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**9.**

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# **INTERNATIONAL FINANCE**

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# CONTENTS

- **FOREX**
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# FUNCTION AND STRUCTURE OF THE FOREX MARKET

**The FOREX market is a two-tiered market:**

- **Interbank Market (Wholesale)**

- about 700 banks worldwide stand ready to make a market in Foreign exchange
- Nonbank dealers account for about 20% of the market
- There are FX brokers who match buy and sell to others but do not carry inventory and FX specialists

- **Client Market (Retail)**

Market participants include international banks, their customers, nonbank dealers, FOREX brokers and central banks.

# CORRESPONDENT BANKING RELATIONSHIPS

- Large commercial banks maintain demand deposit accounts with one another which facilitates the efficient functioning of the forex market.
- International commercial banks communicate with one another with:

SWIFT: The **S**ociety for **W**orldwide **I**nterbank **F**inancial **T**elecommunications.

CHIPS: **C**learing **H**ouse **I**nterbank **P**ayment **S**ystem.

ECHO: **E**xchange **C**learing **H**ouse **L**imited, the first global clearinghouse for settling interbank FOREX transactions.

# THE BID-ASK SPREAD

- **The bid price** is the price a dealer is willing to pay you for something.
- **The ask price** is the amount the dealer wants you to pay for the thing.
- **The bid-ask spread** is the difference between the bid and ask prices.

# SPOT FX TRADING

- In the interbank market, the standard size trade is about 10 mil. USD.
- A bank trading room is a noisy, active place.
- The stakes are high.
- The "long term" is about 10 minutes.

# THE FORWARD MARKET

- A forward contract is an agreement to buy or sell an asset in the future at price agreed upon today.
- Bank quotes for 1, 3, 6, 9 and 12 months maturities are readily available for forward contracts.
- Long-term swaps are available.

## Long and Short forward Positions

- If you have agreed to sell anything (spot or forward), you are „short“.
- If you have agreed to buy anything (forward or spot), you are „blong“.
- If you have agreed to sell forex forward, you are short.
- If you have agreed to buy forex forward, you are long.

# SWAPS

- A swap is an agreement to provide a counterparty with something he wants in exchange for something that you want.
- Swap transactions account for approximately 51 percent of interbank FX trading, whereas outright trades are less than 9 percent.



**EXAMPLE:****Spot and forward quotes, mid-market rates in Toronto**

	Outright		Swap rate	
	Premium or discount, in cents			
	CAD per USD	USD per CAD	CAD per USD	USD per CAD
U.S. Canada spot	1.3211	0.7569		
1 month forward	1.3218	0.7565	+0.07	-0.05
2 months forward	1.3224	0.7562	+0.13	-0.07
3 months forward	1.3229	0.7559	+0.18	-0.10
6 months forward	1.3246	0.7549	+0.35	-0.20
12 months forward	1.3266	0.7538	+0.55	-0.31
3 years forward	1.3316	0.7510	+1.05	-0.59
5 years forward	1.3579	0.7364	+3.68	-0.05
7 years forward	1.3921	0.7183	+7.10	-3.86
10 years forward	1.4546	0.6875	+13.36	-6.94

# „PARITY RELATIONS“

## PARITY RELATIONS:

- *Purchasing Power Parity*
- *Interest Rate Parity*
- *International Fisher Effect*

**The theory of exchange rate** - an integrated system that explains the behavior of the exchange rate.

Knowledge of the exchange rate theories is a basis for the creation of the fundamental model of the exchange rates forecasting.

**Objective of fundamental analysis is to formulate economic models for forecasting of movement of exchange rate**

$$SR_{t+m,t} = f(v_{t-h,t-h-m}, x_{t-k,t-k-m}, \dots, z_{t-n,t-n-m})$$

- SR - relative change in exchange (spot) rate
- v, x, ... z - explaining fundamental factors (of the relative change)
- t, h, k, m, n - variables emphasizing viewership of fundamental factors for different time period

# THEORY OF PURCHASING POWER PARITY

- Development of the exchange rate at the foreign exchange market has a long-term trends.
- Tendencies are the expression of Purchasing Power Parity of different currencies.

## PURCHASING POWER PARITY (PPP)

- expression of individual foreign exchange rates by the basis of comparison of internal purchasing power
- ratio, which expresses the equality of purchasing powers of currencies compared

The internal price levels of the states are therefore monitored by using a consumer basket of selected goods and services

# THEORY OF PURCHASING POWER PARITY

Thesis:

***„identical goods in different countries should have the same price“***

(Law of common price)

Assumptions:

- Free movement of goods
- Market with unlimited competition
- Zero transaction costs

PPP: - **Absolute version**  
- **Relative version**

(Swedish economist **Gustav Cassel**)

# THEORY OF PURCHASING POWER PARITY

## - Absolute version

- exchange rate is derived from the **ratio of price levels**
- PPP is expressed „**statically**„

**ER** - exchange rate expressed in domestic currency units per unit of foreign currency

**$P_{Di}Q_i$**  - set of goods  $Q_i$  expressed in domestic prices and domestic currency  $P_{Di}$

**$P_{Zi}Q_i$**  - the same set of goods  $Q_i$  valued in foreign prices in foreign currency  $P_{Zi}$

$$ER = \frac{\sum_{i=1}^n P_{Di}Q_i}{\sum_{i=1}^n P_{Zi}Q_i}$$

# THEORY OF PURCHASING POWER PARITY

**Example** of absolute version of the PPP theory can be set of goods (Consumer basket) valued at CZK, which represents 30 000 CZK. The same set of goods valued at USD is 1 000 USD.

After substituting into the equation, it will be 30 CZK/USD.

(ER = 30 000 CZK/1 000 USD)

$$ER = \frac{\sum_{i=1}^n P_{Di} Q_i}{\sum_{i=1}^n P_{Zi} Q_i}$$



# THEORY OF PURCHASING POWER PARITY

## Big Mac Index

The consumption basket should reflect the consumption of the population of different countries, but can be different.

It is therefore difficult to verify the theory.

**The Big Mac Index** can serve as a simplified example of purchasing power parity calculation.

**Big Mac** is a commodity that is found in almost every country. Its price reflects the level of the price level in the country.

The Big Mac Index was created by magazine **The Economist** in **1986**.

## Big Mac Index

- the cost of a burger in McDonald's network. Big Mac contains meat, vegetables, cheese, bread and other foods. It also includes the cost of renting space and equipment, labor, and other factors.

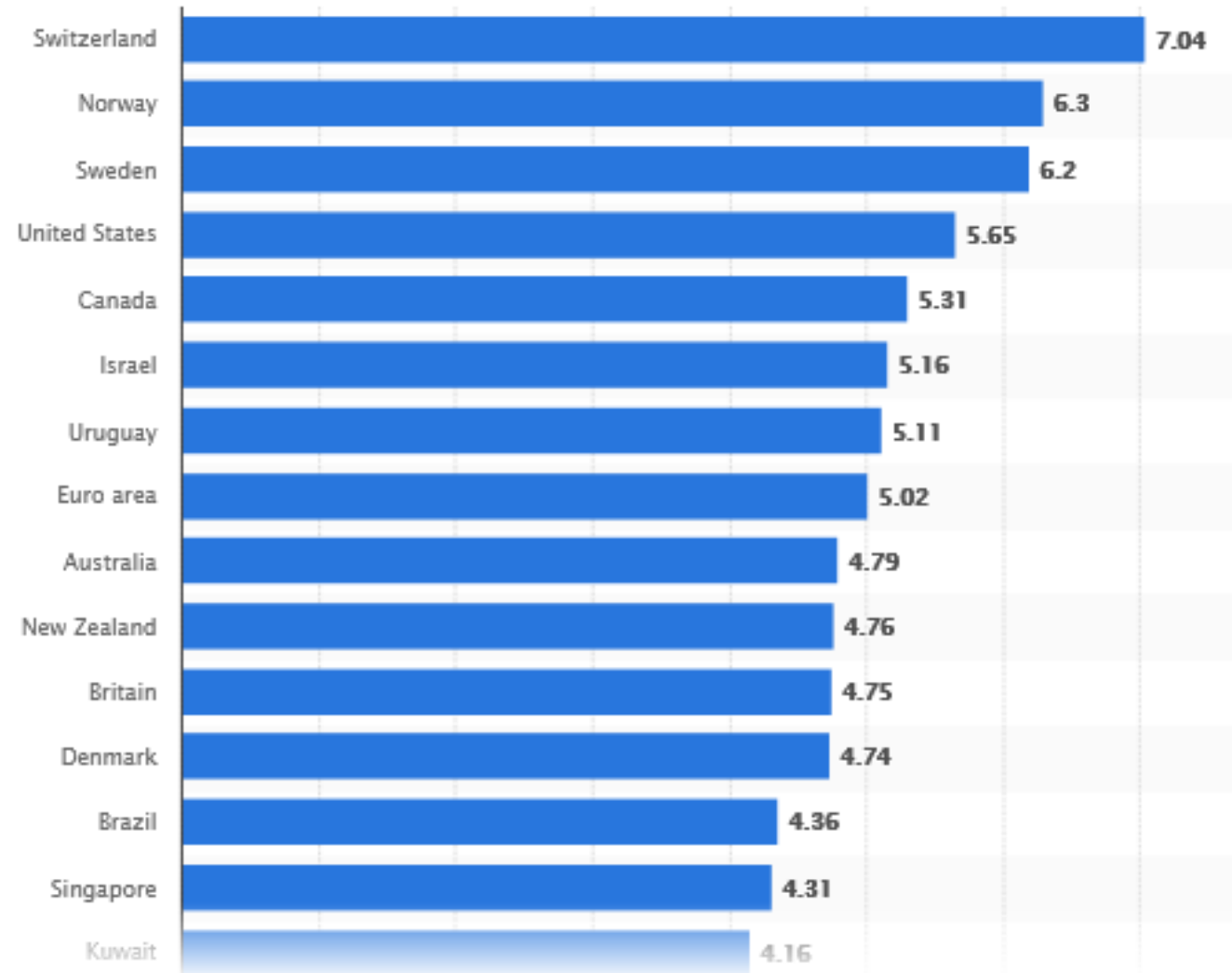
If the price of a Big Mac low then we can say that the prices in the country are low, even if the high prices are relatively high.



# Global price of a Big Mac as of July 2021, by country (in U.S. dollars)

## GLOBAL Big Mac Index

1. Switzerland (7,04 USD)
2. ...
- ...
8. **Euro area** (5,02 USD)



# Big Mac Index - SLOVAKIA

year 2020\* →

## July 2021:

Switzerland (7,04 USD)

Euro area (5,02 USD)

**Slovakia** (4,72 USD)\*2020

Czech Rep. (4,08 USD)

Lebanon (1,68 USD)

[www.globalprice.info](http://www.globalprice.info)

Russia	1.87
Scotland	4.55
Singapore	4.37
Slovakia	4.72
Slovenia	4.72
South Korea	3.82
Spain	4.72
Sweden	5.88
Switzerland	7.06
Taiwan	2.59
Thailand	3.51
Turkey	1.3
UAE	4.02
USA	5.67
Uruguay	4.1
Vietnam	2.91

# THEORY OF PURCHASING POWER PARITY

## - Relative version

- It focuses not on the basket of goods, but on the percentage changes in prices during the period, expressed as **price indexes**
- A new equilibrium exchange rate adjusts to the **inflation differential** (it means changes in the annual inflation rate in the compared countries)
- "**Dynamic**" view of exchange rate

$ER_t$  - equilibrium exchange rate in the base period

$ER_{t+1}$  - equilibrium exchange rate in the period (t + 1)

$P_D(P_Z)$  - annual inflation rate in domestic (foreign) country

$$ER_{(t+1)} = ER_{(t)} \frac{1 + P_D}{1 + P_Z}$$

# THEORY OF PURCHASING POWER PARITY

## Example:

- The price of beer in Czech republic increased by 9%
- The price of beer in GB increased by 5%
- Exchange rate of the British pound in the base period is 50 CZK/GBP

$$ER_{(t+1)} = 50 * \frac{1 + 0,09}{1 + 0,05} = 50 * 1,038 = 51,900 \text{ CZK/GBP}$$

inflation differential

Appreciation of the GBP =  $(51,900 - 50) / 50 = 0,038$

Depreciation of CZK =  $(50 - 51,900) / 51,900 = - 0,037$

# THEORY OF PURCHASING POWER PARITY

**Inflation differential** corrects the nominal exchange rate on the real exchange rate.

**According to the theory of PPP** - PPP is understood as a natural equilibrium level of exchange rate.

## Objections to the theory:

- PPP is unable to explain short-term movements of courses
- The overall level of prices of the country includes all types of goods and services, but only some of them are subject of international exchange of goods
- The definition of inflation is problematic

# PURCHASING POWER PARITY, IMPORT DUTIES, IMPORT CONTINGENTS AND PRO-EXPORT TOOLS

Factor	Demand for foreign exchange	Offer of foreign exchange	Market exchange rate	PPP
<b>Import duty</b>	decrease	slight decrease	Appreciation	Depreciation
<b>Import contingents</b>	decrease		Appreciation	Depreciation
<b>Pro-export tools</b>		increase	Appreciation	Depreciation

Impact of budgetary instruments on market exchange rate and recalculation by PPP.



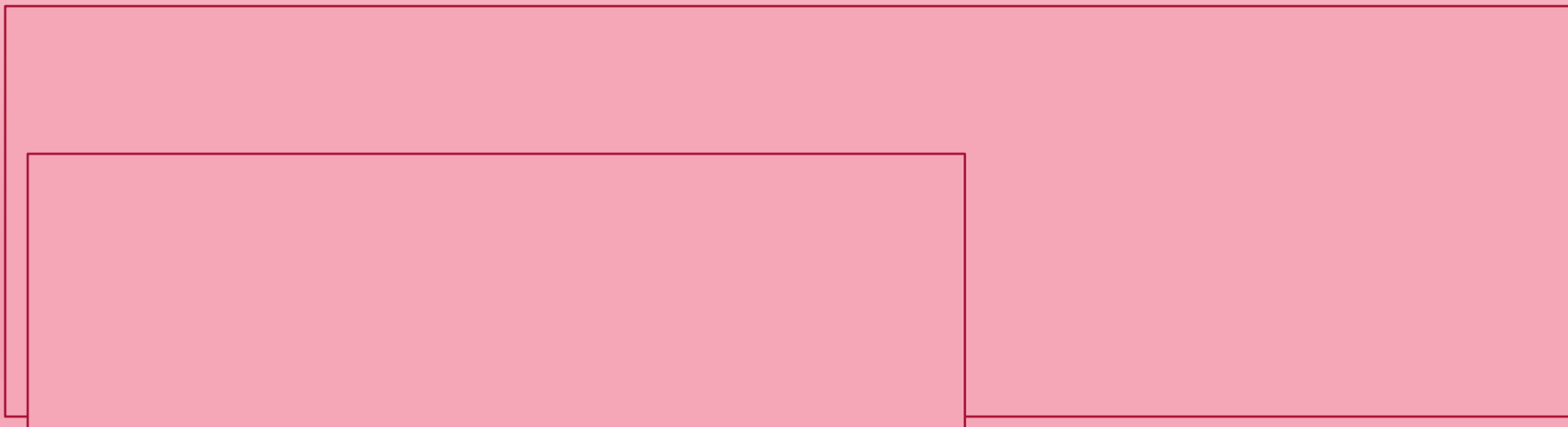
## EXERCISE 1:

Company dealing with forecasting the exchange rates published expected inflation rate for the Czech Republic and Germany for the following five years.

Expected inflation rate in Czech Republic is 7% p.a., in Germany 4% p.a.

When the current exchange rate is 41,5362 CZK/EUR, what will be the exchange rates over the next five years?

(domestic country – Czech Republic; foreign country – Germany)



# PURCHASING POWER PARITY AND ERDI

## ERDI - exchange rate deviation index

- it is the deviation of the nominal exchange rate from the exchange rate in purchasing power parity.

## EXCHANGE RATES ARE DIVIDED:

- Nominal** - Exchange rates (ER) of the national currencies expressed in a foreign national currency (International statistics they mostly expressed in USD)
- Effective** - Expression of the ER of the national currency in the use of 'floating'
- Real** - nominal exchange rates corrected by inflation differences

## **ERDI** - exchange rate deviation index

ERDI - expresses the rate of overvaluation or undervaluation of the actual nominal exchange rate from the exchange rate calculated with the absolute version of purchasing power parity.

When the country is more advanced and richer, its exchange rate is higher than purchasing power parity.

Countries with undervalued currency are attracted for tourist, sell commodities cheaply, and increase their competitiveness.

# THE REAL EXCHANGE RATE THE REAL EXCHANGE RATE INDEX

- **The real exchange rate**

$$I_{\text{RER}} = (SR_{t+n}/SR_t) * (1 + i_{Z(t,z+n)} / 1 + i_{D(t,t+n)})$$

- **The real effective exchange rate**

(REER) calculated on the base of the producer price index is one of the indicators of changes in the price competitiveness of domestic production to foreign

# THE EXCHANGE RATE IS INFLUENCED BY FUNDAMENTAL FACTORS

- balance (imbalance) of balance of payments,
- equilibrium of balance of current payments,
- Inflation differential and interest rate differential,
- change of money supply,
- the growth rate of the national income

**+ the expectations of the subjects of the foreign exchange market, monetary policy and other factors**

# INTEREST RATE PARITY

**PPP** - explains exchange rate movements in long-term period

**IRP** - explains short-term exchange rate movements

# INTEREST RATE PARITY

**PPP** - the theoretical condition of equilibrium on the international market of goods

**IRP** - theoretical condition of equilibrium in the international capital market

IRP is based on the thesis:

*„If there is free movement of capital, investors seeking to achieve the same profits from its assets, may be denominated in any currency.“*

**Investor when investing abroad must be guided by two factors:**

- a) by interest rate in the home country ( $IR_D$ ) and abroad ( $IR_Z$ )
- b) by exchange rate (ER) /current and expected/



## EXERCISE 4:

### IRP – exercise – entering data:



6 months to the payment for  
a factor of production (barley)  
(price 1 mil. GBP)

the possibility  
of short-term  
investments

**in GB (Z)**

$$IR_D = 9 \% \text{ p.a.}$$

$$IR_Z = 5 \% \text{ p.a.}$$

$$ER = 50 \text{ CZK/GBP}$$

$$ER^e = 50,976 \text{ CZK/GBP}$$

## EXERCISE 4:

### IRP – exercise – results:

#### 1) In CR

investment of 1 million. GBP in short-term securities in the money market in the Czech Republic

Income after 6 months  $IR_D/2 = 6$  months period

$$K * ER * (1 + IR_D/2) =$$

$$1 \text{ mil. GBP} * 50 \text{ CZK/GBP} * (1 + 0,09/2) = 52,25 \text{ mil. CZK}$$

#### 2) In GB

(The company will follow not only  $IR_z$  in GB, but also the expected exchange rate  $ER^e = 50,976 \text{ CZK/GBP}$ )

Income after 6 months

$$1 \text{ mil. GBP} * (1 + 0,05/2) * 50,976 \text{ CZK/GBP} = 52,25 \text{ mil. CZK}$$

***Both variants mean the same income for Czech company (52,25 mil. CZK)***

***This is due to balancing the market in the form of "interest rate"***

# UNCOVERED INTEREST RATE PARITY

Condition: *„Expected change of exchange rate ( $ER^e$ ) should approximately correspond to the interest rate differential.,*

$$\frac{ER^e - ER}{ER} = \frac{(1 + IR_D) - (1 + IR_Z)}{1 + IR_Z}$$

According to this, the market is in equilibrium  
(both investment strategies are equivalent)

/0,0195 – 0,0195/

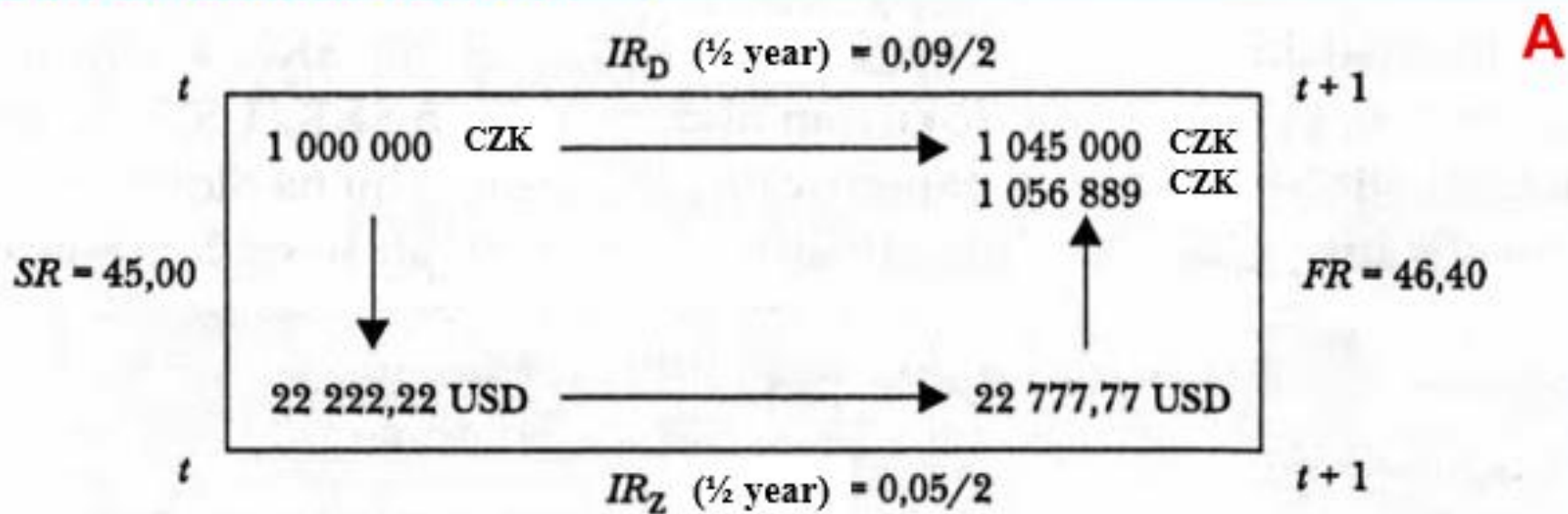
$$\frac{50,976 - 50}{50} = \frac{\left[1 + \left(\frac{0,09}{2}\right)\right] - \left[1 + \left(\frac{0,05}{2}\right)\right]}{\left[1 + \left(\frac{0,05}{2}\right)\right]}$$

# COVERED INTEREST RATE PARITY

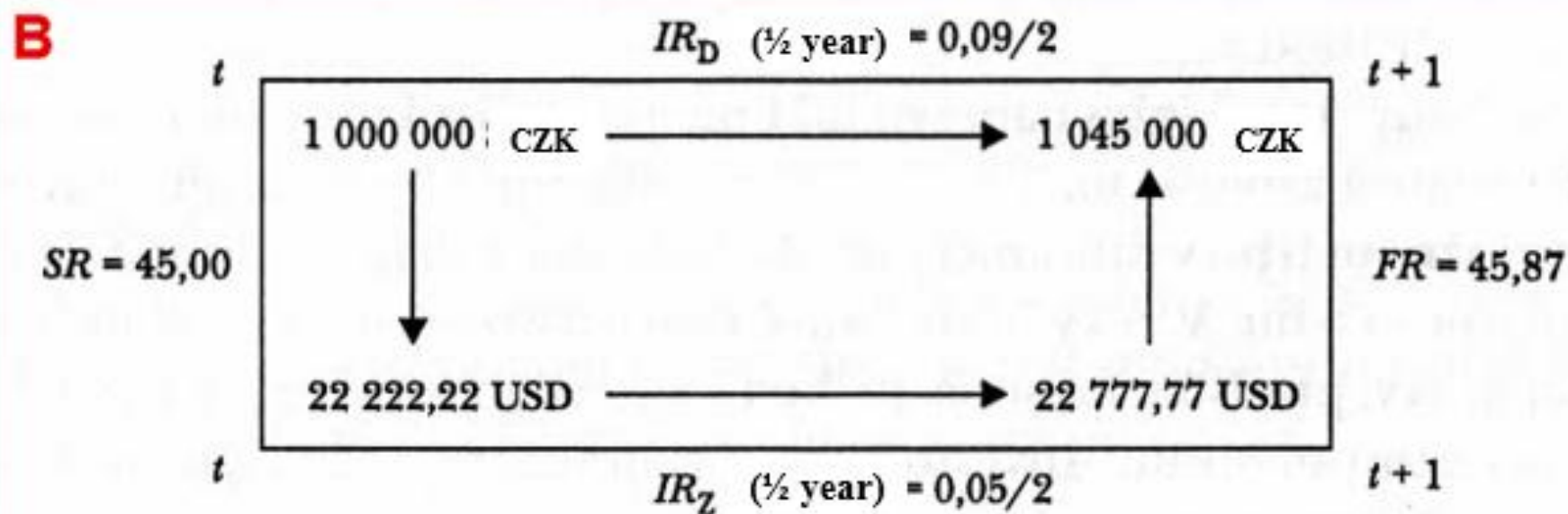
Condition: *„Nominal rate of investment, which is secured or covered against interest rate risk will be the same in all countries,,*

If this is not true  **covered interest arbitrage**

## Covered Interest rate parity



## Interest rate parity



# INTEREST RATE DIFFERENTIAL (IRD)

$$\frac{FR}{SR} = \frac{1 + IR_D}{1 + IR_Z} = IRD$$

$$(FR/SR) - 1$$

It expresses forward premium (+)  
or forward discount (-)

$$45,87/45 = 1,0193 - 1 = 0,0193$$

With the forward premium 1,93% ( $0,0193 * 100$ ) is income from domestic and foreign securities for Czech investors the same.

## EXERCISE 5:

### IRP – exercise – entering data:

Company exports products to Canada. Company will have to pay for raw materials after 6 months. Company has 1 mil. DKK at the account. Company wants to invest these money in the short term. Company must decide whether to invest in short-term securities in Denmark or in Canada.

**Annual interest rate – Denmark = 9% p.a.; in Canada = 5 % p.a.**

**Exchange rate: SR = 4 DKK/CAD; FR = 4,25 DKK/CAD**

- a) Describe possible cash flows
- b) At which forward rate the interest rate parity arise?

## EXERCISE 6:

The annual interest rate in GB was 12% in the USA 9%.

- a) If the current exchange rate is 1,63 USD/GBP, which is the expected exchange rate after one year?
- b) Suppose that the future spot rate in USA will be reduced to 1,52 USD/GBP due to changes in inflation expectations. What should be the interest rate in the USA?



**SR** - spot rate

**FR** - forward rate

**SR<sup>e</sup>** - expected spot rate

Determinant of the expected spot rate is the forward rate.

# FISHER EFFECT

According to Fisher, ***the nominal interest rate (IR)*** consists of a ***real interest rate (IR<sub>R</sub>)*** and the ***expected inflation rate (p<sup>e</sup>)***.

$$IR = IR_R + p^e$$

$$1 + IR = (1 + IR_R) * (1 + p^e)$$

The simple form of the Fisher equation:

$$IR_R = IR - p^e$$

## EXERCISE 7:

If an investor invests 1000 EUR with 3% p. a. expected interest rate and inflation 4%, how much will be required in the future to return?

$$1000 * (1+0,03) * (1+0,04) = 1000 * 1,03 * 1,04 = 1071 \text{ EUR}$$

# INTERNATIONAL FISHER EFFECT

Argument:

***„nominal interest rate differential of two countries is the sum of the differentials of the real interest rates and of the differential inflation expectations“***

$$IR_D - IR_Z = (IR_{D,R} + p^e_D) - (IR_{Z,R} + p^e_Z) = (IR_{D,R} - IR_{Z,R}) + (p^e_D - p^e_Z)$$

# INTERNATIONAL FISHER EFFECT

**IFE** - compares interest rate changes and exchange rate changes for two countries.

According to IFE, low-inflation currencies will appreciate relative to higher-inflation currencies.

The Fisher effect combines purchasing power parity theory and interest rate parity theory and seeks to eliminate their shortcomings.

## THE FOLLOWING EQUATION ARE VALID

a)  $ER = P_D - P_Z$

b)  $ER^e = P_D^e - P_Z^e$

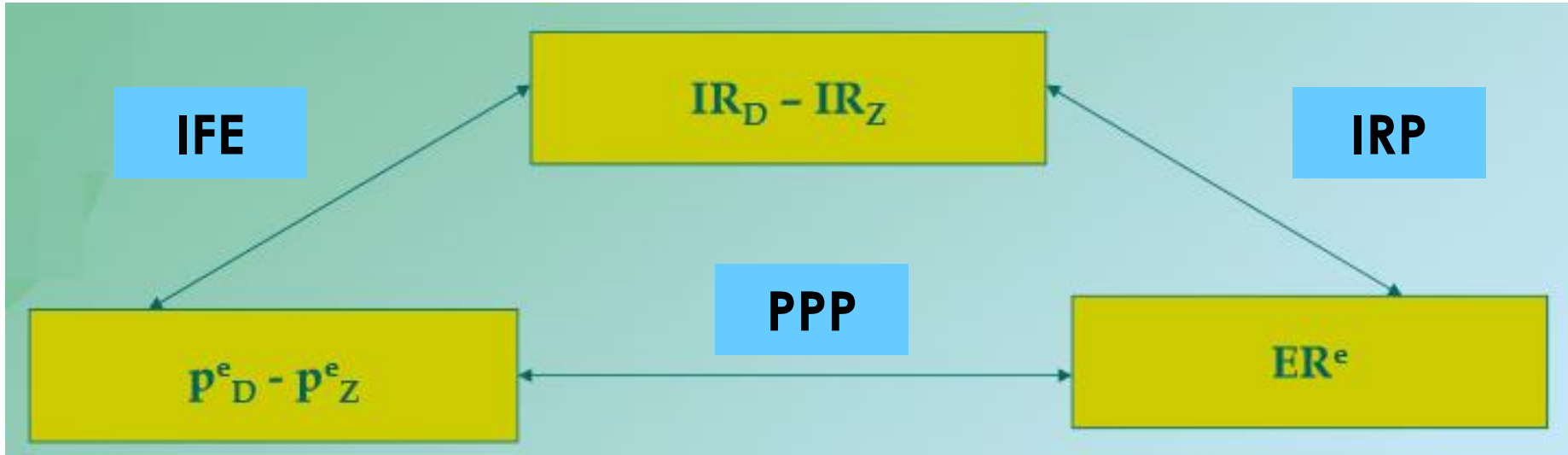
c)  $f = IR_D - IR_Z$

d)  $IR_D - IR_Z = P_D^e - P_Z^e$

e)  $ER^e = IR_D - IR_Z$

- change in exchange rate » inflation differential
- expected change in SR » differential of expected inflation
- forward premium/discount » interest rate differential
- interest rate differential » differential of the expected inflation
- expected exchange of SR » interest rate differential

# RELATIONSHIPS BETWEEN INFLATION, INTEREST RATE AND EXCHANGE RATE



- IFE** - International Fisher Effect (MFE)
- IRP** - Interest Rate Parity (PUM)
- PPP** - Purchasing Power Parity (PKS)
- ER<sup>e</sup>** - expected change of the exchange rate
- IR** - real interest rate
- p** - inflation rate

## EXERCISE 8:

At the beginning of 1996 were short-term interest rates in France, 3,7% and 1,8% expected inflation.

At the same time short-term interest rate in Germany was 2,6% and inflation 1,6%.

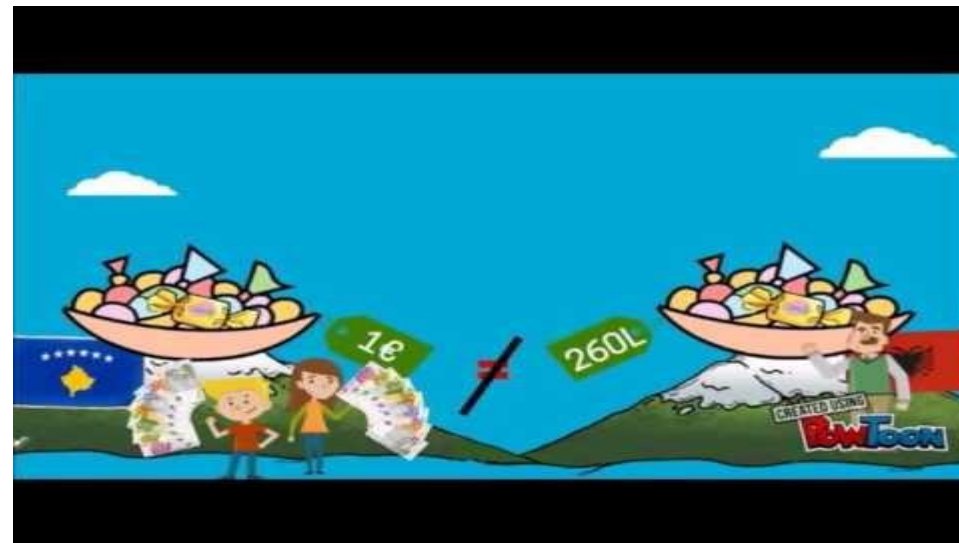
- a) What were the real interest rates in both countries?
- b) What caused the difference in interest rates in these countries?



# VIDEO 1

## Purchasing Power Parity

[s://httpwww.youtube.com/watch?v=iOxYbH5XyG8](http://www.youtube.com/watch?v=iOxYbH5XyG8)



# VIDEO 2

## Interest Rate Parity

<https://www.youtube.com/watch?v=7IJxSMawhfl>



# VIDEO 3

## Uncovered Interest Rate Parity

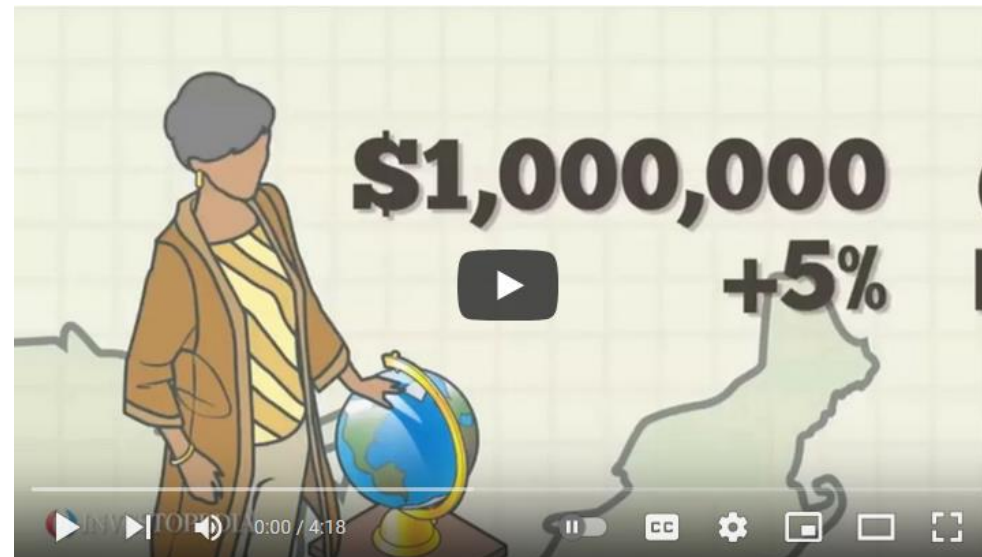
<https://www.youtube.com/watch?v=X1wWTL7mqZo>



# VIDEO 4

## Covered Interest Arbitrage

<https://www.youtube.com/watch?v=FrFPfJ6STW8>



# VIDEO 5

## International Fisher Effect

<https://www.youtube.com/watch?v=unEUz90JP8A>



# IMPORTANT DATES

54

(week 10)

**25.11.2021**: **8:00-9:00 a.m.** – midterm online test (TEST 1)

(MS Forms) - **You will get link for test at 7:45 in MS Teams group!!**

**9:30-11:00 a.m.** – final projects presentations  
(MS Teams)

Send project (WORD + PPT) on e-mail  
zuzana.strapekova@uniag.sk **till the 23.11.2021**

(week 12)

**2.12.2021**: - REPAIR TEST 1 and presentations– final projects  
(MS Forms)

(week 13)

**16.12.2021**: **8:00-9:00 a.m.** – online TEST 2 (EXAM)

**THANK YOU FOR ATTENTION!**

