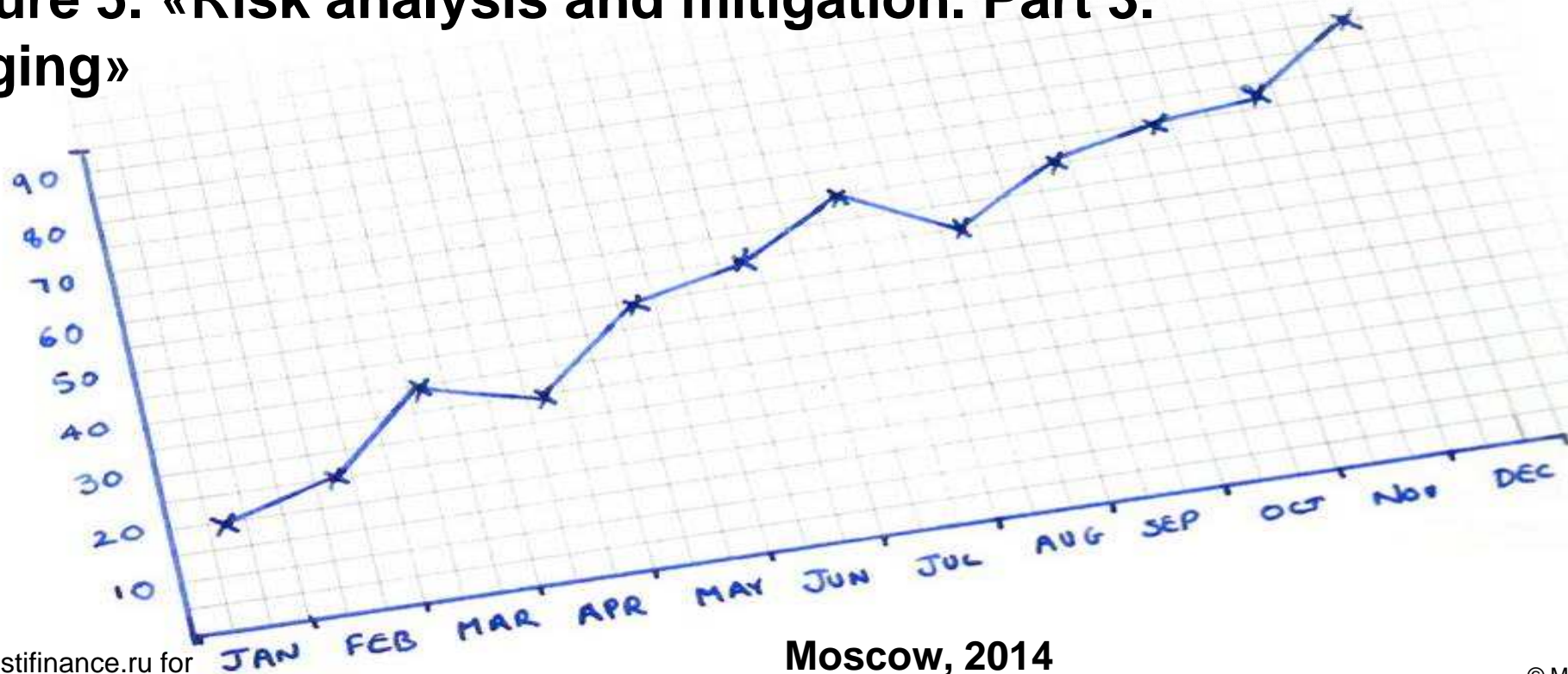


# Investment Project Management

## Lecture 5. «Risk analysis and mitigation. Part 3. Hedging»



Moscow, 2014

## Currency Risk. Swaps

If the Customer needs to cover the risk sourced by currency exchange rates floating he may buy similar financial instruments as for commodities: Futures and Options. But the operations in the FOREX market require special skills and a lot of time. The intermediaries (all Commercial banks) offer an adapted product – the **SWAP contracts** (Out-of-the-Counter, OTC). Swaps differ substantially from similar instruments (like Options): you pay fixed commission today in order to get in the future a fixed amount of the foreign currency.

Swap represents the exchange (of 2 assets, currencies, securities, loans, etc.) between two parties. The conventional Swap contract is an agreement between the Bank and its customer.

Swaps appeared in the second half of XX century as an instrument for multinational corporations who intended to avoid the currency regulations in various countries.

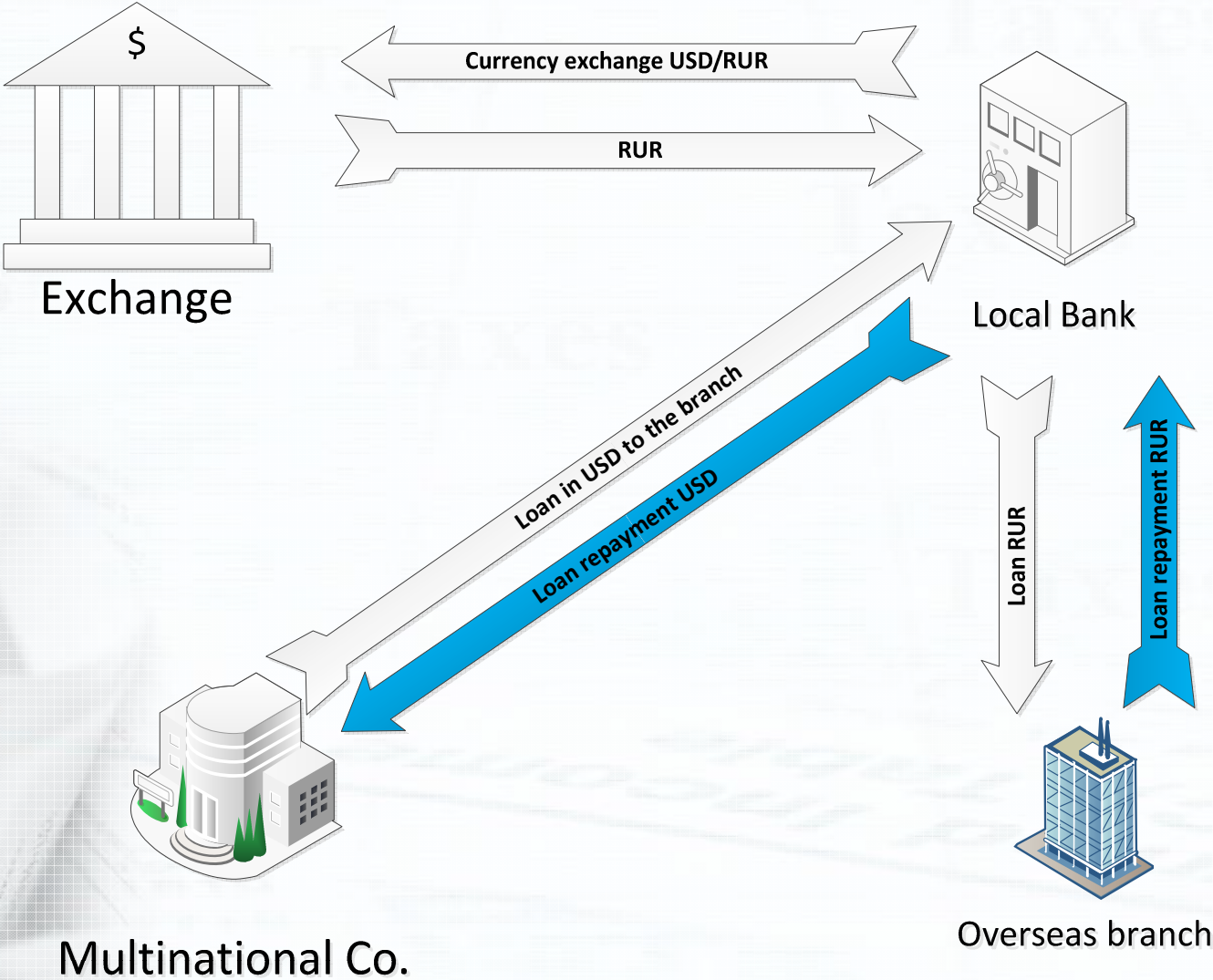
**Currency Swap** – is an operation of exchange of 2 cash flows generated by 2 assets nominated in different currencies within same time period. These flows are named **Swap legs**.

## Currency Risk. Swaps

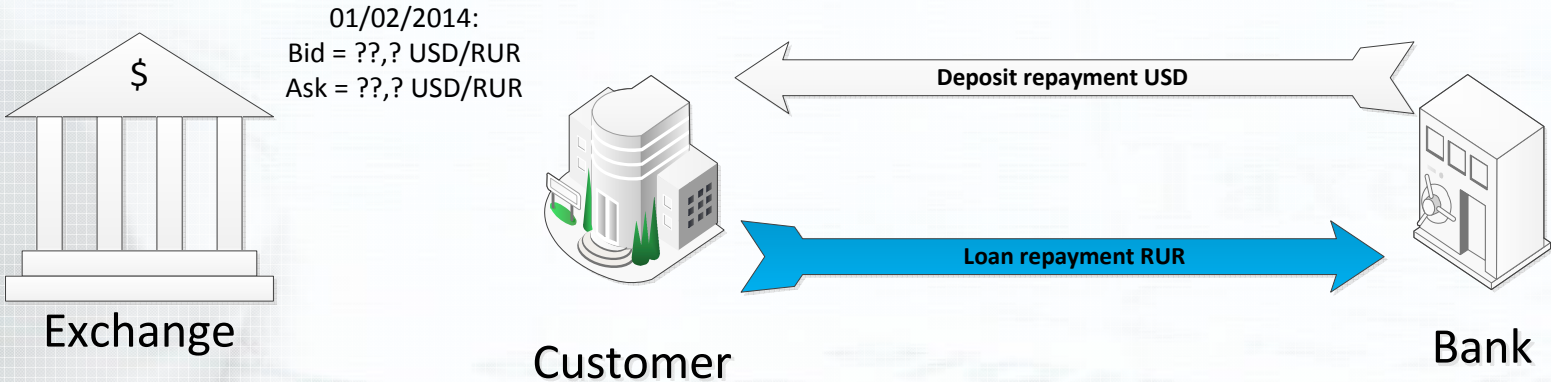
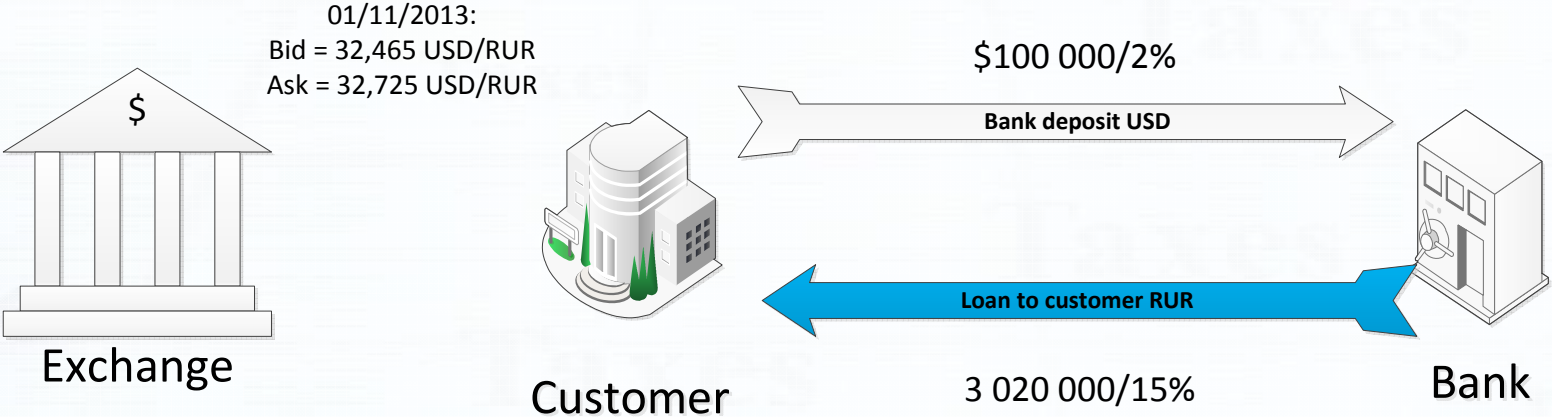
Nowadays there exist the Currency, Interest rate, Commodities, Shares Swaps, etc. If the Customer intends to buy any asset today but in some time to sell it back it's worth to create a Swap agreement with Bank. Swap fixes the risk of asset value changes in the future. As a distinction between Swaps and Futures/Options it's enough to say that the asset price has no impact to Swap: all transactions are made at the moment of the agreement signing and further changes in pricing are out of focus.



# Currency Risk. Swaps



# Currency Risk. Swaps



**Total financial result for the Customer:**

**USD 100 000** (Deposit repayment) + **USD 500** (Deposit interest USD)  
 - [**RUR 121 744** (Loan interest RUR) - **RUR 3 246 500** (Loan principal repayment RUR)]/  
 ??,?? (Exchange rate Ask) = - **USD ??? (SWAP Price)**

# Currency Risk. Swaps

## Forward exchange rate calculation:

	Y0	Y + 1	Y + 2	Y + 3
USD/RUR Rate	32,0000	36,0784	40,6767	45,8609
	$= \text{Rate RUR/USD} * ((1 + \text{USD депозит \%}) / (1 + \text{RUR депозит \%}))^t$			
Deposit USD	100 000	100 000	100 000	100 000
% on deposit USD	2%	2 000	2 000	2 000
Loan RUR	3 200 000	3 200 000	3 200 000	3 200 000
% on loan RUR	15%	480 000	480 000	480 000
	$= \text{Rate USD/RUR} * ((1 + \text{RUR кредит \%}) / (1 + \text{USD депозит \%}))^t$			
RUR/USD	0,0313	0,0277	0,0246	0,0218

# Currency Risk. Swaps

## Swap price calculation:

$$\text{Swap Price Bid} = \text{ExRate Bid} \times \left( \frac{1 + \text{RUR Deposit} \times \text{Maturity RUR}}{1 + \text{USD Credit} \times \text{Maturity USD}} - 1 \right)$$

$$\text{Swap Price Ask} = \text{ExRate Ask} \times \left( \frac{1 + \text{RUR Credit} \times \text{Maturity RUR}}{1 + \text{USD Deposit} \times \text{Maturity USD}} - 1 \right)$$

90-days swap USD/RUR	
ExRate Bid	32,4650
ExRate Ask	32,7250
USD Credit	3%
USD Deposit	2%
RUR Credit	15%
RUR Deposit	10%
Maturity USD (years)	0,2466
Maturity RUR (years)	0,2466
Day Count Convention	Actual/365

### SWAP Price

**Swap Bid = 32,4650 \***  
 $((1+0,10*0,2466)/(1+0,03*0,2466)-1) = 0,5562$

**Swap Ask = 32,7250 \***  
 $((1+0,15*0,2466)/(1+0,02*0,2466)-1) = 1,0438$

# Currency Risk. Swaps

## Swap Forward exchange rate calculation:

$$\text{Forward ExRate Bid} = \text{ExRate Bid} + \text{Swap Price Bid}$$

$$\text{Forward ExRate Ask} = \text{ExRate Ask} + \text{Swap Price Ask}$$

**Forward ExRate Bid** = 32,4650 + 0,5562 = **33,0212** – For **Sell/Buy** operation

**Forward ExRate Ask** = 32,7250 + 1,0438 = **33,7688** – For **Buy/Sell** operation

In banking practice in order to avoid confusion with words Bid & Ask for all types of Swaps (currency, interest rate, securities, commodities) the terms: «**Fixed leg**» (a side of a pair which is constant) & «**Floating leg**» (a side of a pair which is variable) are used.



# Currency Risk. Swaps

## Swap premium/interest rate calculation:

$$\text{Interest USD Bid} = \frac{\left( \frac{\text{ExRate Ask} \times (1 + \text{RUR Credit} \times \text{Maturity RUR})}{\text{Forward ExRate Ask}} - 1 \right)}{\text{Maturity USD}}$$

According to our sample: Interest USD Bid = **2,00%** (or **USD 2 000** – absolute amount of the bank premium to be paid by Customer). This amount represents “currency risk cost” for the Bank, who sells the swap. Obviously, the bank would like to get some additional return from this operation. Accordingly, the real premium amount for the Customer will be located within the frames of “empiric” market estimations.

### Summarizing rule:

$$\begin{aligned} V \text{ Swap Bid USD} &= PV \text{ USD Deposit} - PV \text{ RUR Credit} \\ V \text{ Swap Ask USD} &= PV \text{ USD Credit} - PV \text{ RUR Deposit} \end{aligned}$$

## Currency Risk. Exotic Swaps

There exist some exotic Swap contracts:

➡ **Cross-currency swap** – Swap contract representing the combination of currency and interest rate swaps: the exchange of one currency payments sequence based on floating interest rate to the sequence of another currency payments based on fixed rate.

➡ **With amortizing principles** – a row of consequent intermediary repayments in one currency with amortizing of the principal amount of the swap in another currency.

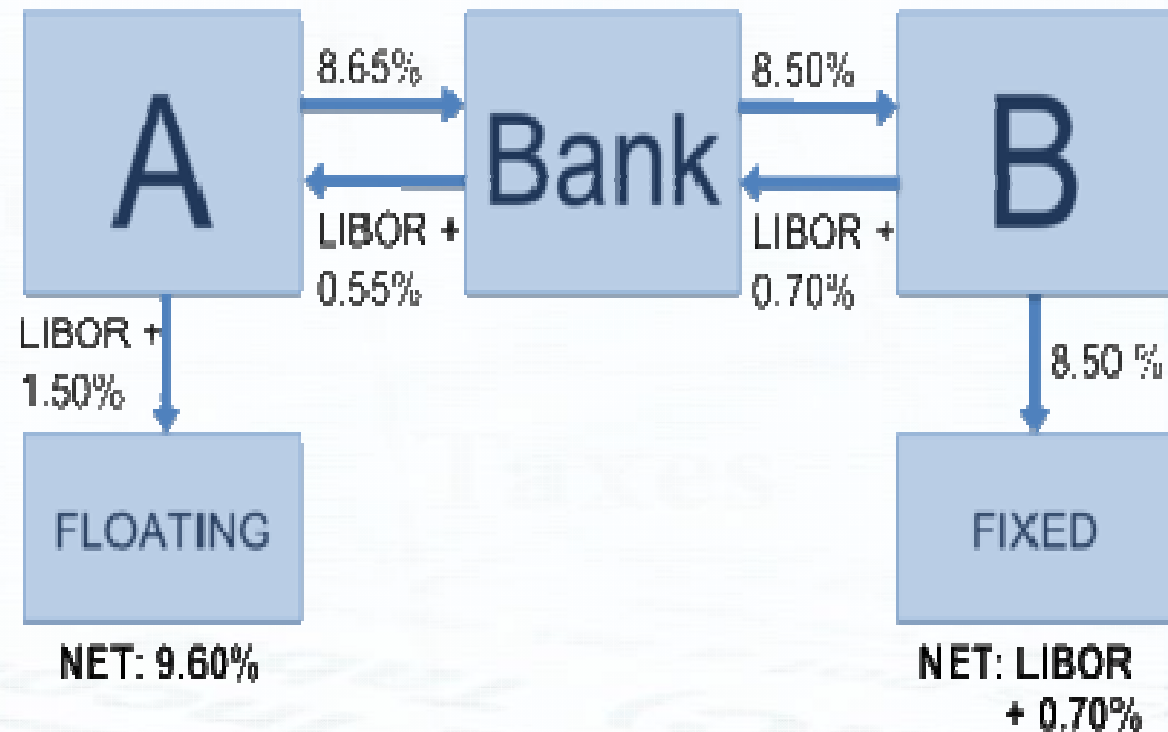
➡ **Cancelable & Extendable** – the swaps which can be cancelled or extended.

➡ **Options on currency swap** – the Options on swap contracts.

# Interest Rate Risk. Swaps

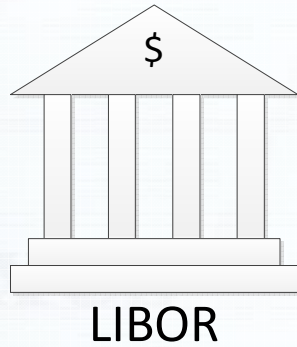
The **Interest rate swaps** are aimed to either fix a rate for a long period of time or to exchange the **Fixed** rate to the **Floating** one.

Also, the change of interest rates in the future can be hedged by special **Futures** and **Options**. But this operation requires some special skills and professional licences.



# Interest Rate Risk. Swaps

01/02/2014:  
LIBOR 1 year = 0,85%



Customer

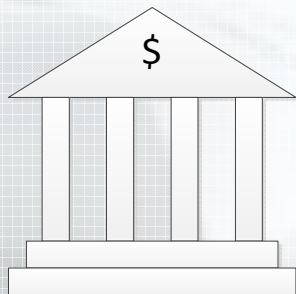
\$100 000/  
LIBOR + 2%

Loan USD

\$100 000/  
2,85%



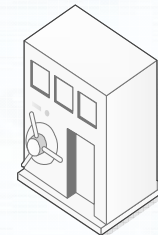
Bank



Customer

\$100 000/  
2,95%

Loan repayment USD



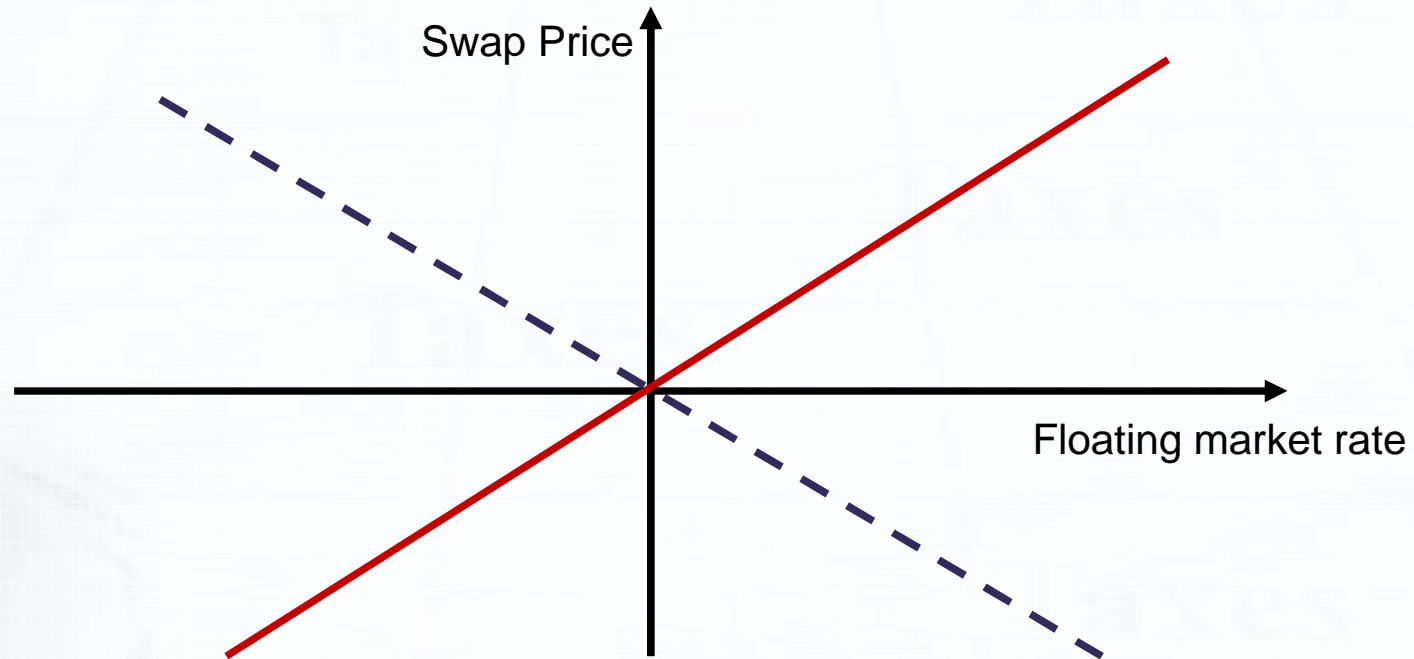
Bank

**Interest rate swap price calculation:**

$$V_{\text{SWAP Fixed}} = \text{PV floating} - \text{PV fixed}$$

$$V_{\text{SWAP Floating}} = \text{PV fixed} - \text{PV floating}$$

# Interest Rate Risk. Swaps



- Fixed rate sold, Floating acquired
- - - Floating rate sold, Fixed acquired

## Interest Rate Risk. Forward rate agreement

The special type of swap contracts is named - **FRA (Forward Rate Agreement)**. FRA is a deal OTC (out-of-the-counter) which is concluded (without margin coverage) by 2 parties for the period between 2 certain dates in the future calculated to the agreed **Notional amount**. The subject of the deal is an exchange of Fixed and Floating interest rates. It's designated as: **US\$ [6/12 – 2,5%/3% p.a.]**. That means that – the **PAYER** pays Fixed rate 3% and gets Floating rate LIBOR USD, the **RECEIVER** pays Floating rate LIBOR USD and obtains Fixed rate 2,5% for the period between 6<sup>th</sup> and 12<sup>th</sup> months since efficient date.

### FRA Settlement payment calculation:

$$\text{Payment} = \text{Notional Amount} * \frac{(\text{Reference Rate} - \text{Fixed Rate}) * \text{Maturity}}{(1 + \text{Reference Rate}) * \text{Maturity}}$$

Where:

*Payment* – Settlement payment amount;

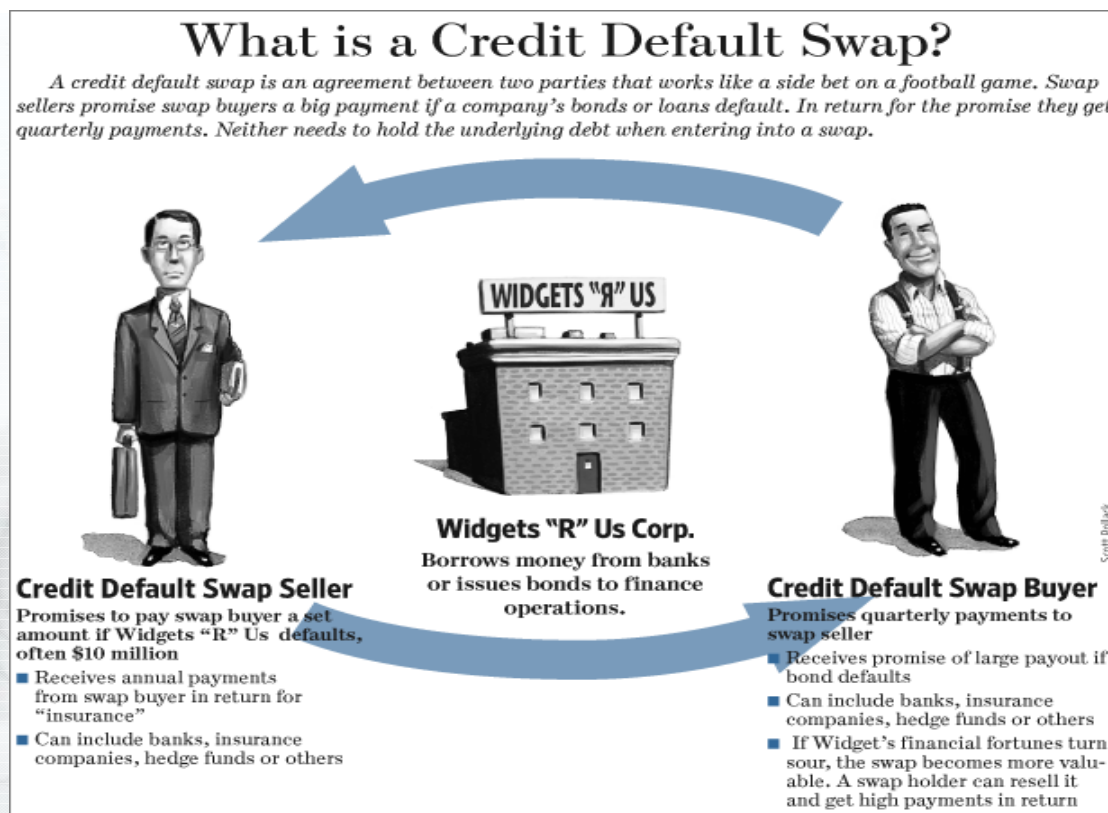
*Notional Amount* – the virtual amount which serves as a base of calculation;

*Reference Rate* – generally known interest rate (LIBOR, etc.)

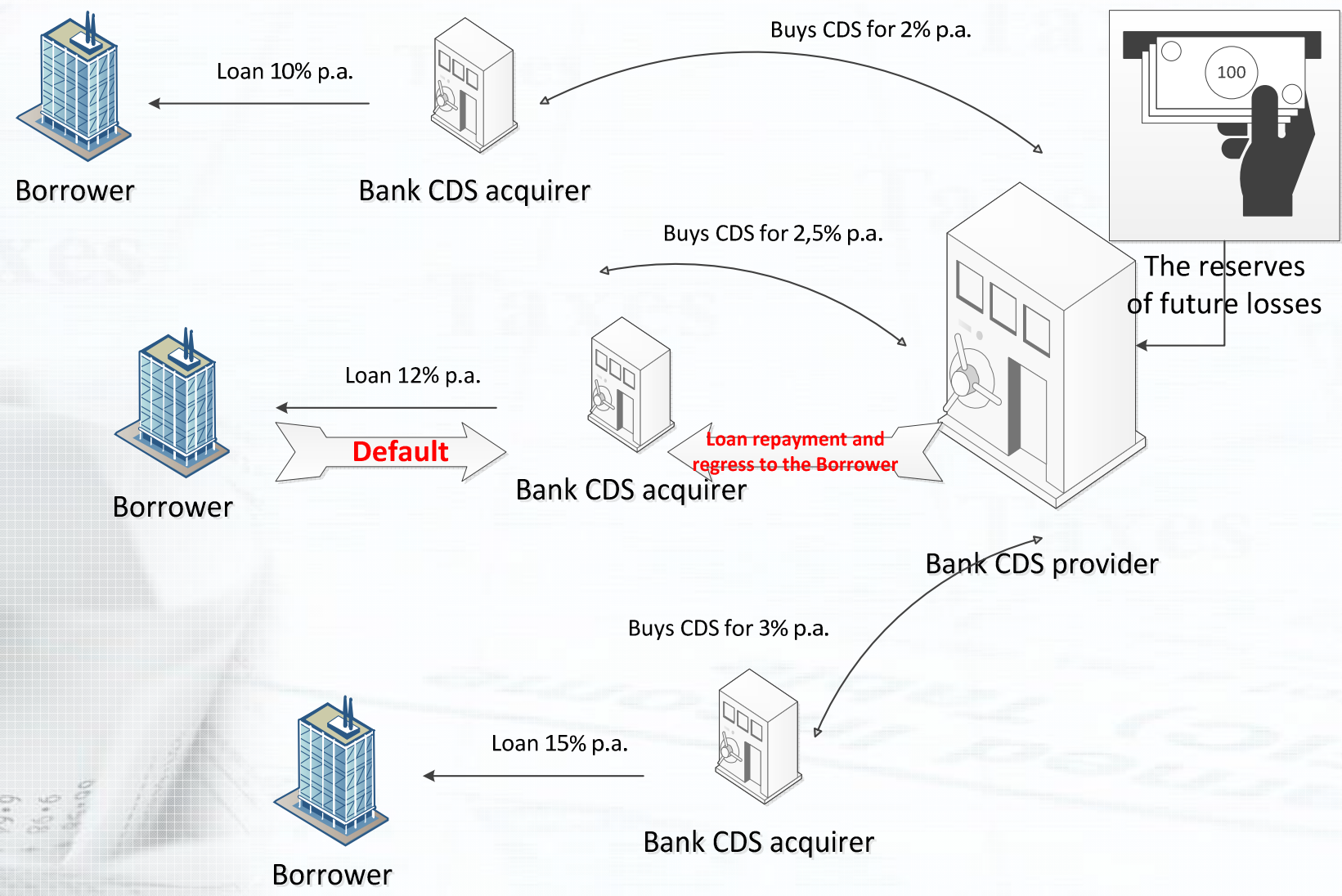
*Fixed Rate* – fixed rate established by the FRA-agreement.

# Country/Debtor Credit Risk. Credit default Swaps

The risk of counterparty non-payment or Credit risk can be mitigated by the special OTC (Over-the-Counter) securities named **CDS (Credit Default Swaps)**. These securities are issued by the Bank-provider in favour of any sort of customer (Bank-lenders, suppliers on long-term basis, etc.) which gives a right to demand repayment of principal debt **in case of Debtor's default**. The provider collects premiums in amounts linked to its analysis of the Debtor's creditability.

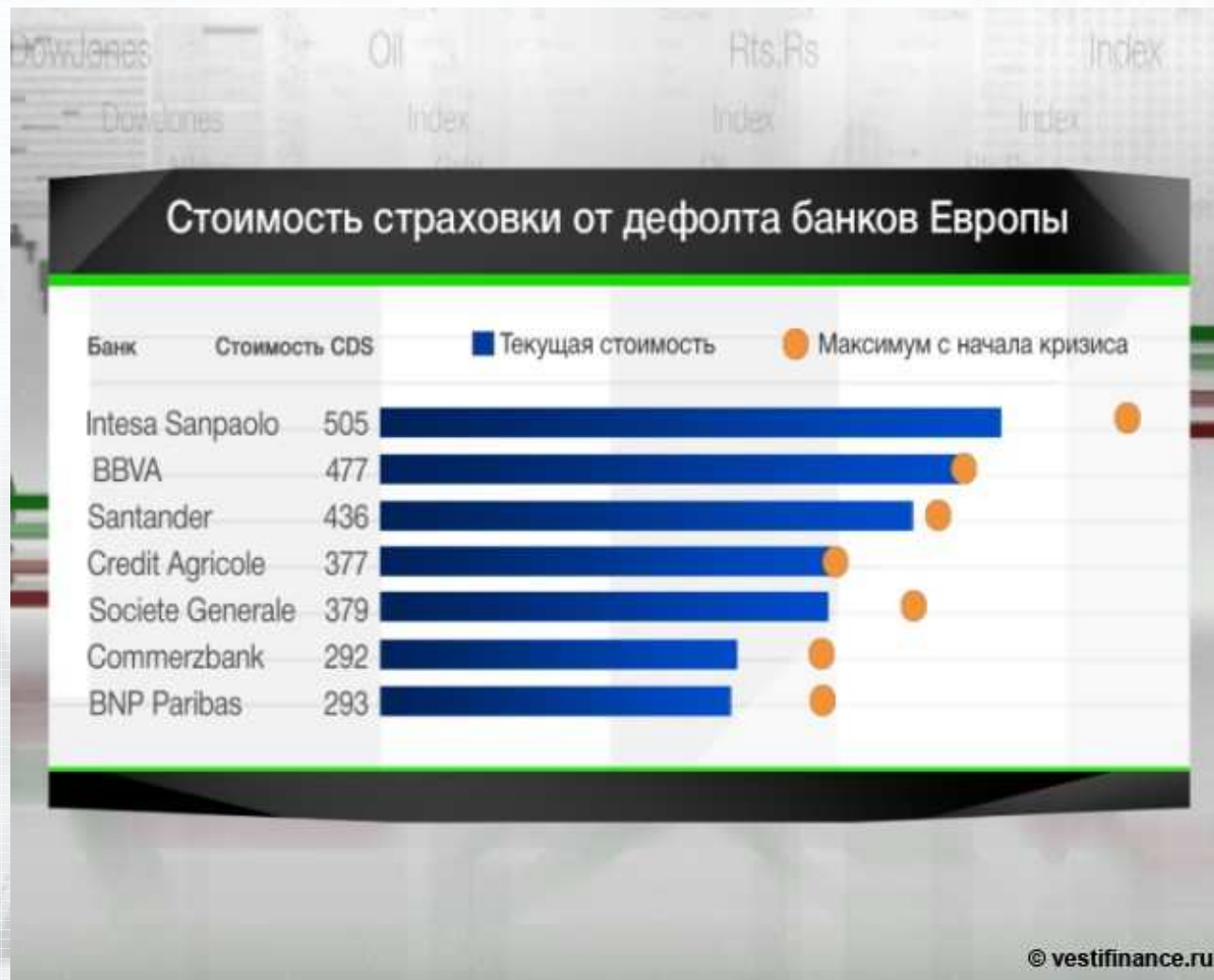


# Country/Debtor Credit Risk. Credit default Swaps





# Country/Debtor Credit Risk. Credit default Swaps



# Country/Debtor Credit Risk. Governmental Insurance

Debtor default risk also can be mitigated by using specialized governmental insurance services provided by **Export-Import Agencies**. Numerous countries grant such a coverage to their residents who exports goods/services abroad. The conditions of insurance: in case of debtor's default the Agency repays principal amount to the beneficiary. The counterparty should be preliminary approved by the Agency. Very often the Agencies take care of financing the Projects outside their countries, if the exported production distributed by their local producers.



**US Ex-Im Bank (USA), HERMES (Germany), CESCE SA (Spain), COFACE (France), EDC (Canada), EGAP (Chech), ERG (Switzerland), Ex-Im Bank of India (India), Ex-Im Bank (Taiwan), Ex-Im Bank of the Slovak Republic (Slovakia), Finnvera (Finland), IFTRIC (Israel), KUKE (Poland), MEH1B (Hungary), SAGE S.p.A. (Italy)**

# Country/Debtor Credit Risk. Commercial Insurance

The leader of commercial risks insurance is global company Euler Hermes, the subsidiary of German insurance holdings Allianz SE.

The product is **insurance** of the risk of debtor's default or its insolvency. The basis of Hermes business is regularly updated data base with 40 million of companies financial reports. The principle of insurance – is establishing of the coverage limit equal to maximal receivables of the Debtor (**Open account limit**) in favour of your company. According to the purpose of insurance the **Loss Payee** is your own company or the Bank-lender.



## Risk of security lost value. Credit default Swaps

Similarly to CDS the **Risk of the security** (represented in the public market) **decrease in value/default** can be mitigated by specific financial instruments (OTC, out-the-counter) as follows:

**EDS (Equity default swaps)** – covers a risk of certain public share decrease in value. EDS has similar structure as CDS because provides that the repayment of indemnity occurs in case of **50% fall** of share market value. It happens mostly in case of issuer default – so, EDS is very closely linked to respective CDS. The indemnity amount represents the difference between current share price and initial price at the Efficient date of EDS. EDS contracts are mostly very long-term (usually 5 years) and the EDS holder regularly pays the premium to the Provider.

**LCDS (Loan credit default swaps)** – special CDS covering public (registered) **Syndicated loans**, as well as Credit-Linked Notes (**CLN**), Loan-Participation Notes (**LPN**), etc.