The International Foreign Exchange Market

The international foreign exchange (ForEx) market is an international money market where short term securities, mainly deposits, denominated in different currencies are exchanged.

The ForEx market is essentially an international network of traders in currencies.

The *vehicle currency* through which most transactions take place is the US dollar.

Exchange rates are determined in the foreign exchange markets through:

- Spot Transactions
- Swap transactions
- Forward Transactions

The financial instruments used in the foreign exchange market are Euro-deposits and Euro-currencies, i.e. deposits in currencies outside the country in which the currency is issued. A deposit in yen in New York or London is a Euro-deposit, as is deposit in dollars or euros in Tokyo, or London or Hong Kong.
Structure of the Foreign Exchange Market

- The different currencies are bought and sold through dealers located in major international banks and financial institutions.
- Dealers hold currency reserves, and their goal is to make profits by buying cheaply and selling dearly.
- The foreign exchange market is characterized by high liquidity and the trading volume is huge.
- The volume of foreign exchange transactions is much greater than the volume of transactions necessary for financing international trade.
Major International Financial Centers

- New York
- London
- Frankfurt
- Hong Kong
- Tokyo
The US Dollar and Triangular Transactions

- The US dollar is considered as a *vehicle currency* for transactions in the foreign exchange market.
- For example, to convert sterling into yen usually requires two transactions. One to convert sterling into dollars, and one to convert dollars into yen.
- Because of the *depth* (high trading volume) in the dollar market, the cost of this triangular transaction is usually less than the direct exchange of sterling for yen.
- This applies even more forcefully to lesser currencies, especially the currencies of less developed countries.
Arbitrage and Exchange Rates

In the foreign exchange market, because of arbitrage, there are no potential profits from triangular transactions in different currencies.

For example, if $S_1$ is the sterling dollar exchange rate, $S_2$ the euro dollar exchange rate, and $S_3$ the sterling euro exchange rate, and transactions have no cost, in equilibrium it can only be the case that,

$$S_1 = S_3 \times S_2$$
Transaction Categories in the Foreign Exchange Market

❖ **Spot transactions**, where the transaction closes immediately (in fact within two days). These transactions determine *spot exchange rates*.

❖ **Swap transactions**, in which the currency is simultaneously bought (sold) today and resold (re-bought) at a future date. The value of both the *spot* and the *forward exchange rate* is determined today, at the moment the swap transaction is concluded.

❖ **Forward transactions**. These are current agreements for future purchase or sale of a currency. The price, quantity and the date of the transaction are determined today.
Swap and Forward Transactions

❖ The swap rate is the difference between the repurchase rate (repo) and the spot exchange rate. The spot exchange rate and the swap rate jointly determine the forward exchange rate.

❖ Swap and forward transactions take place for 1 and 2 weeks, and for 1, 3, 6 and 12 months.

❖ We say that a currency trades at a premium when the forward exchange rate is higher than the spot rate. Otherwise it trades at a discount.

❖ The vast volume of transactions in the foreign exchange market are spot transactions between dealers. Swap transactions constitute about 1/3 of the total volume. Forward transactions constitute a very small percentage of the total volume.
Eurocurrencies and Eurobonds

- A *eurocurrency* deposit, or a *eurodeposit*, is a deposit in foreign currency outside the country issuing the currency.

- A deposit in US dollars in a London or Hong Kong or a Tokyo bank is a eurodollar deposit, while a deposit in yen at a bank in New York, London or Hong Kong is a euroyen deposit.

- Most eurodeposits are fixed interest rate deposits, with terms reflecting those available for swap and forward currency transactions.

- Most foreign exchange transactions take place through funds deposited in eurocurrencies.

- The name eurocurrency, or eurodollar derives from the dollar deposits in European banks following the transfer of US dollar funds from the United States to Europe, through the Marshall plan after the end of World War II. It has nothing to do with the single European currency the euro.

- A more recent development is so called *eurobonds*, that is bonds issued in a foreign currency outside the country of origin of this currency. Thus, a bond issued in dollars in London is a eurobond, as is a bond issued in yen in New York.
LIBOR and EURIBOR

- LIBOR (London Interbank Offered Rate) is the interest rate at which banks are willing to lend dollars, euros or pounds to the most reliable banks and non-bank enterprises that participate in the London interbank market. Loans to less reliable banks and enterprises have a higher rate than LIBOR (premium).

- The EURIBOR (Euro Interbank Offer Rate) is the rate at which banks are willing to lend euros to the most reliable banks and non-bank enterprises, participating in the euro area interbank market. Loans to less reliable banks and enterprises have a higher interest rate than EURIBOR (premium).

- The LIBOR and the EURIBOR vary depending on the loan term (from one week to 12 months), and generally depend on financial conditions in the country issuing the currency. Thus, the dollar LIBOR is close to short term interest rates in New York, whereas the euro LIBOR or the EURIBOR is close to short term interest rates in Euro Area financial markets (Frankfurt, Paris, Milan etc).
Dollar and Euro 3-month LIBOR

![Graph showing Dollar and Euro 3-month LIBOR]

George Alogoskoufis, *Macroeconomics 2018-19*
The EURIBOR
(1 month, 2 months, 3 months)
Comparing Rates of Return in Different Currencies
The Rate of Return of a Deposit in Euros, Measured in Dollars

• Suppose you are a bank or a money market fund and have 1 million $ to invest for a year.
• If you invest in a dollar deposit, at the end of the year you will get $1+i$.
• If you invest in a euro deposit, you must first convert your $1 million into euros. Thus you will invest $S$ times one million, where $S$ is the spot euro/dollar exchange rate.
• At the end of the year, you will earn $(1+i_€)S$ in euros.
• At the same time as you make the spot transaction buying the equivalent of $1$m in euros, you can make a forward transaction, selling $(1+i_€)S$ million euros in the forward market, and buying back dollars at the forward exchange rate $F$.
• Thus, at the end of the year you will use your $(1+i_€)S$ euros to fulfill your forward contract, and you will be left with $(1+i_€)(S/F)$ dollars.
• Thus, the rate of return in dollars of your euro deposit is certain and equal to $(1+i_€)(S/F)$. 
Equilibrium in the Swap Foreign Exchange Market
Covered Interest Parity

Forex traders in the *swap market*, will be buying and selling the two currencies until the rate of return of a dollar deposit is equal to the rate of return of a euro deposit, adjusted by the swap rate of a euro deposit when the euros are covered back to dollars.

This means that they will be buying and selling currencies, changing the spot and the forward exchange rate, until,

\[(1+i_\$) = (1+i_€)(S/F)\]

This equilibrium condition, is called *covered interest parity*.

If this condition is violated, expected profits can be made by borrowing in one currency and lending in the other. These expected profits will lead to *arbitrage*, i.e equilibrating trades, until the condition is satisfied and no incentives for further equilibrating trades exist. Given the speed of transactions in forex markets, the condition will be satisfied almost continuously.
The profit from a swap or forward transaction in the foreign exchange market is the difference of the forward rate from the spot rate, at the end of the term of the transaction. Consequently, at the time of agreement to the forward transaction, with the assumption of risk neutrality, it should apply that,

$$F = S^e$$

where $S^e$ is the expected future spot rate at the end of the term of the forward transaction.

Hence, under the assumption that traders are risk neutral, the forward rate is equal to the expected future spot rate. Substituting in the covered interest parity condition we get that,

$$(1+i_S) = (1+i_e)(S/S^e)$$

This equilibrium condition, is called uncovered interest parity.

In fact, a risk neutral forex trader may not use the swap market at all and concentrate on the spot market.
Comparing Rates of Return in Different Currencies

The Expected Rate of Return of a Deposit in Euros, Measured in Dollars

- Suppose you are a forex trader for a bank or a money market fund and have 1 million $ to invest for a year.

- If you invest in a dollar deposit, at the end of the year you will get $1+i_s$

- If you invest in a euro deposit, you must convert your million into euros. Thus you will invest $S$ times one million, where $S$ is the spot euro/dollar exchange rate.

- At the end of the year, you will earn $(1+i_e)S$ in euros.

- To convert them into dollars, you will need to use the euro/dollar exchange rate in a year’s time, when the euro deposit matures. You do not know what this rate will be, but you can form expectations about it.

- Thus, the expected rate of return in dollars of your euro deposit is uncertain, and equal to $(1+i_e)(S/S^e)$, where $S^e$ is the expected future spot euro/dollar exchange rate in a year’s time.

- If you are risk neutral, you will forego the swap market, unless the market future rate differs from your expected future spot rate.
Equilibrium in the Spot Foreign Exchange Market
Uncovered Interest Parity

Thus, forex traders in the spot market, if they are risk neutral, will be buying and selling the two currencies in the spot market, until the rate of return of a dollar deposit is equal to the expected rate of return of a euro deposit when the euros are measured in dollar terms.

This means that they will be buying and selling currencies, and in the process changing the exchange rate, until,

$$(1+i_S) = (1+i_e)(S/S^e)$$

Their behavior will guarantee uncovered interest parity, because if this condition is violated, expected profits can be made by borrowing in one currency and lending in the other. These expected profits will lead to arbitrage, i.e equilibrating trades, until the condition is satisfied and no incentives for further equilibrating trades exist. Given the speed of transactions in forex markets, the condition will be satisfied almost continuously.
Determining Factors of Spot Exchange Rates

Solving the covered interest parity condition and assuming that future rates as equal to expected future spot rates, we get that,

\[ S = S^e \left( \frac{1+i_s}{1+i_e} \right) \]

Three factors determine the spot euro/dollar exchange rate

First, the dollar nominal interest rate. A rise in the dollar nominal interest rate causes the dollar to appreciate against the euro, as \( S \) goes up.

Second, the euro (foreign) nominal interest rate. A rise in the euro nominal interest rate causes the dollar to depreciate, as \( S \) goes down.

Third, the expected future spot rate. An expected future appreciation of the dollar causes the dollar to appreciate immediately. An expected future depreciation of the dollar causes the dollar to depreciate immediately.
The Uncovered Interest Parity Condition and Exchange Rate Determination in the Short Run

More generally, if $S$ is the spot domestic exchange rate, measured as units of foreign currency per unit of domestic currency, $i$ is the domestic nominal interest rate, $i^*$ is the foreign nominal interest rate and $e$ is the expected future exchange rate, uncovered interest parity implies that in the short term the spot exchange rate will be determined by,

$$S = S^e \left( \frac{1+i}{1+i^*} \right)$$

Three factors then determine the spot exchange rate:

First, the domestic nominal interest rate. A rise in the domestic nominal interest rate causes the domestic currency to appreciate against foreign currencies, as $S$ goes up.

Second, the foreign nominal interest rate. A rise in the foreign nominal interest rate causes the domestic currency to depreciate, as $S$ goes down.

Third, the expected future spot rate. An expected future appreciation of the domestic currency causes the currency to appreciate immediately. An expected future depreciation of the domestic currency to depreciate immediately.
The Short Run Relation between Domestic Interest Rates and the Exchange Rate through Uncovered Interest Parity

\[ i_2 > i_0 > i_1 \]

\[ UIP (i^*, S^o) \]