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International Financial Management

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Foreword

This book was written to support the lecture material within the *International Financial Management* course for students of the International Economy and Business MSc Programme **with intermediate financial knowledge** – namely students who already completed the *International Finance* course. Therefore readers must utilize their knowledge within the field of financial corporate management and **case study** solving.

The chapters are structured to first introduce the case study which will be solved during the semester from the following aspects: reorganisation, valuation, taxation, financial stress, exchange rate exposure as well as long- and short term funding.

All main chapters start out with the related theoretical background to orient the reader, followed by an exercise. This is later followed by some sample solutions and a guide to help the script writing in **Matlab** for optimization purposes. Each theoretical section ends with the lists of essential literature.

This learning material improves the **competencies** of an economist studying in the International Economy and Business MSc programme in the following ways:

a) Regarding knowledge, the student:
   i. Understands the structure, operating process and relationships (domestic and international) of economic organisations along with their motivations and information related factors with a special emphasis on institutional environment.
   ii. Is familiar with the rules, professional and ethical norms of leadership and planning in connection with projects, businesses and the workings of economic institutions.
   iii. Knows and utilises the decision theories and analysing methods of economics, international economics and world economics.
   iv. Is familiar with and has a strong understanding of the problem solving techniques connected to processing the results of the professional literature and innovative practical work as well as knowing the corporate, national, regional and global methods of strategic planning and management. Students are also familiar with the leadership techniques of colleagues, teams, projects and bigger organisations.
   v. Besides being a proficient language user in his/her mother tongue the student has a good command of the linguistic terms used in economics both in his/her mother tongue and at least two foreign languages.

b) Regarding competencies, the student
   i. Can make independent and new deductions, formulate original thoughts and solution methods, utilise sophisticated analytical and modelling methods. The student is capable of formulating solution strategies for complex problems and decisions within the organisational culture both in a domestic and an international setting;
   ii. Is capable of developing effective international business strategies. The student can analyse the geopolitical, social, cultural and religious aspects of international business settings;
   iii. Is capable of planning and organising economic activities in connection with foreign trade, finance and developmental policy along with employing previously learned methods, making deductions, suggestions and decisions. The student is capable of performing well in economic institutions, international and governmental organisations;
   iv. Takes part in international projects and problem solving groups; as a leader he/she plans, directs, organises, coordinates and evaluates these activities.

c) Regarding attitude, the student
   i. Takes a critical attitude towards the work and behaviour of his/her employees and also of himself/herself. The students exhibits an innovative and proactive attitude to solving economic problems;
   ii. Is open to new results and achievements of economic research and practical experiments;

d) Regarding autonomy, the student
   i. Takes responsibility for his/her own work, the organisation or company he/she is leading and the workers he/she is employing. The student identifies, plans and organises his/her own and his/her employees' professional development and takes personal responsibility for them;
   ii. Displays an initiative, responsible attitude towards social and public affairs in connection with his/her co-workers;
   iii. Is initiative in solving problems, creating strategies and in supporting the co-operation of co-workers both within the same organisation and between different institutions.

I. How to simulate a company – dynamic relations among the Balance Sheet, Profit and Loss Statement and Cash-flows

1. Core operations

Today is January 1, 2020.

Flatland Trans is a public traded company on the Hungarian Stock Exchange, denominating its records and reports in Hungarian Forint (HUF). To get an operation license and rolling stock, a Czech (Pandave a.s.) and an Austrian (Wraith AG) subsidiary was acquired many years ago, after the liberalization of freight rail transport[1] in the new member states after 2004. The company focuses on rail traction services: they are responsible for the traction of a daily Bremen-Csepel container freight train between Cheb (Czech-German border crossing) and Budapest. The previous CEO of this company signed this contract at the end of 2019 for *11.07* million euro/year. The pre-tax margin (pre-tax profit / revenues) was 0.0006 at 315 EUR/HUF, which is far from the industrial average (ground freight and logistics weighted average 0.3 in the last 5 years[2]) but the owners were not impressed and so you *have to work out a proposal to improve this profitability ratio*.

Profitability can be increased via the reduction of expenditures and currency fluctuations.

2. Main items in the balance sheet

The entire company group has the following significant items in the balance sheet:

Fixed Assets (1090.75 million HUF)

Ownership in another companies– 490 million HUF

Czech subsidiary was purchased for 1 000 000 EUR in 2010 while the Austrian for 1 000 000 EUR at the same time.

Rolling stock, locomotives – 759.5 mHUF *[actual market value:* 379.75 *million HUF]*

The Hungarian parent company has a Vossloh Euro 4000 diesel locomotive with ETCS train safety system. The top speed of this vehicle is 120km/h only, while its traction power is half of its electric counterparts. The depreciation is calculated for 20 years and linear.

- Vossloh Euro 4000 purchasing value (2010): 3 100 000 euro, 759.5 mHUF, Depreciation: 379.75 mHUF (37.975mHUF/year)

How to rationalize rolling stock

You can manage different electricity standards with four or three traditional locomotives or you can operate with now multiple-electricity locomotives which can handle different standards perfectly.

Our current rolling stock can be sold for their bookkeeping value (purchasing value - depreciation).

[1] Council Directive 95/18/EC of 19 June 1995 on the licensing of railway undertakings: „Whereas a licence issued by a Member State should accordingly be recognized as valid throughout the Community;"

[2] http://www.reuters.com/sectors/industries/rankings?industryCode=67&view=profitMargins

name	Vossloh Euro 4000	Siemens Vectron	Škoda 109E	Softronic Transmontana
year of production/renew	2006	2010	2008	2015
diesel	1	0	0	0
25kV AC	0	1	1	1
15kV AC	0	1	1	1
3kV DC	0	1	1	1
v Max (km/h)	120	160	160	160
weight (t)	123	87	86	120
length (m)	23	19	18	18
power (kW)	3178	6400	6400	6000
fuel consumption l/hours	984	0	0	0
No of axes	6	4	4	6
price (million EUR)	3.1	4	2.8	2.6
yearly maintenance as % of price	0,05	0,025	0,04	0,05
regained electricity at slowing down (% of energy consumption)	0	0,35	0,3	0,2

Source: Wikipedia, manufacturers' website

*Real estates – 112 million HUF, 0 EUR, 9,6 million CZK [market value: **221** million HUF]*

Szolnok (80+80 million HUF, depreciation: 48 million HUF, market value: 112m HUF)

The HQ is in Szolnok, a land was purchased in 2010 for 80 million HUF where a 100m2 office building (60% usage, 30m HUF) and a 100m2 repair facility (40m HUF) with a 1800m long rail (10m HUF). Amortization is calculated for 15 years and linear.

Vienna (20.544 EUR/year)

40 m2 office is rented for 2300 euro/month, locomotive is stored at ÖBB train station for a 0.2895 Euro/meter/day fee (1712 euro/year).

Ostrava (8+4 million CZK, depreciation: 2,4 million CZK, market value: 9,6m CZK)

Subsidiary has a 10000m2 land (8 million CZK) with 600 meter electrified rail, a 5000m2 abandoned storage facility and a new 50m2 office building (build for: 4 million CZK, depreciation: 2,4 million CZK).

Current Assets (662 million HUF)

Cash – 622 million forint

Bank deposit in HUF 150 million (BUBOR-1% interest rate), and in EUR 1,5 million (EURIBOR-0,1%). Government bonds with 12 month maturities in Hungary have a 1,62% yield, and in Germany with 0,38% yield as an alternative investment.

Supplies – 40 million HUF

Old vehicle require spare parts.

Equity and Liabilities

The company is traded on Hungarian Stock Exchange but corporate bonds were issued also for past acquisitions.

Shareholder's equity – 1344 million HUF

Share capital is 722 million HUF, past retained earnings are 622 million HUF. The company issued 1.000.000 shares in 2004. The company pays 20% of profit after tax as a dividend.

Corporate bonds – 408.75 million HUF

Bonds were issued in 2010 to cover the cost of acquisitions (2m EUR). Bonds have to paid back in March 2020 (8% interest rate), which means a 2 million EUR sum to pay (and the yearly 160 000 EUR as interest).

Bond liability can be refinanced via a syndicated loan for 2 million euro (EURIBOR+3%) with 5 year maturity or through a bond issue at 3 million face value and 3m initial market price (EURIBOR+2%), maturity 5 years.

Balance Sheet

Assets						Liabilities and Equity				
	Czech (CZK)	**Austrian (EUR)**	**Hungarian (HUF)**	**Group (HUF)**			**Czech (CZK)**	**Austrian (EUR)**	**Hungarian (HUF)**	**Group (HUF)**
Investments, property, equipment						**Shareholders' equity**				
shares in subsidiaries				490 000 000		common stock				100 000 000
Locomotive				759 500 000		retained earnings				622 000 000
"-depreciation"				*-379 750 000*	*-37 975 000*	profit after tax				1 424 483
Land and buildings						**Liabilities**				
land, Szolnok				80 000 000		Long-term liabilities				
office, Szolnok				80 000 000		owners' loan		500 000		157 500 000
"-depreciation"				*-48 000 000*	*-5 333 333*	corporate bond		1 500 000		472 500 000
land, Ostrava	8 000 000			91 200 000		Short-term liabilities				
office, Ostrava	4 000 000			45 600 000		railway usage fees	52 808 771	345 815	115 768 116	826 719 830
"-depreciation"	2 400 000			*-27 360 000*	*-3 040 000*	fuel or electricity	0	0	2 126 570 348	2 126 570 348
Current assets						maintenance	0	0	37 975 000	37 975 000
bank deposit HUF				150 000 000		rent	0	20 544	0	6 471 360
bank deposit EUR		1 500 000		472 500 000		wages	5 736 000	374 784	142 368 000	325 815 360
supplies				40 000 000		other				563 763 618
customers		11 070 000		3 487 050 000						
Total assets				**5 240 740 000**		**Total liabilities & shareholders' equity**				**5 240 740 000**

Source: author's calculations

3. Profit and losses

a) Revenues – traction for a daily freight train

Company's locomotives are pulling a freight train between Budapest and Cheb (CZ) every day (360 days in a year). This train stands from 29 Rgs container-carriage, 1708 tons at full load. Electric systems and train safety systems are different in Czech Republic, Austria and Hungary – in northern Czech Republic there is 3000 V DC (Cheb-Nedakonice), in southern Czech Republic there is 25000 V AC (Nedakonice-Breclav) as well as in Hungary (Hegyeshalom-Budapest), but in Austria there is 15000 V 16.7 Hz AC (Breclav-Hegyeshalom). These differences would require the usage of four different traditional electric locomotives with local personnel. The company purchased a Vossloh Euro 4000 diesel engine to overcome these problems, but it requires the following time durations for transportation:

- Hungarian lines: 370km (3.08 hours)
- Austrian lines: 266km (2.21 hours)
- Czech lines: 1162km (10.2 hours)

b) Time requirements, fuel consumption, railway usage fee

The rail lines have the following characteristics in distance, electricity, fees, time and energy consumption:

	currency	distance (km)	speed (km/h)	gross weight (t)	fee/km	gross tonnkm fee	km fee to pay	gross tonnkm fee to pay	time (h)	fuel (l)	fuel price in HUF
Cheb-Plzen hl.n.	CZK	107	110	1831	36,1	0,04923	3862,7	9644,994	0,97	957	370422
Plzen hl.n.-Beroun	CZK	72	100	1831	36,1	0,04923	2599,2	6490,089	0,72	708	274182
Praha-Beroun	CZK	38	100	1831	36,1	0,04923	1371,8	3425,325	0,38	374	144707
Česká Trebová os.n.-Praha	CZK	160	120	1831	36,1	0,04923	5776	14422,42	1,33	1312	507744
Pferov-Česká Trebová os.n.	CZK	110	120	1831	36,1	0,04923	3971	9915,414	0,92	902	349074
Nedakonice-Pferov	CZK	46	120	1831	36,1	0,04923	1660,6	4146,446	0,38	377	145976
Breclav-Nedakonice	CZK	48	120	1831	36,1	0,04923	1732,8	4326,726	0,40	394	152323
Wien-Breclav	EUR	66	120	1831	1,3335	0,001244	88,011	150,3324	0,55	541	209444
Wien-Hegyeshalom	EUR	67	120	1831	1,3335	0,001244	89,3445	152,6102	0,56	549	212618
Hegyeshalom-Budapest	HUF	185	120	1831	448	0,23	82880	77909,05	1,54	1517	587079
Hegyeshalom-Budapest	HUF	185	120	1831	448	0,23	82880	77909,05	1,54	1517	587079
Wien-Hegyeshalom	EUR	67	120	1831	1,3335	0,001244	89,3445	152,6102	0,56	549	212618
Wien-Breclav	EUR	66	120	1831	1,3335	0,001244	88,011	150,3324	0,55	541	209444
Breclav-Nedakonice	CZK	48	120	1831	36,1	0,04923	1732,8	4326,726	0,40	394	152323
Nedakonice-Pferov	CZK	46	120	1831	36,1	0,04923	1660,6	4146,446	0,38	377	145976
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Plzen hl.n.-Beroun	CZK	72	100	1831	36,1	0,04923	2599,2	6490,089	0,72	708	274182
Cheb-Plzen hl.n.	CZK	107	110	1831	36,1	0,04923	3862,7	9644,994	0,97	957	370422

Source: OEBB, VPE, SZDC

The company has to pay the following fees for using international railway lines:

Country	fee of distance (km)*	fee of weight (gross ton km)	Traction electricity (/kWh)
Hungary (HUF)	448	0.23	24.63
Austria (EUR)	1.3335	0.001244	0.1292
Czech Republic (CZK)	36.1	0.04923	1.82

Source: VPE[3], ÖBB Infrastruktur[4], SZDC[5]

[3] https://www2.vpe.hu/document/3332/H%C3%9CSZ%202014-2015%2017.%20sz.%20m%C3%B3dos%C3%ADt%C3%A1s_T%C3%B6rzssz%C3%B6veg.zip

[4] http://www.oebb.at/infrastruktur/en/_p_Network_Access/Product_services__prices/02_DMS_Dateien/_Train_Path.jsp

Railway usage fees:

- Hungarian lines: 370km (3.08 hours): -115 768 116 HUF
- Austrian lines: 266km (2.21 hours): -345 815 EUR
- Czech lines: 1162km (10.2 hours): -52 808 771 CZK

c) Vehicle-related expenditures

	fuel or electricity consumption (reduced)			maintenance fee	depreciation
locomotive name	CZK	EUR	HUF	HUF	HUF
Vossloh Euro 4000	0	0	2 126 570 348	37 975 000	37 975 000
Siemens Vectron	23 337 148	321 677	85 298 616	31 500 000	63 000 000
Škoda 109E	25 132 313	346 421	91 860 048	35 280 000	44 100 000
Softronic Transmontana	26 927 479	371 166	98 421 480	40 950 000	40 950 000

Source: author's calculations

d) Prices and fees

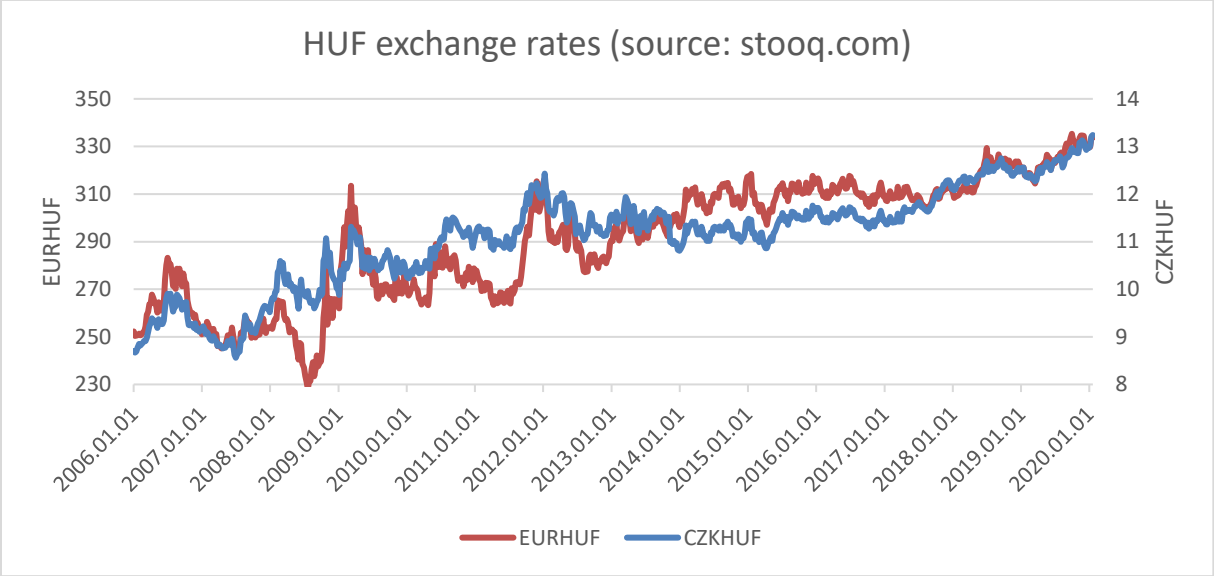
Due to the temporary effect of deflation and fall of energy prices, expenditures are low for the enterprise:

EUR/HUF	315
EUR/CZK	27.6
CZK/HUF	11.4
diesel fuel from MÁV (HUF/l)	387
12 month BUBOR benchmark interest rate	2.11%
12 month EURIBOR benchmark interest rate	0.263%
12 month USD LIBOR benchmark interest rate	0.6315%

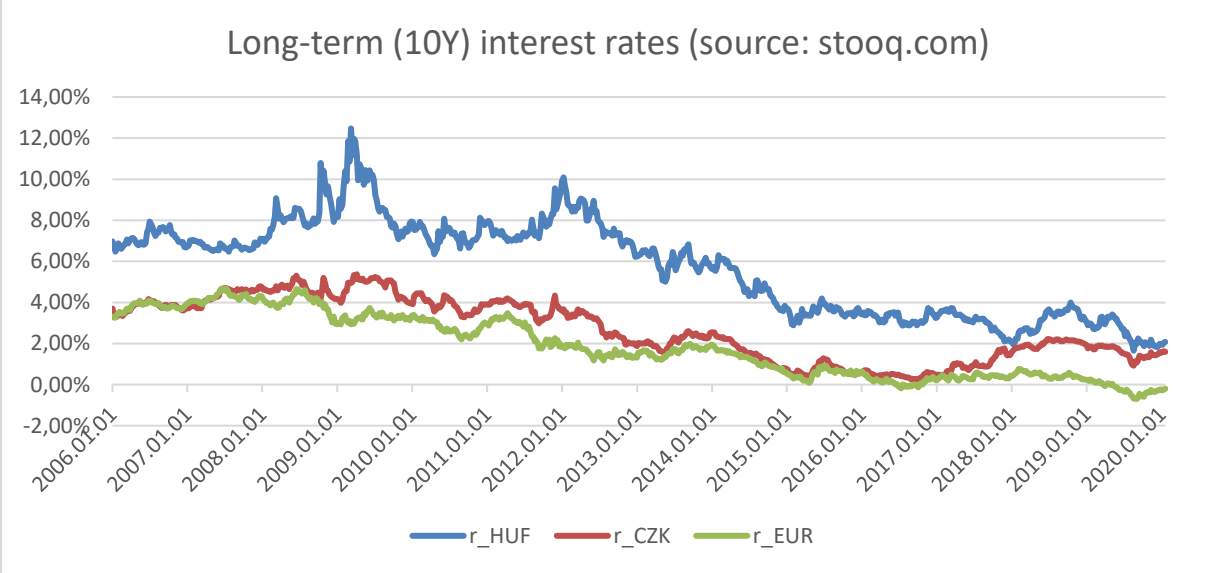
Source: STOOQ.com, MNB, ECB, EIA[6], VPE

There will be three currencies in this case study: euro (EUR), Czech koruna (CZK) and Hungarian forint (HUF) as free floating currencies in the European Union. While the CZK has low volatility and has an appreciating trend, the HUF is more volatile and has the historical tendency of devaluation. The first part of the 2010's was a turbulent period, while the second was a much calmer one. The Czech National Bank lifted a temporary ceiling of 27 EUR/CZK between 2013 and 2017 to avoid excessive appreciation-led deflation in the country. Both the CZK and HUF could join to the Euro-zone within 2 years (since they meet the Maastricht criteria), but it is postponed by domestic political considerations.

[5] http://www.szdc.cz/en/soubory/prohlaseni-o-draze/2015/priloha-c-2015.pdf
[6] http://www.ksh.hu/docs/hun/xstadat/xstadat_eves/i_qsf003b.html
http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=eer_epd2dc_pf4_y05la_dpg&f=d



Funding has always been cheaper in EUR or CZK than in HUF historically, but the unconventional monetary easing of the European Central Bank (ECB) reduced these costs significantly. However, big enterprises in the European Union are funding themselves in euro, due to the higher liquidity and depth of these bond markets. The European Central Bank (like all the others) is operating as a "market maker of last resort" and the high quality sovereign and private bond markets. Corporate bonds have higher yields than their sovereign peers, which will be represented by their risk premium.



e) Wages

Subsidiaries remained autonomous after the takeover, wages are fixed costs for the company (they do not depend on the activity of the company at all).

- Strategic level: Executive Board
  - CEO – 5.000.000 HUF/month and 5% share package
  - Commercial and Operational Manager – 1000.000HUF/month and 5% share package
  - Technical Director – 1000.000 HUF/month and 5% share package
  - Financial Manager – 800.000 HUF/month
  - HR Manager – 600.000 HUF/month

- Operative level - Hungary
    - Commercial and Operational Division
        - 2 Rolling Stock Manager, 100.000 HUF/month/No and 0.5% share package – responsible for cargo forwarding
        - 2 Rolling Stock Manager Assistant, 100.000 HUF/month/No
        - Operative Co-ordinator, 150.000 HUF/month – responsible for purchase of rail track capacity in Hungary
        - Dispatch, 120.000 HUF/month – responsible for real-time rolling stock contact
    - Technical Division
        - 2 Engine Driver, 272.000 HUF/month/No
        - Safety Advisor, 120.000 HUF/month
        - IT Assistant,150.000 HUF/month
        - 4 Engineer-technician, 200.000 HUF/month/No
        - Facility Manager, 120.000 HUF/month
        - Cleaning Personnel, 100.000 HUF/month
    - Financial Division
        - Chief Accountant, 200.000 HUF/month
        - Accountant,150.000 HUF/month
        - Risk Manager, 200.000 HUF/month
        - Controller, 150.000 HUF/month
- Operative level: Austria
    - Branch Manager: 10.000 EUR/month, 2% share package
    - Commercial and Operational Division
        - Rolling Stock Manager, 2.000 EUR/month/No – responsible for cargo forwarding
        - Dispatch, 1.000 EUR/month – responsible for real-time rolling stock contact
    - Technical Division
        - 2 Engine Driver, 1.666 EUR/month/No
        - Safety Advisor, 1.500 EUR/month
        - IT Assistant, 1.300 EUR/month
        - 2 Engineer-technician, 1.500 EUR/month/No
    - Financial Division
        - Accountant, 2.000 EUR/month
    - HR Division
        - HR Assistant, 1.500 EUR/month
- Operative level: Czech Republic
    - Branch Manager: 100.000 CZK/month, 2% share package
    - Commercial and Operational Division
        - 2 Rolling Stock Manager, 10.000 CZK/month/No and 0.5% share package – responsible for cargo forwarding
        - 2 Rolling Stock Manager Assistant, 10.000 CZK/month/No

- Operative Co-ordinator, 15.000 CZK/month – responsible for purchase of rail track capacity in Hungary
- Dispatch, 12.000 CZK/month – responsible for real-time rolling stock contact

- Technical Division
  - 2 Engine Driver, 30.000 CZK/month/No
  - Safety Advisor, 12.000 CZK/month
  - IT Assistant,17.000 CZK/month
  - 4 Engineer-technician, 22.000 CZK/month/No
  - Facility Manager, 11.000 CZK/month
  - Cleaning Personnel, 8.000 CZK/month
- Financial Division
  - Chief Accountant, 22.000 CZK/month
  - Accountant,15.000 CZK/month
  - Risk Manager, 22.000 CZK/month

f) Profit-and-loss statement for 2020 in current situation

Corporate tax in different countries: Austria 25%, Hungary 19%, Czech republic 19%.

		Czech (CZK)	Austrian (EUR)	Hungarian (HUF)	Group (HUF)
Income		60 944 771	741 143	2 558 829 593	3 487 060 028
Expenditures	railway usage fees	-52 808 771	-345 815	-115 768 116	-826 719 719
	fuel	0	0	-2 126 570 348	-2 126 570 348
	maintenance, rent	0	-20 544	-37 975 000	-44 446 360
	wages	-5 736 000	-374 784	-142 368 000	-325 815 360
	amortization (vehicle)			-37 975 000	-37 975 000
	amortization (building)	-2 400 000	0	-48 000 000	-75 360 000
EBIT		0	0	50 173 130	
Financial profit	subsidiaries	0	0	0	50 173 241
	gained interests	0	0	0	2 435 175
	paid interests	0	0	0	-50 400 000
Pre-Tax Profit		0	0	0	2 208 416
Corporate income tax (19%)		0	0	0	419 599
Profit after tax		0	0	0	1 788 817
Dividend		0	0	0	357 763
Profit for the year		0	0	0	1 431 053

Source: author's calculations

4. Modelling in Excel

i. Assignment 1: New corporate strategy

Please evaluate the Pre-Tax Profit Ratio of the company - according to the market averages. What are the reasons of poor company performance at these benchmarks? What is the most important issue to deal with? Hint: you can fire people and buy new locomotives (Current date for the case study is January 1 2015)

SAMPLE

Performance of the company – compared to the market

- Pre-tax profit ratio is way under the market average (zero Vs. 30%)

Reasons of poor performance

- The company has zero profit due to sheer luck: with stronger HUFEUR or weaker CZKHUF exchange rates losses would be imminent.
- Most important expenditure: fuel costs (-2 126 570 348 HUF) – can be improved via purchase of electric locomotives (better efficiency)
- Second most important expenditure: railway usage costs (-826 719 719 HUF) – it is fixed, the company has no impact on it
- Third most important expenditure: wages (-325 815 360HUF) – Czech and Austrian subsidiaries have excessive competences
- Expensive funding: 8% interest rate on corporate bonds (-50 400 000)

Ideas of rationalization

- Without firing people
- Sell old traction vehicle:
  - diesel loco: 379.75 million HUF
  - spare parts: 40 million HUF
- Issuing new corporate bond with flexible interest rate
  - EURIBOR+2%
  - 3m EUR initial market price (potential!)
- Liquid assets:
  - HUF 150 million
  - EUR 1.5 million
- All together:
  - 1045.25 million HUF or **3.3 million EUR**
- Possible vehicle prices at constant exchange rates:
  - Vectron: 4 million EUR (*too expensive*)
  - Skoda: 2.8 million EUR (*affordable*)
  - Softronic: 2.6 million EUR (*affordable*)

Suggestions

- don't fire people
- buy a Softronic Transmontana for 2.6 million EUR by selling the Vossloh Euro 4000 and utilizing the bank deposit
- with the remaining 0.509 million EUR, the corporate debt could be decreased further
- issue new corporate bond for 1.49 million EUR

New profit and loss statement (planned)

		Czech (CZK)	Austrian (EUR)	Hungarian (HUF)	Group (HUF)
Income		60 944 771	741 143	2 558 819 566	3 487 050 000
Expenditures	railway usage fees	52 808 771	345 815	115 768 116	826 719 830
	fuel	26 927 479	371 166	98 421 480	522 311 950
	maintenance	0	0	40 950 000	40 950 000
	wages	5 736 000	374 784	142 368 000	325 815 360
	amortization (vehicle)	0	0	40 950 000	40 950 000
	amortization (building)	2 400 000	0	48 000 000	75 360 000

	rent	0	20 544	0	6 471 360
EBIT		-26 927 479	-371 166	2 072 361 970	1 648 471 500
Financial profit	subsidiaries	0	0	0	1 648 471 500
	gained interests	0	0	0	0
	paid interests	0	0	0	10 621 391
Pre-Tax Profit		0	0	0	1 637 850 109
Corporate income tax (19%)		0	0	0	311 191 521
Profit after tax		0	0	0	1 326 658 588
Dividend		0	0	0	265 331 718
Profit for the year		0	0	0	1 061 326 871

New Pre-tax margin: 47%

g) Simulation of the PLS in Matlab

```
%% IFM 2019 - profit and loss statement
%0. loading in the inputs
clear
    %assets
vehicle=xlsread('IFM_input_1.3.xlsx','vehicles');
real_estate=[4000000 0 80000000];
deposit=[0 1500000 150000000];
customer=[0 11070000 0];
    %liabilities
corp_bond=[0 2000000 0];
    %expenditures
wage=[5736000 374784 142368000];
rent=[0 20544 0];
railway_usage_fees=[52808771 345815 115768116];
    %capital market related inputs
EURHUF=315;
CZKHUF=11.4;
r_eur=0.00263;
r_huf=0.0211;
r_corp_bond =0.08;
    %locomotive
locomotive=1; %1: dízel, 2: Siemens 3: Skoda 4: Transm
%1. PLS structure
    %1.a. expenditures
PLS(2,:)=railway_usage_fees; %railway usage fees
PLS(3,:)=vehicle(locomotive,1:3);  %traction electricity or
%fuel
PLS(4,3)=vehicle(locomotive,4); %maintenance
PLS(5,:)=rent;  %office rental fee
PLS(6,:)= wage;  %wages
PLS(7,:)=[0 0 vehicle(locomotive,end)];  %depreciation (locom)
PLS(8,:)=[2400000 0 48000000]; %depreciation (build)
    %1.b. income
    for j=1:2
PLS(1,j)=sum(PLS(2:8,j));
```

```
    end
PLS(1,3)=sum(customer.*[CZKHUF EURHUF 1])-PLS(1,1)*CZKHUF...
    -PLS(1,2)*EURHUF;
    %1.c. EBIT
for j=1:3
    PLS(9,j)=PLS(1,j)-sum(PLS(2:8,j));
end
    %1.d. group-level conversion to HUF
for i=1:9
    PLS(i,4)=sum(PLS(i,1:3).*[CZKHUF EURHUF 1]);
end
    %1.e. Financial profit
        %dividends
PLS(10,4)=PLS(9,4);
        %gained interests
PLS(11,4)=sum(deposit.*[CZKHUF EURHUF 1].*...
            [0 r_eur-0.001 r_huf-0.01]);
        %paid interests
PLS(12,4)=sum(corp_bond.*[CZKHUF EURHUF 1].*...
            [0 r_corp_bond r_huf-0.01]);
    %1.f. Profit
        % Pre-Tax Profit
PLS(13,4)=PLS(10,4)+PLS(11,4)-PLS(12,4);
        %Corporate income tax
CIT=0.19;
PLS(14,4)=PLS(13,4)*CIT;
        %Profit after tax
PLS(15,4)=PLS(13,4)-PLS(14,4);
        %paid dividend - 20%
PLS(16,4)=PLS(15,4)*0.2;
        %profit for the year
PLS(17,4)=PLS(15,4)*0.8;
```

II. Valuation

1. DCF model

- Model for Valuing a Foreign Target
  - value of an MNC is based on the present value of expected cash flows to be received.
  - similar to the decision to invest in other projects in that it is based on a comparison of benefits and costs as measured by net present value
  - $NPV_a = -IO_a + \sum_{t=1}^{n} \frac{CF_{a,t}}{(1+r)^t} + \frac{SV_a}{(1+r)^n}$
    - where IO_a represents the initial outlay needed for the acquisition
    - $CF_{a,t}$ cash flow generated by the target company
    - r discount rate
    - SV_a salvage value of the assets of the acquired firm in year *n*

        - *n* the year when the company will be sold in the future
    - Estimating the Initial Outlay
        - price to be paid for the target
        - acquire publicly traded foreign targets, they commonly pay premiums (10-40%)
        - acquirer must substantially improve the target's cash flows → overcome the large premium
        - excessively optimistic when estimating the target's future cash flows → ☹
        - Exchange rate of concern
    - Estimating the Cash Flows
        - foreign currency cash flows ($CF_{f,t}$) per period remitted to the United States
        - At the spot rate at that time (S_t)
        - $\boldsymbol{CF_{a,t} = (CF_{f,t})S_t}$
        - ignores any withholding taxes or blocked-funds restrictions
        - salvage value in foreign currency units (SV_f) and the spot rate at the time (period *n*) when it is converted to dollars (S_n)
        - $\boldsymbol{SV_a = (SV_f)S_n}$
    - Estimating the ***NPV***
        - with S exchange rates:
        - $NPV_a = -(IO_a)S + \sum_{t=1}^{n} \frac{(CF_{a,t})S_t}{(1+r)^t} + \frac{(SV_a)S_n}{(1+r)^n}$

Calculation of the discounted cash-flow:

- **Free Cash Flow (FCF)=**
  EBIT *(PLS)*
  -taxes
  (corporate_income_tax+municip_tax+gained_interests*CIT_rate+paid_interests*CIT_rate)
  -spending on investments
  +amortization (depreciation) *(PLS)*
  +floating capital ← *current assets-short term liabilities (PLS)*
- **Weighted average cost of capital (WACC)**
  $r_{WACC} = \frac{E}{D+E} r_e + \frac{D}{D+E} r_d$(1-CIT_rate)
- **E=shareholders' equity *(BS)***
  - $r_e = r_f + (r_m + r_f) * \beta_{sector}$
    - r_f: 10y gov bond yield
    - r_m: stock market index (exponential moving average)
    - β_{sector} : Damodaran-database
      - http://www.stern.nyu.edu/~adamodar/New_Home_Page/datafile/variable.htm
- **D=long term liabilities**

$$r_d = \frac{paid\ interest\ (PLS)}{long\ term\ liabilities\ (BS)}$$

- **Salvage value**
    - Marketable long term assets:
        - Real estates – 5 year depreciation *(BS)*
        - Vehicles – 5 year depreciation *(BS)*
        - *Anything that we can sell on the market*
        - *Market value: book value Vs Discounted cashflow of the asset*
    - Cash reserves

Literature

Madura: part 1, chapter 1

Frykman, D. – Tolleryd, J. (2003): Corporate valuation: an easy guide to measuring value. Pearson, London

a) Mergers and acquisitions

- Background on International Acquisitions
  - international acquisition
    - similar to other international projects
    - requires an initial outlay and is expected to generate cash flows
    - present value will exceed the initial outlay.
  - motivated by the desire to increase
    - global market share
    - capitalize on economies of scale
  - international acquisitions are better than direct foreign investment (establishing a new subsidiary)
    - target is already in place
    - establishing a new subsidiary requires time
    - acquisition usually generates quicker and larger cash flows
    - larger initial outlay
    - integration of the parent's management style
  - Market Assessment of International Acquisitions
    - announcements of acquisitions of foreign targets
      - → neutral or slightly favourable stock price effects for acquirers
      - ability of acquirers to more easily capitalize on their strengths in foreign markets
    - acquisitions of domestic targets → negative effects for acquirers, on average
    - Sarbanes-Oxley (SOX) Act (2002):
      - Impact on the process for assessing acquisitions.
      - Executives of MNCs are prompted to conduct a more thorough review of the target firm's operations and risk (called due diligence).
      - MNCs increasingly hire outside advisers (including attorneys and investment banks)
      - acquirer must ensure that financial information of the target is accurate

b) Foreign Direct Investment (FDI)

- Foreign investment that establishes
  - a lasting interest in or effective management control
  - over an enterprise
  - buying shares of an enterprise in another country,
  - reinvesting earnings of a foreign- owned enterprise in the country where it is located, and
  - parent firms extending loans to their foreign affiliates
  - International Monetary Fund (IMF) guidelines consider an investment to be a foreign direct investment if it accounts for at least 10 percent of the foreign firm's voting stock of shares.
- Trends
  - Flow and stock increased in the last 20 years

- In spite of decline of trade barriers, FDI has grown more rapidly than world trade because
  - Businesses fear protectionist pressures
  - FDI is seen as a way of circumventing trade barriers
  - Dramatic political and economic changes in many parts of the world
  - Globalization of the world economy has raised the vision of firms who now see the entire world as their market

- The Direction of FDI
  - Historically, most FDI has been directed at the developed nations of the world as firms based in advanced countries invested in other markets
    - The US has been the favorite target for FDI inflows
  - While developed nations still account for the largest share of FDI inflows, FDI into developing nations has increased
    - Most recent inflows into developing nations have been targeted at the emerging economies of South, East, and Southeast Asia
  - Gross fixed capital formation summarizes the total amount of capital invested in factories, stores, office buildings, etc.
  - This makes FDI a crucial determinant factor of increased future growth rate of an economy
- FDI forms
  - Purchase of assets: why? Why not?
    - Quick entry, local market know-how, local financing may be possible, eliminate competitors, buying problems
  - New investment: why? Why not?
    - No local entity is available for sale, local financial incentives, no inherited problems, long lead time to generation of sales
  - International joint-venture
    - Shared ownership with local and/or other non-local partner
    - Shared risk
- Alternative Modes of Market Entry
  - FDI
    - FDI - 100% ownership
    - FDI < 100% ownership, International Joint Venture
  - Strategic Alliances (non-equity)
  - Franchising
  - Licensing
  - Exports: Direct vs Indirect
- Pattern of FDI Explanations
  - International product life-cycle (Ray Vernon)
    - Trade theory similarity
  - Eclectic paradigm of FDI (John Dunning)
    - Combines ownership specific, location specific and internalization specific advantages
    - Explains FDI decision over a decision to enter through licensing or exports
    - Ownership advantage: creates a monopolistic advantage to be used in markets abroad
      - Unique ownership advantage protected through ownership
      - e.g., Brand, technology, economies of scale, management know-how

        - Location advantage: the FDI destination market must offer factors (land, capital, know-how, cost/quality of labour, economies of scale) that are advantageous for the firm to locate its investment there (link to trade theory)
        - Internalization advantage: transaction costs of an arms-length relationship -- licensing, exports-- higher than managing the activity within the MNC's boundaries
- Government Policy and FDI
    - The radical view: inbound FDI harmful; MNEs
        - Are imperialist dominators
        - Exploit host to the advantage of home country
        - Extract profits from host country; give nothing back
        - Keep LDCs backward and dependent for investment, technology and jobs
    - The free market view: FDI should be encouraged
        - Adam Smith, Ricardo, et al: international production should be distributed per national comparative advantage
        - An MNE increases the world economy efficiency
            - Brings to bear unique ownership advantages
            - Adds to local economy's comparative advantages
    - Home country
        - Outward FDI encouragement
        - Risk reduction policies (financing, insurance, tax incentives)
        - Outward FDI restrictions
        - National security, BOP
    - Host country
        - Inward FDI encouragement
        - Investment incentives
        - Job creation incentives
        - Inward FDI restrictions
        - Ownership extent restrictions (national security; local nationals can safeguard host country's interests
- Host Country Effects of FDI
    - Benefits
        - Resource -transfer
        - Employment
        - Balance-of-payment (BOP)
            - Import substitution
            - Source of export increase
    - Costs
        - Adverse effects on the BOP
            - After the initial capital inflow there is normally a subsequent outflow of earnings
            - Foreign subsidiaries could import a substantial number of inputs
        - Threat to national sovereignty and autonomy
            - Some host governments worry that FDI is accompanied by some loss of economic independence resulting in the host country's economy being controlled by a foreign corporation
        - Adverse effects on competition
- Legal Institutions and FDI

- Debate over relationship between legal institutions and foreign investment flows
  - Traditional/orthodox view: legal institutions play a crucial role in the process of market-oriented development
    - by protecting private rights, especially the property and contract rights of foreign investors
    - By creating the legal foundations for market-oriented reform

Literature

Madura: part 4, chapter 13, 16

c) Multinational restructuring

- Success: acquirer must substantially improve the target's cash flows → overcome the large premium it pays for the target
- Valuing a Foreign Target
  - Initial Outlay: price to be paid for the target
  - cash flows + salvage value
  - Exchange rate
    - → net present value of a foreign target:
    - $NPV_a = -(IO_a)S + \sum_{t=1}^{n} \frac{(CF_{a,t})S_t}{(1+r)^t} + \frac{(SV_a)S_n}{(1+r)^n}$
- Market Assessment of International Acquisitions
  - *foreign* targets neutral or slightly favourable stock price effects for acquirers (→ new market)
    - comparative advantage in terms of their technology or image
    - competition is not as intense on a foreign market
  - acquisitions of *domestic* targets lead to negative effects for acquirers, on average (→ market share)
  - Sarbanes-Oxley Act on the Pursuit of Targets
    - Improved the process for reporting profits used by U.S. based MNCs
    - Executives of MNCs are prompted to conduct a more thorough review of the target firm's operations and risk (called due diligence)
    - hire outsider advisers (including attorneys and investment banks) to offer their assessment
- Factors That Affect the Expected Cash Flows of the Foreign Target
  - Target's Previous Cash Flows
  - Managerial Talent of the Target
    - managed as it was before the acquisition
    - downsize the target firm later
      - new technology that reduces the need for some of the target's employees
      - reduces expenses but may also reduce productivity and revenue
    - maintain the existing employees of the target but restructure the operations so that labour is used more efficiently
  - Country-Specific Factors
    - Target's Local Economic Conditions (export or domestic market focus)
    - Target's Local Political Conditions (layoff, privatisation)
    - Target's Industry Conditions – industry 4.0
      - Cloud computing, human-machine interface, internet of things, sensor integration, B2C and B2B relations → flexibility
    - Target's Currency Conditions (target's remitted earnings to the parent)

        - Target's Local Stock Market Conditions (volatility)
        - Taxes Applicable to the Target
- Other Types of Multinational Restructuring
    - International Partial Acquisitions (substantial stakes + public listing *or* local partner)
        - requires less funds
        - some influence on the target's management
        - meeting the standards
        - Valuation: much the same way as when it purchases the entire firm
    - International Acquisitions of Privatized Businesses (government-owned businesses sold to individuals or corporations)
        - increase their efficiency
        - operating in environments of little or no competition
        - data are very limited
        - economic and political conditions tend to be volatile
        - government retains a portion of the firm's equity, it may attempt to exert some control
    - International Alliances (joint ventures and licensing agreements)
        - initial outlay and cash flows to be received are typically smaller
        - Royalties
    - International Divestitures (assessment: maintain or sell)
        - increased cost of capital, host government taxes, political risk, or revised projections of exchange rates
        - sell them at a low price

Literature

Madura: part 4, chapter 15

d) Multinational capital budgeting

- Subsidiary versus Parent Perspective
    - parent is financing the project → evaluating the results from its point of view
    - Tax Differentials (remitted funds)
    - Restricted Remittances (percentage of the subsidiary earnings remain in the country)
    - Excessive Remittances (parent that charges its subsidiary very high administrative fees because management is centralized at the headquarters)
    - Exchange Rate Movements (normally converted from the subsidiary's local currency to the parent's currency)
- Input for Multinational Capital Budgeting
    - parent's initial investment
        - finance inventory, wages, and other expenses until the project begins to generate revenue
    - Price and consumer demand
        - price at which the product could be sold can be forecasted using competitive products in the markets as a comparison
        - future prices will most likely be responsive to the future inflation rate
        - market share percentage forecast - projected demand
    - Costs
        - variable-cost forecasts - variable cost per unit
        - fixed cost (not sensitive to changes in demand)
    - Tax laws
        - tax deductions or credits for tax payments

  - Remitted funds
    - host government may prevent a subsidiary from sending its earnings to the parent (encourage additional local spending *or* to avoid excessive sales of the local currency)
  - Exchange rates
    - hedging techniques are used to cover short-term positions
  - Salvage (liquidation) value
    - success of the project and the attitude of the host government toward the project
  - Required rate of return
- Factors to Consider in Multinational Capital Budgeting
  - Exchange rate fluctuations
  - Inflation
  - Financing arrangement - subsidiary & parent financing
  - Blocked funds (earnings generated by the subsidiary be reinvested locally for at least 3 years before they can be remitted)
  - Uncertain salvage value
  - Impact of project on prevailing cash flows
  - Host government incentives
- Adjusting Project Assessment for Risk
  - Risk-Adjusted Discount Rate
    - greater the *uncertainty* about a project's forecasted *cash flows*, the *larger* should be the *discount rate* applied to cash flows
    - tends to reduce the worth of a project
  - **Sensitivity Analysis**
    - alternative estimates for its input variables
  - **Simulation**
    - range of possible values for one or more input variables (100 iterations)

Literature
Madura: part 4, chapter 14

ii. Assignment 2: Company valuation

Please evaluate your company's fundamental value! What is the fundamental value of your shares?
Please summarize the following variables:

- Free Cashflow
- WACC%
- Discounted cashflow
- Salvage value
- Total UEAE value
- UEAE value/shares

SAMPLE

Cash-flow status of the company
The efficiency of the company was poor, presenting a 302 million HUF Free Cash Flow on yearly basis. The new strategy allows us to increase it to 2 066 million HUF, after the modernization of the locomotive.

The old corporate bond which funded the company on the long run expired. Earlier, its fixed interest rate was 8% while the debt was 2 million EUR. After the reorganization, the company issued new corporate bonds with floating interest rate (r=EURIBOR 12M+2%) and collected 1.49 million EUR. The company reduced its debt from the cash reserves – this why the company needs short-term funding (82500 EUR/year).
The weighted average cost of capital (WACC) was 4.54% but after the debt reduction and initiation of the short term funding strategy the new WACC is 3.54%.
The company doesn't allocate resources to hedge its foreign exchange exposures.
Assuming that the company could follow the previous or the new strategies, the discounted cash flows are changing from 1.323 billion HUF to 9.32 billion HUF.

Salvage value

The company can sell its locomotive and real estates in case of liquidation. Originally 296 million HUF could be realized, the new strategy provides 730 million HUF as salvage value 5 years ahead.

Valuation

The original company had an estimated 1.6 billion HUF value, with 162 HUF reasonable share price. The strategy would allow us to increase it to 10.05 billion HUF with 1005 HUF share price.
Assuming that an investor would purchase a 60% package for 972 million HUF and would be able to sell it for 6 billion HUF after the implementation of this strategy. The added value of this strategy is 5 billion HUF.

Matlab code:

```
% Free Cash Flow
CIT_rate=0.19;
corporate_income_tax=;
gained_interests=;
paid_interests=;
    taxes=corporate_income_tax+gained_interests*CIT_rate+paid_interests*CIT_rate
current_asset=;
accounts_payable=;
other_short_term_liabilities=;
    floating_capital=current_asset-accounts_payable-other_short_term_liabilities
EBIT=;
spending_on_investements=;
amortization=;
    FCF=EBIT-taxes-spending_on_investements+amortization+floating_capital

% Weighted average cost of capital
common_stock=;
reained_earnings=;
    Shareholders_equity=common_stock+reained_earnings
beta_sector=1.79; %transportation, railroad, emerging
http://pages.stern.nyu.edu/~adamodar/
dBUX=;
HU10Y=;
    r_e=HU10Y+(dBUX-HU10Y)*beta_sector
debt=;
    r_d=paid_interests/debt
WACC=r_e*Shareholders_equity/(Shareholders_equity+debt)+r_d*debt/(Shareholders_equi
ty+debt)*(1-CIT_rate)

% Discounted Cashflow
t=5;
DCF=FCF/(1+WACC)^t

% Union of European Accounting Experts (Goodwill-based) valuation
    %Salvage value:
    real_estates=;
    vehicles=;
```

```
    cash=;
        SV=real_estates+vehicles+cash-amortization*t-debt
UEC_value=DCF+SV/(1+WACC)^t
```

2. Forecasting corporate defaults

a) Country risk analysis

- Objectives
  - identify common factors to measure a country's political risk and financial risk;
  - techniques used to measure country risk;
  - how the assessment of country risk is used when making financial decisions.
- Definition: Country risk represents the potentially adverse impact of a country's environment on the MNC's cash flows.
- Country risk can be used:
  - to monitor countries where the MNC is presently doing business;
  - as a screening device to avoid conducting business in countries with excessive risk; and
  - to improve the analysis used in making long-term investment or financing decisions
- Political Risk Factors
  - Attitude of Consumers in the Host Country
    - Some consumers may be very loyal to homemade products
  - Attitude of Host Government
    - special requirements or taxes,
    - restrict fund transfers,
      - Funds that are blocked may not be optimally used
      - Currency Inconvertibility: MNC parent may need to exchange earnings for goods
    - subsidize local firms,
    - fail to enforce copyright laws.
  - Political Risk Factors
    - War
      - Internal and external battles, or even the threat of war, can have devastating effects
    - Bureaucracy
      - Bureaucracy can complicate businesses
    - Corruption
      - Corruption can increase the cost of conducting business or reduce revenue
- Financial Risk Factors
  - Current and Potential State of the Country's Economy
    - A recession can severely reduce demand
    - Financial distress can also cause the government to restrict MNC operations
  - Indicators of Economic Growth
    - A country's economic growth is dependent on several financial factors - interest rates, exchange rates, inflation, etc.
- Types of Country Risk Assessment

- A *macro-assessment* of country risk is an overall risk assessment of a country without consideration of the MNC's business
- A *micro-assessment* of country risk is the risk assessment of a country as related to the MNC's type of business
- The overall assessment of country risk thus consists of:
  - Macro-political risk
  - Macro-financial risk
  - Micro-political risk
  - Micro-financial risk
- Note that the opinions of different risk assessors often differ due to subjectivities in:
  - identifying the relevant political and financial factors,
  - determining the relative importance of each factor, and
  - predicting the values of factors that cannot be measured objectively.

- Techniques of Assessing Country Risk
  - A *checklist approach* involves rating and weighting all the identified factors and then consolidating the rates and weights to produce an overall assessment
  - The *Delphi technique* involves collecting various independent opinions and then averaging and measuring the dispersion of those opinions
  - *Quantitative analysis* techniques like regression analysis can be applied to historical data to assess the sensitivity of a business to various risk factors
  - *Inspection visits* involve traveling to a country and meeting with government officials, firm executives, and/or consumers to clarify uncertainties
- Developing A Country Risk Rating
  - Assign values and weights to the political risk factors
  - Multiply the factor values with their respective weights, and sum up to give the political risk rating
  - Derive the financial risk rating similarly
  - Assign weights to the political and financial ratings according to their perceived importance
  - Multiply the ratings with their respective weights, and sum up to give the overall country risk rating

I. MEASURING POLITICAL RISK

A. Country-specific perspective

B. Political Stability

a. Frequency of government changes
b. Level of violence
c. Number of armed insurrections
d. Conflict with other states

C. Economic Factors

1.Indicators of political unrest

a. Rampant inflation
b. Balance of payment deficits
c. Slowed growth of per capita GDP

D. Subjective Factors

1. Profit Opportunity Recommendation
2. Political Risk and Uncertain Property Right
3. Business Environment Risk Index
4. Capital Flight

- Definition: the export of savings by a nation's citizens because of safety-of-capital fears.
- Measurement: use the balance-of- payment account
- Causes:
  - Inappropriate economic policies
  - Expectation of devaluation
  - High political risk

II. Economic and Political Factors:

1. Fiscal Irresponsibility
   - high government deficits
2. Monetary Instability
   - Money expansion
3. Controlled Exchange Rate System
   - currency usually overvalued
4. Wasteful Government Spending
   - inability to service foreign debt
   - Relative size of government debt
   - → debt to wealth ratio
5. Human Resource Base
   - lack of strong work ethic
   - Existence of government-imposed barriers to market forces
   - Amount of government-owned firms
   - Amount and extent of corruption
6. Adjustment to External Shocks
   - how well a nation responds

- Micro-perspective
  - firm-specific perspective
  - shortcomings of previous models
  - Weakness of Political Risk Models
    - assume all firms face the same risk
  - Expropriation
    - Is highly selective
    - Higher probability for extractive,
    - utility, and financial industries

III. MANAGING POLITICAL RISK

A. Pre-investment Planning Four Policy Options

a. Avoidance (no risk)
b. Insurance (shift risk)
c. Negotiate environment
d. Structure the investment

B. Operating Policies

Five Post-Investment Policy Options:

- Planned Divestment
- Short-Term Profit Maximization
- Changing the Benefit/Cost Ratio
- Developing Local Stakeholders
- Adaptation: create a post-confiscation management contract

- Comparing Risk Ratings Among Countries

- One approach to comparing political and financial ratings among countries is the *foreign investment risk matrix (FIRM)*
- The matrix measures financial (or economic) risk on one axis and political risk on the other axis
- Each country can be positioned on the matrix based on its political and financial ratings

- Actual Country Risk Ratings Across Countries
  - Some countries are rated higher according to some risk factors, but lower according to others
  - On the whole, industrialized countries tend to be rated highly, while emerging countries tend to have lower risk ratings
  - Country risk ratings change over time in response to changes in the risk factors
- Reducing Exposure to Host Government Takeovers
  - The benefits of FDI can be offset by country risk, the most severe of which is a host government takeover
  - To reduce the chance of a takeover by the host government, firms often use the following strategies:
  - Use a Short-Term Horizon
    - This technique concentrates on recovering cash flow quickly
  - Rely on Unique Supplies or Technology
    - In this way, the host government will not be able to take over and operate the subsidiary successfully
  - Hire Local Labour
    - The local employees can apply pressure on their government.
  - Borrow Local Funds
    - The local banks can apply pressure on their government.
  - Purchase Insurance
    - Investment guarantee programs offered by the home country, host country, or an international agency insure to some extent various forms of country risk

b) Rating agencies

This section summarizes the Standard & Poor's approach to rate nonfinancial corporations.

Stand-alone credit profile

- **Business risk profile**: *risk/return potential for a company* in the markets in which it participates, the *country risks* within those markets, the competitive climate within those markets (its industry risk), and the competitive advantages and disadvantages the company offers within those markets. The business risk profile affects the amount of financial risk that a company can bear at a given stand-alone credit profile and constitutes the foundation for a company's expected economic success. The assessments of country risk, industry risk, and competitive position are combined to determine a corporate issuer's business risk profile. Business risk profile assessments range from "excellent" (highest) to "vulnerable" (lowest).
  - Industry risk: competitive climate within those markets (scored 1-6)
    - Cyclicality: degree of revenue and profitability cyclicality
    - Competitive risk and growth environment
      - The effectiveness of industry barriers to entry;
      - The level and trend of industry profit margins;
      - The risk of secular change and substitution by products, services, and technologies;

        - The risk in industry growth trends
    - Country risk: broad range of factors that can affect credit quality, which arise from doing business from or within a specific country
    - Competitive position: advantages and disadvantages the company offers
        - Competitive advantage
        - Scale, scope, and diversity
        - Operating efficiency
        - Profitability

- **Financial risk profile:** The financial risk profile is the outcome of decisions that *management* makes in the *context of its business risk profile and its financial risk tolerances*. This includes decisions about the manner in which the company is *funded* and how its *balance sheet is constructed*. It also reflects the relationship of the *cash flows* the organization can achieve, given its business risk profile, relative to its financial obligations. Cash flow/leverage analysis is used to determine a corporate issuer's financial risk profile assessment. Financial risk profile assessments range from "minimal" (least financial risk) to "highly leveraged" (greatest financial risk).
    - Cash flow/leverage: pattern of cash flow generation, current and future, in relation to cash obligations is often the best indicator of a company's financial risk.
        - funds from operations (FFO) to debt
        - debt to EBITDA
        - payback ratios
            - cash from operations [CFO] to debt
            - free operating cash flow [FOCF] to debt
            - discretionary cash flow[7] [DCF] to debt
        - coverage ratios
            - [FFO+ interest] to cash interest
            - EBITDA to interest

Modifiers

- Diversification/portfolio effect (for conglomerates): to capture the value of diversification or the portfolio effect for a company that has multiple business lines
    - how meaningful the diversification
    - degree of correlation in each business line's sensitivity to economic cycles
- Capital structure
    - Currency risk of debt
    - Debt maturity profile
    - Interest rate risk of debt
    - Investments
- Financial policy: short-to-medium term event risks or the longer-term risks stemming from an issuer's financial policy
    - over a longer time horizon, the firm's financial policies can change its risk profile based on management's appetite for incremental financial risk or, conversely, plans to reduce leverage
- Liquidity: the sources and uses of cash
    - potential for a company to breach covenant tests related to declines in EBITDA

[7] „The money left over once all capital projects with positive net present values have been funded, and required payments (operational costs, such as wages) have been made."

  - ability to absorb high-impact, low-probability events
  - the nature of bank relationships
  - the level of standing in credit markets
  - the degree of prudence of the company's financial risk management
- Management and governance: broad range of oversight and direction conducted by an enterprise's owners, board representatives, executives, and functional managers
  - strategic competence
  - operational effectiveness
  - ability to manage risks
- Comparable ratings analysis: issuer's credit characteristics in aggregate

Group or government influence: assessment of likely extraordinary group or government support (or conversely, negative intervention) factors into the issuer credit rating on an entity that is a member of a group or is a government-related entity.

- identify the members of the group
- determine a group credit profile
- assess the status of an entity within the group and the resulting likelihood of support
- and combine the entities' stand-alone credit profile with the support conclusion
- five categories of group status:
  - "core,"
  - "highly strategic,"
  - "strategically important,"
  - "moderately strategic,"
  - "nonstrategic."

Literature:

S&P (2014): How Standard & Poor's Rates Nonfinancial Corporate Entities. Standard and Poor's Rating Serivces https://www.spratings.com/documents/20184/774196/HowWeRateNonFinCorps.pdf

c) Credit rating

Instead of taking a loan from a bank, companies and governments borrow money directly from investors by issuing bonds or notes. Investors purchase these debt securities such as municipal bonds expecting to receive interest plus the return of their principal. Credit ratings may facilitate the process of issuing and purchasing bonds and other debt issues by providing an efficient, widely recognized, and long-standing measure of relative credit risk. Credit ratings are assigned to issuers and debt securities as well as bank loans. Investors and other market participants may use the ratings as a screening device to match the relative credit risk of an issuer or individual debt issue with their own risk tolerance or credit risk guidelines in making investment and business decisions.

Credit ratings are *opinions about credit risk*. It expresses the rating agencies' opinion about the ability and willingness of an issuer, such as a corporation or state or city government, to meet its financial obligations in full and on time. Credit ratings are not absolute measure of default probability. Since there are future events and developments that cannot be foreseen, the assignment of credit ratings is not an exact science. Credit ratings can also speak to the credit quality of an individual debt issue, such as a corporate or municipal bond, and the relative likelihood that the issue may default.

Ratings at S&P can be scaled as:

- AAA: investment-grade with extremely strong capacity to meet financial commitments
- AA: investment-grade with very strong capacity to meet financial commitments
- A: investment-grade with strong capacity to meet financial commitments but somewhat susceptible to adverse economic conditions and changes in circumstances

- BBB: investment-grade with adequate capacity to meet financial commitments, but more subject to adverse economic conditions
- BB: speculative-grade with less vulnerable in the near-term but faces major ongoing uncertainties to adverse business, financial and economic conditions
- B: speculative-grade with more vulnerable to adverse business, financial and economic conditions, but currently has the capacity to meet financial commitments
- CCC: speculative-grade with currently vulnerable and dependent on favourable business, financial and economic conditions to meet financial commitments
- CC: speculative-grade with highly vulnerable; default has not yet occurred but it is expected to be virtual certainty
- C: speculative-grade with currently highly vulnerable to non-payment, and ultimate recovery is expected to be lower than that of higher rated obligations
- D: speculative-grade with payment default on a financial commitment or breach of an imputed promise; also used when a bankruptcy petition has been filled or similar action taken

Cumulative Defaulters By Time Horizon Among Global Corporates, From Original Rating (1981-2018)

	AAA	AA	A	BBB	BB	B	CCC	Total
Number of issuers defaulting per time frame								
One year	0	0	0	3	13	81	110	207
Three years	0	1	6	29	141	587	210	974
Five years	0	3	13	71	293	1,012	240	1,632
Seven years	2	6	28	102	399	1,231	256	2,024
Total	8	30	98	208	613	1,523	274	2,754
Percentage of total defaults per time frame (%)								
One year	0	0	0	1,4	6,3	39,1	53,1	
Three years	0	0,1	0,6	3	14,5	60,3	21,6	
Five years	0	0,2	0,8	4,4	18	62	14,7	
Seven years	0,1	0,3	1,4	5	19,7	60,8	12,6	
Total	0,3	1,1	3,6	7,6	22,3	55,3	9,9	

Source: S&P (2018): Default, Transition, and Recovery: 2018 Annual Global Corporate Default And Rating Transition Study. Standard and Poor's

Literature:

https://www.spratings.com/en_US/understanding-ratings

d) Traditional default forecast methods

Bankruptcy forecasting was initiated by the multivariate discriminant analysis of Altman (1968) as the Altman-Z model for public traded enterprises. Later on other approaches were published like the logit model of Ohlson (1980), Taffler's (1984) modified Z and Zmijewski's (1984) probit model. Since then, these are the most popular methods next to the neural networks and contingent claims analysis (Jackson – Wood 2013) and they provide similar results for the companies (Agarwal – Taffler 2008, Altman 2017).

The Altman-Z (1968) model was the first multivariate default-model for public-listed enterprises in the manufacturing sector – based on their liquidity, profitability and funding conditions. Later on, it was modified to study private firms as well (Altman 1977, Altman 2000), often referred as Altman-Z':

Z' = 0.717X1 + 0.847X2 + 3.107X3 + 0.420X4 + 0.998X5

X1 = (current assets − current liabilities) / total assets

X2 = retained earnings / total assets

X3 = earnings before interest and taxes / total assets

X4 = book value of equity / total liabilities
X5 = sales / total assets

Companies under Z'<1.23 have 95% chance to go default in the next business years (it is 72% two years later and 48% three years later), while this chance is minimal above 2.9 (Altman 2000, Betts 1987, Kotormán 2009).

The original Altman-Z score has been modified many times in the last 50 years to fit private or non-manufacturing enterprises (Altman 2000). Despite its American origin, the model was successfully tested on different European samples: it was validated on 57% of the Slovakian construction industry (Rybárová et al. 2016), an N=521 Lithuanian sample was analysed between 2009 and 2013 (Marcinkevicius – Kanapickiene 2014) and nearly 60 thousand manufacturing and construction enterprises were compared between 2008 and 2013 (Karasa és Režňáková 2015). The banking sector was also a subject of different articles: international banks (N=34) between 2007-2010 (Altman et al. 2017) as well as public owned investment banks (N=34) were studied (Brou – Krueger 2016). The model was able to stand the test of big data analysis: samples like one thousand British enterprises between 2000-2013 (Almamy et al. 2016) or nearly nine thousand Czech companies with more than 10 employees (Machek 2014). The popularity of the method in the last two decades underlines its validity – however, some author (Tian – Yu 2017, Altman et al. 2017, Brou – Krueger 2016, Almamy et al. 2016, Grice – Ingram 2001, Wu et al. 2010, Qi 2014) suggests that a sectorial fine-calibration or the inclusion of macro-variables like inflation, interest rate or lending can enhance the predictive power ever further. The predictability of defaults one year earlier are varying on a narrow scale: 75 for Altman et al. (2017), 95-75% for Berzkalne – Zelgalve (2013), 74.5% for Marcinkevicius – Kanapickiene (2014), 88% for Salimi (2015) and 91% for Karasa – Režňáková (2015). Recession periods can bias the accuracy downwards according to Berzkalne – Zelgalve (2013).

The Ohlson-O model based on a logistic regression (Ohlson 1980), and it represents the probability of default within the next two years for P>0,5 under 96% reliability:

*O=-1,32-0,407*log(TA/GNP)+6,03*TL/TA-1,43*WC/TA+0,0757*CL/CA-1,72*X-2,37*NI/TA-1,83*FFO/TL+0,285*Y-0,521*(NIt-NIt-1)/(abs(NIt)-abs(NIt-1))*

$$P = \frac{e^O}{1 - e^O}$$

TA = total assets
GNP = Gross National Product price index level
TL = total liabilities
WC = working capital
CL = current liabilities
CA = current assets
X = 1 if TL > TA, 0 otherwise
NI = net income (pre-tax profit)
FFO = funds from operations
Y = 1 if a net loss for the last two years, 0 otherwise

The Ohlson-O score has lower popularity in the literature: the Ebsco database accounts for 172 articles which is remarkably lower than the appearance of the Altman-Z score (N=2536). However, it can be converted to an exact default-probability instead of thresholds and the relative size of the company was involved to consider the too-big-to-fail effect as well as the cash-flow. This approach was mostly used to calibrate and backtest other more specific models on big data analyses: US pricing anomalies were studied by Novy-Marx (2013), Stambaugh et al. (2012) or by Charitou et al. (2011).

The combined use of the Altman-Z and Ohlson-O methods was suggested by Dichev (1998) due to their different econometric fundaments (discriminant analysis and logit regression) and different calibration background (samples from the 1960's and the 1970's).

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iii. Assignment 4: Financial distress – Altman Z' and Ohlson O default ratios

Please compute the Altman Z and Ohlson O scores for the original and the modified company!

SAMPLE

The corporate strategy was renewed at the beginning of the year, including:

- A new locomotive (2.6 m EUR);
- Reduced expenditures (maintenance and traction electricity bills);
- Reduced long-term debt (1.49 m EUR);
- Emptied cash reserves (bank deposits: 0);
- A need for short-term funding on min cost basis (82 500 EUR/year).

Financial distress conditions are measured via Altman-Z’ and Ohlson-O ratios in this report.

- Altman-Z' (private companies, Altman 2000[8]): Z= 0,717*A + 0,847*B + 3,107*C + 0,420*D + 0,998*E
    - A = (current assets − current liabilities) / total assets
    - B = retained earnings / total assets
    - C = earnings before interest and taxes / total assets
    - D = book value of equity / total liabilities
    - E = sales / total assets

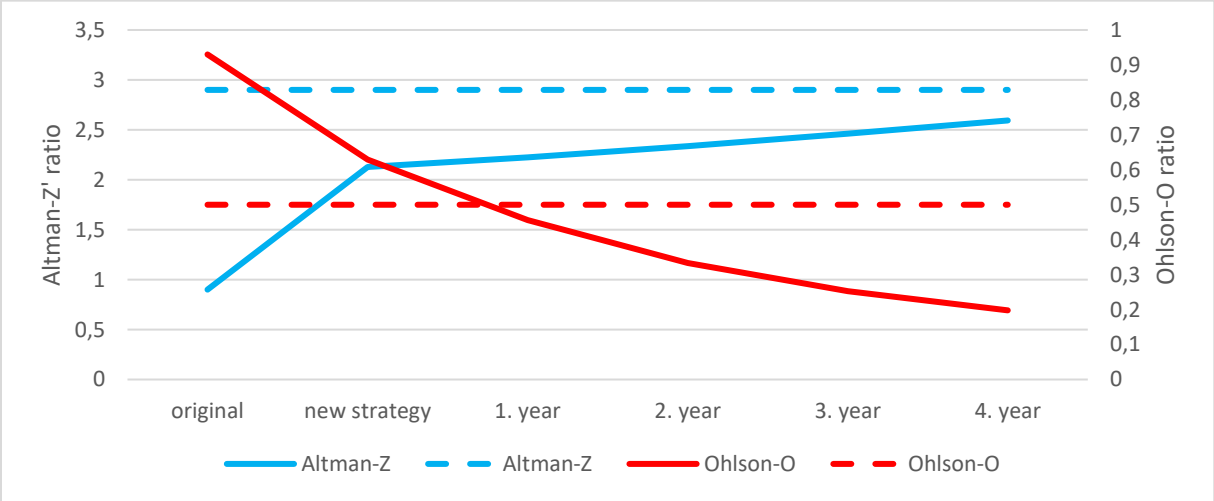
      Zones of discrimination:
      Z’ > 2.9 – “Safe” Zone
      1.23 < Z’ < 2.9 – “Grey” Zone

[8] Altman, E. I. (2000): Predicting Financial Distress of Companies: Revisiting the Z-Score and Zeta models. *Journal of Banking and Finance*, 1, 1-51.

Z' < 1.23 – "Distress" Zone

- Ohlson-O (1980)[9]: O=-1,32-0,407*log(TA/GNP)+6,03*TL/TA-1,43*WC/TA+0,0757*CL/CA-1,72*X-2,37*NI/TA-1,83*FFO/TL+0,285*Y-0,521*(NIt-NIt-1)/(abs(NIt)-abs(NIt-1))
  - TA = total assets
  - GNP =
  - TL = total liabilities
  - WC = working capital
  - CL = current liabilities
  - CA = current assets
  - X = 1 if TL > TA, 0 otherwise
  - NI = net income
  - FFO = funds from operations
  - Y = 1 if a net loss for the last two years, 0 otherwise

The original setup presented high financial distress level as Altman-Z' was 0.9 (red zone: 1.23) and Ohlson-O was p=0.93, representing the unprofitability of this company.
The new strategy decreased these ratios towards more sustainable levels, however the lack of cash reserves had their adverse impacts.



Source: author's calculations

As time passes and company makes 1.027 billion HUF in each year approximately, the financial distress signals are decreasing even further – representing a sustainable design.
Both approaches provided similar results, so the assumptions about the financial distress of the restructured company seems to be robust.

e) Cases of corporate defaults (some famous cases)

Basic concept: corporate value depends on positive long-run cash flows, assets are accumulated to achieve them – while these cash-flows are covering all capital-related costs. Therefore troubles can start when:

- assumptions about long-term cash-flows are overestimated (corporate- or market-level)

[9] Ohlson, J. A. (1980): Financial ratios and the probabilistic prediction of bankruptcy. *Journal of Accounting Research*, 18, 109-131.

- assets are not valued well, market disappears
- short-term funding condition changes, liquidity issues

The role of market failures in financial crises, past and present (BoE 2009):

- Incentive problems
  - Moral hazard and 'too big to fail'
    - 'The Greenspan Put' — some argue that soaring equity prices earlier this decade reflected investors' beliefs that the Federal Reserve would act to prevent the market from falling, but not to stop it rising (2000s).
    - Support for Fannie Mae, Freddie Mac, Bear Stearns and AIG (2008).
    - October 2008 recapitalisation plan and March 2009 Asset Protection Scheme offered to large UK banks.
    - Continental Illinois (1984), US Savings and Loans crisis (1980s/90s).
  - Incomplete contracts
    - Compensation structures that gave staff incentives to pursue unduly risky practices.
- Information frictions
  - Network externalities
    - Credit default swap market at the time of Lehman Brothers & AIG stress (September/October 2008) — contagious consequences of default were unclear to others in the financial network.
  - Risk illusion
    - The 'search for yield' — buoyed by illusory reductions in macroeconomic uncertainty, investors tried to maintain high returns in a low interest in rate environment by purchasing ever riskier products (2003–07).
    - Widespread use of value at risk (VaR) models for risk management purposes, which were estimated over episodes of relative calm financial markets, and so could not capture the possibility of extreme market volatility (1997 onwards).
    - Investors in Bernard L Madoff's funds extrapolated apparent trends in profits (2008).
    - Suspension by BNP Paribas of its hedge funds in August 2007 because of difficulties experienced in valuing sub-prime related exposures — illusion existed over the liquidity risk embedded within asset-backed securities.
  - Adverse selection
    - The freeze of the interbank and asset-backed commercial paper markets (August 2007) — investors bid down prices as they had imperfect information on the quality of underlying assets, and sellers of 'good' assets were unwilling to sell at prevailing market prices.
  - Information cascades
    - Contagious currency devaluations during the Asian financial crisis (1997).
    - Short-selling of the shares of some UK banks (2008).
- Co-ordination problems
  - Peer benchmarking
    - Condition of financial system in mid-2007, as described by Chuck Prince's infamous quote
      - 'When the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you've got to get up and dance. We're still dancing', Financial Times, 9 July 2007.
    - Peer-group comparison among investment managers.

- Fire-sale externalities
  - Series of bank mergers and rescues that followed failure of Lehman Brothers to prevent contagious fire-sales, eg. Bradford and Bingley and HBOS (2008).
  - Long Term Capital Management — the Federal Reserve of New York facilitated a debt restructuring in order to prevent a disorderly unwinding of LTCM spilling over to other institutions (1998).
  - Following the 2001 'dotcom' equity correction, losses faced by UK life insurers could have led to a potential 'asset price loss-spiral' through equity sales — FSA intervened by relaxing solvency rules.
- Credit crunch externalities
  - Bank lending to households and corporates tightened significantly in 2008/09.
- Runs on retail or wholesale deposits
  - Runs on money market funds (2008), prompting the introduction of the Federal Reserve's Money Market Fund facility
  - Runs on Lehman Brothers and Bear Stearns (2008)
  - Run on Northern Rock (2007), leading to the introduction of increased deposit insurance limit in the United Kingdom (2008)
  - Wholesale market run on Continental Illinois (1984)

Overestimated cash-flow:

- **South Sea Company (1711-1720)**
  - *The Governor and Company of the merchants of Great Britain, trading to the South Seas and other parts of America, and for the encouragement of fishing*
  - public–private partnership → consolidate and reduce the cost of national debt
  - total government debt in 1719 was £50 million:
    - £3.4m by the Bank of England
    - £3.2m by the British East India Company
    - £11.7m by the South Sea Company
    - Privately £16.5m
  - £15m consisted of irredeemable annuities
  - granted a monopoly to trade with South America
  - company never realized any significant profit from its monopoly (non-transparent operations)
  - Annual ship, slave trade, whale-hunt
  - Bubble Act
    - estates of the directors of the company were confiscated and used to relieve the suffering of the victims,
    - stock of the South Sea Company was divided between the Bank of England and the East India Company
- **Enron (2001)**
  - US energy company – „biggest audit failure" (Arthur Andersen → 0)
  - selling of electricity at market prices + deregulating the sale of natural gas → price volatility
  - Enron became the largest seller of natural gas in North America by 1992
  - Diversification: gas pipelines, electricity plants, pulp and paper plants, water plants, and broadband services + trading contracts
  - unethical practices: misrepresent earnings, modified balance sheet to indicate favourable performance to hide debt, off-balance-sheet vehicles, complex financing structures

- Executive compensation: short-term earnings to maximize bonuses (stock options)
- Sarbanes-Oxley Act → penalties for destroying, altering, or fabricating records in federal investigations or for attempting to defraud shareholders + audit ← → accounting
- WorldCom – similar, but in ITsector (over-expansion and manipulated balance sheets)

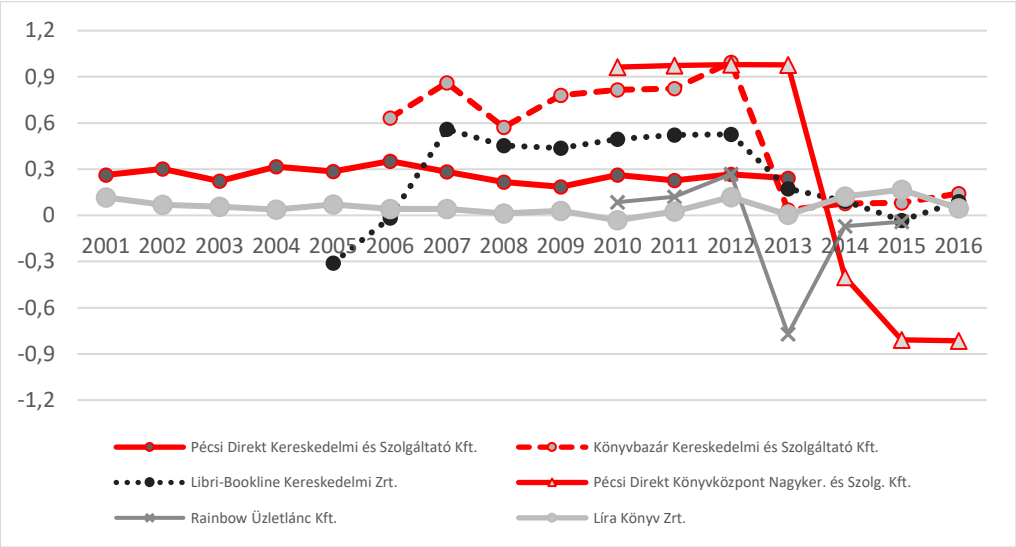
Liquidity problems (growing to fail):

- **Ivar Kreuger (1932)**
  - match monopolies with European and Central and South American governments
  - controlled between two thirds and three quarters of worldwide match production, becoming known as the „Match King"
  - many legitimate and often very profitable businesses, and owned banks, real estate, a rich mine, and pulp and industrial companies, besides his many match companies
  - large scale production facilities, ideas to increase efficiency in production, administration, distribution, and marketing
  - Mergers and acquisitions in Sweden → Norway and Finland
  - gave loans to governments to speed up reconstruction → grant him the match monopoly in their country
  - Covered by Swedish and US bank loans and corporate bonds
  - moved money from one corporation he controlled to another
  - SKF, Ericson, Deutsche Unionsbank in Germany and Union de Banques à Paris in France acquisitions for cash
  - *reported profits when there were none*
  - *paid out ever increasing dividends by attracting new investment*
  - *looting the treasury of a newly acquired company*
- **Infogrames Entertainment SA - Atari SA**
  - Founded: 1983 in Lyon, France
  - 1996–2002: Growth through acquisition to become the world's leading interactive entertainment publisher
    - debt from $55 million (1999) to $493 million (2002)
    - revenue from $246 million to $650 million
    - 1996: merge with British company Ocean International Ltd. (100 m usd)
    - 1997: Philips Multimedia BV (NL), Laguna Video Games (DE): publishing and distribution
    - 1998: OziSoft from Sega (AU, NZ), ABS Multimedia, Arcadia and the Swiss Gamecity GmbH: game distributors
    - 1999: Gremlin Interactive (UK), Accolade (US), Beam Software (AU)): developers; GT Interactive for $135 m+$30 m (+75m usd debt): publisher
    - 2000: Paradigm Entertainment $19.5 m, Den-o-Tech Int. $5.6 m: developers
    - 2001: Hasbro Interactive and game.com consol $100 million; with $95 million as 4.5 million common shares of Infogrames and $5 million in cash
    - 2001: renaming the company under the Atari brand
  - Dot-com bubble bursts in 2001
    - 2002: MicroProse's UK studio closed, acquisitions: Eden Games for $4.1 million, Shiny Entertainment for $47 m: developers; net loss of $67 million on revenues of $650 million
    - 2003: Sheffield House development studio and Atari Hunt Valley studio were closed; US and EU operations separated, net losses increased to $89 million

        - 2004: Legend Entertainment was closed; sold the Civilization franchise to Take-Two Interactive for $22.3 m, lost the rights to the Unreal franchise
        - 2005: sold back to Hasbro the digital rights to most Hasbro properties for $65 m
        - 2006: sold the Games.com site to AOL and two francises to other competitors to generate $13 million in revenue, developer Reflections Interactive and the Driver franchise for $21.6 million to Ubisoft, Shiny Entertainment was acquired by Foundation 9 Entertainment for $1.6 m, Atari Melbourne House was sold to Krome Studios; net loss of $201 million on revenues of $525 million, and debts of around $290 million
        - 2007: Infogrames' founding chairman Bruno Bonnell left the company after 24 years, fired the majority of Atari's directors and laid off 20% of its workforce; net loss of $70 m
    - 2008: buy out all remaining public shares for a value of US$1.68 per share or US$11 million total (Infogrames the sole owner of Atari Inc.): reduce administrative costs and to focus on online gaming
        - bought Cryptic Studios (multiplayer online game developer) for $26.7 million in cash plus performance bonuses
        - Infograme's distribution network to Distribution Partners (34% Namco Bandai and 66% Atari), then sold completely for €37 million in 2009
        - €51.1 million ($72.17 million) in net losses in 2008
        - losses of €226.1 million ($319.33 m in 2009
    - changing its corporate name to an Atari branded name in 2009
        - significant owners like BlueBay Value Recovery (Master) Fund Limited and BlueBay Multi-Strategy (Master) Fund Limited are exploring a disposal of the shares and equity-linked instruments:
            - restructuring of the debt and capital structure of the Atari group
            - €20.9 million Credit Facility Agreement was extinguished via €10.9 million loan forgiveness from BlueBay Value Recovery (Master) Fund Limited and Atari's payment of €10 million
            - cancellation of the dilutive effect of the ORANEs held by BlueBay
            - €20 million capital increases (€10 million with preferential subscription)
    - 2013: bankruptcy protection under French law; its subsidiaries in the United States have sought Chapter 11 bankruptcy protection
        - sell its game assets, developers and the famous tripod logo and the Atari name in auction
        - Eden Games closed down (then reopened up as an independent developer)
        - emerged from bankruptcy and entered the social casino gaming industry with Atari Casino (staff of 10 people)
        - later they sold further franchises (2013-2018)
        - 2017: Ataribox
          Full story: https://en.wikipedia.org/wiki/Atari_SA
- **Alexandra bookstore (2016)**
    - Market leader on the Hungarian retail and wholesale book market since the late 1990's until the mid-2010's.
    - Business model:

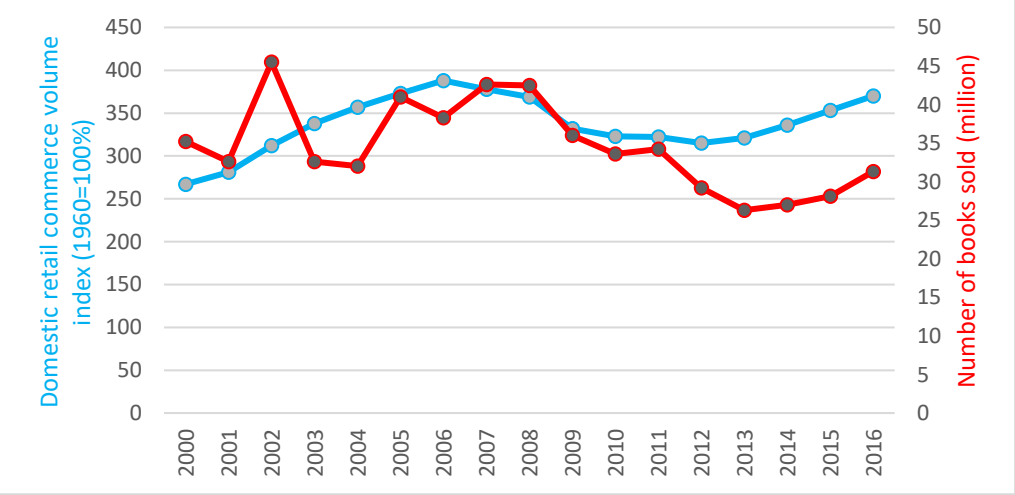
- stores in new shopping malls (plaza-boom in the 2000s in all major cities and in the capital – for example Szeged had 4 stores with 160 thousand population)
- huge market share in the printed book e-commerce as well
- books are not purchased from the publishing houses, they are paid only after the book was sold to the customers (60-180 days)
- strong personal management by Dezső Matyi (founder)

- The working capital to balance sheet ratio was positive, so the company did not followed an aggressive funding strategy:



Source: authors' calculation, based on corporate annual report data
Notes: red lines represent the Alexandra-related companies, grey lines the main competitors

- The company started to diversify its business lines in the late 2000's: winery, football team, etc., but these subsidiaries were not profitable
- The book and publishing market collapsed after the Great Financial Crisis in 2008, mainly due to currency devaluation, rising unemployment, taxes, increased interest rate and lack of funding:



Source: authors' calculation, Hungarian Statistical Office

- The Alexandra was not able to pay after 90 days for the suppliers in 2008.

- Two mayor publishing houses collapsed in 2015/2016 after publishers remained unpaid after the Christmas-period.
- Immediate closure of the over-expanded retail stores, then the reliable ones were picked and reopened by the competitors under their own brand (~30% remained closed or changed profile).
- Dezső Matyi kept the online sales only

Literature:

BoE (2009): *The role of macroprudential policy*. Bank of England, https://www.bankofengland.co.uk/-/media/boe/files/paper/2009/the-role-of-macroprudential-policy.pdf

f) CDS pricing concepts

Credit Default Swap reason:

The company promises to pay coupons and the notional at maturity on corporate bonds. If a default occurs, however, investors receive only a fraction (the recovery rate, RR) on their investment. A comparable risk-free bond on the other hand is certain to repay the notional and coupons, so the yield spread on sovereign bonds is required to compensate investors for choosing the risky bonds instead of risk-free securities.

Credit Default Swap operation:

The protection buyer offers to pay the CDS premium in exchange for receiving the loss on defaulted bonds ($h = 1-RR$) in case a default occurs.

The CDS spread needs to be high enough to compensate the protection seller for the risk of payment, i.e. the probability of default and the loss on bonds given a default.

Pricing credit risk:

- Structural models (Merton 1974): probability of the firm asset value falling below the debt threshold (or the equity value falling below zero) is calculated from an assumed dynamic process for the asset value. When equity becomes negative the firm becomes insolvent and it is liquidated in this case as a result. Merton-type models assume a lognormal price for the asset value, in which case closed-form formulas are available for the bond price. These models therefore assume that there is a stochastic variable and a threshold, which if reached, default necessarily occurs.
- Reduced form models of default instead assume a process for the default intensity (λ_t , the instantaneous hazard rate at t) itself without reference to underlying drivers of the default and a process for the risk-free interest rate r_t^f . Assuming a one-period corporate bond that can only default at the end of the period and with a risk-free alternative that is also a zero-coupon bond that has a unit payoff at $t + 1$, the zero-coupon bond price in t reduces to:
  - $P_t = E_t^Q \left[\frac{1-\lambda_{t+1}}{1+r_t^f} + \frac{(1-h)\lambda_{t+1}}{1+r_t^f}\right] = \frac{1-E_t^Q[h\lambda_{t+1}]}{1+r_t^f}$ with a Q risk-neutral martingale
  - yield on the zero-coupon bond is: $r = \frac{1}{P} - 1 = r_t^f + S_t$ with a S_t spread
  - after dropping the expectations operator: $\frac{1-h\lambda_{t+1}}{1+r_t^f} = \frac{1}{1+r_t^f+S_t}$
  - where the spread can be expressed as: $S_t^{BOND} = \frac{h\lambda_{t+1}}{1-h\lambda_{t+1}}(1 + r_t^f)$
  - spread and default risk have a logistic functional relationship
    - default probability or the loss on bonds converge to zero, so does the spread
    - default probability and the loss on bonds converge to one, the spread becomes infinite
  - variation in the risk-free has a negligible direct effect on spreads
    - non-negligible effect through affecting λ

- further simplification: $S_t^{BOND} = (1 + r_t^f)h\lambda_{t+1}$
  - assumption of the defaulting only on the principal and always repaying the interest on one-period coupon bonds

- CDS: when default occurs the accrued premium is paid out
  - one premium payment is made conditional on the company not defaulting at the end of the period:
  - premium leg is: $\frac{S_t^{CDS}}{1+r_t^f}$
  - protection leg is: : $\frac{h\lambda}{1+r_t^f}$
  - so the spread can be written as: $S_t^{CDS} = h\lambda_{t+1}$
    - a CDS contract pays out the accumulated premium in a default,
    - whereas a company defaulting on the bond would pay the recovery rate on the spread, therefore the premium leg is larger
    - since both the premium payments and protection payments are discounted at the same rate, the risk-free rate does not appear in the CDS premium
    - in empirically relevant cases $(1 - h\lambda_{t+1}), (1 + r_t^f) \sim 1$ so $S_t^{CDS} \sim S_t^{BOND}$

Ratings and spreads:

- Credit ratings are lagged indicators of credit risk and their ordinal scale is can only match ranges of default probabilities.
- Credit spreads on the other hand are influenced by expected recovery rates next to default probabilities and the significant and volatile time-varying risk premia overestimate true default probabilities.
- Negative announcements (worsening credit outlook or downgrades) often found to have significant CDS impact whereas this is usually not true for positive announcements.

Literature:

Pan, Jun and Kenneth J Singleton (2008): Default and recovery implicit in the term structure of sovereign CDS spreads. *Journal of Finance* 63(5):2345–2384.

Lando, David (1998): On Cox processes and credit risky securities. *Review of Derivatives research* 2(2-3):99–120.

Kocsis, Zalán (2019): *Time-Variation in the Pricing of Country Fundamentals in Sovereign Credit Spreads*. Doctoral Thesis, University of Szeged

III. Exchange rate risk management

1. Foreign exchange rate regimes

I case of looking for the de-facto exchange rate regimes, the annual IMF's "Annual Report on Exchange Arrangements and Exchange Restrictions" (AREAER) can help you at (1999-2018): https://www.elibrary-areaer.imf.org/Pages/YearlyReports.aspx

a) Exchange Rate Regime

- Exchange arrangements with no separate legal tender („dollarized", 13)
  - *For example: Ecuador (USD), Panama (USD), Montenegro (EUR)*
- Currency board arrangements (13)
  - *For example: Hong Kong (USD), Bosnia and Herzegovina (EUR), Bulgaria (EUR)*
- Conventional peg (43)

    - *For example: Saudi Arabia (USD), WAEMU & CEMAC (EUR), Denmark (EUR), Kuwait (composite)*
- Stabilized arrangement (24)
    - *For example: Angola (USD), Croatia (EUR), Vietnam (composite), China (composite), Czech Rep. (EUR)*
- Crawling peg (3)
    - *For example: Honduras (USD), Nicaragua (USD), Botswana (composite)*
- Crawl-like arrangement (10)
    - *For example: Iran (composite)*
- Floating (38)
    - *For example: Switzerland, Hungary,*
- Free floating (31)
    - *For example: USA, Japan, Euro-zone, Russia, Sweden, UK*

b) Exchange rate anchor

- The monetary authority buys or sells foreign exchange to maintain the exchange rate at its predetermined level or within a range.
- The exchange rate thus serves as the nominal anchor or intermediate target of monetary policy.
- These frameworks are associated with exchange rate arrangements with no separate legal tender, currency board arrangements, pegs (or stabilized arrangements) with or without bands, crawling pegs (or crawl-like arrangements), and other managed arrangements

c) Conventional peg

- The country formally (de jure) pegs its currency at a fixed rate to another currency or basket of currencies,
    - where the basket is formed, for example, from the currencies of major trading or financial partners and weights reflect the geographic distribution of trade, services, or capital flows.
- The anchor currency or basket weights are public or notified to the IMF.
- The country authorities stand ready to maintain the fixed parity through
    - direct intervention (that is, via sale or purchase of foreign exchange in the market) or
    - indirect intervention (for example, via exchange rate related use of interest rate policy, imposition of foreign exchange regulations, and exercise of moral suasion that constrains foreign exchange activity or intervention by other public institutions).
- There is *no commitment to irrevocably keep* the parity, but the formal arrangement must be confirmed empirically:
    - the exchange rate may fluctuate within narrow margins of less than ±1 percent around a central rate
    - or the maximum and minimum value of the spot market exchange rate must remain within a narrow margin of 2 percent for at least six months.

d) Stabilized arrangement

- Entails a spot market exchange rate that remains within a margin of 2 percent for six months or more (with the exception of a specified number of outliers or step adjustments) and is not floating.
- Statistical criteria are met and that the exchange rate remains stable as a result of official action (including structural market rigidities).
- The classification does **not imply a policy commitment** on the part of the country authorities

e) Crawling peg

- The currency is adjusted in small amounts at a fixed rate
  - or in response to changes in selected quantitative indicators,
  - such as past inflation differentials vis-à-vis major trading partners or differentials between the inflation target and expected inflation in major trading partners.
- The rate of crawl can be set to generate inflation-adjusted changes in the exchange rate (backward looking)
- or set at a predetermined fixed rate and/or below the projected inflation differentials (forward looking).
- crawl-like arrangement: remain within a narrow margin of 2 percent relative to a statistically identified trend for six months or more
- pegged exchange rate within horizontal bands: value of the currency is maintained within certain margins of fluctuation of at least ±1 percent around a fixed central rate, or the margin between the maximum and minimum value of the exchange rate exceeds 2 percent

f) Pros and cons of the fixed (pegged) exchange rate regime

- Beneficial
  - exporters and importers could engage in international trade without concern about exchange rate movements of the currency to which their local currency is linked
  - foreign currency as payment would be insulated from the risk that the currency could depreciate over time
  - firms could engage in direct foreign investment, without concern about exchange rate movements of that currency
  - investors would be able to invest funds in foreign countries, without concern that the foreign currency denominating their investments might weaken over time
  - Intervention – devaluation – revaluation
  - Devaluation is normally used in a different context than depreciation. Devaluation refers to a downward adjustment of the exchange rate by the central bank
- Disadvantages:
  - Its maintenance – direct (from FX reserves) and indirect (interest rates) interventions by monetary policy → never ended well…

g) Floating

- Largely market determined, without an ascertainable or predictable path for the rate
- intervention may be either direct or indirect, and such intervention serves to moderate the rate of change and prevent undue fluctuations in the exchange rate,
- but policies targeting a specific level of the exchange rate are incompatible with floating
- free floating: if intervention occurs only exceptionally and aims to address disorderly market conditions

h) Pros and cons of the floating exchange rate regime

- exchange rate values are determined by market forces without intervention by governments
- A freely floating exchange rate adjusts on a continual basis in response to demand and supply conditions for that currency
- Advantages
  - country is more insulated from the inflation of other countries
  - central bank is not required to constantly maintain exchange rates within specified boundaries
  - if exchange rates were not allowed to float, investors would invest funds in whatever country had the highest interest rate

- Disadvantages
  - FX exposure: impact on exporters and importers, profitability of transnational companies, investments → requirement of hedging (future, option, swap markets)
  - Interest rate will fluctuate too…

i) Currency Board

- currency board is a system for pegging the value of the local currency to some other specified currency.
- The board must maintain currency reserves for all the currency that it has printed
- large amount of reserves may increase the ability of a country's central bank to maintain its pegged currency
- Exposure of a Pegged Currency to Interest Rate Movements
- Exposure of a Pegged Currency to Exchange Rate Movements

j) Dollarization

- replacement of a foreign currency with U.S. dollars.
- This process is a step beyond a currency board because it forces the local currency to be replaced by the U.S. dollar.
- Although dollarization and a currency board both attempt to peg the local currency's value, the currency board does not replace the local currency with dollars.
- Cannot be easily reversed because the country no longer has a local currency.

k) Asset price bubble – anomaly

- An asset price bubble can be interpreted as a sharp rise in the price of an asset and it is not related to future earnings capacity, which is determined by expected cash flows and discount rates. It is limited by the duration of the asset (Siegel 2003). Monetary policy can monitor this phenomenon with methods like the Ball-Svensson model for pre-emptive purposes (Robinson and Stone 2006), but the right interpretation of the so called "Greenspan put" acknowledges the limits of these actions and focuses mostly on crisis-management (Benati and Goodhart 2011). But what happens when a currency is affected by bubble bowing behaviour? This section summarizes the theoretical frameworks of this issue with an intention of focusing on the aspects of volatility and excessive appreciation.

l) Flight to safety – anomaly

- Flight-to-quality is an asset-allocation strategy during market uncertainty as assets are reinvested into higher-quality, less-risky instruments to minimize potential losses in the event of a market downturn and to reduce funds' exposure to systematic risk under high political uncertainty (Feng et al. 2018). Flight to safety can bias currency markets due to a sudden and excessive demand for safe assets which can be captured in portfolio investment changes.
- risk-performance payoffs
  - of international currencies, equities and bond markets
- flight-to-quality: an increase in perceived riskiness engenders conservatism and demand for safety
- Contagion: risk and market crashes spill over across countries, international markets and, possibly, asset classes

m) Safe haven currency – anomaly

- An asset can be considered as a safe haven if it represents a refuge investment when political shocks hit financial markets as it bears a negative risk premium. The value of a safe haven currency appreciates when market risk and illiquidity increase – which can be influenced by

macro factors like inflation, income growth or money supply with an impact on interest rates and currency market volatility. The Swiss franc carries the strongest safe haven attributes, but the yen and euro have also been used as refuge currencies. (Ranaldo and Söderlind 2010)

- currencies' risk-return profiles to equity and bond markets
- depreciations of safe-haven currencies due to gradual erosions of risk aversion inherent in phases of equity markets upturns
- risk episodes of more extreme nature—when risk perception rises suddenly
- Low inflation, moderate interest rates, stable institutions

Reading: https://core.ac.uk/download/pdf/6710655.pdf

n) Carry trade – anomaly

- carry traders holding a short position in a safe-haven currency
  - (borrowing in CHF, JPY, EUR or USD)
- carry traders holding a long position in an emerging currency
  - (bonds in HUF, Turkish Lira, South African Rand)
- Profitable until low FX volatility, high interest rate differential
- Sudden increases in market participants' risk aversion fuel flight to safety that in turn, may lead to abrupt unwinding of carry trade—boosting safe-haven currencies' appreciations

o) Fear of floating - anomaly

- Small and open economies can be in the stage of "fear of floating", meaning the interest rate policy is set by indirect foreign exchange interventions to smooth exchange rate fluctuation regardless the de jure floating status (Calvo – Reinhart 2002, Frankel 2011, Mackiewicz-Lyziak 2016). Exchange rate exposure could be managed on micro level as well, but currency option pricing is also affected by the expected volatility and interest rate differentials.
- Countries that say they allow their exchange rate to flow mostly do not – observed exchange rate variability is quite low
- Je jure floating, de facto soft peg
  - Reserve volatility: high
  - Interest rate volatility: high
  - Monetary aggregates volatility: higher
- Trade shock are not/partially affecting the exchange rate
- Lack of credibility
  - Exchange rate & interest rate correlation: strong +
  - Exchange rate & reserve correlation: strong -

p) Exchange market pressure – anomaly

- Any excess demand for foreign exchange can be fulfilled through speculative attacks – a bubble bowing behaviour. If the speculative attack (currency pressure) is successful, then there will be a sharp depreciation of the domestic currency. This is what is termed as the Exchange Market Pressure (EMP) which Girton and Ropper (1977) measured using their proposed EMP index. The index is based on the idea that a country will fall on its reserves to ward off attack on the currency – a reason why more countries fear to maintain a floating currency regime. This theory is rooted in the monetary account of the balance of payments – the official view of intervention needed to maintain an exchange rate target to finance the current and the capital accounts. According to Girton and Ropper (1977), this view is not synonymous to a measure of independence of monetary policy in a country. The adoption of IT – which is premised on an independent monetary authority – provided an opportunity for researchers to consider the policy rate (interest rate) as an indicator for capturing how monetary authorities react to attacks on their currencies – even though the IT framework

espouses the adoption of a free-floating exchange rate regime. In recognising these facts, Girton and Ropper (1977) for instance adjusted reserve requirement changes with a measure of base money which Stavarek (2010) replicated in making a case for four euro-candidate countries (Czech Republic, Hungary, Poland and Slovakia), to participate in the Exchange Rate Mechanism II – a criterion to be fulfilled before entry into the Euro.

- The EMP index is meant to capture pressure on the currency as would occur under any normal depreciation or appreciation – which is often softened or diverted through monetary authority interventions and does not normally show in the nominal exchange rate dynamics. With countries practicing different monetary and exchange rate regimes – in an ever-increasing use of unconventional monetary policy instruments, the use of the index in its current form may lead to misleading conclusions as Stavarek (2010) for instance found no evidence of serious relationship between EMP and de facto exchange rate regime

$$EMP_t = \frac{1}{\sigma_{\Delta e}}(e_t - e_{t-1}) - \frac{1}{\sigma_{\Delta res}}\frac{\Delta RES_t}{Money_{t-1}} + \frac{1}{\sigma_{\Delta r}}\Delta\left(r_t - r_t^F\right)$$

q) Shocks – anomaly

- critical funding to be suddenly withdrawn,
- liquidity rapidly becomes concerns about solvency
- struggle to reduce leverage in an environment of collapsing risk appetite
- heightened counterparty risk and
- vanishing market liquidity
- become reluctant, even unwilling, to transact with one another.
- result: situations of a drying-up in market and funding liquidity tend to correlate with surges in financial market volatility

Literature:

Benati, L. – Goodhart, C. (2011): Monetary Policy Regimes and Economic Performance: The Historical Record, 1979-2008. In Friedman, B., Woodford, M., (eds.): Handbook of Monetary Economics. North Holland: Elsevier

IMF (2017): Annual Report on Exchange Arrangements and Exchange Restrictions 2017. International Monetary Fund

Hossfeld, O. and Pramor, M., 2018. Global liquidity and exchange market pressure in emerging market economies. Discussion Papers 05/2018, Deutsche Bundesbank.

2. Forecasting exchange rates

Database:

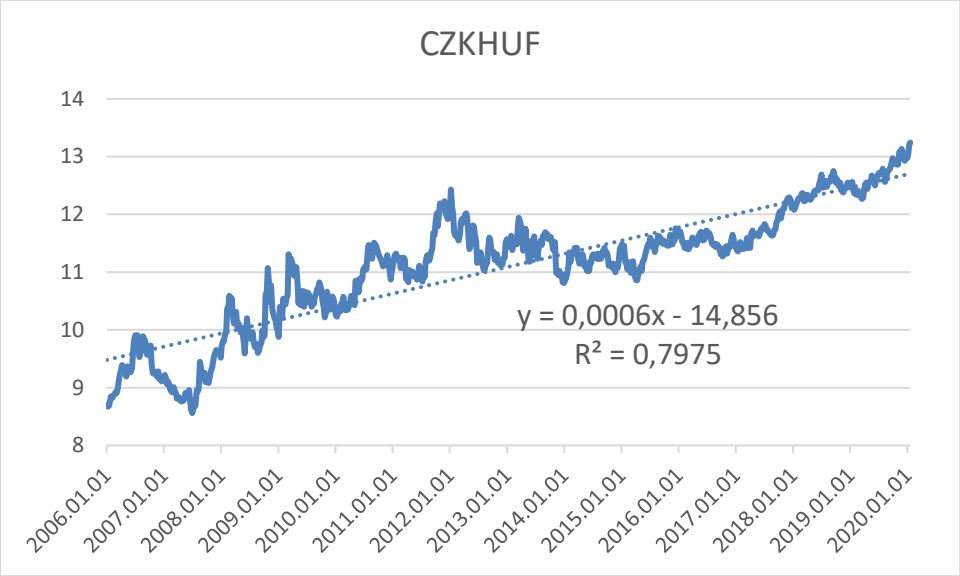
Stooq.com - https://stooq.com/t/?i=576

CME - https://datamine.cmegroup.com/#t=p&p=cme.dataHome

a) Historical trends

Exchange rate forecasting: spot: 25.84 EURCZK (November 8, 2018)

- Historical EURCZK (daily): *Czech Koruna has a tendency towards appreciation*

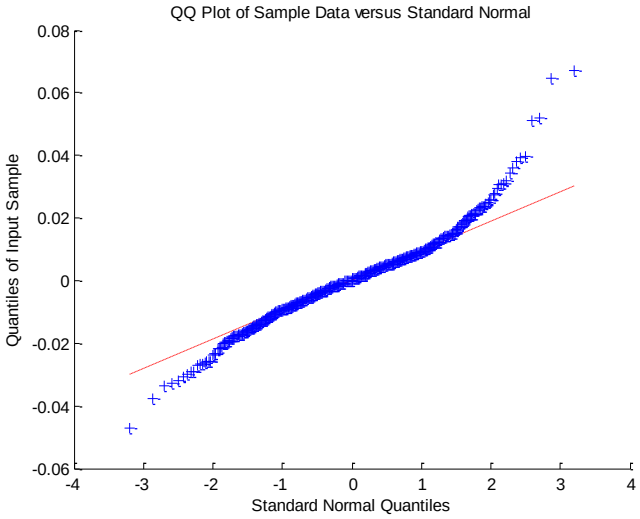


Source: author's calculations

- slope is positive (0.0006)

b) GARCH simulation

- univariate APARCH(1,1,1) models was fitted on the logarithmic returns with Skewed T distribution
  - APARCH (p,o,q): $\sigma_t^{\delta} = \omega + \sum_{i=1}^{p} \alpha_i (|\varepsilon_{t-i}| - \gamma_i \varepsilon_{t-i})^{\delta} + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^{\delta}$,
    - where $\alpha_i > 0$ $(i=1,\dots,p)$, $\gamma_i + \alpha_i > 0$ $(i=1,\dots,o)$, $\beta_i \geq 0$ $(i=1,\dots,q)$, $\alpha_i + 0{,}5\,\gamma_j + \beta_k < 1$ $(i=1,\dots,p,\ j=1,\dots,o,\ k=1,\dots,q)$ and δ index parameter can be between 1 and 2.
  - The Skewed-T distribution seems to be better, because the log returns of the CZKHUF (blue crosses) are not fitting well on the theoretical normal distribution (ret dotted line on the Q-Q plot) at the tails:



Source: author's calculations

- Result:

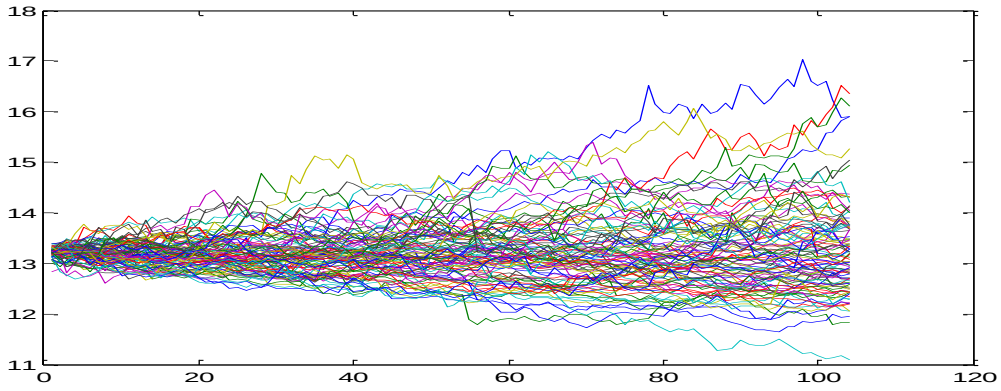
APARCH(1,1,1)

Loglikelihood: 2316.68
AIC: -3.1414
BIC: -3.0975

	Paramet.	Std. Err.	T-stat	P-val
omega	0.0000	0.0000	0.461	0.6447
alpha(1)	0.0422	0.0250	1.688	0.0913
gamma(1)	0.7067	0.5280	1.338	0.1808
beta(1)	0.9519	0.0173	55.1752	0.0000
delta	1.4482	0.5122	2.827	0.0047
nu	6.9208	1.6359	4.230	0.0000
lambda	0.0603	0.0537	1.123	0.2613

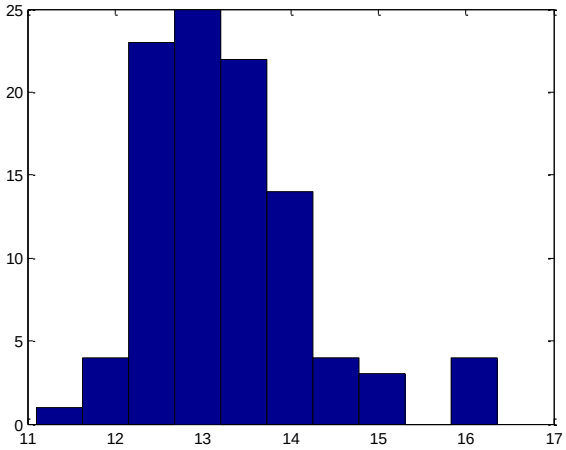
  - beta: The volatility of the CZKHUF is persistent: 95% of current week's volatility was defined by last week's volatility (if the market was uncertain about HUF pricing, it will be uncertain for this week as well).
  - gamma: The volatility of the CZKHUF increased as the HUF started to lose its value against the CZK.

- A univariate simulation of EURCZK: *a minor depreciation is more possible*
  - Model was simulated 100 times with 2*52 iterations (two years ahead):



Source: author's calculations

  - Most of the scenarios are fluctuating around the initial value as a mean (13.0959 CZKHUF)



Source: author's calculations

- The simulation expects further HUF depreciations, since the optimistic upper (5%) quantile was 12.1311 CZKHUF and the pessimistic lower quantile (95%) was 15.1575 CZKHUF

- Matlab script:

```
ret=real(diff(log(data)));
cd 'C:\Users\kiss.gabor\Documents\MATLAB\MATLAB\UCSD_toolbox\UCSD_toolbox'
[parameters, LL, ht, VCVrobust, VCV, scores, diagnostics] = aparch(ret, 1, 1, 1, 'SKEWT');
[text,AIC,BIC]=aparch_display(parameters,LL,VCV,ret,1,1,1,'SKEWT')
for j=1:100
[simulatedata(:,j), ht] = aparch_simulate(250,parameters,1,1,1,'SKEWT');
end
for j=1:100
   arf_sim(1,j)=data(end,1)+10*simulatedata(1,j);
   for i=2:2*52
      arf_sim(i,j)=arf_sim(i-1,j)+10*simulatedata(i,j);
   end
end
Y(1,1) = prctile(arf_sim(end,:),5)
Y(2,1) = prctile(arf_sim(end,:),50)
Y(3,1) = prctile(arf_sim(end,:),95)
mean(arf_sim(end,:))
plot(arf_sim)
hist(arf_sim(end,:))
```

c) VAR forecasting

Definition:

- A VAR is a structure whose aim is to model the time persistence of a vector of *n* time series, y_t , via a multivariate autoregression.
- VAR equation: $y_t = const. + A_{t-p} y_{t-p} + \varepsilon_t$
  - assuming that we have *I* variables with *T* time length in an *Y* matrix:
    - $Y = \begin{bmatrix} y_{1,t} & y_{i,t} & y_{I,t} \\ y_{1,t-p} & y_{i,t-p} & y_{I,t-p} \\ y_{1,t-T} & y_{i,t-N} & y_{I,t-N} \end{bmatrix}$
  - with *p* lag

Properties:

- each variable a linear function of its **own past values** and the **past values of all other** variables: $y_t = F\, y_{t-1} + u_t$
- to do:

  - summarize the co-movements of variables
  - forecast the variables
- contemporaneous links among the variables: $Ay_t = By_{t-1} + e_t$
- to do:
  - effect of a policy-induced change in variables
    - require "identifying assumptions" that establish causal links
    - base on economic theory
- output:
  - impulse responses and forecast error variance decompositions

Forecasting steps:

- Specification of the model
  - variables (guided by theory, preferences)
  - deterministic component (constant, dummies or trends)
  - lags (AIC, BIC)
- Estimation
  - m equations, linked by correlation in errors and lags of variables in each eq
  - OLS estimation by equation, consistent and asymptotically efficient
- Diagnostic checks
  - errors White Noise (uncorrelated, homoskedastic)
    - Multivariate versions of LM test for no correlation, White test for homoscedasticity
  - Chow tests for breaks
- Forecasting
  - "Iterated" approach, calculate ^ yT +1, use to obtain ^ yT +2, keep iterating until obtaining ^ yT +h,

Considerations:

- The accuracy of forecasts can only be determined by considering how well a model performs on new data that were not used when fitting the model.
- When choosing models, it is common practice to separate the available data into two portions, training (~80%) and test (~20%) data, where
  - the training data is used to estimate any parameters of a forecasting method and
  - the test data is used to evaluate its accuracy.
    - Because the test data (in-sample data) is not used in determining the forecasts, it should provide a reliable indication of how well the model is likely to forecast on new data.
    - The test set (hold-out set, out-of-sample data) should ideally be at least as large as the maximum forecast horizon required.
- Attention:
  - model which fits the training data well will not necessarily forecast well
  - perfect fit can always be obtained by using a model with enough parameters
  - Over-fitting a model to data is just as bad as failing to identify a systematic pattern in the data
- forecast “error” is the difference between an observed value and its forecast
  - e_t=training_t-test_t
    - overshoot: e_t>0 since training_t> test_t

- are different from residuals in two ways.
  - residuals are calculated on the training set while forecast errors are calculated on the test set
  - residuals are based on one-step forecasts while forecast errors can involve multi-step forecasts.
- measure forecast accuracy by summarising the forecast errors
  - Scale-dependent errors: forecast errors are on the same scale as the data – we are looking for their minimum
    - Mean absolute error: MAE: mean(abs(e_t)) → forecasts of the median
    - Root mean squared error: **RMSE**: sqrt(mean((e_t)^2)) → forecasts of the mean
- difference between the precision of a forecast and its **bias**[10]
  - Bias represents the historical average error. Basically, will your forecasts be on average too high (i.e. you overshot the demand) or too low (i.e. you undershot the demand)? This will give you the overall direction of the error.
    - bias=1/n sum(e_t)
    - it should be low
  - Precision measures how much spread you will have between the forecast and the actual value. The precision of a forecast gives an idea of the magnitude of the errors but not their overall direction.
- **Std Error** of the forecast
  - is used to build a confidence interval for the predicted value of the dependent variable.
  - The Std Error of the Est. is actually used to calculate the Std Error of the Forecast.
  - The Std Error of the Estimate is a measure of the variability of the actual values of the dependent variable compared to the models predictions of the dependent variable.
  - Std Error of the Estimate is found by taking the square root of the Mean Sum of Squared Errors in the ANOVA table.

Example:

- Let's assume that CZKHUF meets the requirements of the uncovered interest rate parity, the changes of the exchange rates are reflecting the changes in the long term interest premium:
  - $diff(\log(CZKHUF)) \approx \Delta(r_{HUF} - r_{CZK})$
  - Model: $VAR(diff(\log(CZKHUF)), diff(r_{HUF} - r_{CZK}))$
  - data length: 2006Q2 2019Q4
- VAR generally prefers inputs with less than 100 observations, so we should convert of weekly data to quarterly
  - Matlab:

```
q=xlsread('currency_interest.xlsx','weekly');
for i=1:floor(734/(52/4))
    q(i,:)=w(i*(52/4),:);
end
```

- Inputs should be prepared:
  - Matlab:

```
dl_czkhuf=diff(log(q(:,2)));
```

[10] https://medium.com/analytics-vidhya/forecast-kpi-rmse-mae-mape-bias-cdc5703d242d

```
r_prem=diff(q(:,4)-q(:,5));
```

- Exogenous dummy variables to represent shock and regime changes:
  - dummy to represent the temporary upper ceiling in the exchange rate regime of the CZK against EUR (2013 q4 – 2017 q1 =1)
  - dummy to represent recession in the Eurozone, from EABCN[11] database (2008 q2 – 2009 q2 =1; 2011 q4 – 2013 q1 =1)

Source: EABCN database

- IMPORTANT:
  - for the forecast, we have to define the 2020q1 2020q4 dates as well
  - input variables are missing from here
  - exogenous dummy variables are set to zero
- Input must be stationary (no unit root) ADF-test p<0.05

Group unit root test: Summary
Series: DL_CZKHUF, D_R_PREM
Date: 01/17/20 Time: 09:51
Sample: 2006Q2 2019Q4
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 5
Newey-West automatic bandwidth selection and Bartlett kernel

Method	*Statistic*	*Prob.***	*Cross-sections*	*Obs*
Null: Unit root (assumes common unit root process)				
*Levin, Lin & Chu t**	*-7.31531*	*0.0000*	*2*	*103*
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	*-6.25043*	*0.0000*	*2*	*103*
ADF - Fisher Chi-square		*0.0000*	*2*	*103*

[11] https://eabcn.org/dc/chronology-euro-area-business-cycles

	44.3437			
PP - Fisher Chi-square	91.8504	0.0000	2	108

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

- Lag length:
  - can be selected via AIC/BIC information criteria
  - intuitively with quarterly data we can start with 4 (a year)
  - but we have to provide normal distributed and not (so) autocorrelated residuals
    - So it will be set to 12 for this case

WITH EVIEWS11:

- VAR equation:
  - Normality of the residuals: Jarque-Bera test p>0.05

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: Residuals are multivariate normal
Date: 01/17/20 Time: 10:56
Sample: 2006Q2 2019Q4
Included observations: 43

Component	Skewness	Chi-sq	df	Prob.*
1	-0.007245	0.000376	1	0.9845
2	-0.584806	2.450986	1	0.1175
Joint		2.451362	2	0.2936

Component	Kurtosis	Chi-sq	df	Prob.
1	2.745415	0.116124	1	0.7333
2	3.131663	0.031059	1	0.8601
Joint		0.147183	2	0.9291

Component	Jarque-Bera	df	Prob.
1	0.116500	2	0.9434
2	2.482044	2	0.2891
Joint	2.598545	4	0.6271

*Approximate p-values do not account for coefficient estimation

  - No autocorrelation in the residuals: LM test p>0.05

VAR Residual Serial Correlation LM Tests
Date: 01/17/20 Time: 10:58
Sample: 2006Q2 2019Q4
Included observations: 43

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	5.313860	4	0.2566	1.413830	(4, 26.0)	0.2572
2	11.87152	4	0.0183	3.589428	(4, 26.0)	0.0185
3	4.413356	4	0.3529	1.154241	(4, 26.0)	0.3536
4	4.067750	4	0.3969	1.056889	(4, 26.0)	0.3975
5	3.724764	4	0.4445	0.961500	(4, 26.0)	0.4451
6	2.565414	4	0.6330	0.647892	(4, 26.0)	0.6334
7	5.537193	4	0.2365	1.479561	(4, 26.0)	0.2371
8	0.902433	4	0.9242	0.220924	(4, 26.0)	0.9243
9	2.369247	4	0.6682	0.596148	(4, 26.0)	0.6686
10	1.183274	4	0.8808	0.291196	(4, 26.0)	0.8810
11	11.36947	4	0.0227	3.403554	(4, 26.0)	0.0229
12	0.819383	4	0.9358	0.200282	(4, 26.0)	0.9359
13	7.345388	4	0.1187	2.032254	(4, 26.0)	0.1192

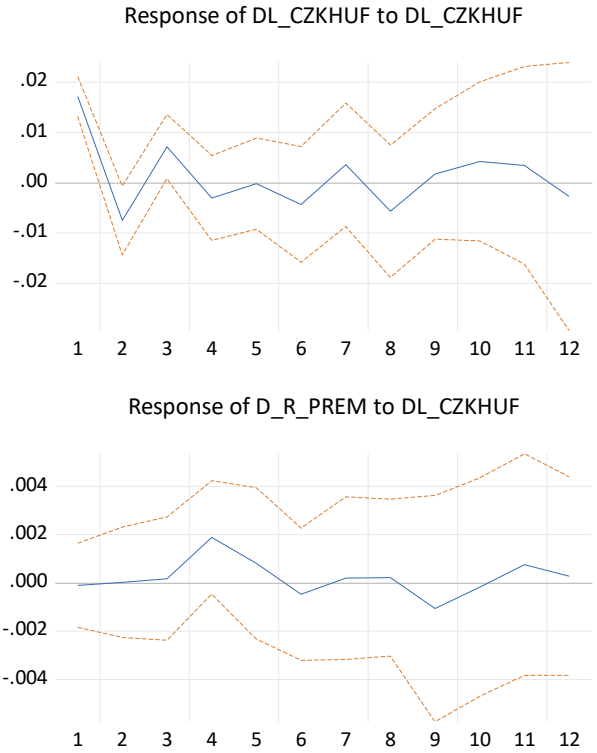
Null hypothesis: No serial correlation at lags 1 to h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	5.313860	4	0.2566	1.413830	(4, 26.0)	0.2572
2	13.62031	8	0.0922	1.991783	(8, 22.0)	0.0960
3	18.00766	12	0.1155	1.781848	(12, 18.0)	0.1300
4	21.36082	16	0.1651	1.544717	(16, 14.0)	0.2096
5	23.19492	20	0.2793	1.194924	(20, 10.0)	0.3995
6	23.38295	24	0.4973	0.739232	(24, 6.0)	0.7266
7	53.48776	28	0.0026	2.454967	(28, 2.0)	0.3307
8	795.5841	32	0.0000	NA	(32, NA)	NA
9	NA	36	NA	NA	(36, NA)	NA
10	NA	40	NA	NA	(40, NA)	NA
11	NA	44	NA	NA	(44, NA)	NA
12	NA	48	NA	NA	(48, NA)	NA
13	NA	52	NA	NA	(52, NA)	NA

*Edgeworth expansion corrected likelihood ratio statistic.

- Impulse responses of the logarithmic change of the CZKHUF exchange rate:
  - It represents what happens with the currency if the other variable increases
  - Each confidence intervals (dotted red line) should be at the same side (above or under 0) with the mean (blue) line to provide significant results
  - There are no significant results

Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.

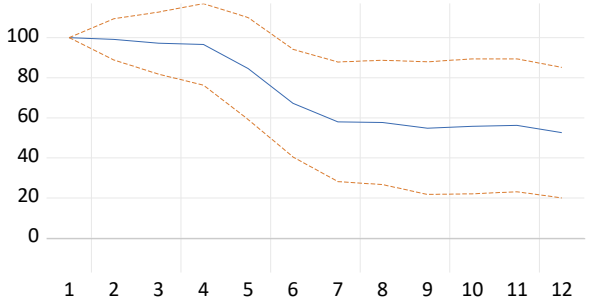


Source: author's calculations

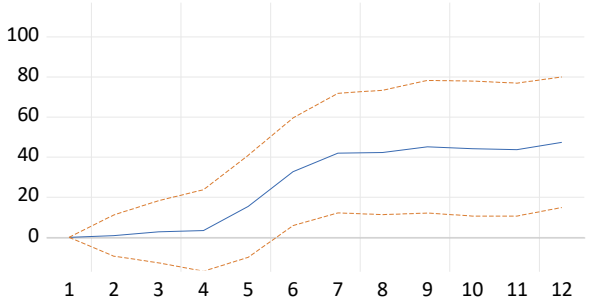
- Variance decomposition
  - How the variance of the CZKHUF can be explained by the interest rate differential?
  - After 6 quarters, the interest rate differential has a 40% importance to explain the variance of the CZKEUR rate

Variance Decomposition using Cholesky (d.f. adjusted) Factors ± 2 S.E.

Percent DL_CZKHUF variance due to DL_CZKHUF

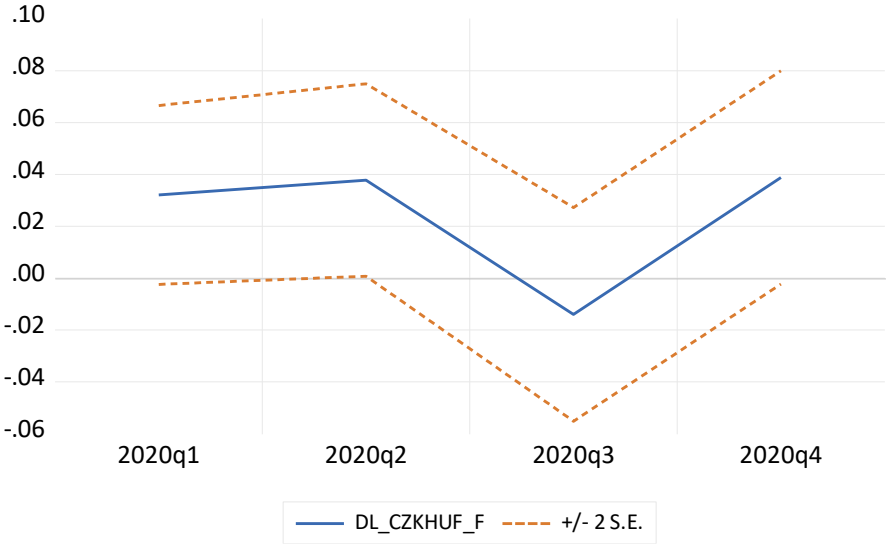


Percent DL_CZKHUF variance due to D_R_PREM



Source: author's calculations

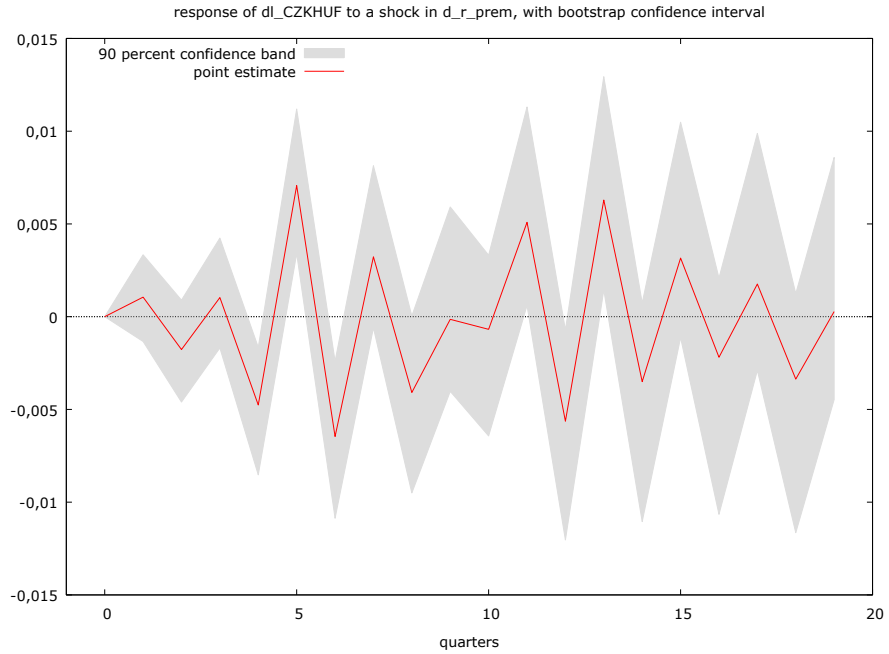
- Dynamic forecast for 2020Q1 2020Q4
  - The logarithmic differential of the CZKHUF can be expected to be significantly increasing only in the 2020 Q2 (HUF weakens further)



Source: author's calculations

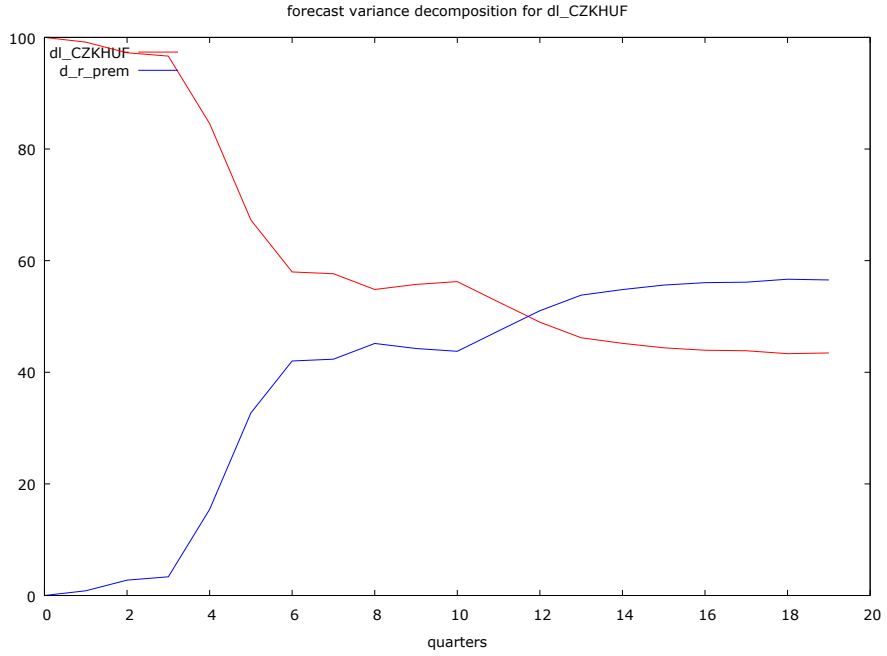
WITH GRETL:

- Results are similar for residuals:
  - Durbin-Watson 2,327527 (not so autocorrelated)
  - Doornik-Hansen test p=0,5664 (normal distribution)
- Impulse-response function:



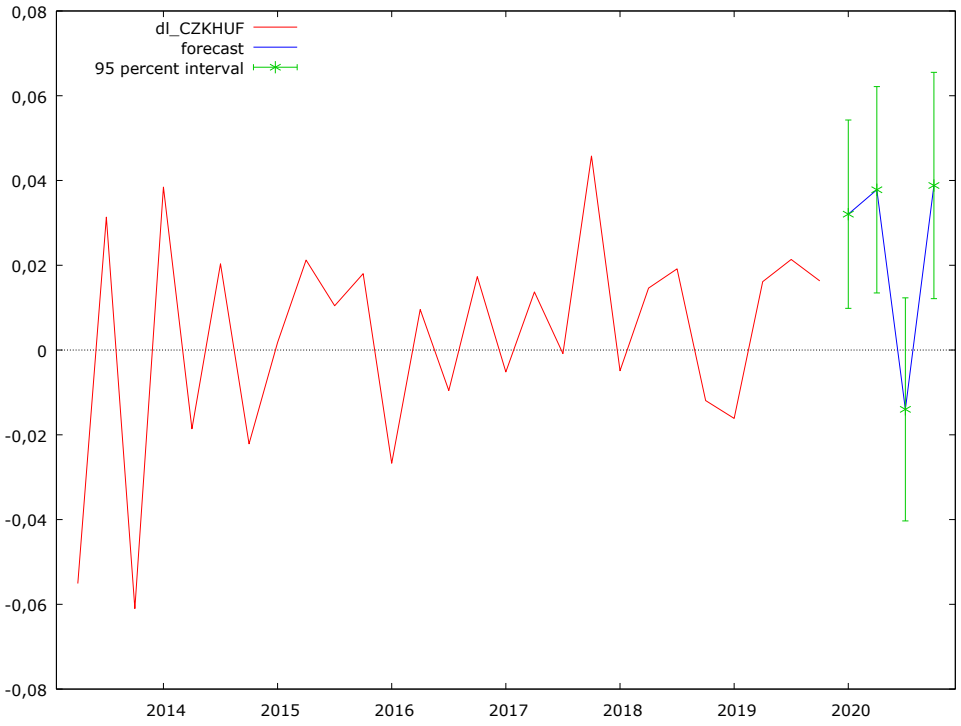
Source: author's calculations

- Variance decomposition:



Source: author's calculations

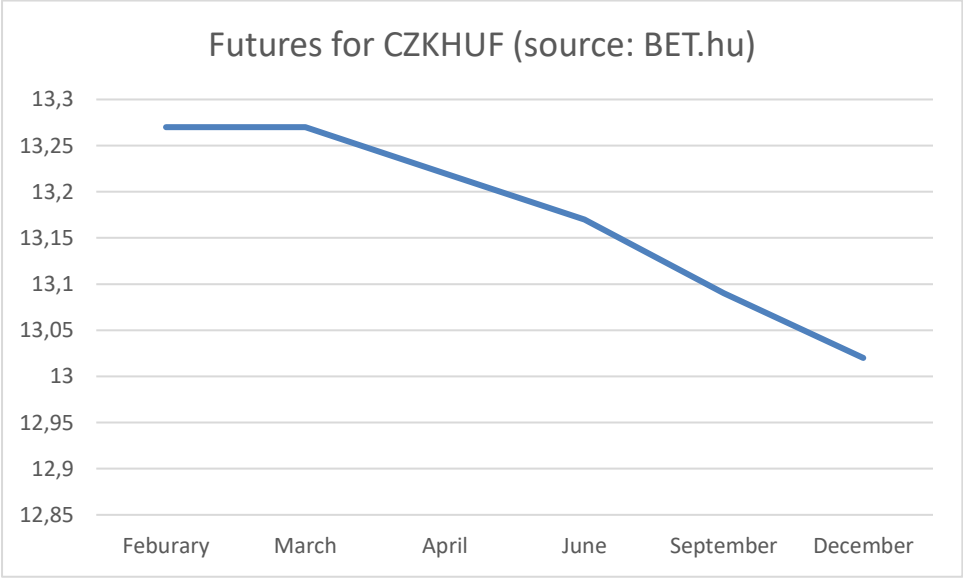
- Forecast:
  - It suggests significant depreciations of the HUF for 2020 Q1, Q2 and Q4



Source: author's calculations

d) Market assumptions - futures

- Futures CZKHUF for 2020 deliveries[12]: *HUF depreciation is expected*
  - Future rates are representing the current market consensus about the future path of the exchange rate, but this is a dynamically changing variable!
  - Futures for different delivery dates (remember: the spot rate was 12.97 at the end of 2019):



[12] https://bet.hu/oldalak/derivativ_termek/$strike/CZK2012

- But future prices are subject of market mood changes:

Source: BET.hu

Summary:
All four approaches suggested the slight devaluation of the HUF against the CZK

iv. Assignment 5: FX exposure

Measuring the impact of transactional FX exposure on profitability - Assignment 2:
Please test your strategy not only under EUR=315, CZK=11.4 and BUBOR=0.0211 or EURIBOR=0.00263 but under the following unlucky conditions as well: EUR=300, CZK=13 and BUBOR=0.05 or EURIBOR=0.04. What is happening with your pre-tax margin? If you are under the market average of pre-tax margin=30%, how could you modify your own strategy to perform better?

SAMPLE

My profit and loss statement (under original conditions)
EUR=315, CZK=11.4, BUBOR=0.0211, EURIBOR=0.00263

		Czech (CZK)	Austrian (EUR)	Hungarian (HUF)	Group (HUF)
Income		60 944 771	741 143	2 558 819 566	3 487 050 000
Expenditures	railway usage fees	52 808 771	345 815	115 768 116	826 719 830
	electricity	26 927 479	371 166	98 421 480	522 311 950
	maintenance	0	0	40 950 000	40 950 000
	wages	5 736 000	374 784	142 368 000	325 815 360
	amortization (vehicle)	0	0	40 950 000	40 950 000
	amortization (building)	2 400 000	0	48 000 000	75 360 000
	rent	0	20 544	0	6 471 360
EBIT		-26 927 479	-371 166	2 072 361 970	1 648 471 500
Financial profit	subsidiaries	0	0	0	1 648 471 500
	gained interests	0	0	0	0
	paid interests	0	0	0	10 621 391
Pre-Tax Profit		0	0	0	1 637 850 109
Corporate income tax (19%)		0	0	0	311 191 521
Profit after tax		0	0	0	1 326 658 588
Dividend		0	0	0	265 331 718
Profit for the year		0	0	0	1 061 326 871

Pre-tax margin: 47%

My profit and loss statement (under much less optimal conditions)
EUR=300, CZK=13, BUBOR=0.05, EURIBOR=0.04

		Czech (CZK)	Austrian (EUR)	Hungarian (HUF)	Group (HUF)
Income		60 944 771	741 143	2 306 375 077	3 321 000 000
Expenditures	railway usage fees	52 808 771	345 815	115 768 116	906 026 639
	electricity	26 927 479	371 166	98 421 480	559 828 429
	maintenance	0	0	40 950 000	40 950 000
	wages	5 736 000	374 784	142 368 000	329 371 200
	amortization (vehicle)	0	0	40 950 000	40 950 000
	amortization (building)	2 400 000	0	48 000 000	79 200 000

	rent	0	20 544	0	6 163 200
EBIT		-26 927 479	-371 166	1 819 917 481	1 358 510 532
Financial profit	subsidiaries	0	0	0	1 358 510 532
	gained interests	0	0	0	0
	paid interests	0	0	0	26 820 000
Pre-Tax Profit		0	0	0	1 331 690 532
Tax		0	0	0	253 021 201
Profit after tax		0	0	0	1 078 669 331
Dividend		0	0	0	215 733 866
Profit for the year		0	0	0	862 935 464

Pre-tax margin: 40.1%

What is happening with your pre-tax margin?
It is still 40.1% which is above the industrial average (30%), so no modification is required.

3. Foreign exchange exposure

a) Is Exchange Rate Risk Relevant?

- Purchasing Power Parity Argument:
  - exchange rate movements are just a response to differentials in *price changes* between countries → irrelevant
  - But: exchange rate will not necessarily change in accordance with the inflation differential between the two countries
- The Investor Hedge Argument
  - investors in MNCs can hedge exchange rate risk on their own
  - But: An MNC may be able to hedge at a lower cost than individual investors
- Currency Diversification Argument
  - MNC is well diversified across numerous countries, its value will not be affected by exchange rate movements because of offsetting effects
  - Creditors may prefer that the MNCs maintain low exposure to exchange rate risk. Consequently, MNCs that hedge their exposure to risk may be able to borrow funds at a lower cost.

Literature
Madura p. 280-281

b) Types of Foreign Exchange Risk

- 1. Translation exposure („accounting exposure")
  - difference between foreign-currency-denominated assets and foreign-currency-denominated liabilities
  - FX rate in Annual reports
- 2. Transaction exposure
  - resulting from the uncertain domestic currency value of a foreign-currency-denominated transaction to be completed at some future date
  - → estimate "Net" Cash Flows in Each Currency
- 3. Economic exposure.
  - firm's value to changes in exchange rates.

- Value of future after-tax cashflows -> parent company's balancesheet
- Share price: industry price-earnings (P/E) ratio to expected annual earnings to derive a value per share of stock
- Determinants
  - The proportion of its business conducted by foreign subsidiaries
  - The locations of its foreign subsidiaries
  - The accounting methods that it uses

Literature

Madura p 282

Melvin M., Norrbin S. C. (2013): International Money and Finance, Elsevier p 151-155

c) Exposure

Measuring the Potential Impact of the Currency Exposure

- net cash flows of an MNC are generated from a portfolio of currencies
  - standard deviation of the portfolio
  - $\sigma_p = \sqrt{w_{eur}^2 \sigma^2 EUR^2 + w_{czk}^2 \sigma^2 CZK^2 + 2 w_{eur} w_{czk} \sigma_{eur} \sigma_{czk} \rho_{eurczk}}$
  - MNC's exposure to multiple currencies is influenced by the variability of each currency and the correlation of movements between the currencies.
  - Currency Variability and cross-correlation over Time: GARCH-models (conditional volatility) and dynamic conditional correlation
- Value at Risk:
  - net cash flows under 5% probable change
  - Maximum one-day loss= $CF_{EUR,\ CZK\ in\ HUF} * 1.65 * \sigma_p$ [13]
  - distribution of exchange rate movements is normal

Measuring Economic Exposure

- Sensitivity Analysis
  - firms have developed forecasts of sales, expenses, and exchange rates for several periods ahead, they can assess their economic exposure over time
- Regression Analysis
  - applying regression analysis to historical cash flow and exchange rate data
  - Assuming ceteris paribus!

4. Currency derivatives

a) Currency futures contract

Forward and futures contracts are financial instruments that allow market participants to offset or assume the risk of a price change of an asset over time.

A *futures contract* is distinct from a forward contract in two important ways: first, a futures contract is a legally binding *agreement to buy or sell a standardized asset on a specific date* or during a specific month. Second, this transaction is facilitated through a *futures exchange*.

The fact that futures contracts are standardized and exchange-traded makes these instruments indispensable to commodity producers, consumers, traders and investors. A standardized contract specifies the quality, quantity, physical delivery time and location for the given product. Given the standardization of the contract specifications, the only contract variable is price. Price is discovered by bidding and offering, also known as quoting, until a match, or trade, occurs.

[13] For VaR 1%, the threshold would be 2.326.

The exchange guarantees that the contract will be honoured, eliminating counterparty risk due to *centrally cleared contracts*: as a futures contract is bought or sold, the exchange becomes the buyer to every seller and the seller to every buyer. This greatly reduces the credit risk associated with the default of a single buyer or seller and provides anonymity to futures market participants.
Hedge ratio defines the amount of futures to sell against a long currency cash position, to effectively hedge market risk.

$$Hedge\ ratio = \frac{value\ at\ risk}{notional\ value} = \frac{value\ at\ risk}{contract\ unit * \ contract\ price}$$

Futures markets have *an official daily settlement price* set by the exchange. Once a futures contract's final daily settlement price is established the back-office functions of trade reporting, daily profit/loss, and, if required, margin adjustment is made. In the futures markets, losers pay winners every day. This means no account losses are carried forward but must be cleared up every day. Mark-to-market enforces the daily discipline of exchanges profit and loss between open futures positions eliminating any loss or profit carry forwards that might endanger the clearinghouse. Having one final daily settlement for all means every open position is treated equally. By publishing these daily settlement values the exchange provides a great service to commercial and speculative users of the futures markets and the underlying markets they derive their price from.
Futures *margin* is the amount of money that *you must deposit and keep on hand with your broker when you open* a futures position. It is not a down payment and you do not own the underlying commodity or currency. Futures margin generally represents a smaller percentage of the notional value of the contract, *typically 3-12% per futures contract* as opposed to up to 50% of the face value of securities purchased on margin. When markets are changing rapidly and daily price moves become more *volatile*, market conditions and the clearinghouses' margin methodology may result in *higher margin requirements* to account for increased risk. Types of margins are:

- Initial margin is the amount of funds required by the clearing house to initiate a futures position. Your broker may be required to collect additional funds for deposit.
- Maintenance margin is the minimum amount that must be maintained at any given time in your account.

If the funds in your account drop below the maintenance margin level, a few things can happen:

- will be required to add more funds immediately to bring the account back up to the initial margin level;
- if the margin call cannot be met : position reduction or liquidation.

Exit strategies:

- *Offsetting or liquidating* a position is the simplest and most common method of exiting a trade. When offsetting a position, a trader is able to *realize all profits or losses* associated with that position without taking physical or cash delivery of the asset. To offset a position, a trader must take out an opposite and equal transaction to neutralize the trade, where the difference in price between his initial position and offset position will represent the profit or loss on the trade.
- *Rollover* is when a trader *moves* his position from the *front month contract to another* contract further in the future: a trader will simultaneously offset his current position and establish a new position in the next contract month.
- If a trader has not offset or rolled his position prior to contract expiration, the contract will expire and the trader will go to *settlement*. At this point, a trader with a short position will be *obligated to deliver* the underlying asset under the terms of the original contract. This can be either *physical delivery or cash settlement* depending on the market.

Pricing is based on the currency pair's spot rate and a short-term interest differential:

$$Futures\ price = Spot\ price * \frac{1+r_{foreign}*\frac{days\ utnil\ expiration}{360}}{1+r_{domestic}*\frac{days\ utnil\ expiration}{360}},$$

where *r* represents a short-term interest rate of the specific currency. As a futures contract approaches expiration, the time value of money runs out and futures price converges toward spot.

Reading:
https://www.cmegroup.com/education/courses/introduction-to-futures/definition-of-a-futures-contract.html
https://www.cmegroup.com/education/courses/introduction-to-fx/importance-of-fx-futures-pricing-and-basis.html

b) Currency forward contracts

A forward contract is an agreement between a *corporation and a commercial bank* to exchange a specified amount of a currency at a specified exchange rate (called the forward rate) on a specified date in the future.
Forward contracts normally are not used by consumers or small firms. In cases when a bank does not know a corporation well or fully trust it, the bank may request that the corporation make an *initial deposit* to assure that it will fulfill its obligation. Such a deposit is called a compensating balance and typically does not pay interest.
The most common forward contracts are for 30, 60, 90, 180, and 360 days, although other periods (including longer periods) are available. The forward rate of a given currency will typically vary with the length (number of days) of the forward period.

Literature:
Madura: Chapter 5: Currency Derivatives

c) Currency options

Currency options are derivative financial instrument where there is an agreement between two parties that *gives the purchaser the right, but not the obligation*, to exchange a given amount of one currency for another, at a *specified rate*, on an *agreed date* in the future (for a premium or option fee). Currency *options insure* the purchaser against adverse exchange rate movements (Hull, 1997).
A *call option* on a particular currency gives the holder the *right* but not an obligation *to buy* that currency at a predetermined exchange rate at a particular date and a foreign currency *put* option gives the holder the *right to sell* the currency at a predetermined exchange rate at a particular date. The seller or *writer of the option, receives a payment* (*option premium*), that then obligates him to sell the exchange currency at the pre specified price known as the strike price, if the option purchaser chooses to exercise his right to buy or sell the currency.
Foreign currency options can either be *European options* that can only be exercised on the *expiry* date or *American* options that can be exercised at *any day* and up to the expiry date.
Garman and Kohlhagen model is used in pricing of options as an extension of Black–Scholes model to manage two interest rates (one for each currency), based in the idea that foreign exchange rates could be treated as nondividend-paying stocks.
Garman-Kohlhagen put option fee:

$$European\ call = e^{-r^*T}SN\left\{\frac{ln\frac{S}{X}+T[r-r^*+\frac{\sigma^2}{2}]}{\sigma\sqrt{T}}\right\} - e^{-rT}XN\left\{\frac{ln\frac{S}{X}+T[r-r^*-\frac{\sigma^2}{2}]}{\sigma\sqrt{T}}\right\}$$

$$European\ put = Europen\ call + e^{-rT}X - e^{-r^*T}S$$

where *r* represents domestic interest rate, *r** is foreign interest rate, *S* spot exchange rate, *X* target exchange rate, *T* remaining time till maturity in years, *e* natural logarithm, *N(.)* is standard normal cumulative distribution function and σ conditional standard deviation from GARCH model (Madura 2008, pp. 136). The main concern about the B-S derivative option pricing is, that its inability to generate the volatility smile and the skewness in the distribution of the return.

Heston options: has generated by much more realistic assumptions about volatility: satisfying the market observations, being non-negative and mean-reverting, and also providing a closed-form solution for the European options.
First, we have to define a stochastic Wiener-process:

$$X_t = \mu t + \sigma \widetilde{W}_t^X$$

Where: *t* time index, μ drift, σ variance, W: N(μ, σ) a normal distributed stochastic process.
Both the price (S_t) and the volatility (σ_t) can be assumed as two Wiener processes (B-S consideres it only for the price!):

$$\Delta S_t = rS_t\Delta t + \sqrt{\sigma_t}S_t\Delta\widetilde{W}_t^S$$
$$\Delta\sigma_t = \kappa[\theta - \sigma_t]\Delta t + h\sqrt{\sigma_t}S_t\Delta\widetilde{W}_t^\sigma$$
$$\Delta\widetilde{W}_t^S\Delta\widetilde{W}_t^\sigma = \rho\Delta t$$

Where: $\Delta\boldsymbol{S_t}$ the changes of the price at time $\boldsymbol{t}$, $\boldsymbol{\sigma_t}$ the instantaneous volatility estimated from a GARCH model (*GARCH sqrt(ht(i,1))*), $\boldsymbol{r}$ a risk-free interest, $\boldsymbol{\theta}$ long-term mean of the variance (*mean(sqrt(ht))*), κ is the speed of mean-reversion i.e. the rate at which the variance converges to its θ long-run (or unconditional) mean level, while $\boldsymbol{h}$ represents the instantaneous volatility of the variance process ("volatility of the volatility" *std(sqrt(ht))*). The $\boldsymbol{\rho}$ accounts for the correlation between the shocks driving the asset price and its instantaneous volatility, often interpreted as the "leverage effect".

A $\boldsymbol{\kappa}$ reverting ratio can be assumed by the Feller classification: $\kappa > \frac{h^2}{2\theta}$ (*kappa=(std(sqrt(ht))/(2* mean(sqrt(ht)))+10^-3*)

A $\boldsymbol{\rho}$ correlation can be assumed by the correlation of the $\Delta\boldsymbol{S_t}$ and $\boldsymbol{\sigma_t}$ (*corr(ret,sqrt(ht))*), since this is behind the asymmetric behaviour of the volatility.
The $\boldsymbol{h}$ parameter will be responsible for the fat-tailness of the return.
The risk premium of volatility risk $\boldsymbol{\lambda}$ switches the market price of volatility from probability measure to the risk-neutral measure, allowing the introduction of the uncertainty of the $\boldsymbol{\kappa}$ reverting ratio $\lambda = \kappa^* - \kappa = \frac{\kappa\theta}{\theta^*} - \kappa \cong 0$ what can be assumed to be zero under optimal circumstances.
Volatility should be calculated from the short-term options, but without such a dataset, we can approximate them from a GARCH or DCC-GARCH model.
Volatility is *time variant* as market sentiment changes constantly, so the usage of uncontidional (time-invariant) standard deviation would be misleading. Different GARCH models can be fitted to estimate conditional (time-variant) standard deviations, following Cappeiello, Engle and Sheppard (2006). The floowing GARCH(p,q), GJR GARCH(p,o,q), TARCH(p,o,q) and APARCH(p,o,q) models can be useful to capture volatility developments and their clustering in time (heteroscedasticity).
GARCH (p,q): $\sigma_t^2 = \omega + \sum_{i=1}^{p}\alpha_i\,\varepsilon_{t-i}^2 + \sum_{j=1}^{q}\beta_i\,\sigma_{t-j}^2$.
where σ_t^2 represents present variance, ω is a constant term, *p* denotes the lag number of squared past ε_{t-i}^2 innovations with α_i parameters, while *q* denotes the lag number of past σ_{t-j}^2.variances with β_i parameters to represent volatility persistence. Asymmetric GARCH models can be introduced via $\begin{cases} S_{t-i}^- = 1, if\,\varepsilon_{t-i} < 0 \\ S_{t-i}^- = 0, if\ \varepsilon_{t-i} \geq 0 \end{cases}$ as a sign asymmetric reaction to decreasing returns.
GJR GARCH (p,o,q): $\sigma_t = \omega + \sum_{i=1}^{p}\alpha_i|\varepsilon_{t-i}| + \sum_{i=1}^{o}\gamma_i S_{t-i}^-|\varepsilon_{t-i}| + \sum_{j=1}^{q}\beta_i\,\sigma_{t-j}$,
TARCH (p,o,q): $\sigma_t^2 = \omega + \sum_{i=1}^{p}\alpha_i\,\varepsilon_{t-i}^2 + \sum_{i=1}^{o}\gamma_i\,S_{t-i}^-\varepsilon_{t-i}^2 + \sum_{j=1}^{q}\beta_i\,\sigma_{t-j}^2$,

APARCH (p,o,q): $\sigma_t^{\delta} = \omega + \sum_{i=1}^{p} \alpha_i (|\varepsilon_{t-i}| - \gamma_i \varepsilon_{t-i})^{\delta} + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^{\delta}$,

where $\alpha_i > 0$ ($i=1,\dots,p$), $\gamma_i + \alpha_i > 0$ ($i=1,\dots,o$), $\beta_i \geq 0$ ($i=1,\dots,q$), $\alpha_i + 0{,}5\,\gamma_j + \beta_k < 1$ ($i=1,\dots,p$, $j=1,\dots,o$, $k=1,\dots,q$) and δ index parameter can be between 1 and 2.

Model selection can be made with a focus on homoscedastic residuals (using a 2 lagged ARCH-LM test), searching for the lowest Bayesian Information Criteria (BIC).

Strategies:

- Long Currency Straddle: take a long position (*buying*) in both a *call option and a put* option for that currency; the call and the put option have the same expiration date and striking price. Call option will become profitable if the foreign currency appreciates, and the put option will become profitable if the foreign currency depreciates, a long straddle becomes profitable when the *foreign currency either appreciates or depreciates.* Disadvantage of a long straddle position is that it is *expensive* to construct, because it involves the purchase of two separate options.
- Short Currency Straddle: *selling* (taking a short position in) both a *call option and a put* option for that currency. As in a long straddle, the call and put option have the same expiration date and strike price. The advantage of a short straddle is that it provides the option writer with income from two separate options. The disadvantage is the possibility of substantial losses if the underlying currency moves substantially away from the strike price.
- Currency strangles: call and put options of the underlying foreign currency have *different exercise prices*. Nevertheless, the underlying security and the expiration date for the call and put options are identical.
- Currency Bull Spreads with Call Options: *buying a call option* for a particular underlying currency and simultaneously *writing a call option* for the same currency with a *higher exercise price* – expecting that the underlying currency *will appreciate* modestly, but not substantially.
- Currency Bull Spreads with Put Options: buy a *put option with a lower* exercise price and *write a put option with a higher* exercise price.
- Currency Bear Spreads: *writes a call option* for a particular underlying currency and simultaneously *buys a call option* for the same currency with a *higher exercise price*. Consequently, the bear spreader *anticipates a modest depreciation* in the foreign currency.

Estimation in Matlab[14]:

1. loading in the data
2. GJR-GARCH(1,1,1) model fitting for the conditional volatility (UCSD toolbox)
3. parametrization
   a. v: conditional volatility at time i (σ_t);
   b. r: risk-free return at time I;
   c. eta: long-term mean of the variance (θ)
   d. sig: volatility of the volatility (h)
   e. kappa: from Feller classification
   f. ld: uncertainty of kappa, assumed to be 0
   g. rho: the correlation of the return and conditional volatility
   h. spot, target price, time
4. Fitting the Heston model
5. Fitting the B-S model

```
%% Heston option
%0. loading the data
```

[14] https://github.com/ymh1989/Heston

```
clear
cd 'C:\Users\tanar\Documents\MATLAB\'
data=xlsread('evil_portfolio.xlsx','price');
ret=real(diff(log(data(:,1))));
US10Y=data(:,11); %rike free return
%1. parameters
   %1.a. GARCH model
cd 'C:\Users\tanar\Documents\MATLAB\UCSD_toolbox'
[parameters, LL, ht] = tarch(ret, 1, 1, 1);
plot(sqrt(ht))
   %1.b. paraméterek
for i=1:length(ret)
v= sqrt(ht(i,1)); %conditional std
r=US10Y(i,1)/100; %risk free rate
eta=mean(sqrt(ht)); %long term mean, it could be std(ret) as well
sig=std(sqrt(ht)); %volatilitás volatilitása
kappa=(sig/(2*eta))+10^-3; %mean reverting
ld = 0; %% lambda
rho=corr(sqrt(ht),ret); %korrelation of the two wiener processes
   %1.c. prices
S=data(i,1); %spot
K=S; %target
t=1; %years (time)
%2. Heston model
cd 'C:\Users\tanar\Documents\MATLAB\Heston-master'
R3(i,1) = HestonCall(S,K,v,r,t,kappa,eta,sig,rho,ld);
end
plot(R3)

%% 3. B-S model
for i=1:length(ret)
s0=data(i,1); %spot
k=s0; %target
T=1; %years
r=US10Y(i,1)/100; %risk-free rate
damount=0;    %dividend
sigma= sqrt(ht(i,1)); %conditional std
rd = -r*T;
erd = exp(rd);
ds = damount.*erd;
sa = s0-sum(sum(ds));
lsa = (log(sa/k)+(r+(sigma*sigma)/2)*T);
d1 = lsa/(sigma*sqrt(T));
d2 = d1 - sigma*sqrt(T);
c0(i,1) = sa*normcdf(d1)-k*exp(-r*T)*normcdf(d2); %call option
p0(i,1) = k*exp(-r*T)*normcdf(-d2)-sa*normcdf(-d1);  %put option
end
plot([R3 c0])
```

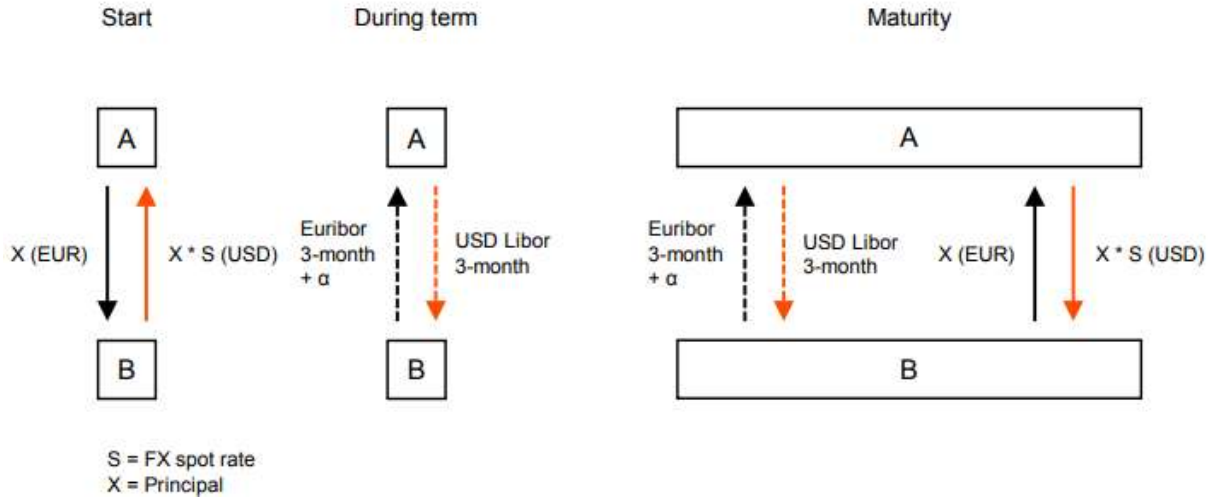
d) Cross currency swap

- Definition: A cross currency swap occurs when two parties simultaneously lend and borrow an equivalent amount of money in two different currencies for a specified period of time.

- are used by market participants as a means of hedging currency exposure or speculating on currency direction over a given period of time
- interest rates can both be fixed, both be floating, or one of each
- exchange of principals (in the two different currencies): at the beginning of the contract and at the end, at the spot rate prevailing when the swap is initiated

- covered interest parity (CIP): interest rate differential between two currencies should equal the differential between the forward and spot exchange rate
  - interest rates priced in cash/bond markets should correspond to the interest rates implicit in cross currency swap markets for the respective currencies
  - if interest rates do not correspond to the FX forward rate, an opportunity would exist that would allow a party to generate a riskless profit
  - since 2008 in particular, CIP does not hold in FX markets, resulting in a persistent cross currency basis across many currency pairs, including EUR/USD

e) Cross currency basis swap



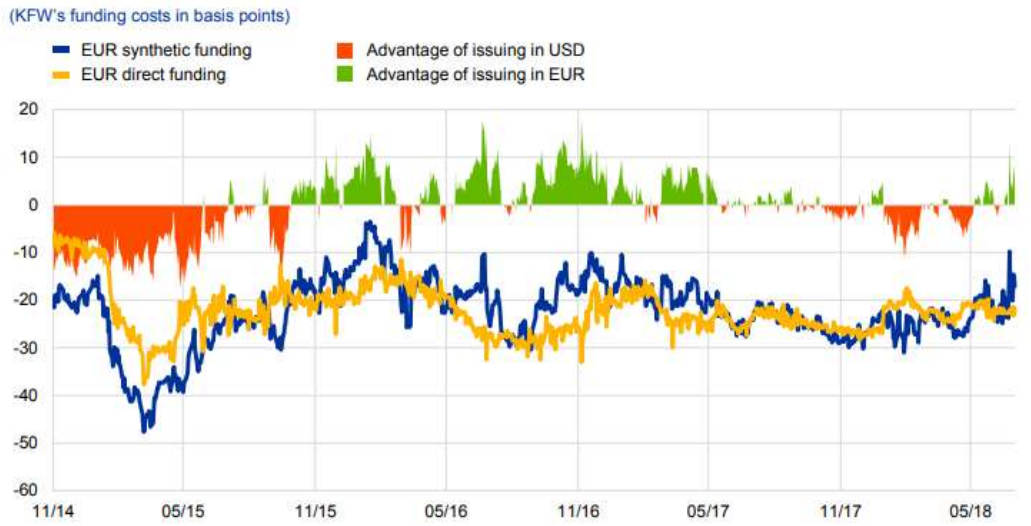
Source: Seamus O'Donnell (2019)

- floating-for-floating exchange of interest rate payments and notional amounts in two different currencies
- supply and demand for one currency versus another
- additional cost, or gain, of transacting between one currency and another, not explained through the published reference interest rate differential
- EUR/USD cross currency swaps are **priced** assuming
  - the US dollar **LIBOR leg** of the transaction is exchanged
    - **credit spread:** difference in yield between two bonds of **similar maturity** but **different credit quality**
      - 10-year Treasury note is trading at a yield of 6% and a 10-year corporate bond is trading at a yield of 8%
  - as is and any premium/discount for the other currency is the quoted parameter (the **basis** α in the above chart)
    - the basis α is the negative spread added to the non-USD leg of the interest payments

- For example: negative quotation of -25 basis points (bps) means that the counterparty borrowing USD in a cross currency swap pays the 3-month **US dollar Libor**, while the counterparty borrowing the euro in the same transaction pays the **3-month Euribor minus 25 bps**
  - an *increase in the discount* is referred to as a *widening of the basis*,
  - a *reduction* in the discount is referred to as a *tightening* of the basis

- US issuer's decision to issue in euro or US dollars depends ultimately on cost
  - issue in US dollars, in which case it would determine at what spread it could fund itself using the local (US dollar) asset **swap spread as a benchmark**
    - spread reflects the difference between the yield it pays on its bond and the yield on the benchmark yield curve (interest rate swap curve) at the same maturity
    - spread will depend on the credit rating or quality of the issuer
  - US issuer could also issue in euro: it has to take into account the extra yield it has to pay in euro over and above the euro asset swap curve
    - it incurs the extra cost of hedging the FX risk of the issue: added to the credit spread to calculate the overall cost of issuing in euro
    - *euro credit spread* < *US dollar credit spread* + *cross currency basis* (+quoting conventions: quarterly vs. semi-annual swap frequencies + spread conversion factor)
- cost of funding in euro has come down → increase in euro issuance on behalf of US entities → higher demand for FX hedges → need to borrow US dollars (for US issuers) → increase in the rate at which it borrows US dollars → reflected in the basis
  - more **negative the basis**, the **more expensive** it becomes **to borrow** US dollars
  - cost of hedging the FX risk (embodied by the basis) will cancel out the extra benefit obtained by the lower EUR credit spread
- Example, consider a 5-year issue of KFW, a German guaranteed agency, which will issue in US dollars if:
  - 5Y euro credit spread > 5Y US dollar credit spread + 5Y EUR/USD cross currency basis – 5Y 3s6s basis
  - On 3/8/2017: -31.07 > 0.22 -31.25 -10.435

Implied funding levels for 5-year KFW: outright in euro, US dollar-swapped, and the difference between the two



Source: Seamus O'Donnell (2019)

- Euro synthetic funding represents the spread
  - on a 5-year par rate KFW bond issued in US dollars and
  - the 5-year US dollar swap rate converted to euro by
  - adding the 5-year EUR/USD XCCY basis and subtracting the 5-year 3s6s basis swap
- Euro direct funding cost represents the spread between
  - the yield on a 5-year par rate KFW bond issued in euro and
  - the 5-year euro swap rate

Literature:

Madura: Chapter 5: Currency Derivatives
Madura: Appendix 5B Currency Option Combinations
Hull, John C. (1997). Options, Futures and Other Derivatives, Prentice Hall International, Inc.
Thomas Brophy, Niko Herrala, Raquel Jurado, Irene Katsalirou, Léa Le Quéau, Christian Lizarazo, Seamus O'Donnell (2019): *Role of cross currency swap markets in funding and investment decisions*. ECB Occasional Paper Series No 228 / August 2019, https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op228~bb3e50120a.en.pdf
Cappeiello, L., Engle, R. F., & Sheppard, K., (2006). Asymmetric Dynamics in the Correlations of Global Equity and Bond Returns. Journal of Financial Econometrics, 4 (4), 537–572. http://dx.doi.org/10.1093/jjfinec/nbl005
Mrázek, M. & Pospíšil, J. (2017). Calibration and simulation of Heston model. Open Mathematics, 15(1), pp. 679-704. Retrieved 5 Nov. 2019, from doi:10.1515/math-2017-0058

Reading:

https://www.kevinsheppard.com/MFE_Toolbox

Matlab Script:

```
clear
% 0. loading in the data
data=xlsread('opc_curr_rv_int.xlsx');
CZ10Y=data(:,4);
EU10Y=data(:,5);
```

```
eurczk=data(:,10)./data(:,9);
% 1. conditional variance with a GARCH model
cd 'C:\Users\tanar\Documents\MATLAB\UCSD_toolbox'
epsilon=real(diff(log(eurczk)));
[parameters, LL, ht] = tarch(epsilon, 1, 1, 1);
plot(ht)
% 2. option fee
TT=size(eurczk);
for i=1:TT(1,1)-1
      S0 =eurczk(i,1); %spot price
      X = S0; %tagret price (hedge == spot price)
      T= 1; %remaining time in YEARS
      rd=CZ10Y(i,1)/100; %domestic interest rate --> czk
      rf=EU10Y(i,1)/100; % foreign interest rate --> eur
      vol=sqrt(ht(i,:)); %GARCH
      F=S0*exp((rd-rf).*T);
      d1=log(F./X)./(vol.*sqrt(T))+vol.*sqrt(T)/2;
      d2=log(F./X)./(vol.*sqrt(T))-vol.*sqrt(T)/2;
      European_call(i,1) = exp(-rd.*T).*(F.*normcdf(d1)-X.*normcdf(d2));
      European_put(i,1) = European_call(i,1)+(X-F)*exp(-rd.*T);
end
% 2. option fee is affected by interest or volatility?
r_diff=CZ10Y-EU10Y;
cd 'C:\Users\tanar\Documents\MATLAB\JPL_toolbox'
y=[European_call r_diff (1:end-1,1) sqrt(ht)];
results = vare(y,1);
prt(results)
```

5. Managing transaction exposure

a) Steps

1. Identify its degree of transaction exposure.
   - Expenditures and incomes in different FX rates
2. decide whether to hedge this exposure
   - Total hedge: to avoid the possibility of a major adverse movement in exchange rates
   - No hedge: well diversified cash-flows across many currencies may consider not hedging their exposure.
   - Selective hedge: hedging only when a market benchmark signs higher market risks
   - Hedge versus No Hedge
     - Desired exchange rate movements (devaluation – appreciation)
     - Historical trends, forward rates (expectations)
     - No hedge: profit decrease under 10% undesired change in FX rate (simple) or usual yearly changes from the last decade (histogram)
     - Hedge: currency call option fee (last decade)
     - RCH= Cost of *hedging payables* - Cost of payables if *not hedged*
3. if it decides to hedge part or all of the exposure, it must choose among the various hedging techniques available
   - Selective Hedging: hedge only when they expect the currency to move in a direction that will make hedging feasible
   - Following a market benchmark to find a signal of market stress (like VaR)

Literature
Madura p. 307, 325

b) Hedge techniques

- 1. *Trading in forward, futures, or options markets*
- 2. Invoicing in the domestic currency
- 3. Speeding (slowing) payments of currencies expected to appreciate (depreciate)
- 4. Speeding (slowing) collection of currencies expected to depreciate (appreciate)
- 5. short-term currency loans
- Forward market:
  - Forward exchange market refers to buying and selling currencies to be delivered at a future date
  - With a bank as a middleman
- Futures market:
  - Where foreign currencies may be bought and sold for delivery at a future date.
  - The futures market differs from the forward market in that only a few currencies are traded;
  - trading occurs in standardized contracts and in a specific geographic location, such as the Chicago Mercantile Exchange (CME)
  - → interest parity: $\frac{1+rEUR}{1+rHUF} = \frac{forward\ (or\ futures)}{spot}$
- Currency option:
  - Contract that provides the right to buy or sell a given amount of currency at a fixed exchange rate (*strike price*) on (European option) or before (American option) the maturity date
  - call option gives the right to buy currency
  - put option gives the right to sell
  - Garman-Kohlhagen option
- Selective hedge: Value-at-Risk act as a benchmark as extreme fluctuation of the data can be detected with ordinary Value-at-Risk (1%) and (5%) models:

  $VaR\ (1\%): r \in (r_n \cup r_x^- \cup r_x^+),\ where\ r_x^- < \mu - 2.326 * \sigma\ and\ r_x^+ > \mu + 2.326 * \sigma$,

  $VaR\ (5\%): r \in (r_n \cup r_x^- \cup r_x^+),\ where\ r_x^- < \mu - 1.65 * \sigma\ and\ r_x^+ > \mu + 1.65 * \sigma$,

  - where r is a logarithmic return, μ unconditional mean, σ conditional standard deviation from a GARCH model, r_x^-represents extreme negative, r_x^+extreme positive returns and r_n denotes a non-extreme subset of data (Madura 2008). VaR (5%) has the tendency to define more return as extreme (~5% of the data on each tail), so it can be used better to highlight the difference between missing data approaches. However, selective hedging requires a low amount or signals, which is why VaR (1%) approach will be used there.

Literature:
Melvin M., Norrbin S. C. (2013): International Money and Finance, Elsevier p 86
Madura: Chapter 11: Managing Transaction Exposure

v. Assignment 6: Exchange rate risk management.

Please introduce your hedging strategy!

1. Size of currency exposure in each currency
2. Required change of the exchange rate (appreciation or depreciation)
3. Which hedging strategy is preferred by you for EURHUF and CZKHUF? No hedge, total hedge, partial hedge?

4.a If no hedge is selected: what is happening with the pre-tax ratio under 10% de- and appreciation of the HUF?

4.b Elseif total hedge is selected: total expenditure of the option contract(s)? It impact on pre-tax ratio.

SAMPLE

My profit and loss statement (under original conditions)

EUR=315, CZK=11.4, BUBOR=0.0211, EURIBOR=0.00263

		Czech (CZK)	Austrian (EUR)	Hungarian (HUF)	Group (HUF)
Income		60 944 771	741 143	2 558 819 566	3 487 050 000
Expenditures	railway usage fees	52 808 771	345 815	115 768 116	826 719 830
	electricity	26 927 479	371 166	98 421 480	522 311 950
	maintenance	0	0	40 950 000	40 950 000
	wages	5 736 000	374 784	142 368 000	325 815 360
	amortization (vehicle)	0	0	40 950 000	40 950 000
	amortization (building)	2 400 000	0	48 000 000	75 360 000
	rent	0	20 544	0	6 471 360
EBIT		-26 927 479	-371 166	2 072 361 970	1 648 471 500
Financial profit	subsidiaries	0	0	0	1 648 471 500
	gained interests	0	0	0	0
	paid interests	0	0	0	10 621 391
Pre-Tax Profit		0	0	0	1 637 850 109
Corporate income tax (19%)		0	0	0	311 191 521
Profit after tax		0	0	0	1 326 658 588
Dividend		0	0	0	265 331 718
Profit for the year		0	0	0	1 061 326 871

Pre-tax margin: 47%

1. Size of currency exposure in each currency

- CZK: after summing up all the expenditures: -87.8 million CZK
- EUR: 11.07 (income) -1.49*0.026315 (bond interest)-1.111 (total expenditures in EUR)=9.9 million EUR

2. Required change of the exchange rate (appreciation or depreciation)

- CZK: HUF shall appreciate (from current 11.4 to become 10,9,8 etc.)
- EUR: HUF shall depreciate (from current 315 to become 316, 317,318 etc)

3. Which hedging strategy is preferred by you for EURHUF and CZKHUF? No hedge, total hedge?

- No hedge in EURHUF, because HUF is on a depreciation trend on the long run.
- Total hedge in CZKHUF, because it is highly improbable that HUF can appreciate in the future

4.a If no hedge is selected: what is happening with the pre-tax ratio under 10% de- and appreciation of the HUF?

- 10% appreciation of EURHUF – 283.5 EURHUF, Pre-tax ratio is 42.23% (-5%)

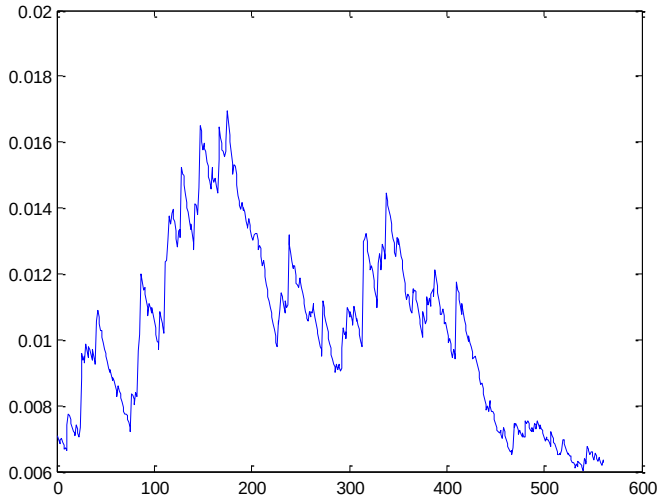
		Czech (CZK)	Austrian (EUR)	Hungarian (HUF)	Group (HUF)
Income		60 944 771	741 143	2 233 460 570	3 138 345 000
Expenditures	railway usage fees	52 808 771	345 815	115 768 116	815 826 658
	fuel	26 927 479	371 166	98 421 480	510 620 229
	maintenance	0	0	40 950 000	40 950 000
	wages	5 736 000	374 784	142 368 000	314 009 664
	amortization (vehicle)	0	0	40 950 000	40 950 000
	amortization (building)	2 400 000	0	48 000 000	75 360 000
	rent	0	20 544	0	5 824 224
EBIT		-26 927 479	-371 166	1 747 002 974	1 334 804 225
Financial profit	subsidiaries	0	0	0	1 334 804 225
	gained interests	0	0	0	0
	paid interests	0	0	0	9 559 251
Pre-Tax Profit		0	0	0	1 325 244 974
Tax		0	0	0	251 796 545
Profit after tax		0	0	0	1 073 448 429
Dividend		0	0	0	214 689 686
Profit for the year		0	0	0	858 758 743

- 10% depreciation of EURHUF – 346.5 EURHUF, Pre-tax ratio is 50.85% (+4%)

		Czech (CZK)	Austrian (EUR)	Hungarian (HUF)	Group (HUF)
Income		60 944 771	741 143	2 884 178 561	3 835 755 000
Expenditures	railway usage fees	52 808 771	345 815	115 768 116	837 613 003
	fuel	26 927 479	371 166	98 421 480	534 003 672
	maintenance	0	0	40 950 000	40 950 000
	wages	5 736 000	374 784	142 368 000	337 621 056
	amortization (vehicle)	0	0	40 950 000	40 950 000
	amortization (building)	2 400 000	0	48 000 000	75 360 000
	rent	0	20 544	0	7 118 496
EBIT		-26 927 479	-371 166	2 397 720 965	1 962 138 774
Financial profit	subsidiaries	0	0	0	1 962 138 774
	gained interests	0	0	0	0
	paid interests	0	0	0	11 683 530
Pre-Tax Profit		0	0	0	1 950 455 244
Tax		0	0	0	370 586 496
Profit after tax		0	0	0	1 579 868 748
Dividend		0	0	0	315 973 750
Profit for the year		0	0	0	1 263 894 998

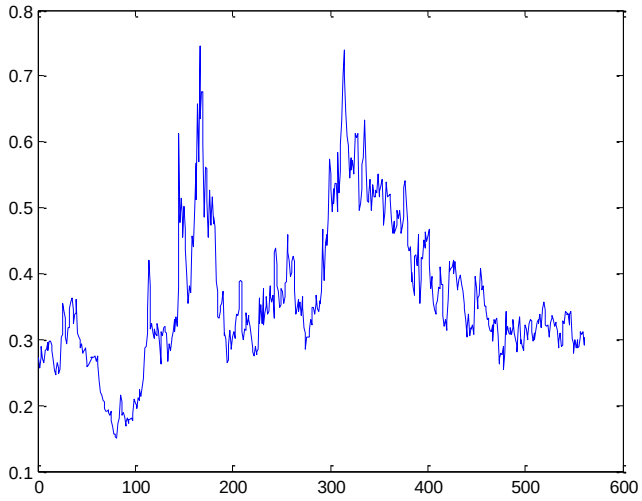
4.b Elseif total hedge is selected: total expenditure of the option contract(s)? It impact on pre-tax ratio.

We have to buy 87.8 million CZK in each year to cover our expenditures.



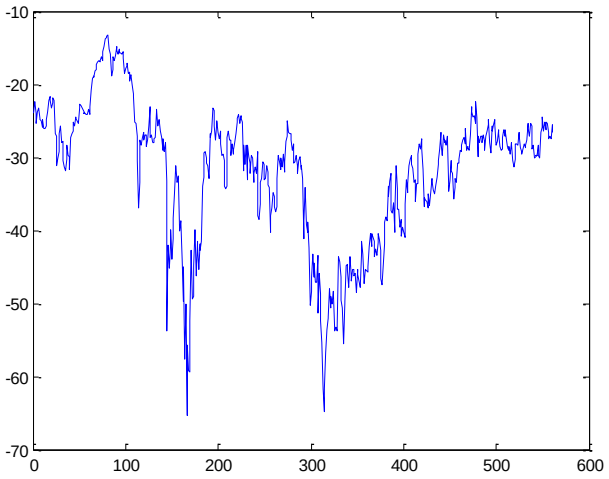
Source: author's calculations

According to a GARCH(1,1) model, the CZKHUF had the following conditional standard deviation on each week between 2006 and 2016. On January 1 2015, it was 0.0000536.
We would like to buy CZK, so a call option is required.



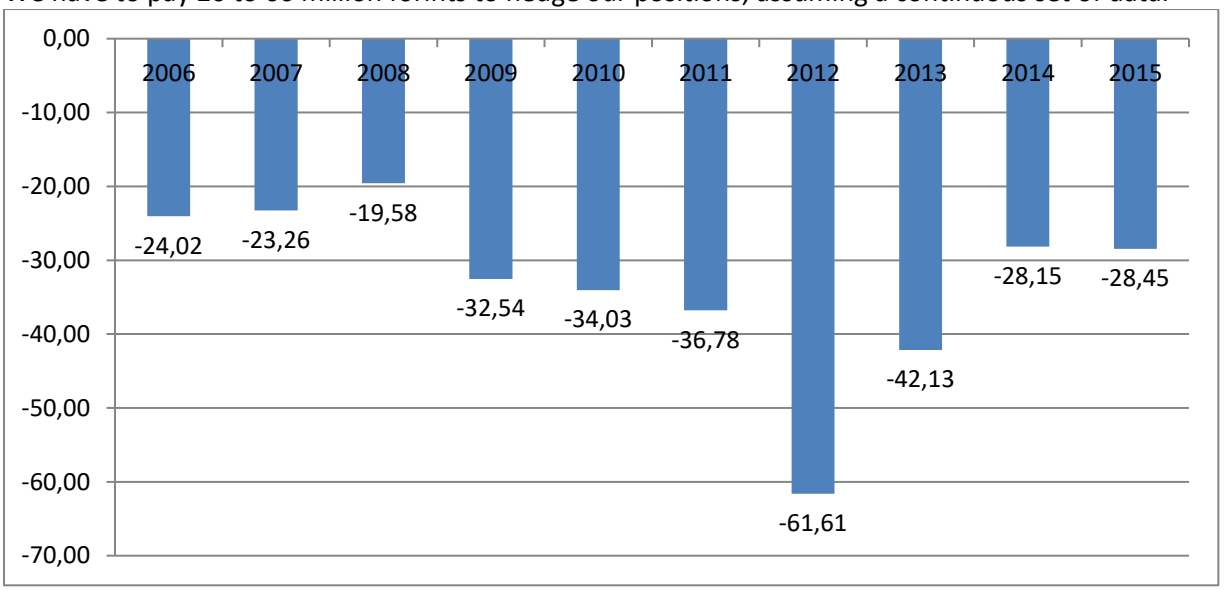
Source: author's calculations

Call option prices are fluctuating around 0.4 HUF for each CZK to be hedged. It was 0,327 on the specific day.



Source: author's calculations

We have to pay 20 to 60 million forints to hedge our positions, assuming a continuous set of data.



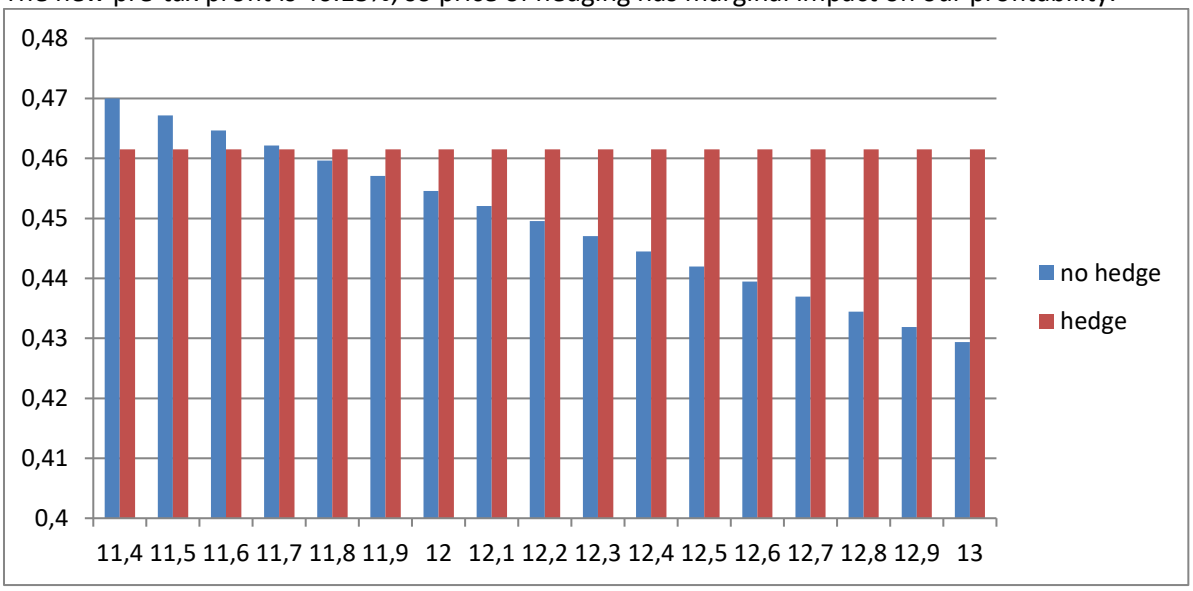
Source: author's calculations

The price of total hedge was 28.45 million HUF in 2015 (is was added to the paid interests).

		Czech (CZK)	Austrian (EUR)	Hungarian (HUF)	Group (HUF)
Income		60 944 771	741 143	2 558 819 566	3 487 050 000
Expenditures	railway usage fees	52 808 771	345 815	115 768 116	826 719 830
	fuel	26 927 479	371 166	98 421 480	522 311 950
	maintenance	0	0	40 950 000	40 950 000
	wages	5 736 000	374 784	142 368 000	325 815 360
	amortization (vehicle)	0	0	40 950 000	40 950 000
	amortization (building)	2 400 000	0	48 000 000	75 360 000
	rent	0	20 544	0	6 471 360
EBIT		-26 927 479	-371 166	2 072 361 970	1 648 471 500
Financial profit	subsidiaries	0	0	0	1 648 471 500
	gained interests	0	0	0	0
	paid interests	0	0	0	39 071 391
Pre-Tax Profit		0	0	0	1 609 400 109
Tax		0	0	0	305 786 021
Profit after tax		0	0	0	1 303 614 088
Dividend		0	0	0	260 722 818
Profit for the year		0	0	0	1 042 891 271

Source: author's calculations

The new pre-tax profit is 46.15%, so price of hedging has marginal impact on our profitability.



Source: author's calculations

Hedging is highly recommended, as above figure suggested. The impact of option expenditures are compensated by the FX exposure right after 11.7 exchange rate.

Matlab script:

```
%% IFM - case study 2018, FX exposures
%We have to manage CZK exposure: 60.94 million CZK
    % we can choose between the following strategies:
        %a. no hedge (no way)
        %b. total hedge (buy a call option)
        %c. selective hedge (if CZK appreciates more
            %than 1% probable, than CZK call option, otherwise: nothing)
%0. load the data
clear
data=xlsread('ifm_currency.xlsx');
    %HU10Y  CZ10Y   EU10Y   CZKHUF  EURHUF
CZKHUF=data(:,4);
 ret=real(diff(log(CZKHUF))); %logarithmic differential as change
    std(ret)
CZ10Y=data(:,2);
HU10Y=data(:,1);
%1. call option fees
%GARCH
    cd 'C:\Users\tanar\Documents\MATLAB\UCSD_toolbox'
    p=1; %lag number of error term
    o=1; %non asymetric model
    q=1; %lag number of past variance
    ht=[]; %variance
    [parameters, LL, ht,VCVrobust,VCV] =tarch(ret, p,o,q);
    [TEXT,AIC,BIC] = tarch_display(parameters,LL,VCV,ret,p,o,q);
    st_dev=sqrt(ht);
    plot(st_dev)
    %3.b.2. calculate the option fee
    for i=1:561
    S0 =CZKHUF(i,1); %price
    X = S0; %target prices - now it is equal to spot price
    T= 1; %remaining time in YEARS
    rd=HU10Y(i,1); %r huf
    rf=CZ10Y(i,1); % r czk
    vol=st_dev(i,1); %GARCH standard deviation
    F=S0*exp((rd-rf).*T);
    d1=log(F./X)./(vol.*sqrt(T))+vol.*sqrt(T)/2;
    d2=log(F./X)./(vol.*sqrt(T))-vol.*sqrt(T)/2;
    European_call(i,1) = exp(-rd.*T).*(F.*normcdf(d1)-X.*normcdf(d2));
    European_put(i,1) = European_call(i,1)+(X-F)*exp(-rd.*T);
    end
    plot(European_call)
%2. comparing different strategies
    %b. total hedge (buy a call option on each Jan)
for i=1:10
    total_hedge(i,1)=CZKHUF(i*52-51,1);
    total_hedge(i,2)=European_call(i*52-51,1)*60.94;
    total_hedge(i,3)=st_dev(i*52-51,1)*1000;
    total_hedge(i,4)=(HU10Y(i*52-51,1)-CZ10Y(i*52-51,1))*100;
end
bar(total_hedge)
Expenditure(1,1)=sum(total_hedge(:,2));%million HUF
    %c. selective hedge (if CZK appreciates more
            %than 1% probable, than CZK call option, otherwise: nothing)
        %VaR(1%)-GARCH benchmark
    for i=1:561
            if ret(i,1)>mean(ret)+2.326*st_dev(i,1)
                VaR(i,1)=1;
                VaR(i,2)=CZKHUF(i,1);
                VaR(i,3)=European_call(i,1);
            else
                VaR(i,1)=0;
                VaR(i,2)=0;
                VaR(i,3)=0;
            end
    end
  bar(VaR)
  for i=1:561
      if VaR(i,1)==1
          selective_hedge(i,1)=VaR(i,2);%exchange rate
          selective_hedge(i,2)=VaR(i,3)*60.94;%option fee
          VaR(i+1:i+52,:)=zeros(52,3);
```

```
        end
    end
    bar(selective_hedge)
Expenditure(1,2)=sum(selective_hedge(:,2));%million HUF
bar(Expenditure)
```

6. Managing economic exposure and transaction exposure

Sensitivity Analysis

- firms have developed forecasts of sales, expenses, and exchange rates for several periods ahead, they can assess their economic exposure over time

Regression Analysis

- applying regression analysis to historical cash flow and exchange rate data
- Assuming ceteris paribus!

Literature

Madura: part 2-3

IV. Funding

The selection among different international projects requires the estimation of funding costs on the long run to calculate the expected net present value for each projects.

1. Markets

a) International Money Market

Serves to transfer **short-term funds** denominated in the local or foreign currency from local surplus units (savers) to local deficit units (borrowers).

Corporations and governments commonly need to borrow short-term funds to support their operations or to finance their budget deficits. Individuals or institutional investors provide funds through short-term deposits at commercial banks. In addition, corporations and governments may issue short-term securities that are purchased by investors. It involves the exchange rate risk. Interest rates in developing countries are typically higher than rates in other countries.

- Eurodollars or Eurocurrency markets:
  - To conduct international trade with European countries, corporations in the United States deposited U.S. dollars in European banks. The banks were willing to accept the deposits because they could lend the dollars to corporate customers based in Europe.
  - These dollar deposits in banks in Europe (and on other continents as well) came to be known as Eurodollars, and the market for Eurodollars came to be known as the Eurocurrency market.
  - Because OPEC generally requires payment for oil in dollars, the OPEC countries began to use the Eurocurrency market to deposit a portion of their oil revenues. These dollar-denominated deposits are sometimes known as petrodollars. Oil revenues deposited in banks have sometimes been lent to oil-importing countries that are short of cash. As these countries purchase more oil, funds are again transferred to the oil-exporting countries, which in turn create new deposits.
- Asian dollar market.
  - The market emerged to accommodate the needs of businesses that were using the U.S. dollar (and some other foreign currencies) as a medium of exchange for international trade.
  - These businesses could not rely on banks in Europe because of the distance and different time zones. Today, the Asian money market, as it is now called, is centered in Hong Kong and Singapore, where large banks accept deposits and make loans in various foreign currencies.
  - The major sources of deposits in the Asian money market are MNCs with excess cash and government agencies.
  - Manufacturers are major borrowers in this market. Another function is interbank lending and borrowing. Banks that have more qualified loan applicants than they can accommodate use the interbank market to obtain additional funds. Banks in the Asian money market commonly borrow from or lend to banks in the European market.

b) International Credit Market

- MNCs also have access to **medium-term funds** through banks located in foreign markets.
- Loans of one year or longer extended by banks to MNCs or government agencies in Europe are commonly called Eurocredits or Eurocredit loans. These loans are provided in the so called Eurocredit market.

- The loans can be denominated in dollars or many other currencies and commonly have a maturity of 5 years.
- Because banks accept short-term deposits and sometimes provide longer-term loans, their asset and liability maturities do not match. This can adversely affect a bank's performance during periods of rising interest rates, since the bank may have locked in a rate on its longer-term loans while the rate it pays on short-term deposits is rising over time. To avoid this risk, banks commonly use floating rate loans.
    - The loan rate floats in accordance with the movement of some market interest rate, such as the London Interbank Offer Rate (LIBOR), which is the rate commonly charged for loans between banks.
    - The premium paid above LIBOR will depend on the credit risk of the borrower. The LIBOR varies among currencies because the market supply of and demand for funds vary among currencies.
- Financial institutions tend to reduce their participation in those markets when credit risk increases. Thus, even though funding is widely available in many markets, the funds tend to move toward the markets where economic conditions are strong and credit risk is tolerable.
- **Syndicated Loans:**
    - A single bank is unwilling or unable to lend the amount needed by a particular corporation or government agency. In this case, a syndicate of banks may be organized.
    - Each bank within the syndicate participates in the lending. A lead bank is responsible for negotiating terms with the borrower. Then the lead bank organizes a group of banks to underwrite the loans.
    - The syndicate of banks is usually formed in about 6 weeks, or less if the borrower is well known, because then the credit evaluation can be conducted more quickly.
    - Borrowers that receive a syndicated loan incur various fees besides the interest on the loan. Front-end management fees are paid to cover the costs of organizing the syndicate and underwriting the loan.
    - Not only reduce the default risk of a large loan to the degree of participation for each individual bank, but they can also add an extra incentive for the borrower to repay the loan (likely have difficulty obtaining future loans).

c) International Bond Market

MNCs obtain **long-term debt** by issuing bonds in their local and foreign markets as well. Institutional investors such as commercial banks, mutual funds, insurance companies, and pension funds from many countries are major participants in the international bond market.

- Motivations:
    - Issuers recognize that they may be able to attract a stronger demand by issuing their bonds in a particular foreign country rather than in their home country. Some countries have a limited investor base, so MNCs in those countries seek financing elsewhere.
    - MNCs may prefer to finance a specific foreign project in a particular currency and therefore may attempt to obtain funds where that currency is widely used.
    - Financing in a foreign currency with a lower interest rate may enable an MNC to reduce its cost of financing, although it may be exposed to exchange rate risk (as explained in later chapters).
- Eurobond:
    - International bonds are typically classified as either foreign bonds or Eurobonds.

- A foreign bond is *issued by a borrower foreign to the country* where the bond is placed. For example, a U.S. corporation may issue a bond denominated in Japanese yen, which is sold to investors in Japan.
- They are usually issued in bearer form, which means that there are no records kept regarding ownership. Coupon payments are made yearly. Some Eurobonds carry a convertibility clause allowing them to be converted into a specified number of shares of common stock.
- Commonly denominated in a number of currencies: USD ~60%, EUR ~20%, GBP, JPY (extremely low interest rates), RNB etc.
- Eurobonds are underwritten by a multinational syndicate of investment banks and simultaneously placed in many countries, providing a wide spectrum of fund sources to tap.
- Secondary Market: market makers are in many cases the same underwriters who sell the primary issues. A technological advance called Euro-clear helps to inform all traders about outstanding issues for sale, thus allowing a more active secondary market. The intermediaries in the secondary market are based in 10 different countries, with those in the United Kingdom dominating the action. They can act not only as brokers but also as dealers that hold inventories of Eurobonds. Many of these intermediaries, such as Bank of America International, Smith Barney, and Citicorp International, are subsidiaries of U.S. corporations.

- reading:
  - ECB: The international role of the euro, European Central Bank, Interim report, https://www.ecb.europa.eu/pub/ire/html/ecb.ire201906~f0da2b823e.en.html
- Parallel bonds:
  - Currency denominating each type of bond is determined by the country where it is sold.

d) International Stock Markets

MNCs and domestic firms commonly obtain long-term funding by issuing stock locally. Yet, MNCs can also attract funds from foreign investors by issuing stock in international markets. The stock offering may be more easily digested when it is issued in several markets. In addition, the issuance of stock in a foreign country can enhance the firm's image and name recognition there.

- Issuance of Stock in Foreign Markets
  - The stocks of some U.S.-based MNCs are widely traded on numerous stock exchanges around the world. This enables non U.S. investors easy access to some U.S. stocks.
  - MNCs need to have their stock listed on an exchange in any country where they issue shares. Investors in a foreign country are only willing to purchase stock if they can easily sell their holdings of the stock locally in the secondary market.
  - The stock is denominated in the currency of the country where it is placed.
  - Large MNCs have begun to float new stock issues simultaneously in various countries. Investment banks underwrite stocks through one or more syndicates across countries. The global distribution of stock can reach a much larger market, so greater quantities of stock can be issued at a given price.
  - Market Characteristics:
    - degree of trading activity
    - legal protection of shareholders

        - government enforcement of securities laws
        - less corporate corruption
        - degree of financial information that must be provided by public companies
- Issuance of Foreign Stock in the United States
    - Non-U.S. corporations that need large amounts of funds sometimes issue stock in the United States (these are called Yankee stock offerings) due to the liquidity of the new issues market there.
    - To diversify its shareholder base and reduce price volatility.
    - The U.S. investment banks commonly serve as underwriters of the stock targeted for the U.S. market and receive underwriting fees representing about 7 percent of the value of stock issued.
    - In 2002, the *Sarbanes-Oxley Act* was passed in the United States.
        - This act requires that firms whose stock is listed on U.S. stock exchanges provide more complete financial disclosure.
        - It is the result of financial scandals involving U.S.-based MNCs such as Enron and WorldCom that used misleading financial statements to hide their weak financial condition from investors. Investors overestimated the value of the stocks of these companies and lost most or all of their investment.
        - It was intended to ensure that financial reporting was more accurate and complete.
        - Consequently, many non-U.S. firms that issued new shares of stock decided to place their stock in the United Kingdom instead of in the United States so that they would not have to comply with the law. Furthermore, some U.S. firms that went public decided to place their stock in the United Kingdom so that they would not have to comply with the law.

Literature
Madura: Chapter 3: International Financial Markets

e) Venture capital funds

- overview (Cumming 2010):
    - **specialized** form of financing
        - available to a **minority** of entrepreneurs
        - in **attractive** industries
    - serves as an important source for
        - economic development
        - wealth
        - job creation
        - innovation
    - firms
        - grow more quickly
        - create far more value
    - specialized knowledge of a particular industry
        - experience – growing a busines start-up to publicly traded company
        - network of contacts
        - seasoned managers, partners
    - exit – liquidity event:
        - IPO (most lucrative)
        - acquisition to another firm/fund

    - bankruptcy / liquidation of assets
- Business models:
  - SBICs are privately owned and operated firms that partner with the Federal Government to provide venture capital to small businesses
    - lend as little as $50,000 and are likely to offer
    - more flexible terms that traditional VC firms
    - equity capital, long term loans and management assistance
    - small startups that might not be able to get the attention of larger VC firms
  - Angel Investors
    - single individuals
    - often entrepreneurs who enjoy helping out other small business owners and do so by investing their personal wealth in a start up business
    - seeking high rates of return for their monetary investment, but angel investors are also aware of the high risk that the investment entails
  - Traditional venture capitalist
    - raise money from private sources that may include:
    - insurance, hedge funds, pension funds, endowments, banks or individuals.
    - VC firms, on average, fund approximately 10% of the deals that their firms consider in a given year
- venture capital firms
  - banks tolerate a low risk/return paradigm,
  - VC firms accept a lot more risk and will take a 30-50% ownership stake in the funded company
  - “strategic involvement” in decision making in the companies that they fund
  - focused on an end goal that will culminate in a “liquidity event.”
    - exit strategy that will insure that the investor(s) are paid out completely- most often through the sale of the company
  - not driven by transaction fees or quick returns
  - benefit all stakeholders with their success
    - Investors, employees and company founders all stand to reap rewards if the VC financed company is successful in the marketplace
  - 10.4 million people are currently employed in high quality jobs created as a result of VC financing.
  - $2.3 trillion in revenue was generated in 2006.
  - VC financed companies account for 9.1% of U.S. private sector employment.
  - Bottom Line: A 0.2% investment in total U.S.GDP through venture capital financing yields a return of 17.6% of overall GDP.
- financing of innovation in the SME sector is the involvement of venture capital (Arratibel et al. 2007)
  - Venture capital:
    - specialised financial institutions
    - playing the role of intermediary
    - between firms that are in
      - need of financing
      - the primary sources of financing (banks and pension funds)
  - Generally plays a prominent role
    - in identifying and financing
    - viable projects of small, innovative enterprises
    - in the high-tech sectors

        - especially vital in the case of start-ups in new industries
            - risk (and also the potential reward) is unusually high.
    - much smaller share of project financing
        - than in the euro area,
        - especially in the case of early stage projects
    - government
        - Traditionally, some part of the R&D financing is responsibility,
            - in particular basic research with a highly unpredictable rate of return
        - applied research
            - Governmental involvement often distorts economic incentives
            - and the public sector lacks the knowledge to select the most commercially viable projects
    - requires well-functioning financial markets
- Two main areas of risk capital markets identified (Hartmann et al. 2007)
    - Financing of start-ups and other small innovative firm's investment projects is particularly difficult
        - have no access to public capital markets and
            - may have difficulties obtaining private bank financing due to asymmetric information
        - Significant private equity and venture capital markets help to overcome
            - indicators show that venture capital financing in the euro area is much lower than that observed
        - lack of venture capital activity
            - many new and innovative firms do not emerge
            - Caused by a
                - lack of capital supplied,
                - a lack of liquidity in still somewhat nationally segmented venture capital markets,
                - a lack of demand from entrepreneurs or
                - by a shortage of exit options for venture capitalists through liquid equity markets
    - securitisation of illiquid assets
        - much larger in the United States than in Europe
        - significant growth in European securitisation could help to improve the allocation of risks and free bank capital for increased lending to firms

Literature:

Cumming, D. J. (2010): Venture capital : investment strategies, structures, and policies, John Wiley & Sons, Inc., Hoboken

Arratibel, O. – Heinz, F. – Martin, R – Przybyla, M. – Rawdanowicz, L. – Serafini, R. – Zumer, T. (2007): Determinants of Growth in the Central and Eastern European EU Member States – a Production Function Approach. ECB OCCASIONAL PAPER SERIES NO 61 / APRIL 2007

Hartmann, P. – Heider, F. – Papaioannou, E. - Lo Duca, M. (2007): The Role Of Financial Markets And Innovation in Productivity and Growth in Europe. ECB Occasional Paper Series, No 72 / September 2007

2. Long-term funding

Equity or debt financing to fund long-term projects. Firms attempt to use a specific capital structure, or mix of capital components, that will minimize their cost of capital. The lower a firm's cost of

capital, the lower is its required rate of return on a given proposed project. A firm's weighted average cost of capital (referred to as r_{WACC}) can be measured as:

$r_{WACC} = \left(\frac{E}{D+E}\right) r_E + \left(\frac{D}{D+E}\right) r_D(1 - CIT)$

Where E: amount of firm's equity, D: amount of firm's debt, CIT: corporate income tax rate (effective if there is available data), r_E: expected return from equity (CAPM: $r_E = r_F + (r_M - r_F) * \beta$; $\beta = \sigma_{EM}/\sigma_M^2$ beta represents the sensitivity of the project's cash flow to market conditions), r_D: average interest rate of the debt ($r_D = \frac{paid\ interests}{D}$ from the profit and loss statement). Two types of risk: (1) unsystematic variability in cash flows unique to the firm (it can be diversified away) and (2) systematic risk

Advantage to using debt than equity as capital: the interest payments on debt are tax deductible. However, the greater the use of debt, the greater the interest expense and the higher the probability that the firm will be unable to meet its expenses.

Many possible values for each input variable (such as demand, price, labor cost, etc.) can be incorporated to estimate net present values (NPVs) under alternative scenarios and then derive a probability distribution of the NPVs. When the WACC is used as the required rate of return, the probability distribution of NPVs can be assessed to determine the probability that the foreign project will generate a return that is at least equal to the firm's WACC. If the probability distribution contains some possible negative NPVs, this suggests that the project could backfire.

Multinational companies differ from domestic firms:

- Size of the company: borrows substantial amounts may receive preferential treatment from creditors, thereby reducing its cost of capital and reduced flotation costs, because MNCs may more easily achieve growth (they operate on more than one markets);
- Access to international capital markets: they can choose markets with lower funding costs (higher liquidity). Or they can tap the capital markets of the subsidiary's country so there will be no currency mismatch between the generated cash flows and funding expenditures.
- International diversification: If a firm's cash inflows come from sources all over the world, those cash inflows may be more stable because the firm's total sales will not be highly influenced by a single economy. Until they are not so integrated to each other.
- Exposure to exchange rate risk: subsidiaries' profit can decrease when parent company's currency appreciates. The possibility of bankruptcy will be higher if the cash fl ow expectations are more uncertain, exposure to exchange rate fluctuations could lead to a higher cost of capital.
- Exposure to country risk: possibility that a host country government may seize a subsidiary's assets (without a fair compensation) or unfortunate tax law changes.

Literature

Madura: Chapter 17: Multinational Cost of Capital and Capital Structure

a) Costs of Capital across Countries

MNCs based in some countries may have a competitive advantage over others (technology and resources as cost of capital differs from country to country) therefore they can more easily increase their world market share. They may be able to adjust their international operations and sources of funds to capitalize on differences in the cost of capital among countries.

Country differences in the **cost of debt**:

- Differences in the Risk-Free Rate: determined by the interaction of the supply of and demand for funds (influenced by tax laws, demographics, monetary policies, and economic conditions as inflation and growth). And in the ratings.
- Differences in the Risk Premium: The risk premium on debt must be large enough to compensate creditors for the risk that the borrower may be unable to meet its payment

obligations. When a country's economic conditions tend to be stable, the risk of a recession in that country is relatively low. Thus, the probability that a firm might not meet its obligations is lower, allowing for a lower risk premium. Corporations and creditors have closer relationships in some countries than in others. Governments in some countries are more willing to intervene and rescue failing firms - even if the government is not a partial owner, it may provide direct subsidies or extend loans to failing firms. Creditors are willing to tolerate a higher degree of financial leverage.

- Comparative Costs of Debt across Countries: before-tax cost of debt as measured by high-rated corporate bond yields has correlation between country cost-of debt levels over time. Disparity in the cost of debt among the countries is due primarily to the disparity in their risk-free interest rates.

Country differences in the **cost of equity**: firm's cost of equity represents an opportunity cost: what shareholders could earn on investments with similar risk if the equity funds were distributed to them. This return on equity can be measured as a risk-free interest rate that could have been earned by shareholders, plus a premium to reflect the risk of the firm.

- The cost of equity is also based on investment opportunities in the country of concern. In a country with many investment opportunities, potential returns may be relatively high, resulting in a high opportunity cost of funds and, therefore, a high cost of equity.
- The price-earnings multiple is related to the cost of capital because it reflects the share price of the firm in proportion to the firm's performance (as measured by earnings). A high price-earnings multiple implies that the firm receives a high price when selling new stock for a given level of earnings, which means that the cost of equity financing is low. The price-earnings multiple must be adjusted for the effects of a country's inflation, earnings growth, and other factors, however.
- The MNC can attempt to measure the expected return on a set of stocks that exhibit the same risk as its project. This expected return can serve as the cost of equity.

Sensitivity analysis:

- Relationship between Project's Net Present Value and Capital Structure.
- Tradeoff When Financing in Developing Countries.
- Accounting for Multiple Periods.
- Comparing Alternative Debt Compositions.
- Comparing Alternative Capital Structures.
- Assessing Alternative Exchange Rate Scenarios.
- Considering Foreign Stock Ownership.

The MNC's Capital Structure Decision:

- MNC-characteristics:
  - MNCs with *more stable cash flows* can handle more debt because there is a constant stream of cash inflows to cover periodic interest payments. MNCs that are diversified across several countries may have more stable cash flows since the conditions in any single country should not have a major impact on their cash flows.
  - MNCs that have *lower credit risk* (risk of default on loans provided by creditors) have more access to credit. Any factors that influence credit risk can affect an MNC's choice of using debt versus equity. MNCs with assets that serve as acceptable collateral (such as buildings, trucks, and adaptable machinery) are more able to obtain loans and may prefer to emphasize debt financing.
  - Highly profitable MNCs may be able to finance most of their investment with *retained earnings* and therefore use an equity-intensive capital structure. MNCs with less growth need less new financing and may rely on retained earnings (equity) rather than debt.

- If the *parent backs the debt of its subsidiary*, the subsidiary's borrowing capacity might be increased. Therefore, the subsidiary might need less equity financing.
- If a subsidiary in a foreign country cannot *easily be monitored by investors* from the parent's country, agency costs are higher. To maximize the firm's stock price, the parent may induce the subsidiary to issue stock rather than debt in the local market so that its managers there will be monitored. In this case, the foreign subsidiary is referred to as "partially owned" rather than "wholly owned" by the MNC's parent.

- Country Characteristics
  - Stock Restrictions in Host Countries: investors are allowed to invest only in local stocks, or potential adverse exchange rate effects and tax effects. This could entice the MNC to use more equity by issuing stock in these countries to finance its operations.
  - Interest Rates in Host Countries
  - Strength of Host Country Currencies
  - Country Risk in Host Countries
  - Tax Laws in Host Countries

Literature
Madura: Chapter 17: Multinational Cost of Capital and Capital Structure

b) Long-term financing

Sources of Equity

- MNCs may consider a domestic equity offering in their home country in which the funds are denominated in their local currency.
- They may consider a global equity offering in which they issue stock in their home country and in one or more foreign countries. The stock will be listed on an exchange in the foreign country so that investors there can sell their holdings of the stock.
- MNCs may offer a private placement of equity to financial institutions in their home country. Private placements are beneficial because they may reduce transaction costs. The funding must come from a limited number of large investors who are willing to maintain the investment for a long period of time because the equity has very limited liquidity.
- May offer a private placement of equity to financial institutions in the foreign country where they are expanding

Sources of Debt

- Public placement of debt in their own country or a global debt offering.
- Engage in a private placement of debt in their own country or in the foreign country where they are expanding.
- They may also obtain long-term loans in their own country or in the foreign country where they are expanding.

Cost of Debt Financing

- Steps: (1) determine the amount of funds needed, (2) forecast the price at which it can issue the bond, and (3) forecast periodic exchange rate values for the currency denominating the bond.
- Use of exchange rate probabilities (historical density of changes) or simulation
- The *exchange rate risk* from financing with bonds in foreign currencies can be reduced:
  - *Offsetting Cash Flows with High-Yield Debt:* If a U.S.-based MNC issues bonds denominated in the local currency in one of subsidiaries' countries where yields on debt are typically high, there may be a natural offsetting effect that will reduce the MNC's exposure to exchange rate risk because it can use its cash inflows in that currency to repay the debt. Alternatively, the MNC might obtain debt financing in

dollars at a lower interest rate, but it will not be able to offset its earnings in the foreign currency. Also consider that the currencies of countries with relatively high inflation tend to weaken over time (as suggested by purchasing power parity).

- *Implications of the Euro for Financing to Offset Cash Inflows.* The decision of several European countries to adopt the euro as their currency has important implications for MNCs that require long-term fi nancing and wish to offset some of their cash infl ows with debt payments. MNCs that have cash infl ows in many of the participating European countries can now issue bonds denominated in euros and then use their cash inflows from operations in these countries to make the debt payments.
- *Forward Contracts*: The firm could arrange to purchase the foreign currency forward for each time at which payments are required. However, the forward rate for each horizon will most likely be above the spot rate.
- *Currency Swaps*: The large commercial banks that serve as financial intermediaries for currency swaps sometimes take positions. That is, they may agree to swap currencies with firms, rather than simply search for suitable swap candidates.
- *Parallel Loans*: Using Parallel Loans to Hedge Exchange Rate Risk for Foreign Projects - function as a useful alternative to forward or futures contracts as a way to finance foreign projects.
- *Diversifying among Currencies*: A U.S. firm may denominate bonds in several foreign currencies, rather than a single foreign currency, so that substantial appreciation of any one currency will not drastically increase the number of dollars needed to cover the financing payments.
  - Currency Cocktail Bonds: currency cocktail simply reflects a multicurrency unit of account

- *Interest Rate Risk* from Debt Financing:
  - The Debt Maturity Decision:
    - assess the yield curves of the countries in which they need funds
      - Upward-sloping yield curve: the annualized yields are lower for short-term debt than for long-term debt. Investors may require a higher rate of return on long-term debt as compensation for lower liquidity. The market value of long-term debt is more sensitive to market interest rate movements, so investors face a greater risk of a loss if they need to sell the debt before its maturity.
      - Not always upward sloping because other forces such as interest rate expectations may affect the demand and supply conditions for debt at various maturity levels. In some countries, the yield curve is commonly flat or downward sloping for longer maturities.
      - Compare annualized rates among debt maturities, so that they can choose a maturity that has a relatively low rate.
      - Assess the prevailing market demand for and supply of funds for particular debt maturities, which may indicate the future movement in interest rates.
  - The Fixed versus Floating Rate Decision
    - If it wishes to avoid the prevailing fixed rate on long-term bonds may consider floating rate bonds. In this case, the coupon rate will fluctuate over time in accordance with interest rates. For example, the coupon rate is frequently tied to the London Interbank Offer Rate (LIBOR), which is a rate at which banks lend funds to each other. As LIBOR increases, so does the coupon rate of a floating rate bond.

        - A floating coupon rate can be an advantage to the bond issuer during periods of decreasing interest rates, when otherwise the firm would be locked in at a higher coupon rate over the life of the bond. It can be a disadvantage during periods of rising interest rates.
        - If the coupon rate is floating, then forecasts are required for interest rates as well as for exchange rates.
    - Hedging with Interest Rate Swaps
        - May use interest rate swaps to hedge the interest risk. Enables a firm to exchange fixed rate payments for variable rate payments. Bond issuers use interest rate swaps because they may reconfigure the future cash flows in a manner that offsets their outflow payments to bondholders.
        - Financial institutions such as commercial and investment banks and insurance companies often act as dealers in interest rate swaps. Financial institutions can also act as brokers (arranges an interest rate swap between two parties, charging a fee for the service) in the interest rate swap market.
        - Plain Vanilla Swap
            - standard contract without any unusual contract additions
            - floating rate payer is typically highly sensitive to interest rate changes and seeks to reduce interest rate risk, believes interest rates are going to decline
            - fixed rate payer in a plain vanilla interest rate swap, on the other hand, expects interest rates to rise and would prefer to make fixed rate payments
        - Accretion swap: notional value is increased over time
        - Amortizing swap: the notional value is reduced over time
        - Basis swap: involves the exchange of two floating rate payments. For example, a swap between 1-year LIBOR and 6-month LIBOR is a basis swap
        - Callable swap gives the fixed rate payer the right to terminate the swap in case of significant interest rate falls
        - Forward swap: enters into today, but swap payments start at a specific future point in time
        - Putable swap: gives the floating rate payer the right to terminate the swap in case of significant interest rate rise
        - Zero-coupon swap: all fixed interest payments are postponed until maturity and are paid in one lump sum when the swap matures
        - Swaption: gives its owner the right to enter into a swap. The exercise price of a swaption is a specified fixed interest rate at which the swaption owner can enter the swap at a specified future date. A payer swaption gives its owner the right to switch from paying floating to paying fixed interest rates at the exercise price. A receiver swaption gives its owner the right to switch from receiving floating rate to receiving fixed rate payments at the exercise price.

Literature:
Madura: Chapter 18: Long-Term Financing
Database:
FRED corporate bond yield database: https://fred.stlouisfed.org/categories/32348

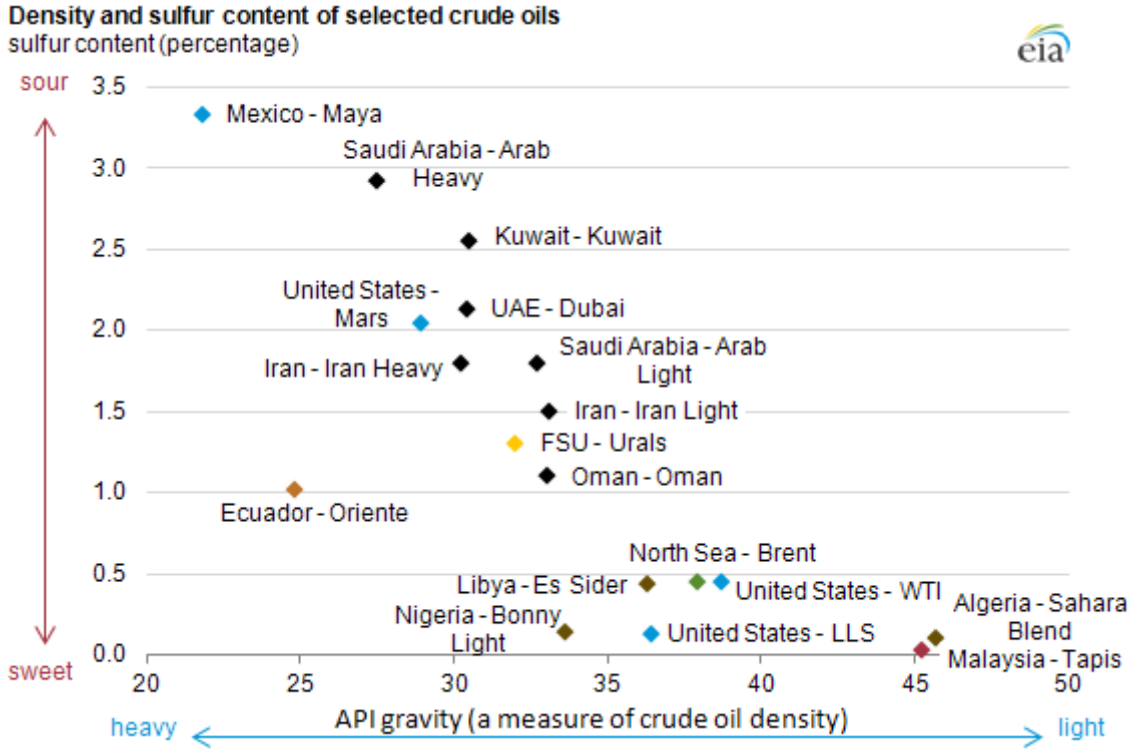
c) Convertible bonds – a case study

Definition:

"A type of bond that the holder can convert into a specified number of shares of common stock in the issuing company or cash of equal value."

The story of MOL Magnolia convertible bond

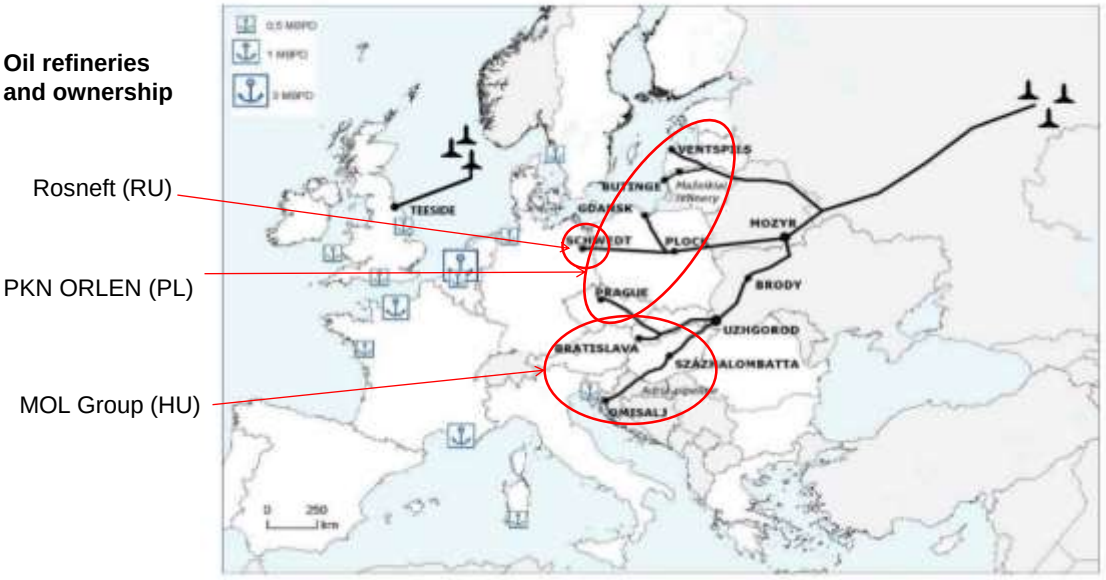
- Russian oil differs from other crude oils in its sulphur content, which means that refineries must be adapted to it.



Source: wikipedia

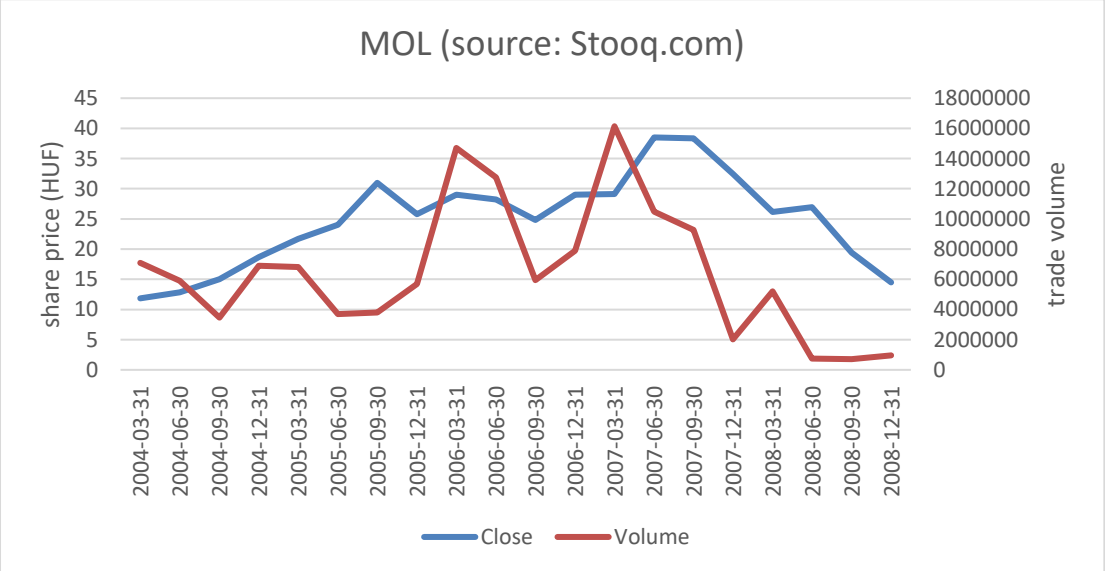
- The Central-Eastern European region is connected to Russia trough pipelines and local refineries are processing mainly Russian crude oil, which are owned by 2 major public listed (formet state owned, later privatized) companies:
  - PKN Orlen (Poland): 2 Polish, 1 Czech and 3 Baltic refineries
  - MOL (Hungary): 1 Hungarian, 1 Slovakian, 1 Croatian

Map 4: The Druzhba and the Norpipe oil pipelines (Teeside)



Source: Commission Staff Working Paper: Oil Infrastructures. 2008 (COM (2008) 782).
http://www.europarl.europa.eu/RegData/etudes/note/join/2009/416239/IPOL-ITRE_NT(2009)416239_EN.pdf
Source: European Parliament

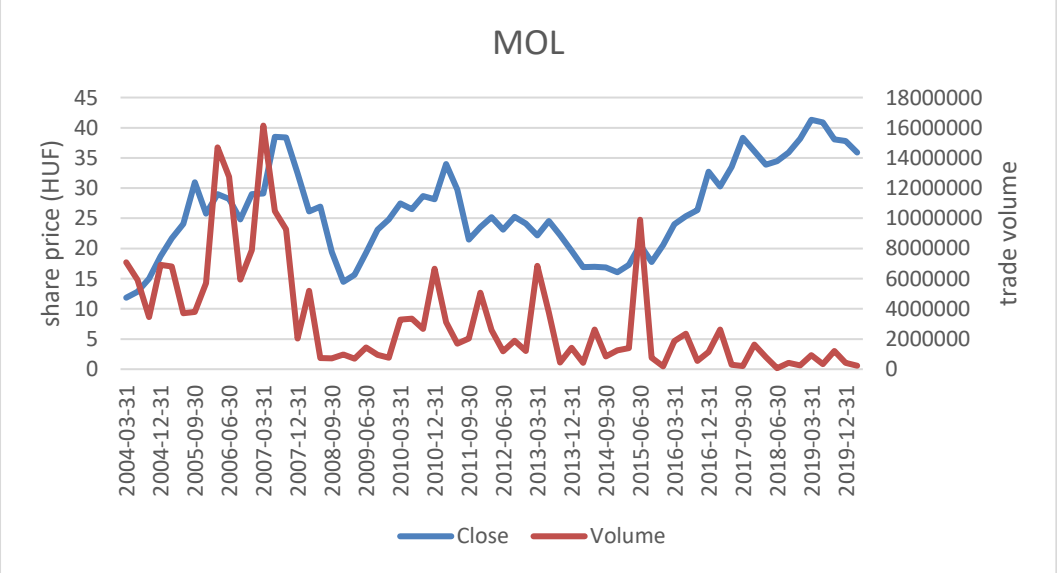
- Meanwhile, companies like the Austrian OMV or the Russian Rosneft and Lukoil have also interests in the region.
    - Local oil extraction (upstream) is insufficient, so most of the operations are focusing on the downstream sector (refinery, fuel distribution and chemical industry)
- MOL started its international expansion in the early 2000s with the acquisition of the Slovakian and a Croatian recently privatized enterprise.
- Raw material prices were increasing constantly from 2000 until 2008, but MOL share prices exploded both in their value and trade volume in the summer of 2007.



    - We can see, that the trade volume increased dramatically during this rally, so it was assumed someone started an accumulation of public shares to prepare a future hostile takeover (MOL's management was not open to any M&A idea).

- If you are reaching the 10% ownership in a public traded company, you have to announce it publically that you have a significant ownership in this company – then you can delegate your people in the upper management (board).
- Therefore, to stay under the radar, OMV used the support of other investment banks to accumulate nearly 30% of the shares but in different hands to avoid unwanted publicity – then, during the next shareholders' meeting, they would be able to remove the management and replace with their own people.

- This is why the MOL stated to purchase its own shares from the company's cash reserves to dry out public market before the OMV (and its friends) purchases everything.
  - As the market started to dry up, share prices reached 40 HUF.
  - However, a company can't keep its own shares for more than one fiscal year: then they have to resell or to terminate them.
- Share repurchase (or stock buyback or share buyback) programs became popular since the 1980s, because it can distribute the cash earnings to the shareholders during the entire year, instead of waiting for an annual dividend payment. It can be lucrative from taxation point of view (tax rates on capital gains are usually lower than tax rates on dividends). At the same time, companies with lower cash reserves and higher share prices are less exposed towards hostile takeovers.
  - Since MOL had to sell the shares, but to avoid that they can land in the OMV's hands, they created MOL Magnolia Ltd. on Jersey islands in March 2006. Later, MOL Magnolia issued a convertible bond to collect 610 million EUR.
  - Notional value: 100 000 EUR/bond, which expires on March 2016.
  - Bondholder has the option to purchase MOL shares for 26.670 HUF after March 2011.
  - Until this point, the bond will pay 4% interest.
  - After this point, the bond will pay 3M Euribor + 0.55% interest.
- Investors can be desperate sometimes: between October 2008 and April 2009, MOL magnolia had a ~38 000 EUR price, but later it converged back to its notional value.



Source: stooq.com

- Historically we can say that this attempted takeover dried up the market for good. We can see also that there were not so many opportunities to covert the bonds to shares since market prices were far under the defined 26.670 HUF levels.

- The MOL is still an independent enterprise, later the OMV-package (after a Russian turn) moved to the hands of the Hungarian government, which invested it in to the public foundation of the Corvinus University.

3. Financial lease

a) Concept

International Financial Reporting Standards 16 (*after 1 January 2019*): single lessee accounting model

- requires a lessee to recognise assets and liabilities for all leases with a term of more than 12 months, unless the underlying asset is of low value.
  - similarly to other non-financial assets (such as property, plant and equipment): depreciation of the right-of-use asset on a straight-line basis
- lessee is required to recognise a right-of-use asset representing its right to use the underlying leased asset and a lease liability representing its obligation to make lease payments.
  - similarly to other financial liabilities: interest on the lease liability
  - In the statement of cash flows, a lessee separates the total amount of cash paid into principal (presented within financing activities) and interest (presented within either operating or financing activities)
- Assets and liabilities arising from a lease are initially measured on a present value basis
  - includes non-cancellable lease payments (including inflation-linked payments),
  - and also includes payments to be made in optional periods
  - if the lessee is reasonably certain to exercise an option to extend the lease,
  - or not to exercise an option to terminate the lease.
  - The initial lease asset equals the lease liability in most cases.

Literature:
https://www.ifrs.org/issued-standards/list-of-standards/ifrs-16-leases/

Definition: Lease is a contractual arrangement, under which the right to use the asset (usually fixed assets like the industrial equipments), has been granted by a person or company to another person or company, in consideration of the return by way of periodical payments of the lease rent. The person who so gives the asset on lease is known as the 'lessor', and the person, to whom it has been given, with the right to use the same, is called the 'lessee'.

Finance Lease (also referred to as Capital Lease or Full-Pay-Out Lease), a means and source of financing on a *medium or long-term* basis.

- (i)It is granted for a medium or long-term (period), and such an arrangement *cannot be cancelled or revoked* during the initial lease period (also known as the primary lease period). This (initial) period usually ranges from three to five years or even up to eight years.
- (ii)The lease, by and large, is *fully amortized during* the primary or initial lease period itself. That is to say that the **lessor** is able to get back (realize) the entire amount of his capital investment in the industrial equipment in question, plus a *reasonable and acceptable rate of return*, by way of realization of the periodical rental regularly.
- (iii)In such cases, the **lessee** (and not the lessor) is responsible for the *periodical maintenance* as also for the payment of the insurance instalments and taxes.
- (iv)Besides, here the **lessee** has been given the *option to get the lease renewed* for a future period, and this time usually at a much lesser rental charges

Economic Life vs Running Life

- Thus, the economic life of an equipment, can be said to be the period up to which its operating/running cost is well within the range, based on the basic principle of cost and benefit.
- As a practical matter, however, a lessor must generally use a residual value greater than zero to be price competitive.

Dry and Wet lease

- (a)'Wet Lease', where the lessor is responsible for maintenance and insurance of the equipment so leased.
- (b)'Dry Lease', where these responsibilities lie with the lessee, instead.

Operating lease

- The term (period) of operating lease is substantially less than the economic life of the industrial equipment.

Single Investor Lease

- In a Single Investor Lease arrangement, the leasing company raises sufficient long-term funds, by way of a suitable mix of equity and debt, to acquire the required fixed asset (industrial equipment) to be leased.
- But, in such an arrangement, the loan fund (the debt raised by the lessor company) is without recourse to the lessee. That is to say that, in the event of the lessor company failing to make regular payments against the instalments, with interest due, on due dates, the creditors (lenders) of the lessor company cannot demand payment of the instalments and interest due against the lessor company, from the lessee company or person

Full Service Lease and Net Lease

- Full Service Lease: When the lease agreement provides that the lessor will be responsible for the insurance and maintenance of the leased assets (like cars, computers or office equipments), such lease is known as the 'full-service lease'.
- Net Lease: As against this, where the lessee is responsible for the insurance and maintenance of the leased asset, such lease is known as the 'net lease'

Reasons behind the popularity of leasing

- (i) Convenience:
  - the company doesn't want to invest all its capital to acquire the asset;
  - provides flexibility to build up or to decrease capacities to react on changes in demand;
  - ideal for limited use needs;
  - preserves capital.
- (ii)Tax Benefits:
  - tax benefits of depreciation on the assets (depreciation is accounted at the lessee)
- (iii)Fewer Restrictive Covenants:
  - In the case of term loans, the banks and the financial institutions usually stipulate a large number of restrictive and inconvenient covenants, like restrictions on fresh investments and new loans, managerial appointments and dividend payments, provision of guarantees and appointment of their own nominee director(s) on the board of the borrowal company, and so on. Such inconvenient and restrictive clauses and conditions are not stipulated in the lease deeds.
- (iv)Obsolescence Risks:
  - When a user is concerned that equipment may become obsolete before the end of its useful life and therefore have little or no resale value, leasing can reduce that concern.
- (v)Quick Deal:

- Banks and financial institutions are known for taking too long a time in the actual disbursement of the term loan, which involves various steps and stages, like the preparation and submission of the projects, its appraisal and sanction and phased disbursements.
- As against this, the lease financing can well be finalized far more expeditiously, say, within a month's time.

- (vi)Rational Pay-back Schedule:
  - It has been observed that some of the banks and financial institutions have, till recently, been most unrealistic, and even irrational, in insisting upon the repayment of their term loans in equal periodical instatements with interest, within the stipulated period, usually starting immediately after the expiry of six months from the date of disbursement, without taking into account the normal gestation period, trial runs prior to the commencement of commercial production, and generation of sufficient profits and cash surplus, to service the loan. In the process, most of the companies have been, unjustifiably and unrealistically, been declared defaulters due to non-payment of three consecutive instalments on the loan, even though their commercial production, or even trial runs, have not been undertaken, leave alone the generation of sufficient profits and cash surplus, to service the loan.

Relations to Project Financing Mechanisms

- Build-Own-Operate-Transfer Arrangement BOOT:
  - Under such an arrangement, a private company builds (i.e. constructs and completes) a project, owns and operates it for a reasonable period of time, so as to earn a reasonable return on its investment (ROI), and thereafter, transfer, the project to the host government or its agency.
  - Solicited BOOT:
    - The project is first conceived and identified, developed and formulated, by the government, and thereafter, some company in the private sector is invited to submit the proposal to participate in the venture.
  - Unsolicited BOOT:
    - A private sector company or group of companies, on their own, prepare and submit a project proposal to the government for its acceptance and participation.
- Build-Own-Operate Arrangement (BOO):
  - Under such an arrangement, the element of transfer (T) is absent, and the ownership of the project rests with the sponsors all through.
  - BOO arrangement, thus, naturally does not provide for any sovereign guarantee and, accordingly, it is in the nature of limited recourse financing.
- Build-Lease-Transfer Arrangement (BLT):
  - Under the BLT arrangement, the shareholders (the owners of the project), retain the complete ownership throughout. They only transfer the control and operation to the lessee, under a lease agreement.
  - The host government, however, agrees to buy the output (the end-product), like the electricity in a power project, or the services like in the cases of the flyovers and so on, from the respective lessor.
  - The sponsors, as the lessor, is entitled to receive the periodical lease rentals, the regular and timely payment whereof is guaranteed by the host government.

Literature:

Mathur, S. B., & Rangarajan, C. (2015). Financial Management : Theory and Practice. New Delhi: Laxmi Publications Pvt Ltd.; Chapter 27 - Leasing, Hire-Purchase, and Project Financing

Finance Leasing Companies

- After agreeing on a lease with a lessee, they buy the specific equipment needed for the leasee.
- The lessee orders and receives the equipment from the vendor.
- When it arrives, the finance leasing company pays for it, takes title, and leases it to the equipment user.
- Finance leasing companies typically write leases, called finance leases that run from 70% to 80% of the equipment's useful life. The total amounts received under these leases, including the *rents payable* and the *equipment residual value* proceeds are usually sufficient to provide lessors with a full return of their equipment investment and a profit.
- If the equipment purchase is *leveraged with third-party debt*, then the rents will generally be enough to *cover the full repayment of the debt*.
- This type of long-term lease is net to the lessee; that is, the lessee must assume substantially all the equipment ownership responsibilities such as *maintenance, taxes, and insurance*.

Service Leasing Companies

- Nonfinancial services to lessees in addition to the equipment financing: equipment maintenance and repair or advice on the equipment's operation and design.
- Typically limit their activity to a single type of equipment.
- Write leases with much shorter lease terms than finance leases, to recover its investment and make a profit, the service lessor must continue to re-lease the equipment. To be compensated for taking that high risk and for providing other services, service lessors will generally charge higher rents than finance lessors.

When-to-Lease Checklist

- There is a high risk that equipment will become obsolete before the end of its useful life.
- The equipment will be needed only for a short time.
- It is desirable to maximize available capital resources.
- Technical, administrative, or other nonfinancial equipment-related services that are not internally available can be easily secured from a leasing company.
- High interest rates must be paid for borrowed money.
- The tax benefits resulting from the equipment ownership cannot be used.
- The equipment will have a poor market value at the end of its term of use.

Literature:

Contino M. R. (2002): *The Complete Equipment-Leasing Handbook*. AMACOM

b) Pricing a lease (classical approach)

Lease fee must cover the present value or the asset with respect on the residual value (*Re*), while it is derived from 5 interest components (*r*).

$$Lease\ fee = \frac{(Asset\ price * (1 - Re)) * 0.9}{\frac{1 - (1 + r)^{-T}}{r}}$$

Where $r = r_0 + r_1 + r_2 + r_3 + r_4$

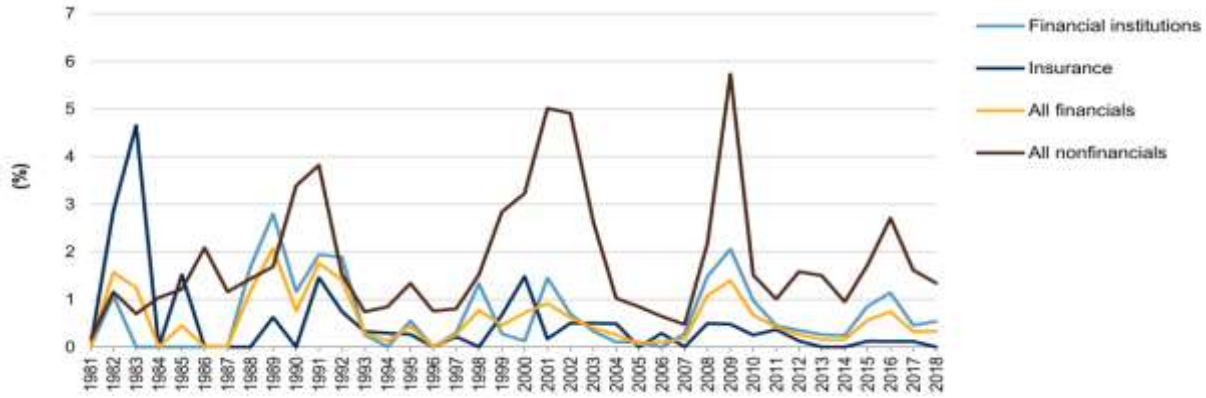
Interest base is defined by the lessor's liability interest rate, where the leasing company can fund itself on the long run. Interest premium 1 depends on the maturity and additional down payments. Interest premium 2 is defined by the commission of the leasing company. Interest premium 3 represents the partner risk and the volatility of the asset price volatility while interest premium 4 covers the additional services (if there is any).

$$r_3 = \frac{default\ rate}{time\ to\ default} * 12\ month * Multiplier\ due\ to\ capital\ reduction$$

c) Default rates from S&P

An obligor rated 'D' (default) is in default on one or more of its financial obligations, including rated and unrated financial obligations but excluding hybrid instruments classified as regulatory capital or in nonpayment according to terms. An obligor is considered in default unless S&P Global Ratings believes that such payments will be made within five business days of the due date in the absence of a stated grace period, or within the earlier of the stated grace period or 30 calendar days. A 'D' rating is assigned when S&P Global Ratings believes that the default will be a general default and that the obligor will fail to pay all or substantially all of its obligations as they come due.
S&P Global publishes its "*Annual Global Corporate Default And Rating Transition Study*" report with sectoral and industrial breakdown.

One-year Default Rates By Broad Sector



Source: S&P (2018): Default, Transition, and Recovery: 2018 Annual Global Corporate Default And Rating Transition Study. Standard and Poor's

"Over the long term, nonfinancial sectors have tended to show a more pronounced cyclicality of defaults than the financial sectors. While the one-year default rate for nonfinancial companies has climbed above 3.5% in three previous cyclical peaks (1991, 2001-2002, and 2009), the annual default rate for financial services has remained below 2% since 1990. The higher default rates for nonfinancials is not surprising, given this sector's higher concentration of speculative-grade issuers. Financial services companies are more likely to be initially rated in the investment-grade category, while nonfinancial companies are more likely to initially be rated speculative grade."

Global Corporate Default Rates By Industry

(%)	2018	2017	Weighted average (1982-2018)	Median	std	Min.	Max.
Aerospace/auto/capital goods/metals	1.13	1.33	2.11	1.32	2.02	0	9.47
Consumer/service	2.49	2.74	2.3	1.79	1.56	0	6.29
Energy & natural resources	3.95	4.72	3.05	1.72	2.86	0	13.67
Financial institutions	0.54	0.46	0.66	0.34	0.72	0	2.8
Forest & building products/homebuilders	0.82	1.65	2.48	1.46	2.87	0	14.51

Health care/chemicals	0.87	1.11	1.37	0.84	1.3	0	4.89
High tech/computers/office equipment	0.86	1.53	1.15	0.94	1.43	0	4.82
Insurance	0	0.12	0.3	0.23	0.9	0	4.65
Leisure time/media	1.44	1.42	3.29	2.11	3.27	0	17.02
Real estate	0.26	0.27	0.69	0	2.72	0	12
Telecommunications	0.94	0.93	2.47	0.92	3.83	0	18.52
Transportation	0.69	0.37	2	1.77	1.64	0	6
Utility	0	0.31	0.43	0.17	0.75	0	4.26

Source: S&P (2018): Default, Transition, and Recovery: 2018 Annual Global Corporate Default And Rating Transition Study. Standard and Poor's

"When comparing default rates across sectors, we note some key differences between the various industries. Several sectors have had distinct default cycles, such as the high technology, computers, and office equipment sector and the telecommunications sector, which both fuelled the prolonged and pronounced spike in the default rate during the tech bubble, when the global speculative-grade default rate reached 12.1% in June 2002. Other sectors, such as the consumer services sector, have had more frequent default cycles, both during and between economic cycles"

Time To Default From Post-Original Ratings By Industry

	Average years to default	Median years to default	Standard deviation of years to default
Aerospace/auto/capital goods/metals	3.7	1.5	5
Consumer/service	3.6	1.6	5.1
Energy & natural resources	2.7	1	4.2
Financial institutions	2.9	1	4.7
Forest & building products/homebuilders	2.9	1.3	3.9
Health care/chemicals	3.1	1.4	4.7
High tech/computers/office equipment	4	2	5.1
Insurance	3.1	1.7	3.7
Leisure time/media	3.1	1.2	4.5
Real estate	1.4	0.8	1.7
Telecommunications	1.6	0.6	2.7
Transportation	4.8	1.8	6.5
Utility	3.2	0.8	5.2
Total	3.2	1.3	4.8

Source: S&P (2018): Default, Transition, and Recovery: 2018 Annual Global Corporate Default And Rating Transition Study. Standard and Poor's

"Among the 2,754 defaults recorded globally over the long term, six sectors displayed average times to default that are lower than the overall average of 5.8 years. These sectors are energy and natural resources; financial institutions; high technology, computers, and office equipment; leisure time and media; real estate; and telecommunications"

d) An example for full service lease

Indicative proposal for the lease of one Siemens Vectron VM locomotives

- Locomotive: Siemens Vectron VM
- VM Quantity: 1
- Homologation requested: HU, CZ, AT
- Lease term: 36 months
- Assumed mileage per year: 150,000 km/ 200,000 km
- Type of lease: Full service
- Lease price per month 150,000 km: €42,252,-
- Lease price per month 200,000 km: €44,746,-

This offer is subject to the lease company's management approval.

Our full service offer includes:

- preventive (PM)-,
- corrective maintenance (CM) and
- main overhaul (MO)/ revisions, and
- insurance (I).

This offer does not include a spare locomotive option.

Overview of the service package included in the monthly lease price:

- Preventive maintenance - Total-country coverage in the relevant countries of use in accordance with the regulations of the manufacturer.
- Corrective maintenance - Damage due to technical defects will be borne by lease company. The Lessee, therefore, does not bear any technical risk.
- Spare/wearing parts - Spare parts and wearing parts due to normal wear during service.

- Stocking of spare parts - Stocking of selected spare parts, 24-hour access to your own store, as well as cooperation with other utility companies.
- Wheels - Turning of wheels, change of new wheels.
- Main overhaul reserves - Formation of reserves for main overhauls.
- Locomotive service - Software Upgrades, documentation, operational support.
- Change of locomotive type - A change of the locomotive according to other operational requirements is always during the lease term possible.
- Driver training - Optionally we can offer you a driver training and instruction for the type of locomotives in our offer.

Indicative prices for the VM type for 150,000 km and 200,000 km per year.
The VM variant has a broad homologation range and is therefore a high-end and relatively more costly locomotive. Domestic locomotives are considerably more affordable compared to our extend VM type locomotive (which is meant to cover the majority of Europe).
I have reviewed your indicated annual mileage and due to practical implications would like to propose an alternative.
The majority of lease company's customers driving with this type of locomotives, drive approximately 150,000-200,000 km per year. This annual mileage is realistic with one locomotive, more than 300,000 km per year would not be realistic due to scheduled maintenance etc. If more kilometres need to be covered, multiple locomotives are needed.
Due to safety regulations, lease company's locomotives require on average once a week one day downtime for preventive maintenance.

vi. Assignment 7: Long-term asset and liability management

Please show, how the acceptance of the lease-offer (3 Vectrons) would change the profitability (considering: no maintenance personnel, no own locomotive)!

SAMPLE

Ideas of rationalization

- Sell old traction vehicle:
  - diesel loco: 379.75 million HUF
  - spare parts: 40 million HUF
- Issuing new corporate bond with flexible interest rate
  - EURIBOR+2%
  - 3m EUR initial market price
- Liquid assets:
  - HUF 150 million
  - EUR 1.5 million (472,500,000 HUF)

Two scenarios were compared in this assignment: the first uses a full service lease contracts to modernize the traction capacities, while the second one increases corporate debt level to acquire the necessary locomotives. Considering depreciation appears in both cases, it was left out from the comparison.

1. Full service lease contract (not considering the tax-benefits of depreciation)**:**

- Savings:
  - Fire all engineer-technicians (Wages are reduced by 9 600 000 HUF, 36 000 EUR and 056 000 CZK, a total of 32 978 400 HUF saving).
  - Selling the diesel locomotive increases the bank deposits by 419.75 million HUF, increasing our total interest revenues after our bank deposits by 4 617 250 HUF

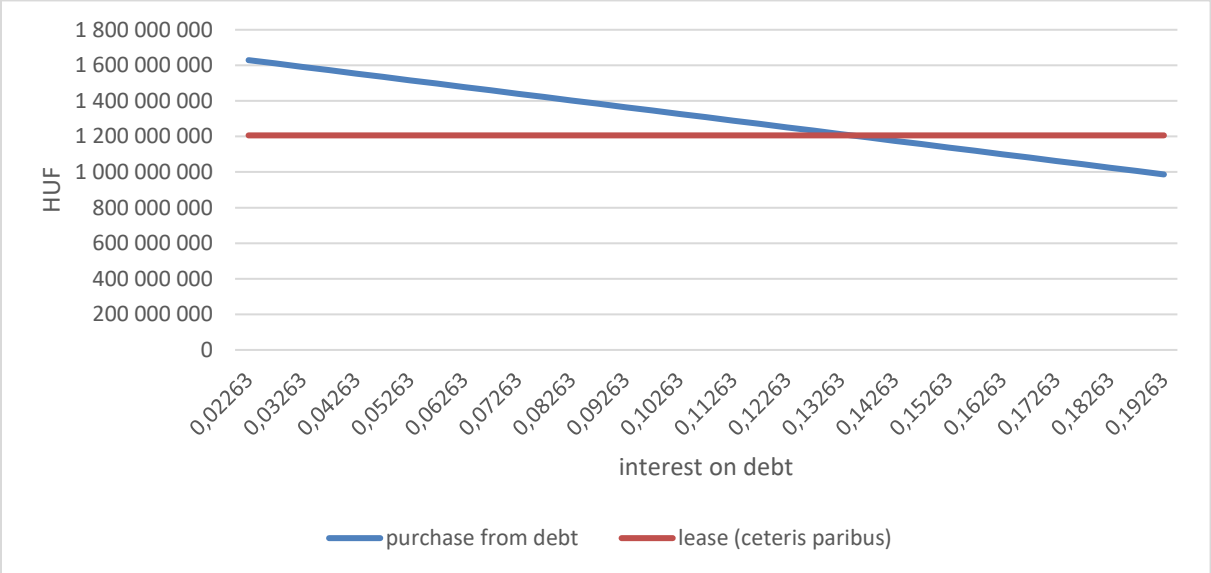
- Renew our 2 million EUR debt by issuing new corporate bonds (EURIBOR+2%) to save 36 143 100 HUF on interest payment
- The company would save on traction electricity instead of spending on diesel fuel: 1 673 899 991

- Expenditures:
  - Lease 3 Siemen Vectron locomotives (1 718 856 EUR/year for leasing fees, a total of 541 439 640 HUF expenditure).
- Total: 1 206 199 101 HUF, the use of lease would increase profitability

2. Purchasing 3 Siemens Vectrons from debt (not considering the tax-benefits of depreciation)**:**

- Savings:
  - Selling the diesel locomotive increases the bank deposits by 419.75 million HUF, increasing our total interest revenues after our bank deposits by 4 617 250 HUF
  - Renew our 2 million EUR debt by issuing new corporate bonds (EURIBOR+2%) to save 36 143 100 HUF on interest payment
  - The company would save on traction electricity instead of spending on diesel fuel: 1 673 899 991
- Expenditures:
  - Issuing 12 million EUR corporate bonds under similar yields and increasing interest payments by 85 541 400 HUF
- Total: 1 629 118 941 HUF, so the purchase of the vehicles from debt would increase profitability even more.

Assuming that the company is able to issue more bonds under the same conditions, the "purchase from debt" strategy would be more profitable. Full service financial lease can be favourable after the interest rates of the additional bonds exceeded the 13.7% level.



Source: author's calculations

4. Short-term funding

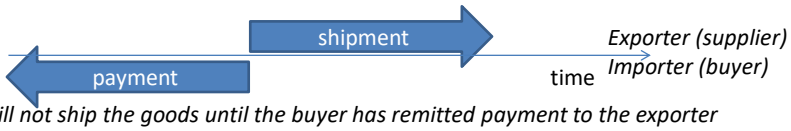
a) Financing international trade

Production → delivery → payment

- supplier credit
- bank financing (middleman)

Payment Methods

Prepayment



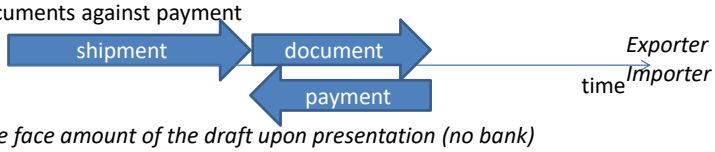
the exporter will not ship the goods until the buyer has remitted payment to the exporter

Letter of credit (L/Cs)

instrument issued by a bank on behalf of the importer (buyer) promising to pay the exporter (beneficiary) upon presentation of shipping documents

→ exporter receiving payment from the issuing bank as long as it presents documents

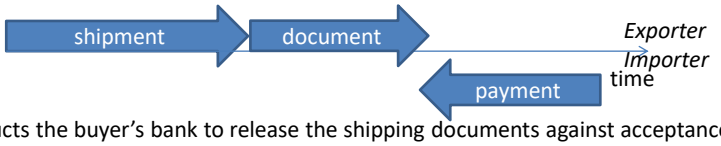
Sight draft; documents against payment



buyer to pay the face amount of the draft upon presentation (no bank)

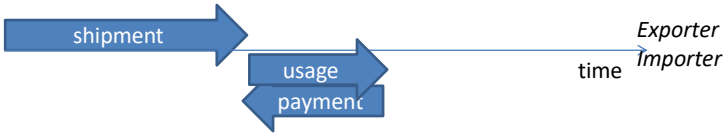
buyer's bank will not release the shipping documents to the buyer until the buyer has paid the draft

Time draft; documents against acceptance



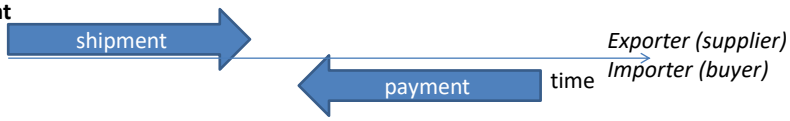
exporter instructs the buyer's bank to release the shipping documents against acceptance (signing) of the draft → buyer is promising to pay the exporter at the specified future date

Consignment



exporter ships the goods to the importer's warehouse but owns the merchandise. The importer has access to the inventory but does not have to pay for the goods until they have been sold to a third party

Open Account



exporter ships the merchandise and expects the buyer to remit payment according to the agreed-upon terms

exporter is relying fully upon the financial creditworthiness, integrity, and reputation of the buyer

Source: Madura (2008)

- ACCOUNTS RECEIVABLE MANAGEMENT
  - A. Trade Credit
    - extended in anticipation of profit by
      1. expanded sales volume
      2. retaining existing customers
  - B. Credit Terms Should Consider
    1. Sales force
    2. Adjusting bonuses for cost of credit sales.
- INVENTORY MANAGEMENT
  - A. Problems: seems to be more difficult due to
    1. Long, variable transits
    2. Lengthy customs procedures
  - B. Production Location/Inventory Control
    1. Overseas location may lead to higher inventory carrying costs due to
       a. larger amounts of work-in-process
       b. more finished goods
  - C. Advance Inventory Purchases
    1. Usually where there are no forward hedges available
    2. Another hedging method: advance inventory purchases of imported items, i.e. inventory stockpiling.
       d. Reason for Stockpiling: greater risk of delay
       e. Solution to higher carrying costs: Adjust affiliate's profit margins to reflect added costs.

b) Working capital

- Working Capital Management
  - Alternative Working Capital Policies
  - Cash Management
  - Inventory and A/R Management
  - Trade Credit
  - Bank Loans
- Working Capital Terminology
  - Working capital – current assets.
  - Net working capital – current assets minus non-interest bearing current liabilities.
  - Working capital policy – deciding the level of each type of current asset to hold, and how to finance current assets.
  - Working capital management – controlling cash, inventories, and A/R, plus short-term liability management.
- Working Capital Financing Policies
  - Moderate – Match the maturity of the assets with the maturity of the financing.
  - Aggressive – Use short-term financing to finance permanent assets.
  - Conservative – Use permanent capital for permanent assets and temporary assets
- Operating cycle: average age of inventory + average collection period
  - average age of inventory: sell finished good on account – purchase raw material on account
  - average collection period: collect accounts receivable - sell finished good on account
- Cash Conversion Cycle

  - The cash conversion cycle focuses on the length of **time between** when a company **makes payments** to its creditors and when a company **receives payments** from its customers.
  - CCC: cash inflow – cash outflow (time requirement)
  - CCC=inventory conversion period + receivables collection period – payables deferral period
  - CCC=(days per year/inventory turnover)+days sales outstanding – payables deferral period
- Determining permanent vs. Seasonal Funding Needs
  - permanent or minimal need
  - peak need: seasonal need
  - Sum: total need
- Accounts Receivable Management: The Five Cs of Credit
  - **Character:** The applicant's record of meeting past obligations.
  - **Capacity:** The applicant's ability to repay the requested credit.
  - **Capital:** The applicant's debt relative to equity.
  - **Collateral:** The amount of assets the applicant has available for use in securing the credit.
  - **Conditions:** Current general and industry-specific economic conditions.
- Minimizing Cash Holdings
  - Use a lockbox
  - Insist on **wire transfers** and debit/credit cards from customers
  - Synchronize **inflows and outflows**
  - Reduce need for **"safety stock" of cash**
    - Increase *forecast* accuracy
    - Hold *marketable securities*
    - Negotiate a *line of credit*
- Cash Budget
  - Forecasts **cash inflows, outflows, and ending** cash balances.
  - Used to **plan loans** needed or funds available to invest.
  - Can be daily, weekly, or monthly, **forecasts**.
    - Monthly for annual planning and daily for actual cash management.
- Inventory Costs
  - Types of inventory costs
    - **Carrying** costs – *storage and handling* costs, *insurance*, property *taxes, depreciation*, and *obsolescence*.
    - **Ordering** costs – cost of *placing orders*, *shipping*, and *handling* costs.
    - Costs of **running short** – loss of *sales or customer goodwill*, and the disruption of *production schedules*.
  - **Reducing inventory** levels generally **reduces carrying costs**, **increases ordering costs**, and may increase the **costs of running short**.
- Elements of Credit Policy
  - Credit Period – **How long to pay?** Shorter period reduces DSO and average A/R, but it may discourage sales.
  - **Cash Discounts** – Lowers price. Attracts new customers and reduces DSO.
  - Credit Standards – **Tighter standards** tend to **reduce sales, but reduce bad debt** expense. Fewer bad debts reduce DSO.
  - Collection Policy – How tough? Tougher policy will reduce DSO but may damage **customer relationships**.

- What is trade credit?
  - Trade credit is credit furnished by a **firm's suppliers**.
  - Trade credit is often **the largest source of short-term credit**, especially for small firms.
  - Spontaneous, easy to get, but cost can be high.

Literature

Gitman, L. Managerial Finance. Pearson, Chapter 14
Shapiro, A.: Multinational Financial Management. J.Wiley & Sons

c) Short-term financing strategy

A. **Strategy**

1. Identify: **key factors**
2. Formulate/evaluate: **objectives**
3. Describe: available **options**
4. Develop a methodology: to calculate/compare **costs**

B. **Key Factors**

1. **Deviation**s from **Int'l Fisher Effect**?

(exchange rate change=interest differential)

a. If yes
trade-off required between
int. cost and exchange risk

b. If no
interest costs are same everywhere

2. **Exchange** Risk
   a. Offset **foreign assets** with foreign **liabilities**
   b. Borrow where no exposure increases exchange risk
3. Firm's **Risk Aversion**
direct relation to price incurred to reduce exposure
4. Does **Interest Rate Parity** Hold?
$F/S=r_{domestic}/r_{foreign}$
   a. Yes. Currency is irrelevant.
   b. No. Cover costs may differ
   -added risk may mean the forward premium/discount does not offset interest rate differentials.

5. Political Risk: If high,

a. MNCs should
1.) maximize **local financing**.
2.) Faced with confiscation or currency controls, **fewer assets** at risk. (*Outsourcing, Lease, joint venture, franchise….)*

C. Short-Term Financing **Objectives**

1. Four Possible Objectives:
   a. **Minimize** expected **cost**.
   b. **Minimize risk** without regard to cost.

c. Trade off expected **cost and** systematic **risk**.
d. Trade off expect cost and total risk.

D. Short-Term **Financing Options**

1. Three Possibilities
   a. **Inter-company** loans
   b. **Local currency** loans
   c. **Euro** market
   (taking up a loan in a foreign currency on a foreign market)
2. **Local Currency** Financing: Bank Loans
   a. Short-term in nature role of cleanup clause
   b. Forms
      1.) Term loans
      2.) **Line of credit**
      3.) Overdrafts
      4.) Revolving Credit
      5.) Discounting
3. Calculating **Interest Costs**
   a. **Effective interest rate** (EIR): most efficient measure of cost
   b. Basic formula:
   EIR = **Annual Interest Paid / Funds Received**
4. Commercial Paper

a. Definition: short-term unsecured promissory note generally sold by large MNCs on a discount basis.
b. Standard maturities
c. Bank fees charged for:
   1.) Backup line of credit
   2.) **Credit rating** service

Literature

Shapiro, A.: Multinational Financial Management. J.Wiley & Sons

d) International cash management

A. Seven Key Areas:

1. **Organization – centralization**
   Advantages:
   a. Efficient liquidity levels
   b. Enhanced profitability
   c. Quicker headquarter action
   d. Decision making enhanced
   e. Better volume currency quotes
   f. Greater cash management expertise
   g. Less political risk
2. **Collection**/Fund Disbursement
   1. Key Element: Accelerate collections
   2. Acceleration Methods:
      a. Cable remittances
      b. Mobilization centers
      c. Lock boxes

d. Electronic fund transfers

3. Methods to Expedite Cash Payments
   a. Cable remittances
   b. Establish accounts in client's bank
   c. Negotiate with banks
      - obtain value dating

3. Interaffiliate Payments **Netting**
   1. Definition: offset payments of affiliate receivables/payables so that net amounts only are transferred.
   2. Create **Netting Center**
      a. a subsidiary set up in a location with minimal exchange controls
      b. Coordinate interaffiliate payment flows
      c. Center's value is a direct function of transfer volume.

4. **Excess-Funds** Investment
   1. Major task:
      a. determine *minimum cash balances*
      b. short-term *investment of excess* balances
   2. Requirements:
      a. Forecast of *cash needs*
      b. Knowledge of minimum cash position
   3. Investment Selection Criteria:
      a. Government regulations
      b. Market structure
      c. Foreign tax laws

5. Optimal Global **Cash Balances**
   1. Establish centrally managed **cash pool**
   2. Require affiliates to **hold minimum**
   3. Benefits of Optimal Cash Balances
      a. Less borrowing needed
      b. More excess fund investment
      c. Reduced internal expense
      d. Reduced **currency exposure**

6. Cash **Planning**/Budgeting

7. **Bank** Relations
   1. **Good Relations** Will Avoid
      a. Lost *interest income*
      b. *Overpriced services*
      c. Redundant services
   2. Common Bank Relation **Problems**
      a. *Too many* banks
      b. High costs such as compensating balances
      c. Inadequate *reporting*
      d. Excessive *clearing delays*

B. Goals of an International Cash Manager

1. Quick/efficient *cash control*

2. Optimal conservation/*usage*

1. Organization: Centralize

2. Collection/Disbursement of Funds

Literature

Shapiro, A.: Multinational Financial Management. J.Wiley & Sons

Madura: part 5

vii. Assignment 8: Short-term asset and liability management

Please evaluate both short term funding strategies:

1. Minimizing risk
2. Minimizing expenditures

Which one was the cheapest for you?

SAMPLE

Data and assumptions

Assuming, that: incomes will be scheduled to paid at the end of the year; as interest payments, tax payments are accounted at the end of the year as well as the rental fee of the Vienna-office. The company covers short term funding needs (represented by EBITDA) through monthly bank loans until the end of the year.

Estimations are based on Assignment 1, and *seminar_06_ST_funding.m* Matlab sript file.

Short term funding conditions in different currencies are:

CZK: PRIBOR+0.04=4.51%

EUR: EURIBOR+0.03=3.26%

HUF: BUBOR+0.05=7.11%

Revenues (corrected with interests) are considered as the collateral for these loans: 11.036 million EUR, which was distributed originally among the subsidiaries to cover their expenditures:

CZK	EUR	HUF	*Group (HUF)*
60 944 771	741 143	2 558 819 566	*3 487 050 000*

Without short term funding, the company would face the following position at the end of the year:

	CZK	EUR	HUF
running fee	-52 808 771	-345 815	-115 768 116
energy and maintenance	-26 927 479	-371 166	-139 371 480
labor costs	-5 736 000	-374 784	-142 368 000
total	**-85 472 250**	**-1 091 765**	**-397 507 596**

Monthly expenditures in local currencies to cover with short term loans until the company is paid at the end of the year (monthly EBITDA in different currencies)**:**

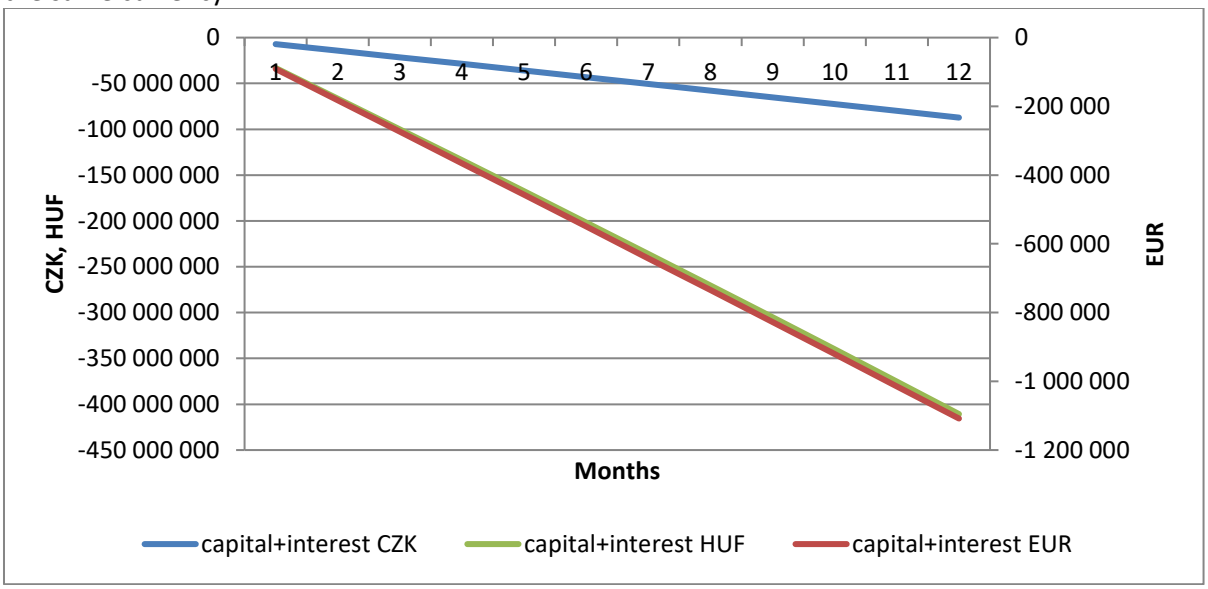
running fee	CZK	-4 400 731
	EUR	-28 818
	HUF	-9 647 343
energy and maintenance	CZK	-2 243 957
	EUR	-30 931
	HUF	-11 614 290
labour costs	CZK	-478 000
	EUR	-31 232
	HUF	-11 864 000
Total monthly expenditure	**CZK**	**-7 122 688**
	EUR	**-90 980**

	HUF	**-33 125 633**

Note: depreciation has no impact on cash flows.

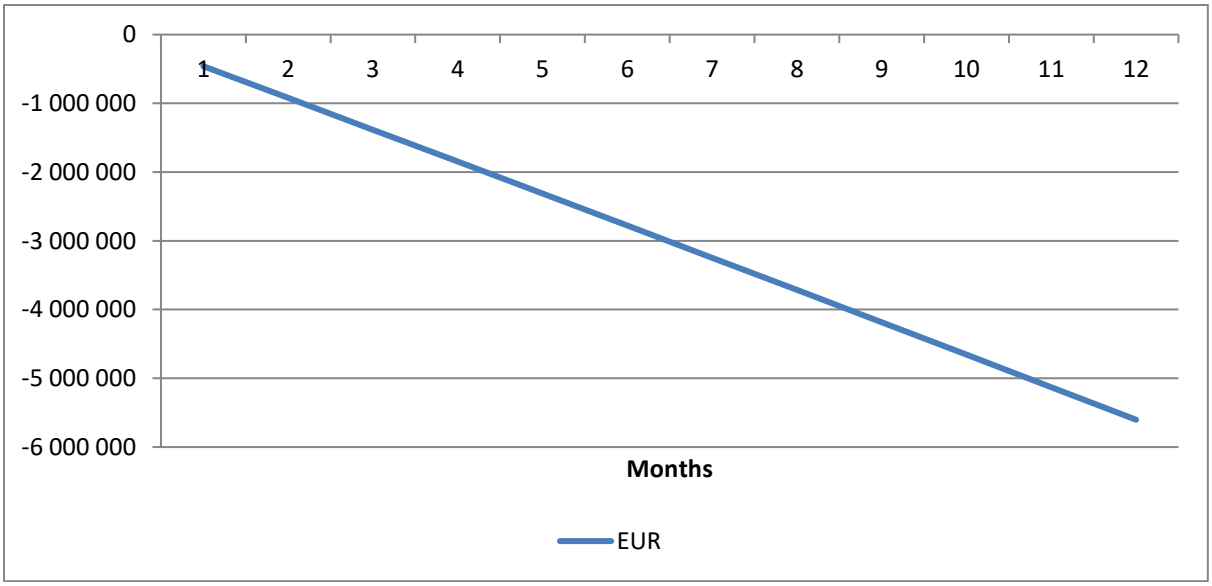
Comparison of different funding strategies

Minimum risk strategy considers no currency mismatch – each monthly expenditure is financed from the same currency.



Source: author's calculations

Minimum cost strategy uses euro to finance the entire short term debt, because it has the lowest interest rate and it has the same denomination as the revenues.



Source: author's calculations

Assuming that **monthly expenditures** can be aggregated **as annuities**, the following debt is generated until the end of the year (under constant exchange rates).

	Min risk (no currency mismatch)	Min cost (funding in EUR)
CZK	87 261 355	0
EUR	1 108 242	5 602 629
HUF	410 720 655	0
group (HUF)	**1 754 596 236**	**1 764 828 278**

The company has the **following position at the end of the year** as a corrected EBITDA after the short term funded position (monthly expenditure annuities) are deducted from the incoming incomes:

	CZK	EUR	HUF	group (HUF)
Min risk (no currency mismatch)	-26 316 584	-367 099	2 148 098 911	1 732 453 764
			EBITDA	*1 715 797 140*
			gap:	**16 656 624**
Min cost (funding in EUR)	60 944 771	-4 861 486	2 558 819 566	1 722 221 723
			EBITDA	*1 715 797 140*
			gap:	**6 424 583**

As we can see, short term funding was always more expensive than the original EBITDA. However, the "mind risk" strategy proved to be 10 million HUF more expensive than the "min cost" approach with currency mismatch. However, the exchange rates can change.

Matlab code:

```
%% 2. Short term funding
%1. Monthly net expenditures (EBITDA-incomes)
for j=1:3
    C(1,j)=sum(PLS([2:4 6],j))/12; %CZK,EUR,HUF
end
%2. Avaliable income at the end of the year (EUR)
net_income=PLS(1,4);
%3. Annuity ^:altgr+3
  %PRIBOR+0.04 EURIBOR+0.03 BUBOR+0.05
r=[0.0051+0.04 r_eur+0.03 r_huf+0.05];
for j=1:3
FV(1,j)=((((1+(r(1,j)/12))^12)-1)/(r(1,j)/12))*C(1,j);
end

%4.a. Strategy 1: Minimize risk! (HUF)
    %no currency missmatch
    ST=FV(1,:)-C*12;
Spending_on_ST_funding(1,1)=ST(1,1)*CZKHUF...
    +ST(1,2)*EURHUF+ST(1,3);
ST_EBITDA(1,1)=...
    (sum(PLS([2:4 6],4))-Spending_on_ST_funding(1,1))...
    /(net_income);
%4.b. Minimize expenditure!
    %all lending in EUR
    r=[];
r=[r_eur+0.03];
C_EUR=C(1,1)*(CZKHUF/EURHUF)+C(1,2)+C(1,3)/EURHUF;
FV(2,:)=[0 (((((1+r/12))^12)-1)/(r/12))*C_EUR 0];
ST=[];
ST=FV(2,2)-C_EUR*12;
Spending_on_ST_funding(2,1)=ST*(EURHUF);
ST_EBITDA(1,2)=...
    (sum(PLS([2:4 6],4))-Spending_on_ST_funding(2,1))...
    /(net_income);
Spending_on_ST_funding(1,1)-Spending_on_ST_funding(2,1)

bar(ST_EBITDA)
```

V. Tax optimization

1. Offshoring and backshoring

- Offshoring:
  - the location of firms' activities in foreign countries irrespective of the governance mode
  - early 1990s
  - by Western manufacturing companies in order to maintain or to foster their *competitive* advantage
- last decade a counter trend
  - Companies that had offshored their production have started bringing production back to their home countries
- reshoring
  - "the relocation of value creation tasks from offshore to geographically closer locations […] irrespective of the ownership mode"
  - Backshoring: relocation back to the home country of the firm
  - Nearshoring: relocation to a location closer to (but not within) the home country
- full outsourcing:
  - the vendor provides services to the client as specified in a commercial contract
  - work is actually performed is at the vendor's discretion (service-level requirements)
- captive center (critical mass of work)
  - company builds an entire service operation from scratch
  - wholly owned
- "collaborative" model
  - Between full outsourcing and a pure captive - hires an outside service provider in the chosen offshore market to help set up an offshore service center on the company's behalf
  - "build-operate-transfer" (BOT) model:
    - vendor initially builds and operates the center and eventually hands over ownership to the parent company
  - "assisted captive" model:
    - vendor assists the parent company to build the center but the actual work is performed by the parent company
  - "joint venture" model:
    - the service center is set up as a joint venture between the parent company and the vendor
- Backshoring motivations
  - managerial errors such as insufficient planning and knowledge of the offshore location (Resource Based View):
    - firm's inability to develop distinctive resources abroad, and/or to properly exploit the host country's resources
  - contingencies and changes in the offshore or home country environment,
    - rising total costs of ownership in China, or
    - the lower costs of energy in the West
    - Internalization Theory: backshoring can be explained by changes in the fundamental characteristics of the world economy
    - Dunning's eclectic paradigm: interprets backshoring as a response to a deterioration of one or more of the offshore location advantages
    - productivity improvement due to production rationalization

  - inability of firms to solve complex challenges created by offshore production (Transaction Cost Economics)
    - higher control and coordination costs of globally extended supply chains
    - repatriating production activities to better connect R & D, engineering and manufacturing units
  - consumers' pressures on companies ("made in" effect): higher value consumer goods
- two variables:
  - the company's strategic goal
  - increasing customer perceived value vs. improving cost-efficiency
  - Value: perceived quality - product innovation - customer services
  - Efficiency: lower unit of labour costs or higher labour productivity, benefits from automation, shorter logistics lead times, lower inventories, psychic distance, lower monitoring costs
- the predominant factors
  - internal to the company vs. relating to the external environment

Literature

Mauro C. D. et al. (2018): Offshoring and backshoring: A multiple case study analysis. Journal of Purchasing and Supply Management, 24 (2) p. 108-134

Reading

https://www.ssonetwork.com/business-process-outsourcing/articles/offshoring-support-services-outsourced-or-captive

2. Tax havens

a) Basics

- Definition
  - identifies an area as a tax haven is the existence of a composite tax structure established deliberately to take advantage of, and exploit, a worldwide demand for opportunities to engage in tax avoidance
- ***Four key factors:***
  - No or nominal tax on the relevant income;
    - Level of taxes
    - Treaty network
    - Tax incentives
    - Stability of tax laws
  - Lack of effective exchange of information, transparency;
  - Non-tax factors :
    - Political and economic stability
    - Availability of professional services
    - Access to capital markets and other sources of finance
    - Exchange control and currency restrictions
    - Initial formation and recurring costs
  - *No substantial activities*
- OECD: Important aspects
  - The 'no or nominal tax' criterion is not sufficient, by itself, to result in characterization as a tax haven

- The 'no substantial activities' criterion was included in the 1998 Report as a criterion for identifying tax havens because the lack of such activities suggests that a jurisdiction may be attempting to attract investment and transactions that are purely tax driven.
- In 2001, the OECD's Committee on Fiscal Affairs agreed that this criterion would not be used to determine whether a tax haven was co-operative or un-cooperative

- Usage of tax havens
  - The 'no or nominal tax' criterion is not sufficient, by itself, to result in characterization as a tax haven
  - The 'no substantial activities' criterion was included in the 1998 Report as a criterion for identifying tax havens because the lack of such activities suggests that a jurisdiction may be attempting to attract investment and transactions that are purely tax driven.
  - In 2001, the OECD's Committee on Fiscal Affairs agreed that this criterion would not be used to determine whether a tax haven was co-operative or un-cooperative
- Legal entities
  - Offshore International Business Corporation
  - Offshore Limited Liability Company
  - Offshore Trusts & Foundations
    - Offers asset protection as legal ownership no longer vests with settler
    - But settler continues to enjoy control / benefits -Foundations are legal entities unlike Trusts
    - All types of assets (tangible & intangible) can be held including shares in a corporation which in turn may undertake commercial activities
- Types
  - Base Havens:
    - Traditional offshore centers with nil of very low tax on corporate or business income
    - Few or no treaties
    - Charges fees in lieu of taxes
    - No Exchange Control
    - High Level of Banking and Commercial Secrecy
    - Less Chances of Exchange of Information
    - Scant regulatory norms
    - Primary Use – to collect and accumulate income in tax free / low tax environment; safe haven for undeclared funds
  - Treaty Havens:
    - Traditional offshore centers with reasonable domestic tax rates
    - Special tax regimes that allow the use of their treaty network for offshore activities
    - NIL withholding taxes on inbound and outbound income
    - Primary Use: Flow through income with low or NIL taxes

Particular	**Example of Countries**
No corporate tax	Bermuda, Cayman Island
low-taxed countries	Hong Kong, Ireland, Jersey
Jurisdictions with no (or very few) tax treaties that offer nil (or very low) or negotiated tax regimes for offshore entities	British Virgin Islands, Cook Islands, US Virgin Islands
No or nil tax regimes for offshore companies with	Cyprus, Malaysia, Mauritius

the benefit of tax treaties	
Fiscally beneficial regimes for intermediary holding finance or licensing companies with full benefits of treaty network	Austria, Belgium, Denmark, France, Germany
Special tax concessions for entities engaged solely in management services and coordination activities for	Belgium, Denmark, France, Germany, Malaysia
Jurisdictions with fiscal incentive for new residents	Ireland, Israel
Retirement havens for high net worth individuals	Cyprus, Sri Lanka
Offshore jurisdictions for estate planning or asset protection trusts	Bahamas, Cayman Island
Special incentives for shipping operations	Singapore, Cyprus
Encourage captive insurance activities	Ireland, Mauritius

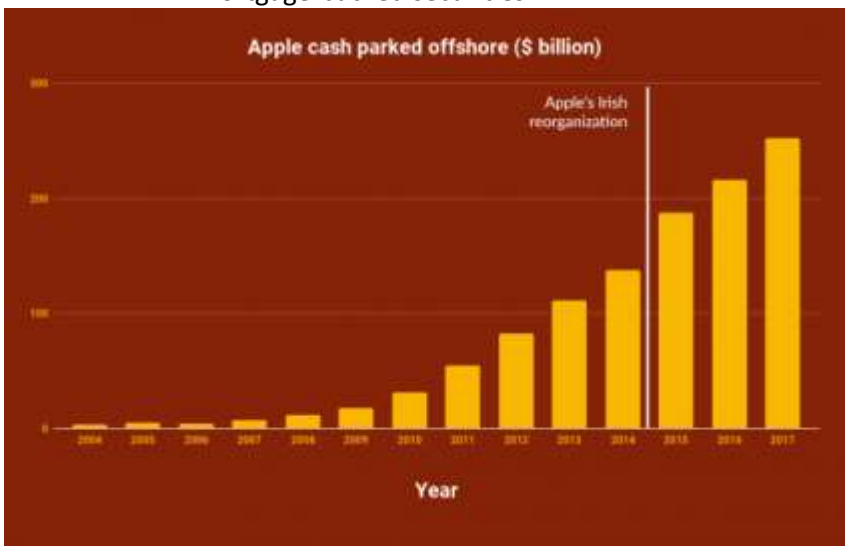
- Effects
  - Integrated financial markets pose new global challenges
  - Opportunities for illicit activities:
    - Money laundering
    - Misuse of corporate vehicles
    - Terrorist financing
    - Tax abuse
    - Threats to stability of financial system
    - All activities which thrive in climate of secrecy, non- transparency and non-cooperation
  - Treaty shopping: Routing of income arising in one country to a person in another country through an intermediary country to obtain the tax advantage of tax treaties
  - Round Tripping: Flow back of money into the country sent out through hawala
  - Escaping the regulatory regime of home country
  - Revenue implications of the illegitimate use of tax havens can be serious; it is estimated that developing countries loose as much as US $50 billion per year in tax revenue
  - But Tax Havens have following positive aspects:
    - Offers legitimate tax planning opportunities
    - Provides a neutral regulatory environment for residents of other countries to do business e.g. collective investment funds; captive insurance
    - Can be used for non-commercial reasons
    - Offers tax competition which is a healthy disciplining force. It is the only competition governments of different jurisdictions have
- Broader impacts
  - It undermines the fairness and the integrity of the tax system
  - It either:
    - Restricts the ability of government to reduce tax rates for all
    - Requires government to increase tax rates on labor or consumption with negative impact on labor markets
    - Or forces expenditure cuts

        - Or raises deficit
    - As a matter of public policy, condoning tax abuse is bad politics
- Global response (fiscal policy)
    - Launching the FATF (Financial Action Task Force)
    - Creating the FSF (Financial Stability Forum)
    - Creating the OECD Forum on Harmful Tax Practices
    - Parallel tracks but common goals:
        - To improve transparency
        - To raise governance standards in financial centers
        - To encourage cooperation to counter abuse
    - Limitation of Benefits clause in DTAAs (Double taxation)
    - Treaty override
    - Anti – avoidance measures

b) Strategies

- Territorial scheme
    - nation will **tax** income generated within its borders, regardless of whether the corporation is domestic or foreign
    - **parent** company (in Country A) with a subsidiary (in Country B)
    - pay **tax** according to Country A's provisions for the parent company's income, and according to Country B's tax law for the subsidiary's income
- Foreign trade - offsite pricing
    - imported into the U.S.:
        - invoiced through a company established in one of the tax havens
    - Products exported from the U.S.
        - „sold" first to a tax haven company to drop most of the profit in the no tax jurisdiction
    - importing cheese from Holland
        - set up a company in the Bahamas to buy the cheese
            - buys $100,000 worth of cheese from Holland
            - sells the cheese to you in America for $150,000
        - sell for $200,000 to US supermarkets
            - gross profit is only $50,000 not $100,000 in the US
            - other $50,000 in profit was earned by the Bahamas company where there is no income tax
    - U.S. company sells T-shirts to France for gross of $300,000 ($3 per shirt)
        - company in Hong Kong at a price of $1.50 per shirt
            - no tax on this income
        - sells the shirts to France for the full $3
        - → U.S. company now has gross income of only $150,000
- Receive royalty income from patents or copyrights
    - book authors, software developers, and inventors
    - rights to offshore companies and
    - have the funds collected in a tax haven jurisdiction
- **Apple**
    - Ireland:
        - company can collect profits through one subsidiary with *Irish tax residence*
        - and shift the profits to a **second** Irish subsidiary with *tax residency in a low-tax haven*

        - intangible asset tax reliefs
        - *$1.5 billion in tax there – 7 percent of all corporate income taxes paid in that country*
    - Apple Sales International and Apple Operations International in Jersey (English Channel island):
        - no tax on corporate profits for most companies
            - crown dependency of the United Kingdom, but it makes its own laws, sets its own tax rates and is not subject to most European Union legislation
        - „Confirm that an Irish company can conduct management activities . . . without being subject to taxation in your jurisdiction."
        - "Are there any developments suggesting that the law may change in an unfavourable way in the foreseeable future?"
        - Apple Sales International holds 60% of its **non-U.S.** earnings
            - two-thirds of its worldwide profits were made in other countries
        - Apple Operations International: cash manager
            - portfolio that includes corporate bonds, government debt and mortgage-backed securities



Source: SEC

        - Taxation in Ireland based on management and control; in USA: place of formation
        - Apple Operations International (Ireland, no tax residence – not controlled or managed in Ireland, but is not in the US)
        - Apple Operations Europe (Ireland, no tax residence
    - Reading:
        - https://www.icij.org/investigations/paradise-papers/apples-secret-offshore-island-hop-revealed-by-paradise-papers-leak-icij
        - https://itep.org/shopping-for-a-tax-haven-how-nike-and-apple-accelerated-their-tax-avoidance-strategies-according-to-the-paradise-papers

- **Google**
    - international operations is headquartered in Dublin
        - international company purchases advertisements

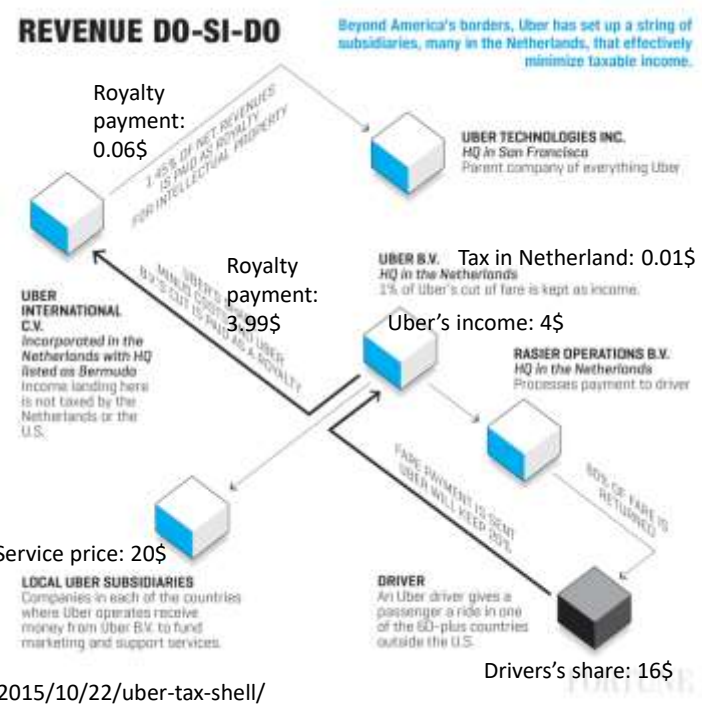
- office accommodates over 2,000 employees, and claims 88% of Google's $12.5 billion in foreign sales
  - earnings do not remain in the Ireland office, the company is exempt from paying 12.5% corp. income tax
  - payment is first directed to the Netherlands (EU member states), "post box office,"
  - passes approximately 99.8% of the original payment from the customer to Bermuda
- most profits are directed to a tax haven in Bermuda (no corporate income tax)
- Effective tax rate of 2.4% on foreign earnings

- **Nike**
  - Pre-2014 Nike International Ltd.: trademarks were owned by a Bermudan subsidiary
    - charge royalty fees for use of the logo in Europe
    - island of Bermuda: profits were taxed at a rate of 0 percent
    - no employees or offices in Bermuda
  - Post-2014 Nike Innovate CV (new Dutch subsidiary)
- **Walmart**
  - established at least 78 subsidiaries and branches in 15 overseas tax havens
    - never listed any of them on Exhibit 21 ("Subsidiaries") of the company's annual 10-K filing with the SEC
  - Walmart's foreign operating companies are owned through subsidiaries in tax havens
    - Walmart has transferred ownership assets to its Luxembourg subsidiaries (companies in Brazil, Japan, Puerto Rico and South Africa), total of $64.2 billion
      - paying less than 1 percent in tax to Luxembourg on $1.3 billion in profits
  - Walmart took $2.4 billion in low-interest, short-term loans from subsidiaries in tax havens
    - making phantom interest payments to Wal-Mart International Holdings, Inc. in the United States
    - some of its foreign operating companies to take out long-term loans from Walmart subsidiaries in tax havens

- Reading:
  - https://americansfortaxfairness.org/files/TheWalmartWeb-June-2015-FINAL.pdf

- **Uber**

Uber



Not taxed by US nor Dutch government
No corporate tax in Bermuda

http://fortune.com/2015/10/22/uber-tax-shell/

Source: Fortune.com

Literature

Przychocka I. (2013): Methods of making use of tax havens. Finanse, 6 (1) p. 125-145

Julia Galica (2015): Corporate Tax Havens: Analysis of an Aggressive Tax Approach as a Strategic Necessity for Large Multinational Corporations. Honors Scholar Theses. 436

Reading

https://www.rjmintz.com/offshore-havens/common-tax-strategies

viii. Assignment 3: Tax optimization

After the reorganization, the company will have the potential of generating _____ million HUF pre-tax profit as well as _____ million HUF profit after taxation and dividends.

The question is: how can we increase the efficiency of this money generating process through optimized taxation?

Let's compare the original and an offshore strategy (it's up to you, see lecture slides), supposing constant cash-flows, exchange rates and the following interest rates: 3% for EUR and 4% for HUF. The two alternatives can be compared via future value annuities. Please compare your results!

Databases:

tax rates: https://home.kpmg.com/xx/en/home/services/tax/tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html

countries: https://www.offshorecompany.com/company/

SAMPLE

After the reorganization, the company will have the potential of generating 1044.48 million HUF profit after taxation and dividends[15] , being reinvested into the enterprise. The question is: how can we increase this amount of money through the optimized taxation of the 1611.85 million HUF pre-tax profit?

Let's compare the original and an offshore strategy, supposing constant cash-flows, exchange rates and the following interest rates: 3% for EUR and 4% for HUF. The two alternatives were compared via future value annuities.

Further analysis based on the KPMG's Corporate tax rates table: Bahamas has no corporate income taxation and the maximum authorized share capital is $5,000 USD, for the minimum Government fees.

Accumulation in the original strategy:

- The company has 1044 million HUF as profit after taxation, which can be theoretically invested into a bank deposit for 10 year with 4% interest rate, where 12 540,19 million HUF would be accumulated:
- *=JBÉ(0,04;10; 1044)* in HU, *=FV(0,04;10; 1044)* in EN in Excel.

Our offshore-strategy is:

- Flatland International Ltd. registered on Bahamas as the owner of the "Flatland" trademark in the Czech Republic and Austria. It charges royalty fees for use of the logo in Czech Republic and Austria, for 1.5 million EUR/year (or 41.45 million CZK/year) fee in each countries.
- Planning with a 3 million EUR accumulation and 3% interest rate for 10 years, this subsidiary can accumulate 34.39 million EUR in this subsidiary as a reserve for further business expansion: =JBÉ(0,03;10;3) in HU, =FV(0,03;10;3) in EN
- The remaining 432 million HUF profit will be reinvested in a bank deposit with an estimated 4% interest rate, where the result would be 5188.13 million HUF: =JBÉ(0,04;10;432) in HU, =FV(0,04;10;432) in EN.
- Total accumulation: 16021.5 million HUF.

[15] Considerations: 1 Transmontana locomotive is used and minimal cost short term funding is applied.

VI. Basics of Script Writing in Matlab

Each workgroup will elaborate a detailed strategy and an analysis in the different topics during solving the case study. Matlab is used to simulate the impacts of the different suggestions and the stress the company's profitability under different external conditions. The analysis focuses mainly on the **Profit and Loss Statement (PLS)** as it will be the script's output as well.

Each rows of the PLS can be defined as a row vector (like: revenues row, expenditures on wages row etc.), while the entire PLS functions as a matrix (to represent revenues and expenditures in different currencies).

$$PLS = \begin{bmatrix} revenues & in\ CZK & in\ EUR & in\ HUF \\ expenditure & in\ CZK & in\ EUR & in\ HUF \\ EBIT & in\ CZK & in\ EUR & in\ HUF \end{bmatrix}$$

Rows and columns can be referred as the first and second coordinates of a matrix:

```
PLS(row,coloumn)
```

row can be defined as a number (row=1), as an interval (row=2:4), as an earlier defined variable (j=1:4; row=j) or as the entire set (row=:).

Functions in Matlab are defined as the left side of the equation contains all the outputs, while the right side contains the name of the function and the inputs:

```
[output1,output2]=function(input1,input2,input3);
```

There can be changes in the value of variables (like the exchange rate changes from 315 to 330) what can be captured in a **for-cycle**:

```
for i=1:15
        HUF_revenue(i,1)=EUR_revenue*(300+i-1);
end
```

Decision trees (if-elseif-else) can be constructed to adapt the behaviour of the script to an external factor:

```
for i=1:15
        if EUR_exchange_rate(i,1)<300
                HUF_revenue(i,1)=EUR_revenue*EUR_exchange_rate(i,1);
        elseif EUR_exchange_rate(i,1)<315 & EUR_exchange_rate(i,1)>300
                HUF_revenue(i,1)=EUR_revenue*option_target_rate;
        else
                HUF_revenue(i,1) =EUR_revenue*EUR_exchange_rate(i,1);
        end
end
```

Comments can be written in the script after a "%" mark.

Lines shall be ended with a ";" mark.

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VIII. Appendix I.: Hungarian Keyboard and Special Characters

:	colon	→ shift + .
;	semicolon	→ alt gr + ,
,	comma	→ ,
-	hyphen	→-
(	bracket	→ shift + 8/9
[	square bracket	→ alt gr + f/g
^	upper cap	→ alt gr + 3