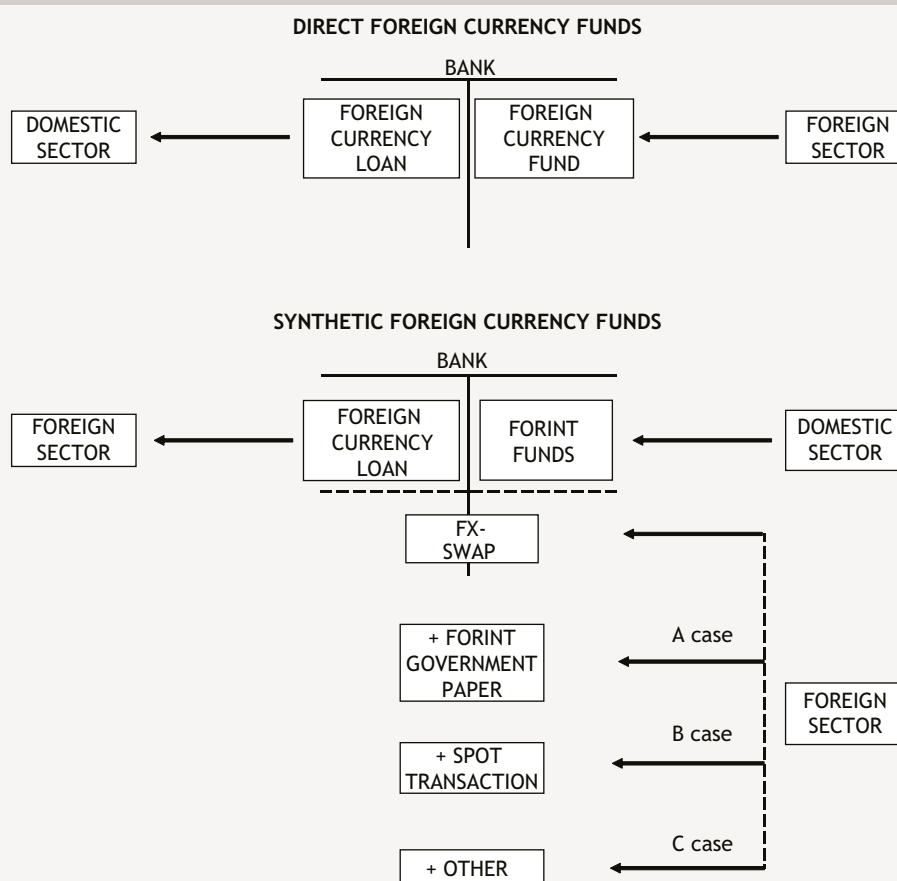
purchase in the forward leg and the volume of outstanding transactions involving a forint sale in the forward leg (from the point of view of domestic banks).

1.3.1 Foreign currency lending and foreign currency based lending using FX swap transactions

In recent years, banks financed a portion of foreign currency and foreign currency (e.g. Swiss franc) based loans with domestic currency (e.g. Hungarian forint) or other foreign currency (e.g. US dollar) denominated funds. In the framework of FX swap transactions, they borrow short-term foreign currency denominated cross-border loans and lend domestic currency (hereinafter forint) denominated loans. First, this enables the generation of foreign currency liquidity necessary for the provision of foreign currency loans (through the spot leg), and second, the cover of the exchange rate risk arising from the foreign currency receivable vis-à-vis the forint debt (through the forward leg) until the end of the maturity of the FX swap (Chart 3). The banks thereby close a portion of their on-balance sheet position arising from foreign currency lending (that is, the difference between the on-balance sheet foreign currency assets and foreign currency liabilities) with the help of FX swap transactions.

Chart 3

Simplified scheme of the comparison of raising direct and synthetic foreign currency funds in case of the foreign currency lending of a domestic bank



Note: In the case of raising synthetic foreign currency funds, the FX swap + forint government securities strategy of non-residents (case A) may be considered as synthetic foreign currency lending. The spot + FX swap strategy of non-residents practically corresponds to the assumption of a synthetic forward (short forint) position. In case C, the non-resident renews its previously concluded FX swap transactions, or carries out yield spread speculation of an opposite direction, combined with a longer term FX swap transaction, or makes available the forint funds (deposit, mortgage bond) provided to the bank through the spot leg of the FX swap.¹⁴

¹⁴ See Chapter 1.3.3.

In this manner, the entire domestic banking system produces synthetic foreign currency funds from a portion of forint funds, with the help of currency swap transactions. Most of the synthetic production of foreign currency funds at the sector level was performed by banks converting their household and corporate forint deposits to foreign currency funds through short-term currency swap transactions concluded with non-residents: the inflow of synthetic foreign currency funds contributes to the expansion of the on-balance sheet and off-balance sheet foreign exchange position. By contrast, in relation to the direct raising of foreign currency funds, the hedging of the exchange rate risk is also performed within the balance sheet: its advantage compared to hedging with FX swap transactions is that it is possible with fewer transactions. The direct and synthetic production of foreign currency funds may complement each other; they do not necessarily represent substituting forms of financing (Chart 3). Chapter 2.2. deals with the systemic comparison of the two methods of raising foreign currency funds in greater detail. The remainder of this chapter places emphasis on the characteristics and risks underlying foreign currency lending and foreign currency based lending through the use of FX swap transactions.

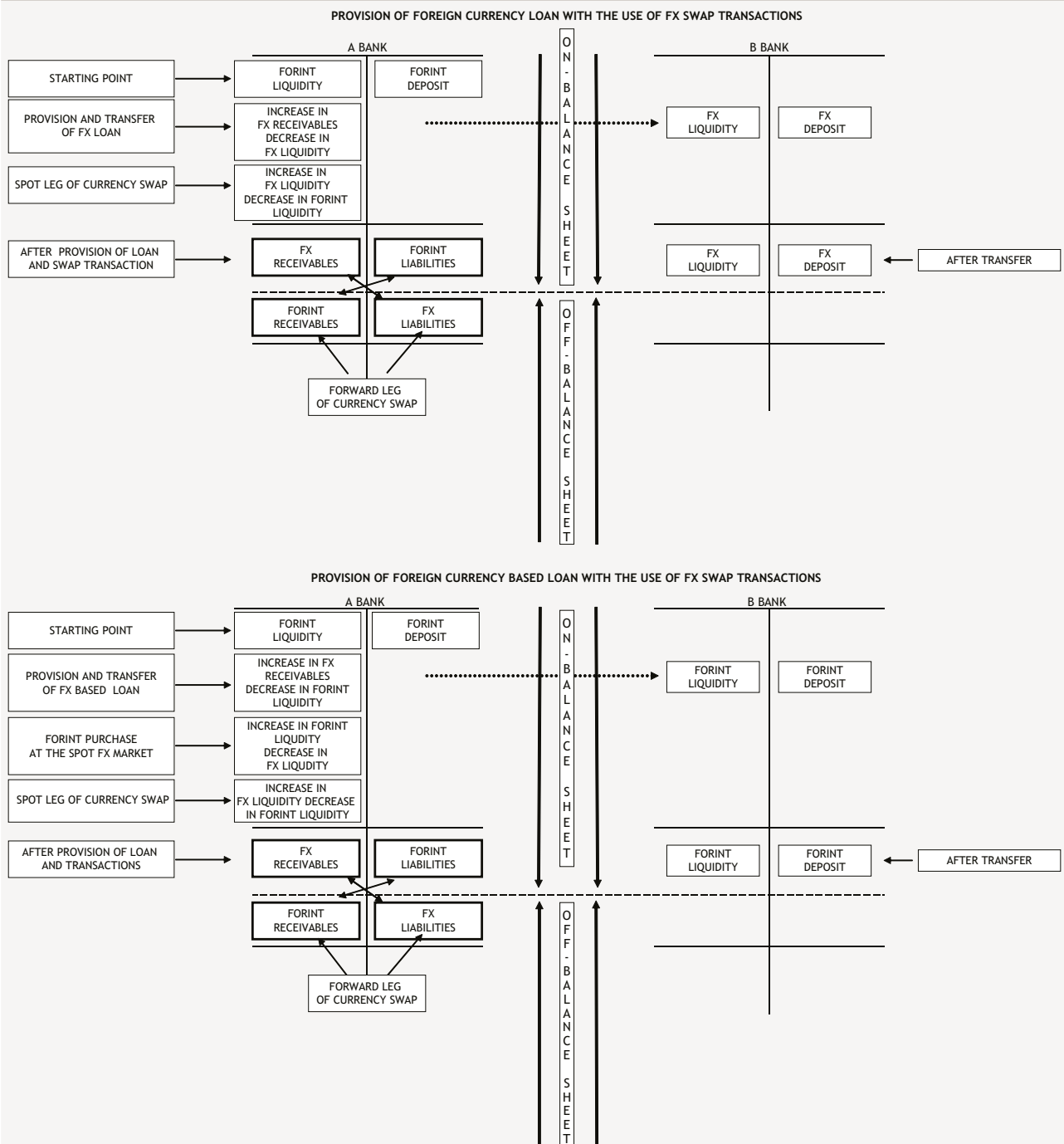
Foreign currency *based* lending differs from foreign currency lending in that in the former case, the disbursement and repayment of the loan is made in forints while in the latter case the loan is actually disbursed to customers in foreign currency.

With respect to *foreign currency loans*, too, the customer can (itself) convert the received foreign currency amount to forints (or the economic participants to whose account the transfer is made), and it can provide for the necessary foreign currency amount for repayment through the spot market sale of its forint revenue. At the sector level, the proportion of the foreign currency provided by the bank and *subsequently converted* by the economic participants into forints depends on the subsequent decisions of customers, the portfolio allocation decisions of various economic participants, macroeconomic relationships and the currency of payment obligations and revenues. A substantial portion of foreign currency originating from the provision of foreign currency loans is rechanneled into the banking system as a forint deposit (liability), that is, the economic participants convert the transferred amounts into forints.

In the case of *foreign currency based loans*, the creditor bank *automatically, directly* performs conversion into forints upon the provision of the loan and conversion to foreign currency upon repayment (either on its own or the customer's behalf). If it converts to forints the placed foreign currency amount *to the benefit of the customer* through a spot transaction concluded with another bank, the spot transaction used for conversion will not appear in the balance sheet of the given bank. If the bank converts the foreign currency amount to forints for the customer (internal conversion), the bank sells the foreign currency received in the spot leg of the FX swap on the spot foreign currency market (*on its own behalf*) and buys forints with it, and the spot transaction appears in the balance sheet of the bank (Chart 4 illustrates the latter case). The direction of this spot transaction is opposite to the spot leg of the FX swap transaction (thus, the bank concludes a spot and a swap transaction). In the case of the repayment of a foreign currency *based* loan, the transactions are of an opposite direction.

Chart 4

Provision of foreign currency and foreign currency based loans with forint funds, using FX swap transactions



Note: Foreign currency liquidity corresponds jointly to foreign currency account money and cash, HUF liquidity to forint account money and cash. In relation to foreign currency based lending, we assume that the bank concludes the spot transaction on its own and not the customer's behalf.

Source: MNB.

Box 2**Foreign currency and foreign currency based lending and the balance sheet total of the banking system**

In the case of foreign currency lending, the lending bank opens and increases a foreign currency deposit account; in case of a foreign currency based loan, it opens and increases a forint deposit account. Generally, the foreign currency amount must be transferred to another bank (lending and transfer is frequently performed in one step) and liquidity necessary for the transfer must be available. If the bank only has HUF liquidity available for this purpose, it can convert it on the foreign currency market. Upon application of a simple spot transaction, the total foreign currency position of the bank would open up, while it remains closed if an FX swap transaction is applied. This is one of the reasons why the use of FX swap transactions has gained ground.

In relation to both foreign currency loans and foreign currency based loans, the balance sheet total of the bank and the entire banking system increases at the moment of lending.

In the course of foreign currency lending:

1. it either opens a foreign currency deposit account for the customer from where the transfer is made (two steps),
2. or the transfer is made immediately to the foreign currency deposit account of another customer at the same bank (one step),
3. or the loan is transferred immediately to a foreign currency account managed by another bank¹⁵ (one step).

In the course of foreign currency *based* lending, the bank:

1. either opens a forint deposit account for the customer the forint amount is transferred from such account to another account (two steps),
2. or it immediately transfers it to the account of another customer (one step),
3. or it immediately transfers it to the forint account managed by another bank (one step).

In the first case, upon disbursement of the loan, the forint deposit account opened for the customer momentarily appears on the liabilities side of the bank's balance sheet which is cancelled immediately after the transfer. The amount of the loan, however, is transferred to another forint account; the balance sheet total increases overall on a banking system level. (The balance sheet total decreases to the original level with repayment of the loan.)

Thus, *following* the disbursement of the foreign currency and foreign currency based loan, *the banking system's balance sheet total increases*, but not necessarily on an individual basis. If the amount of the loan is transferred to a deposit account managed by a foreign bank (e.g. import), the balance sheet total of the foreign banking system increases, *that of the domestic banking system does not – following* disbursement. In this case, namely, as a result of the change caused (in itself) by the lending in the balance sheet of the domestic banking system, the banking system converts its liquid assets into loans repayable. In this case, the balance sheet total of the domestic banking system increases *prior* to the disbursement of the loan: as a result of foreign funds, for example.

With regard to the two types of loans (foreign currency and foreign currency based), the overall difference in relation to hedging with FX swaps is that currency swap transactions are applied to jointly hedge the production of foreign currency liquidity and the exchange rate risk in relation to the foreign currency loans provided by domestic banks, while these are applied to hedge the exchange rate risk in relation to foreign currency based loans – if the bank converts the foreign currency to forints on its own behalf.

¹⁵ Domestic participants, however, convert a substantial portion of revenue originating from the resulting foreign currency deposit into forints which is ex-post apparent in the composition of the asset and liabilities side of the balance sheet.

In relation to hedging with FX swap transactions, namely, the (forward) exchange rate used upon maturity for conversion is already known upon conclusion of the transaction and determined by the yield spread: in this case, the profit of the bank, as a whole, does not depend on whether the amount of exchange rate weakening (due on principal) exceeds the yield spread. In relation to both foreign currency based and foreign currency loans, the interest rate spread priced in the FX swap transactions through the forward exchange rate (see Chart 1: $HUF_{0T} - HUF_0$) partly offsets the difference between interest received on the foreign currency loans and paid on the forint deposits.¹⁶ In this case, the profit of the bank resulting from the foreign currency lending also depends on whether the bank actually priced the same interest rate spread in the foreign currency loan and the forint deposit as in the FX swap transaction.

$$HUF_{0T} - HUF_0 \approx \frac{t}{360} \cdot (r_{HUF} - r_{DEV}) \cdot S_0 \cdot DEV_0$$

However, it is important to emphasise that exchange rate risk management in the banking system with FX swap transactions is commonly performed at a “macro level” (on the level of the total balance sheet) and not for individual transactions. On a given day, transactions are basically concluded in an amount and direction determined by changes in the on-balance sheet foreign currency position (foreign currency assets-foreign currency liabilities). The net stock of swap transactions newly and previously concluded, but not matured, approximates the open on-balance sheet position of the banking system. There is no total correspondence because the off-balance sheet items do not only include the FX swap forward leg. In addition, foreign currency based loans have longer maturities than FX swap transactions, typically with annuity based repayment which further diversifies the picture.

1.3.2 Risks and characteristics of hedging foreign currency and foreign currency based lending with short-term transactions

The maturity of foreign currency and foreign currency based loans may vary significantly from the maturity of forint funds and FX swap transactions due to the primary characteristic of banking, i.e. maturity transformation. Therefore, it can be worthwhile to examine whether the strategy based on the renewal of FX swap transactions enables the hedging of the exchange rate risk due on principal in the case of maturity mismatch (Annex 4-5).

In relation to hedging with short-term FX swaps, upon disbursement of foreign currency based loans and repayment, the same procedures are applied as in the case of the FX swap and foreign currency based loan with the same maturity. The difference is related to the fact that short-term FX swap transactions need to be renewed upon maturity.

The total open position of the bank remains closed upon rollover of the FX swap transactions. Because upon rollover, the forward leg of the previous transaction and the spot leg of the new transaction appears as an on-balance sheet item; these run in opposite directions, thus the on-balance sheet foreign currency receivable remains unchanged. In parallel, among off balance sheet items, the forward leg of the previously concluded FX swap transaction is cancelled (forint receivables and foreign currency liabilities decrease). At the same time, the forward leg of the transaction concluded for its rollover increases the amount of off-balance sheet forint receivables and foreign currency liabilities. Thus, the overall amount of off-balance sheet foreign currency liabilities remains at the same level¹⁷ (see Annex 6 for more details).

The yield spread priced in the forward exchange rate of FX swap transactions compensates the interest rate spread arising from the difference between the foreign currency interest received on foreign currency loans and forint interest paid on forint deposits in the given periods. Such compensation is regarded as complete if the interest rate period (repricing period) of the forint deposits and the foreign currency denominated loans with variable interest rates corresponds to the

¹⁶ The difference between interest rates priced in foreign currency loans and forint deposits may vary from the interest rate spread priced in the FX swap transactions: the amount of such difference also depends on the degree to which domestic banks pass on costs and their increase and the margin level they apply. In this case, by interest we mean only the portion of the APR that does not cover other costs.

¹⁷ In some of the transactions concluded by market participants, the nominal amount paid in foreign currency is equal in the spot and forward leg, and the amount of foreign currency received in the spot leg in the new transactions corresponds to the amount of foreign currency payable in the forward leg of the previously concluded transactions. In this case, the priced interest rate spread is expressed by the difference between the forint amounts payable in the spot leg and received in the forward leg. However, there is also a different practice: in certain cases, the amounts payable in forints and not in foreign currency match. In such cases, the amount of the priced interest rate spread can be derived from difference in the foreign currency amounts.

maturity of the FX swaps used (rolled over) for hedging. Otherwise, the hedging of foreign currency denominated loans with FX swaps also contains interest rate (spread) risk: the difference between the interest rate priced in foreign currency denominated loans with a longer interest rate period or with a fixed interest rate and the interest rate of forint deposits may vary from the interest rate spread resulting from the rollover of FX swap transactions with shorter maturity. Because upon disbursement of the loan, the forward interest rate spread priced for the given period does not necessarily correspond to the actual interest rate spread subsequently applied, which is priced in the new FX swap transaction.

The majority of foreign currency denominated loans provided by domestic banks feature variable interest rates (typically with 1-3 month repricing), while forint deposits have short maturities. Accordingly, while the exchange rate risk is hedged with a rollover of 1-3 month FX swap transactions, the interest rate spread risk can also be neutralised. The interest rate spread risk, however, is not eliminated if hedging is performed with the rollover of FX swap transactions with shorter maturities.

Although the total foreign currency position remains stable upon the rollover of FX swaps, the *direct* HUF liquidity requirement and surplus changes due to exchange rate fluctuation.¹⁸ The change appearing in the balance sheet, caused by the exchange rate fluctuation, actually arises as a HUF liquidity requirement or surplus – as the resultant of the cash flows of the forward leg of the maturing transaction and the spot leg of the new transaction, as in this case, the forint amounts payable in the spot and forward leg may differ. In parallel with the above, the change in off-balance sheet forint receivables in an opposite direction does not affect HUF liquidity upon rollover. The off-balance sheet forint receivables change depending on the difference between the forward exchange rates priced in the previous and newly concluded swap transactions. This is basically determined by two factors: changes in the interest rate spread relating to the maturity (period) of the two transactions and the spot forint exchange rate. This means that with weakening of the forint exchange rate, the HUF liquidity requirement increases upon rollover, otherwise a HUF liquidity surplus arises as a result of the series of transactions.¹⁹

First, this HUF liquidity effect arises only on a direct, individual level.²⁰ Second, as an “offset” of the possibly arising HUF liquidity requirement, later, upon maturity of the loan, the change caused by the weakening exchange rate linked to this period arises as a HUF liquidity surplus, as the amount repayable in forints increases proportionately.²¹ In other words, the hedging of the foreign exchange rate risk of the foreign currency denominated loan is ensured over the entire maturity; although the related HUF liquidity requirements and surpluses arise as distributed over time (in case of hedging with short-term FX swaps), the sum of them is approximately zero over the entire maturity.

Thus, the hedging of longer-term variable rate foreign currency based loans (financed from short-term forint funds) with short-term FX swaps is not linked to an exchange rate risk or an interest rate spread risk,²² but rather to a rollover risk. Because in the event that the FX swap and forward markets dry up, the banking system is able to discharge the foreign currency obligations of the maturing swap transactions by downsizing its foreign currency assets or spot foreign currency market transactions. The first case runs into limits due to the longer maturity of the foreign currency assets. And the latter case leads to the opening of the total foreign exchange position of the banks and thereby to a rise in exchange rate risk; and if it occurs on a systemic level, it may lead to the weakening of the exchange rate on the currency spot market. It is also possible that the FX swap transactions can only be rolled over with a shorter maturity, which also increases the interest rate spread risk of hedging. If a margin call agreement is also concluded (credit support annex) in connection with the swap transactions, in the event of marked depreciation of the exchange rate, the collateralisation requirements commonly payable in foreign currency also rise, which increases the foreign currency liquidity risks.²³

¹⁸ In such a case, the combined amount of account money and cash on the asset side of the bank is defined as HUF liquidity.

¹⁹ See Annex 4 and 6 for more details.

²⁰ See Chapter 5.4. for more details.

²¹ See Annex 4 and 6 for more details.

²² Or to an exchange rate risk linked to foreign currency interest rates.

²³ See Chapter 5.2.

1.3.3 Alternative uses of FX swap transactions: why do the swap counterparties of banks use FX swaps?

In addition to the financing of foreign currency lending, FX swap transactions are also used to pursue other strategies. This chapter describes these alternative utilisation strategies. First, because banks providing foreign currency loans can also use FX swap transactions to set up other types of strategies, and second because it is important to assess the possible motivations of the swap counterparties of domestic banks to conclude FX swap transactions that are necessary for the hedging of the exchange rate risks of domestic banks.

1.3.3.1 Production of a synthetic forward position with FX swap transactions

FX swap transactions differ from forward transactions by virtue of the fact that upon conclusion, there is also a cash flow in the initial leg. Thus, a synthetic forward position may be produced with the use of an FX swap transaction and a currency spot market transaction in an opposite direction to the initial leg, the net cash flow, hence market value of which corresponds to that of a forward transaction (cash flow basis derivation). This means that the market value of the position at maturity depends on the relationship between the spot exchange rate of the forint at maturity (S_T) and the forward exchange rate (F). If the spot exchange rate weakens by a rate larger than the value determined by the interest rate spread ($r_{HUF} - r_{DEV}$) (i.e. $F < S_T$), the transaction produces a loss for the swap counterparty, otherwise it is profitable in case of FX swap transaction providing foreign currency liquidity in the spot leg. This is why the FX swap transaction can also be applied in assuming an exchange rate position.

Market participants conclude an FX swap transaction providing foreign currency liquidity in the spot leg to establish a synthetic forward position if they speculate on weakening of the forint exchange rate. In this case, they sell forints in the forward leg of the FX swap. This also means that domestic banks are more likely to find a swap counterparty for the financing of foreign currency lending if the market participants have strong exchange rate weakening expectations.

Participants taking up forward positions can function as stable swap counterparties of banks hedging long-term loans with short-term FX swap transactions if they continue to maintain the forward position against the forint, and as a result, they roll over the previously concluded FX swap transactions in accordance with the new market conditions. The cash flows of the forward leg of the maturing FX swap and the spot leg of the new FX swap neutralise each other, therefore a spot transaction is not necessary to close the maturing forward leg.

This strategy differs from the originally long-term forward position in that its liquidity requirement or surplus arising from the variation of the spot forint exchange rate from the forward exchange rates arises upon rollover and not upon the final closing of the position. Furthermore, this variation does not (only) depend on conditions existing upon the launching of the position and the spot exchange rate valid upon (final) closing, but (also) on conditions existing upon rollover.

Recent years have witnessed a massive increase in the popularity of carry trades, speculation exploiting the interest rate spread between currencies. In this case, the speculator provides a short-term loan in a currency (forint) with a higher interest rate and becomes indebted in the currency of the currency pair with the lower interest rate.²⁴ If non-residents conduct such activity on a wider scale by taking up synthetic forward positions with the help of FX swap transactions, the net swap stock of the banking system available for hedging the exchange rate risk declines. This strategy results in a profit if the spot exchange rate does not weaken until maturity by a rate higher than the swap point.

1.3.3.2 Hedging of forint government securities purchases and holding with FX swap transactions

Swap counterparties can use FX swap transactions not only for taking up forint positions, but also for the opposite, the closing and hedging of positions taken up previously (with the purchase of forint instruments). This is the case if non-residents receive the liquidity necessary for the purchase of forint government securities through the spot leg of the FX swap, then roll over these shorter-term transactions during the term of the government securities until maturity or up to an earlier date.

²⁴ See Mák and Páles (2009).

If the swap counterparty rolls over the FX swaps until the maturity of the government securities, the government securities holding+swap strategy is equivalent to the synthetic foreign currency loan, but it also constitutes yield speculation; the non-resident receives the fixed forint yield priced in the bond and pays the yield spread priced in the rolled over, short-term FX swap transaction. Thus, if during the term of the government securities, the forint-foreign currency yield spread declines more than the one priced into the long-term yields, the forint government securities purchase + FX swap strategy is more favourable for the investor than the direct provision of a foreign currency loan (Annex 8).

In the case of a liquid FX swap market, the flexibility of the application of FX swap transactions may represent an advantage in pursuing a forint government securities + short-term FX swap strategy: during the term of the bond, the non-resident investor may freely decide when and for how long to hedge or take up the resulting exchange rate risk with the conclusion of FX swap transactions and its closing with a spot transaction. Thus, the currency of the loan provided by the non-resident can be quickly changed with an FX swap transaction.

Banks providing foreign currency based and foreign currency loans with longer maturities are more likely to find counterparties applying the government securities + FX swap strategy in the course of the rollover of FX swap transactions, if the non-resident investors do not wish to take up the risk of the forint exchange rate or wish to hedge it.

The individual swap counterparties may also pursue mixed strategies, which is frequently motivated by differences in the maturity of the government securities, the desired period of the assumed exchange rate position and the maturities of FX swap transactions; it is possible that a swap counterparty hedges the exchange rate risk of the previously purchased government securities with a spot+swap transaction, or it does not roll over the maturing FX swap, and overall it assumes an exchange rate risk by closing the swap transaction with a foreign currency spot transaction.

It is also possible that the combined strategy applied at the sector level is the result of the various strategies pursued by individual participants of the foreign sector; for example, if certain participants only hold government securities, while others establish only a synthetic forward short forint position (with the use of a spot + rollover swap), at the sector level it appears as if the government securities purchase is hedged with FX swap transactions.

1.3.3.3 Interest rate spread speculation with FX swap transactions of different maturity

In the event of simultaneous application of opposite direction FX swap transactions with different maturities, the net swap stock and on-balance sheet position of the given participant remains at an unchanged²⁵ level under this strategy; in this case, the bank is not hedging the exchange rate risk either, but satisfies customer demand and carries out speculation on the yield spread. In this case, the gross swap stock and turnover, however, simultaneously increases in relation to the transactions in both directions.

This strategy may be appropriate for yield spread speculation, because the yield spread priced in the FX swap transaction with a longer maturity may deviate from the yield spreads (and the amount thereof) priced in rolled-over transactions of an opposite direction. Thus, if a bank expects the yield spread to decrease by a larger rate in comparison to the one priced in the current yield curves, thus in the FX swap transactions as well, it is worth concluding transactions providing HUF liquidity (forint loan) with longer maturities in the spot leg and transactions acquiring (borrowing a forint loan) HUF liquidity with shorter maturities in the spot leg (Annex 3 and 7).

²⁵ By net swap stock, we mean the difference in the stock of transactions in directions opposite to each other. The balance sheet foreign currency position may change if the interest rate spread is expressed in the foreign currency amount and not the forint amount in relation to the forward legs.

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