

Price

A relationship between two quantities of goods.

Supply

The quantity of goods and services which participants are willing to buy at a given price.

Money

Invention conceived to aid in the simplicity of the exchange of goods and services.

Functions of money

- **Means of exchange:** exchange goods simply and easily, eliminates the need to barter in transactions
- **Unit of account:** how many units of something can be bought from proceeds of selling something
- **Store of value:** money makes it possible to postpone purchasing power

Currency

Money in circulation in an economy.

Kinds of people in the world

- First group has money (investors)
- Second group requires money (loan to buy house)
- Third group facilitates between groups one and two (bank)

Interest

The cost of renting money for a required period

Investor \rightarrow 1,000,000 \rightarrow Bank \rightarrow 1,000,000 \leftarrow Borrower

Investor \leftarrow 2% \leftarrow Bank \leftarrow 2.1% \leftarrow Borrower

Typically short-term rates are lower than long term ones, except in cases with high inflation.

Inflation

The increase in the general price level of an economy, meaning an amount of money will buy less in the future.

Exchange Rate

Example, 1.39 USDCHF is the price of a US dollar in terms of Swiss francs.

1,000,000 CHF can buy goods, services or securities to the amount of 719,424 USD.

A drop in the rate to 1.37 means an appreciation of the Swiss franc relative to USD.

1,000,000 CHF buys a greater of USD - namely 729,927 USD.

Consumer Price Index

Measure of price levels, quantifying a basket of goods typically consumed by private households, changes allow us to calculate price inflation.

Net Exports

Exports = sales of domestic goods and service to foreign countries

Imports = domestic purchase of foreign goods and services

Net exports = Exports - Imports

Positive Net Exports

Exported greater than imported causes domestic wealth increases and a net flow of income.

Balance of Payments

The total amount of money flowing from one country to another during a given period.

Current Account Deficit

A country has imported more than it has exported, leading to depreciation of said currency.

Interest Rate Parity

Domestic interest rates correspond to foreign interest rates plus the expected change in interest rates.

$$\text{Domestic interest rate} = \text{Foreign interest rate} + \text{Expected exchange rate}$$

e.g. If EURCHF is 1.5660, and CHF and EUR yields are 3.69% and 4.81% respectively then:

$$3.69\% = 4.81\% + \frac{(X - 1.5660)}{1.5660}$$

$$X = 1.5660 \times (3.69\% - 4.81\%) + 1.5660 = 1.5485$$

Money Supply Increase

If domestic central bank suddenly increases the money supply so that the market has more cash at disposal, the market will also expect the inflation rate to rise.

A long term fall in the value of the domestic exchange rate can be expected.

After the immediate announcement, exchange rates rise and domestic interest rates falls.

Booming economy

Low unemployment and high production capacity lead to higher inflation, as country is producing more than it can sell.

Higher interest rates lead to money flow into a country, increasing demand for a currency hence exchange rates increase.

Direct quote vs Indirect Quote

A direct currency quote is simply a currency pair in which the domestic currency is the quoted currency; while an indirect quote, is a currency pair where the domestic currency is the base currency.

For example, if Canada is the domestic currency, a direct quote would be 1.18 USD/CAD and means that USD\$1 will purchase C\$1.18. The indirect quote for this would be the inverse (1/1.18), 0.85 CAD/USD, which means with C\$1, you can purchase US\$0.85.

Direct Pricing Example

Compare USDSEK and USDJPY and create a SEKJPY cross rate.

$$? \text{ JPY} = 1 \text{ SEK}$$

$$\text{if } 7.1726 \text{ SEK} \rightarrow 1 \text{ USD} = 7.1726 \text{ SEK}$$

$$\text{and } 107.290 \text{ JPY} \rightarrow 1 \text{ USD} = 107.290 \text{ JPY}$$

$$\text{then } \text{SEKJPY} = \frac{107.290 \text{ USDJPY}}{7.1726 \text{ USDSEK}} = 14.9583 \text{ JPY} = 1 \text{ SEK}$$

i.e.

$$\begin{aligned} & \left. \begin{aligned} x \text{ JPY} &= 1 \text{ SEK} \\ 7.1726 \text{ SEK} &= 1 \text{ USD} \\ 107.290 \text{ JPY} &= 1 \text{ USD} \end{aligned} \right\} \begin{aligned} 7.1726 \text{ SEK} &= 107.290 \text{ JPY} \\ 7.1726(x \text{ JPY}) &= 107.290 \text{ JPY} \Leftrightarrow x = \frac{107.290}{7.1726} \end{aligned} \end{aligned}$$

Indirect Pricing Example

Find GBPCAD exchange rate from GBPUSD and USDCAD.

$$\begin{aligned} ? \text{ GBP} &= 1 \text{ CAD} \\ \text{if } 1 \text{ USD} &= 1.2236 \text{ CAD} \\ \text{and } 1 \text{ GBP} &= 1.8387 \text{ USD} \\ \text{then } \text{GBPCAD} &= 1.2236 \text{ USDCAD} \times 1.8387 \text{ GBPUSD} \\ \text{GBPCAD} &= 2.2498 \times 1 \text{ GBP} \text{ i.e. } 2.2498 \text{ CAD.} \end{aligned}$$

$$\begin{aligned} \text{i.e. } \propto \text{ GBP} &= 1 \text{ CAD} \\ 1 \text{ USD} &= 1.2236 \text{ CAD} \\ 1 \text{ GBP} &= 1.8387 \text{ USD} \\ 1 \text{ GBP} &= 1.8387 (1.2236 \text{ CAD}) \\ 1 \text{ GBP} &= 2.2498 \text{ CAD.} \end{aligned}$$

Factors that affect FX rates:

1. Inflation Rates

Changes in market inflation cause changes in currency exchange rates. **A country with a lower inflation rate than another's will see an appreciation in the value of its currency.** The prices of goods and services increase at a slower rate where the inflation is low. A country with a consistently lower inflation rate exhibits a rising currency value while a country with higher inflation typically sees depreciation in its currency and is usually accompanied by higher interest rates

2. Interest Rates

Changes in interest rate affect currency value and dollar exchange rate. Forex rates, interest rates, and inflation are all correlated. **Increases in interest rates cause a country's currency to appreciate** because higher interest rates provide higher rates to lenders, thereby attracting more foreign capital, which causes a rise in exchange rates

3. Country's Current Account / Balance of Payments

A country's current account reflects balance of trade and earnings on foreign investment. It consists of total number of transactions including its exports, imports, debt, etc. **A deficit in current account due to spending more of its currency on importing products than it is earning through sale of exports causes depreciation.** Balance of payments fluctuates exchange rate of its domestic currency.

4. Government Debt

Government debt is public debt or national debt owned by the central government. **A country with government debt** is less likely to acquire foreign capital, leading to inflation. Foreign investors will sell their bonds in the open market if the market predicts government debt within a certain country. As a result, a **decrease in the value of its exchange rate** will follow.

5. Terms of Trade

Related to current accounts and balance of payments, the terms of trade is the ratio of export prices to import prices. **A country's terms of trade improves if its exports prices rise at a greater rate than its imports prices.** This results in higher revenue, which **causes a higher demand for the country's currency and an increase in its currency's value. This results in an appreciation of exchange rate.**

6. Political Stability & Performance

A country's political state and economic performance can affect its currency strength. A country with less risk for political turmoil is more attractive to foreign investors, as a result, drawing investment away from other countries with more political and economic stability. Increase in foreign capital, in turn, leads to an appreciation in the value of its domestic currency. A country with sound financial and trade policy does not give any room for uncertainty in value of its currency. But, **a country prone to political confusions may see a depreciation in exchange rates.**

7. Recession

When a country experiences a recession, its interest rates are likely to fall, decreasing its chances to acquire foreign capital. As a result, **its currency weakens** in comparison to that of other countries, therefore lowering the exchange rate.

8. Speculation

If a country's currency value is expected to rise, investors will demand more of that currency in order to make a profit in the near future. As a result, the value of the currency will rise due to the increase in demand. With this increase in currency value comes a rise in the exchange rate as well.

Hedging Over Longer Periods for Forward Trades

spot USD CHF	1.2674	1.2679	← bid/offer.
6-month	- 84	- 80	
12-month	- 169	- 163	

$$\text{costs p.a.} = \frac{\text{premium/discount} \times \frac{\text{months}}{\text{term}}}{\text{spot}} \times 100$$

customer Sells at rate on LHS.

$$\text{6month costs} = \frac{0.0084 \times (12/6)}{1.2674} = 1.33\%$$

Premium or Discount

$$\text{discount} = \frac{1.2674 \times 1.33 \times 6}{12 \times 100} = 0.0084$$

$$\text{premium/discount} = \frac{\text{spot} \times \text{hedge cost in \% p.a.} \times \text{term in months}}{\text{no. months in year} \times 100}$$

Broken Dates Calculation

1-month swap rate: 101 points

2-month swap rate: 203 points

Spot value date on 3 March = 7 March

1-month value date = 7 April

2-month value date = 9 May

① 25 April - 9 May = 14 days

$$14 \text{ days} \times 3.4 = 48 \text{ points}$$

②
$$\begin{array}{r} 203 \text{ 2-month swap rate} \\ - 101 \text{ 1-month swap rate} \\ \hline 102 \end{array} = 3.4 \text{ points per day (approx)}$$

$$\begin{array}{r} 203 \\ - 48 \\ \hline 155 \end{array} = \text{mathematical swap rate on 3 March for 25 April.}$$

$$102/30 = 3.4$$

Currency Swap

Combination of spot buy with simultaneous forward sale.

Swap Costs Approximation

$$\text{Swap costs} = \frac{0.0034 \times 100 \times 360}{0.6740 \times 90} = 2.02\%$$

formula:
$$\text{swap costs} = \frac{\text{swap} \times 100 \times 360}{\text{spot} \times \text{term.}}$$

Swap Costs Exact Value

$$\begin{aligned} \text{Swap costs} &= \frac{(\text{Swap} \times \text{deposit rate} \times \text{term}) + (\text{swap} \times 100 \times 360)}{\text{Spot} \times \text{term}} \\ &= \frac{(0.0034 \times 5.42 \times 90) + (0.0034 \times 100 \times 360)}{0.6740 \times 90} \end{aligned}$$

Premium or Discount

If USD pays 2.5% and 1% in CHF.

Then swap rate corresponds to 1.5% CHF.

This indicates the USD trades at discount of 1.5% to CHF or that CHF has trades at a premium of 1.5% compared to USD.

Money Market Investments

Liquid funds are borrowed from or deposited with a bank for a specific period, ranging from a few hours to up to two years.

The bank's role is to determine the interest rate for this transaction.

Example

Investor buys a GBPUSD 12-month forward on the following terms:

Nominal:	1,000,000 USD
Spot:	1.8472 GBPUSD
12-month forward GBPUSD:	1.8088 GBPUSD
12-month swap rate GBPUSD:	384 pips (=2.08% p.a.)
Money market rate GBP for 12 months:	4.861% p.a.
Money market rate USD for 12 months:	2.78% p.a.

- 1,000,000 USD borrowed for one year in money market at 2.78% p.a.
- 1,000,000 USD exchanged for GBP at spot 1.8472 GBPUSD.
- The 541,359 GBP are invested in the money market for one year at rate of 4.861%.
- After one year, investor receives 567,675 GBP (spot + accrued interest).
- In return, investor delivers 1,027,800 USD, reflecting agreed forward rate of 1.8088 GBPUSD. The bank pays its loan.

$$\begin{aligned} \text{swap rate} &= \frac{\text{spot} \times \text{term in days} \times (\text{borrowing interest} - \text{lending interest})}{(100 \times \text{daily basis}) + (\text{borrowing interest} - \text{term in days})} \end{aligned}$$

Forward Rate Agreement (FRA):

A forward on a money market investment to hedge against interest risks.

$$\frac{PA \times D \times (MR - FR)}{100 \times B} \times \frac{1}{1 + \left(\frac{MR \times D}{100 \times B} \right)}$$

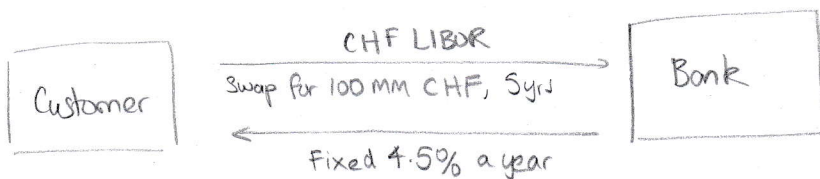
e.g. 6 x 12 FRA for 15MM EUR @ 2.1%
at end of period it is 2.5%

MR = market rate
FR = forward rate
D = no. days contractual period
PA = capital amount
B = daily basis (360 or 365).

$$\text{Settlement amount} = \frac{15,000,000 \times 180 \times (2.5\% - 2.1\%)}{100 \times 365} \times \frac{1}{1 + \left(\frac{2.5\% \times 180}{100 \times 365} \right)} = 29,228 \text{ EUR.}$$

Interest Swap:

An insurance between two parties for exchanging interest payments.



Year	1	2	3	4	5	
Interest Rate	4.5%	4.0%	3.5%	3%	2.5%	← Finance dept expects rates to fall.
Company Receives	4.5MM	4.5MM	4.5MM	4.5MM	4.5MM	
Company Pays	4.5MM	4.0MM	3.5MM	3MM	2.5MM	
Net payments	0	0.5MM	1MM	1.5MM	2MM	

Foreign Exchange and Money Markets Notes

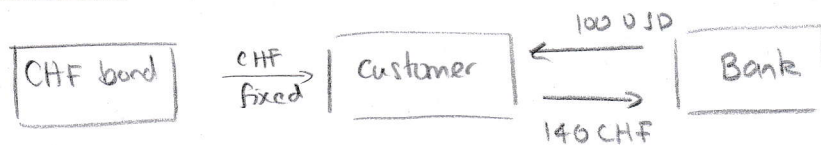
Cross Currency Swap:

On the start date both parties swap the nominal value in two different currencies at the spot rate.

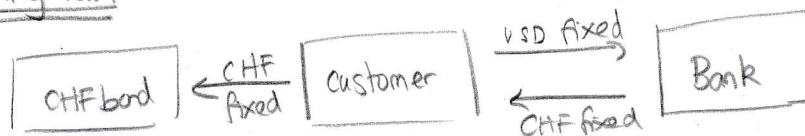
During the term of the swap, each party pays interest on the currency received.

At the end date, both parties make their last interest payment and swap the nominal values at the same conditions as on the start date.

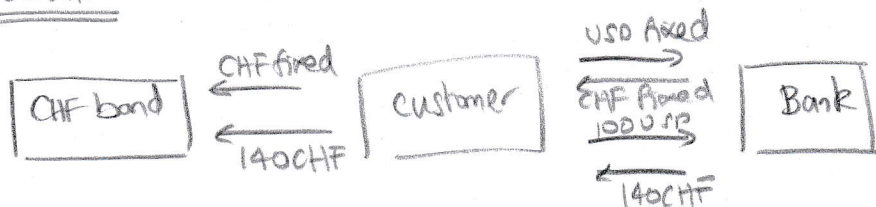
Start date



During term



On end date



Overnight Index Swap:

An overnight index swap is used to hedge against short-term assets and liabilities.

Foreign Exchange and Money Markets Notes

Repurchase (Repo) Agreements:

The sale of securities linked with the simultaneous obligation to buy back the same stocks on a specified or unspecified date.

Bank A has liquidity problem for one week and refinances with repo.

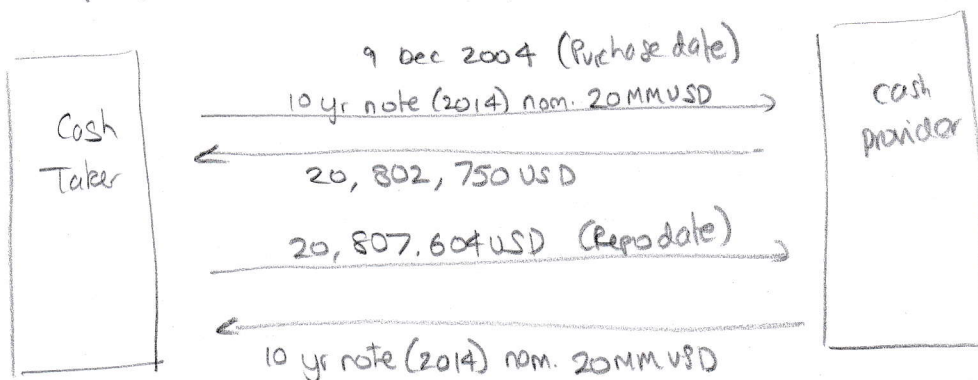
As security it offers 20MM USD in government bonds until 2014.

Bank B has surplus of funds and can offer a loan for one week,

secured with a 10-year note @ 4.75%.

A rate of 1.2% is agreed.

- Security 10-year note 4.75% 2014
- Nominal 20 MM USD
- Price 104.01375 %
- Purchase date 9 Dec 2004
- Repo date 16 Dec 2004
- Repo rate 1.2%.
- Price difference $20,802,750 \text{ USD} \times (7/360) \times 1.2\% = 4,853.975 \text{ USD}$
- Repo price 20,807,604 USD.



Collateral Swap:

Mutual exchange of securities between two parties, instead of exchanging securities against cash as in Repo.

This kind of swap is mainly used if the counterparty holds specific securities and wants to swap these for a specific period in return for other products.

This can have two causes:

1. A counterparty holds securities with aa high credit quality and wants to exchange them for some with a lower credit worthiness in order to realise higher interest
2. One party holds securities with a lower credit value and wants to swap these for securities with a better credit quality. It is prepared to pay a fee for this.



Dual Currency Product:

A structured product that combines a money market investment with a simultaneous sale of an option.

Example:

An investor buys 1m EUR in funds and wants to improve her return compared to the 3-month EUR interest rate (2.0830% p.a.). Over the next three years, she expects a stable or slightly increasing EURJPY exchange rate (spot rate at 137.70).

At maturity, two possible outcomes:

1. EURJPY at maturity is ATM or ITM (spot > strike)

⇒ investor receives capital invested plus 4.86% p.a. in EUR.

2. OTM (spot < strike)

⇒ investor gets capital invested plus 2.083% p.a. on interest converted into JPY at previously agreed strike.

