BANKING

Lecture 9 – Central Banking

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Key terms from Lecture 8/Liquidity risk

- Liquidity risk is the probability of a situation when a bank cannot meet its proper obligations as they become due or the bank will not be able to fund its assets
- Transformation margin through the ALM department
- Bank's confidence function, importance of deposit insurance, liquidity gap analysis
- Basel III: the Liquidity Coverage Ratio (LCR) – short term, the Net Stable Funding Ratio (NSFR) - medium/long term resilience
- Liquidity injection as 1 out of 4 types of bank´s rescues
- Investment banks reported a low share of stable deposits and faced huge liquidity risk after the fall of Lehman Brothers in 2008
- Deposit products: current account, savings account, term account
- The core of current accounts (80%) can be invested in long-term investments (contractual vs real maturity)
- Savings accounts = non-maturing accounts bearing a relatively high rate of return and two embedded options (case study´s methodology: replication portfolio)

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1. What is the difference between theoretical and empirical definition of money?

1. Basic terms

Theoretical vs empirical definition

Theoretical definition of money

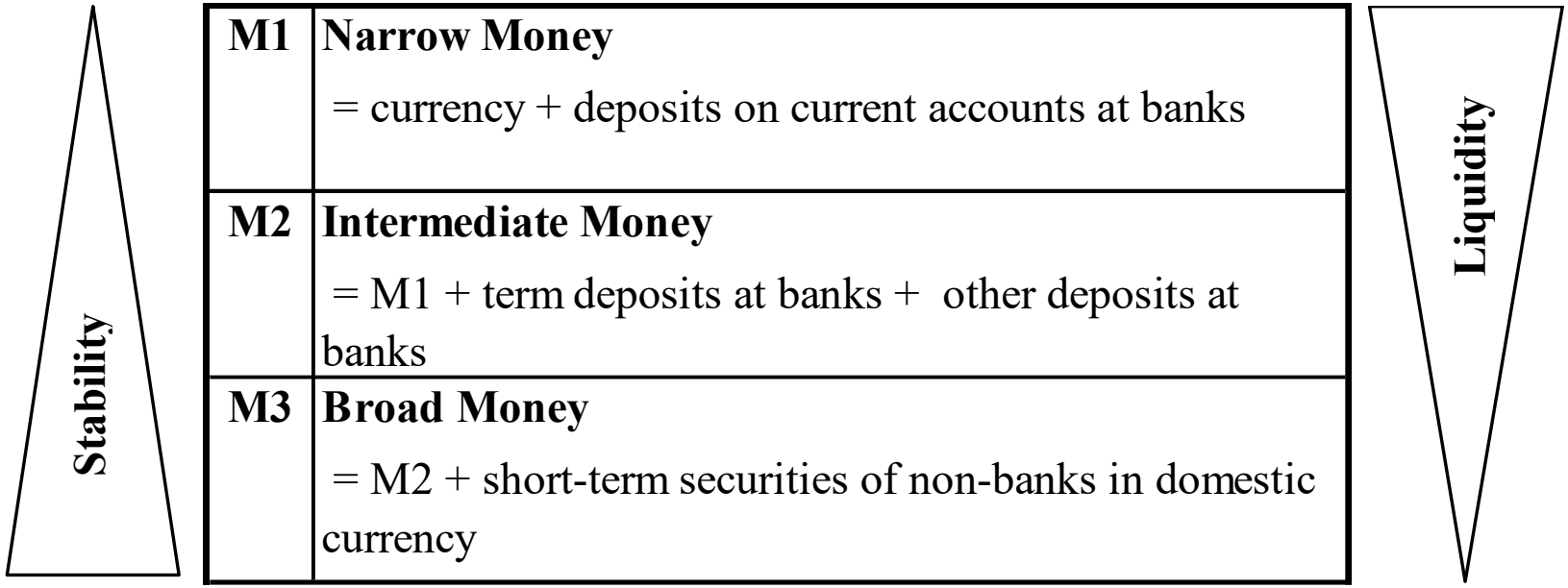
- Money = an asset generally accepted for business transactions and used as a legal tender or for repaying debts.
- Related to the three key functions of money (a medium of exchange, a unit of account, and a store of value)
- Wealth = the total collection of pieces of property that serve to store value.
- Income is a flow of earnings per unit of time (but money = stock)

Empirical definition of money

- Related to the need to predict economic variables, which are influenced by the amount of money (e.g. inflation).
- Monetary aggregates as well as money from the macroeconomic point of view

1. Basic terms

Monetary aggregates (empirical definition of money)



M1	**Narrow Money** = currency + deposits on current accounts at banks
M2	**Intermediate Money** = M1 + term deposits at banks + other deposits at banks
M3	**Broad Money** = M2 + short-term securities of non-banks in domestic currency

- The higher number of the aggreagate implies its higher stability but lower liquidity
- M0 is sometimes used for currency in circulation
- Low M0/M2 ratio around the globe (10-12%)

2. How is trust related to money?

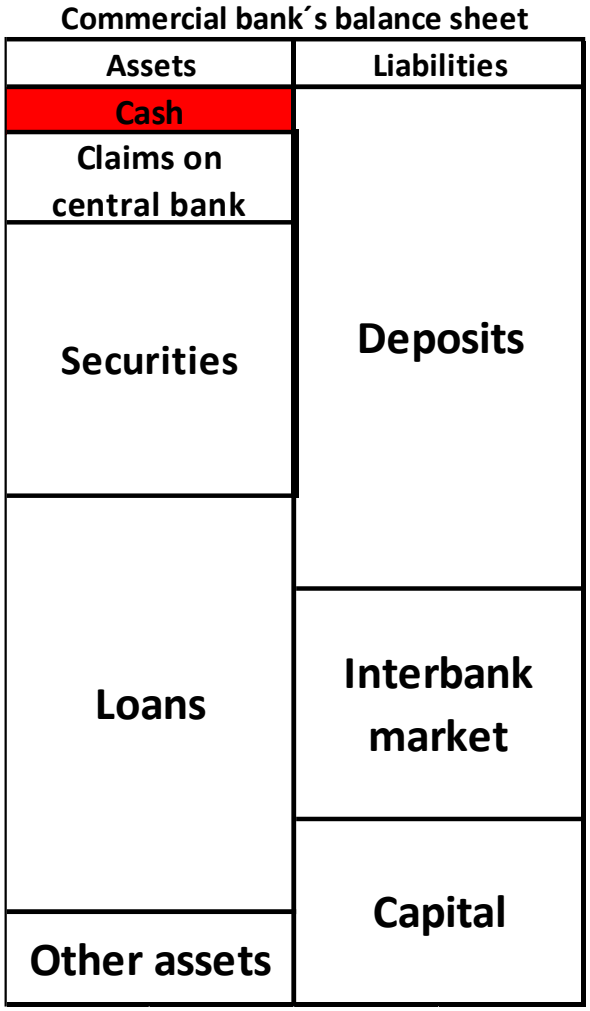
Money with(out) a trusted counterparty

1) **Money with a trusted counterparty** (state/government)
   a) Real money (coins and banknotes)
   b) Digital money (money as accounting items at banks)
2) **Money without a trusted counterparty**
   - Virtual (crypto) currencies (BTC, Etherum etc.)

- a type of unregulated, digital money, which is issued and usually controlled by its developers, and used and accepted among the members of a specific virtual community.

1. Basic terms

No 'real'money in banks: a low share of cash on commercial bank´s balance sheet (<1%)



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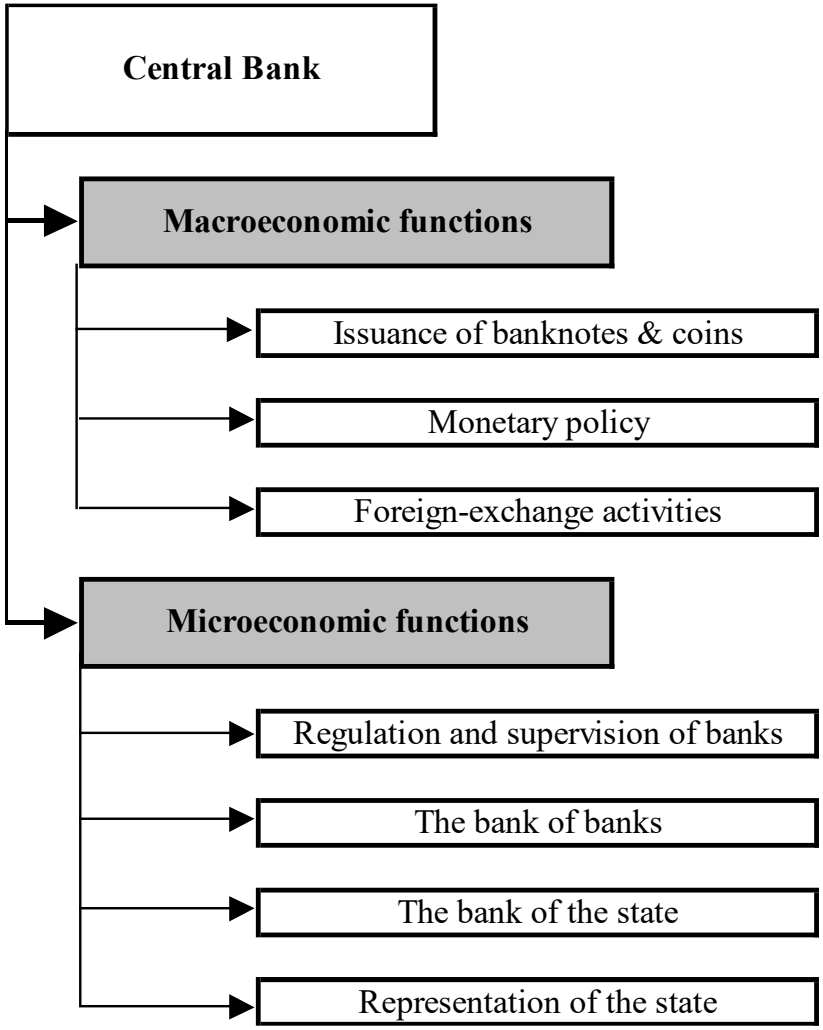
Central banks

- Central banks play an important role on financial markets, especially due to their close relationship with commercial banks, government institutions and other central banks.
- **Central bankers affect interest rates**, the amount of credit, and the money supply, all of which influence financial markets and macroeconomic variables such as aggregate output or inflation.
- At present, central banks are usually responsible for **monetary control**, and are involved **in regulation and supervision of financial markets**

2. Central banks

Key functions of a central bank

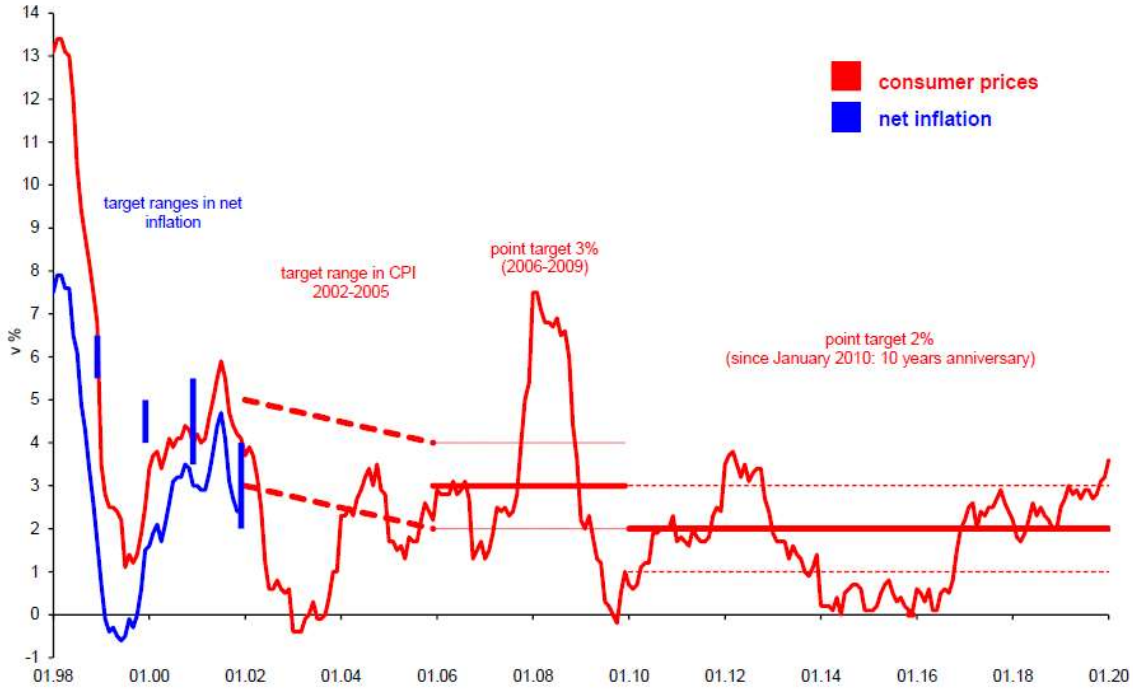


Source: Mejstrik, M. et al. (2014). Banking in Theory and Practice, Prague: Karolinum Press

3. What type of monetary regime is recently used in the Eurozone and the Czech Republic?

2. Central banks

Case study: the CNB's 2% inflation targeting



- Targets originally set for "net inflation", since 2002 for headline inflation.
- From January 2006 the target set at 3% with a tolerance band of ±1%, since January 2010 the point target of 2% established.
- **Inflation targeting prevails around the world** (the Eurozone, the UK)

Source: Mora, M. (2019). The Czech Republic: 20 Years of Inflation Targeting and the Way Forward, Central Bank of Malta, 12 November 2019

Instruments of a central bank

A. Conventional instruments

1) open market operations (OMO)
2) mandatory minimum reserves (MMR)
3) interest rates (IR)
4) other tools.

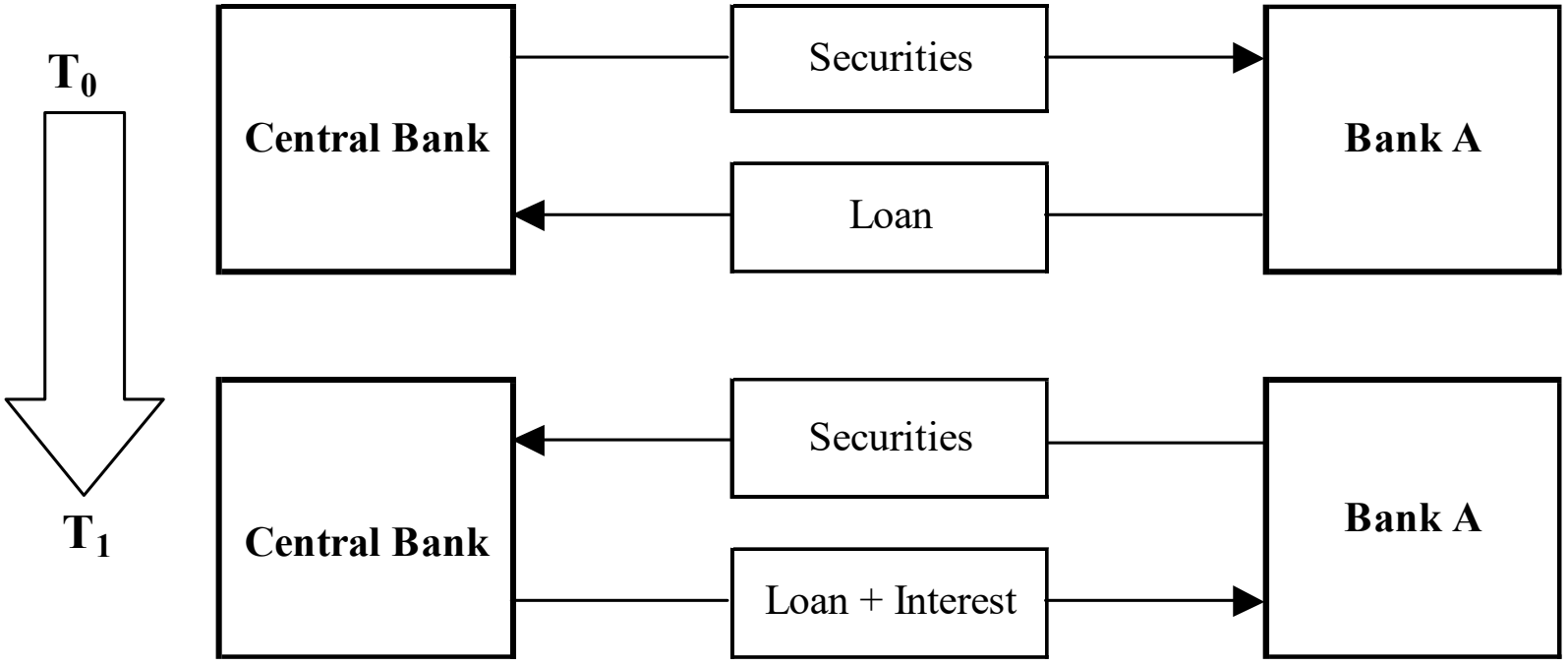
B. Nonconventional instruments

1) open liquidity facilities,
2) credit facilities,
3) quantitative easing (QE),
4) forward guidance,
5) foreign exchange (FX) interventions.

2. Central banks

1a) OMO/Classic Repo

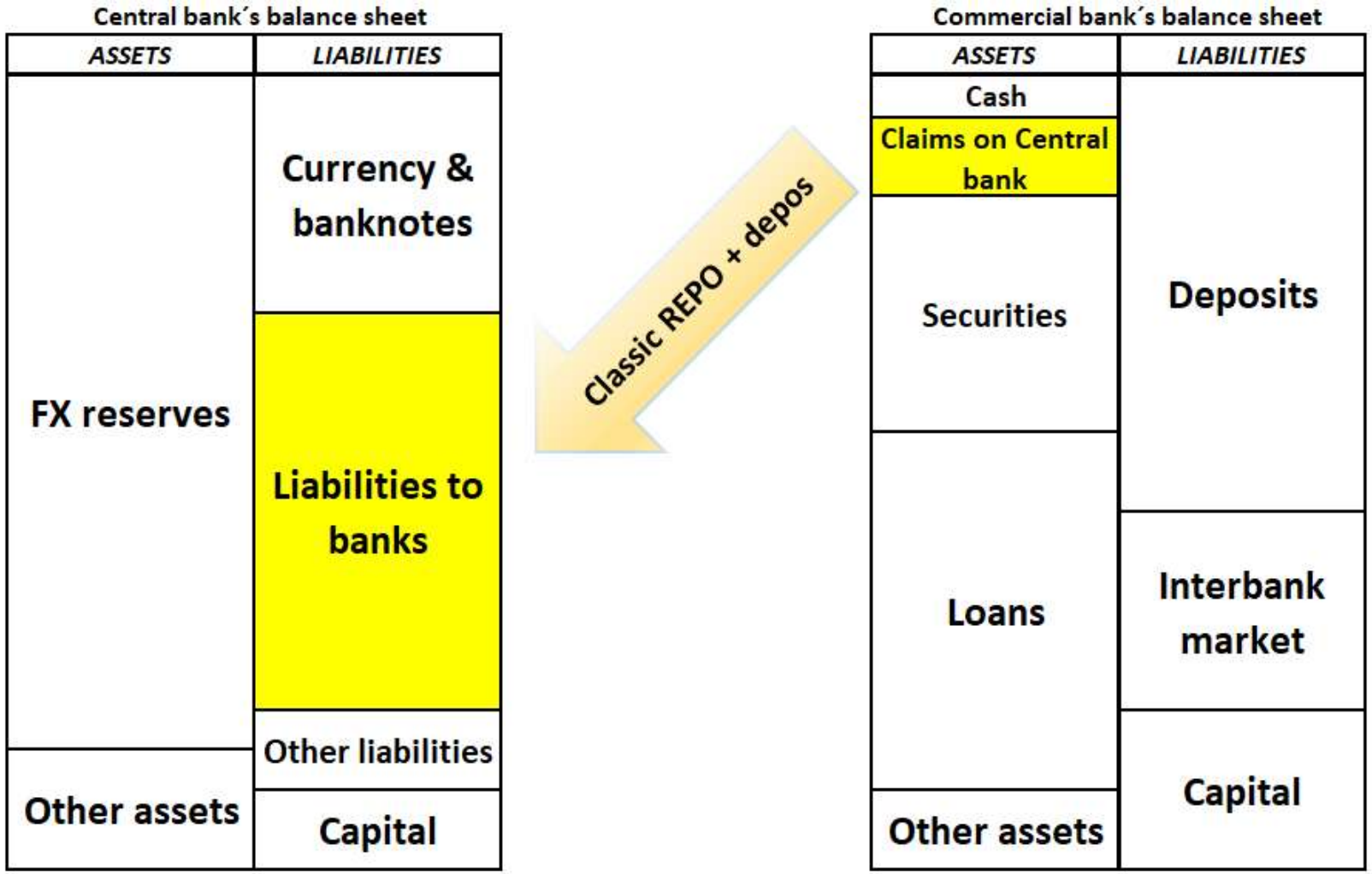
- a classic repo operation (a sale of securities followed by their future purchase)



Source: Mejstrik, M. et al. (2014). Banking in Therory and Practice, Prague: Karolinum Press

2. Central banks

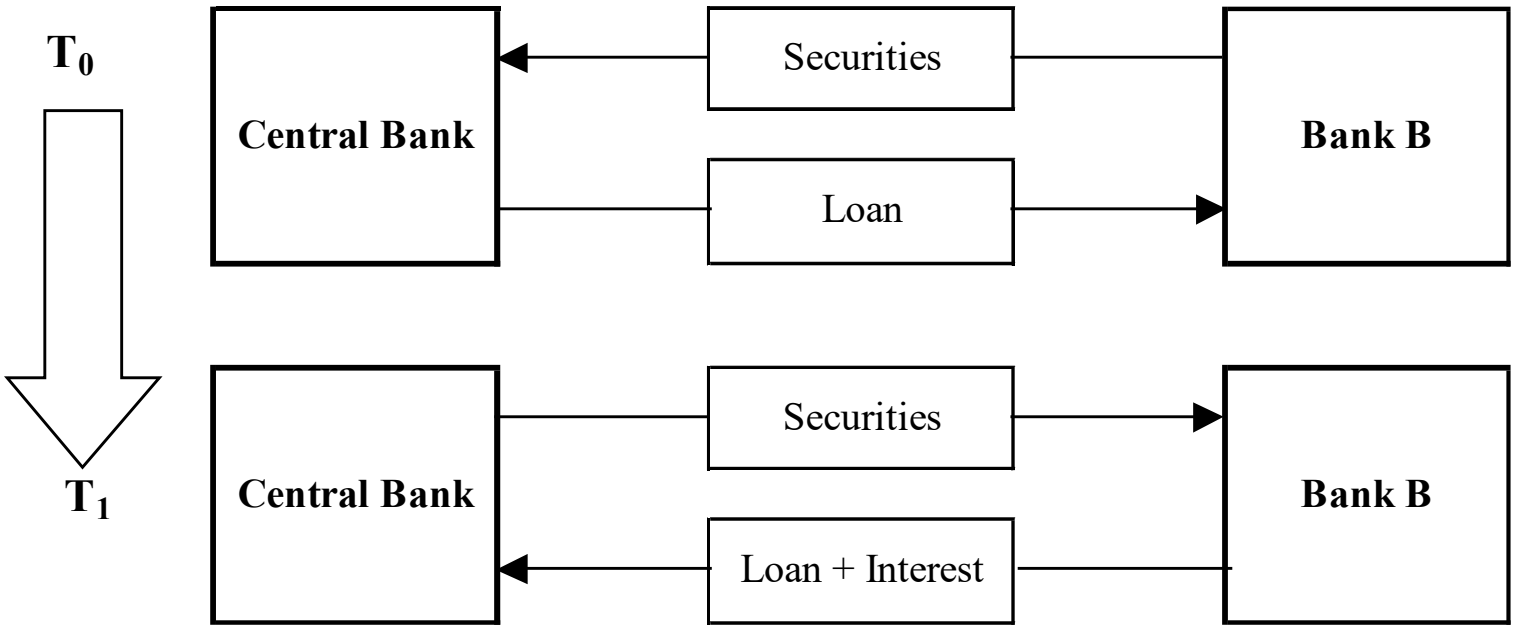
Classic repo on balance sheets



2. Central banks

1b) OMO/Reverse Repo

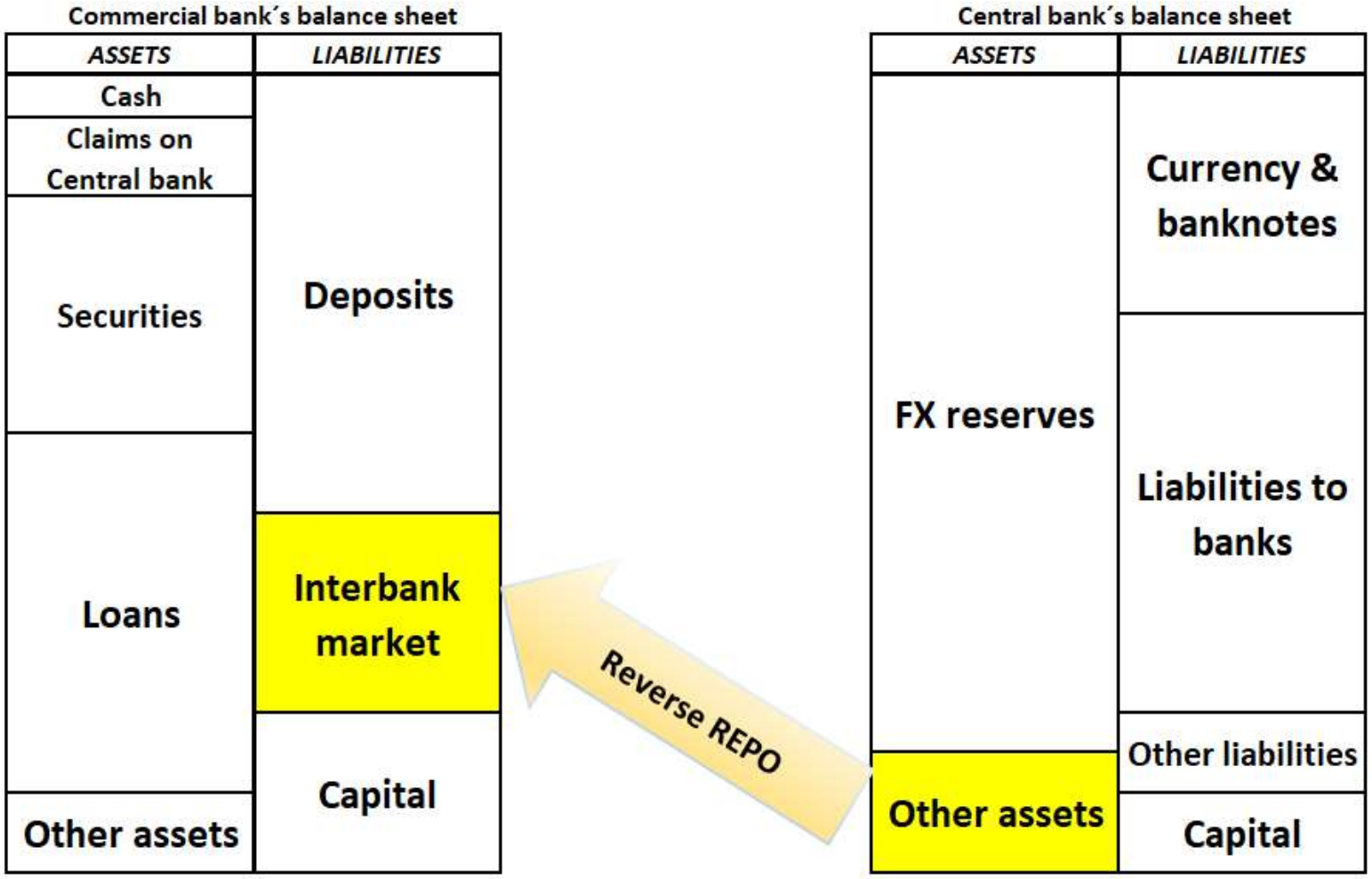
- a reverse repo operation (a purchase of securities followed by their future sale).



Source: Mejstrik, M. et al. (2014). Banking in Therory and Practice, Prague: Karolinum Press

2. Central banks

Reverse repo on balance sheets



4. What is the use of mandatory minimum reserves?

2. Central banks

2) Mandatory minimum reserves

- Mandatory minimum reserves (MMR), a part of a deposit that a commercial bank has to place in a central bank, are another tool of central banks.
- In theory, central banks can influence banks through MMR, for example an increase in MMR may result in a lower multiplication of deposits. However, **in reality MMR plays an important role in an interbank payment system and liquidity management**
- Nowadays MMR in the CR: 2.0%, Eurozone: 1.0%, China 9.4% (down from 21% in 2012 - tool of credit restriction)

3) Interest rates set by the CNB

- The CNB announced three key interest rates:

i) **discount rate**, which is paid by the CNB to commercial banks for making their deposits (discount facility), and is the lowest interest rate on the market;

ii) **repo rate**, the maximum rate for which the CNB provides repurchase agreements with commercial banks;

iii) **lombard rate**, the rate charged by the CNB for granting loans to commercial banks against a pledge for securities (a so-called lombard credit or marginal lending facility).

5. What is the recent deposit rate by the ECB and by the CNB?

2. Central banks
3) Recent interest rates/deposit facilities of the CNB (+0.05%) and of the ECB (-0.50 %)

Interest rates	Interest rate	Valid since
two-week repo operations – 2W repo rate	0.25%	11 May 2020
deposit facility – discount rate	0.05%	27 March 2020
marginal lending facility – Lombard rate	1.00%	11 May 2020

Source: http://www.cnb.cz/en/monetary_policy/instruments/index.html

Date		Deposit facility	Main refinancing operations		Marginal lending facility
			Fixed rate tenders Fixed rate	Variable rate tenders Minimum bid rate	
With effect from					
2019	18 Sep.	−0.50	0.00	-	0.25
2016	16 Mar.	−0.40	0.00	-	0.25
2015	9 Dec.	−0.30	0.05	-	0.30
2014	10 Sep.	−0.20	0.05	-	0.30

Source: https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html

2. Central banks

4) Other tools

- **Automatic facilities** (used for providing and depositing liquidity overnight)
  - The deposit facility
  - The marginal lending facility
- **Extraordinary facilities** (introduced by the CNB in autumn 2008 and in 2020 due to the COVID-19 crisis)
  - Liquidity-providing repo operations (under special conditions)

Source: www.cnb.cz

2. Central banks

Instruments of a central bank

A. Conventional instruments

B. Nonconventional instruments

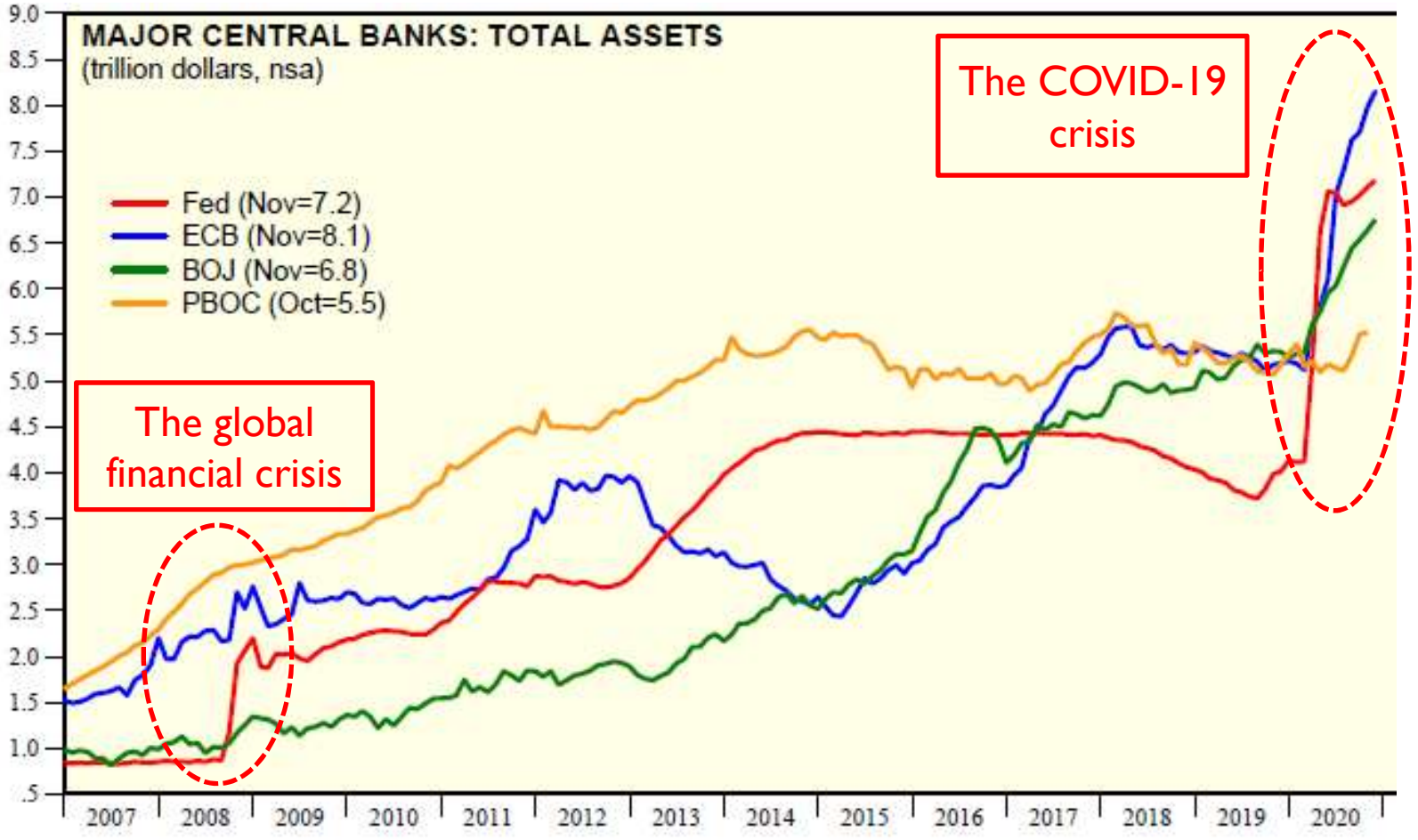
1) **open liquidity facilities** liquidity provision to commercial banks and currency swaps among central banks),
2) **credit facilities** should encourage both bank and nonbank sectors to higher lending to economies that are frozen during crises such as Long-Term Refinancing Operations (LTRO) by the European Central Bank (ECB)
3) **quantitative easing** (large-scale asset purchases into a central bank's portfolio – e.g. purchases of Eurozone government bonds into the ECB)
4) **forward guidance** through explicit statements that set monetary conditions (e.g., low IR) will prevail until a certain value of an indicator is exceeded (e.g., unemployment rate)
5) **foreign exchange interventions** (e.g. the CNB in 11/2013 - 4/2017)

Source: Mejstrik, M. et al. (2014). Banking in Theory and Practice, Prague: Karolinum Press

6. What is the result of non-conventional instruments used by central banks?

2. Central banks

Increasing balance sheets of central banks as a result of non-conventional instruments



Source: Yardeni Research (2020). Central Banks: Monthly Balance Sheets

2. Central banks

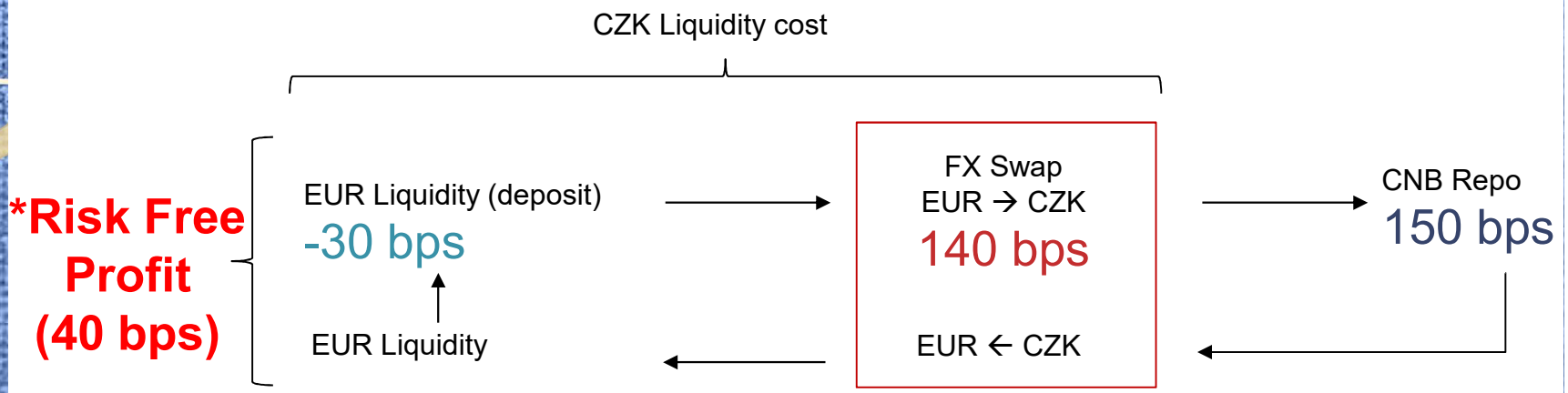
Case study: impact of ECB´s actions (QE+negative deposit interest rate)

1) Lower Eurozone governments´ bond yields
2) Higher expected inflation
3) Higher ECB´s balance sheet

Source: The Economist (2020). Christine Lagarde is taking the ECB out of its comfort zone, 28.11.2020

7. Was an arbitrage possible on the Czech banking market in recent years?

2. Central banks
Case study: arbitrage* was possible in 2018 in The CR (banks with EUR surplus vs currency speculators)



1) **Bank A** (parent bank in the Eurozone) places EUR liquidity by **Bank B** (Czech subsidiary) – the EUR deposit for -30bps (-0.30%), i.e. higher yield then deposit by the ECB for deposit rate of -40bps

2) **Bank B** through a FX Swap swaps EUR to CZK and CZK deposits places to CNB through a reverse repo (in 10/2018 for 150 bps)
If FX Swap = 140 bps, then **Banka B** earns **40bps** (=150-140-(-30))

3) After termination of the reverse repo, both FX Swap and EUR deposit are terminated. After the settlement, a new EUR deposit of Bank A is placed by Bank B…

Source: Hejdová, M. (2018). ALM in theory and practice, lecture at University of Economics

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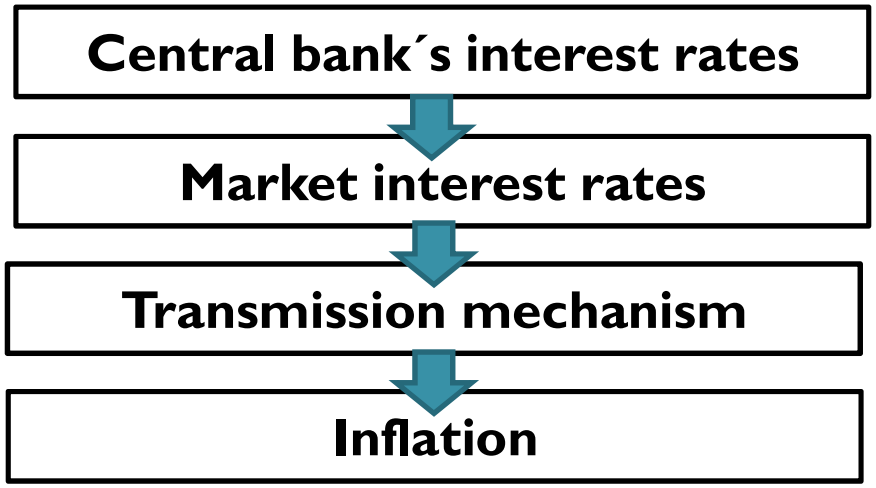
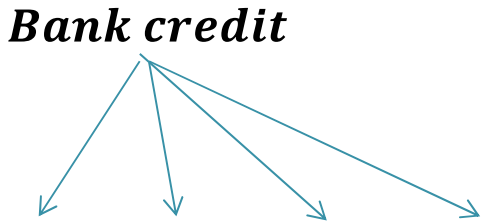
Monetary policy in theory

a) Transmission mechanism: view from a central bank



b) Transmission mechanism of low i.r.: impact on economy

$\downarrow i \rightarrow \uparrow credit \rightarrow \uparrow C, \uparrow I, \uparrow NX \rightarrow \uparrow GDP$ (↑ inflation)



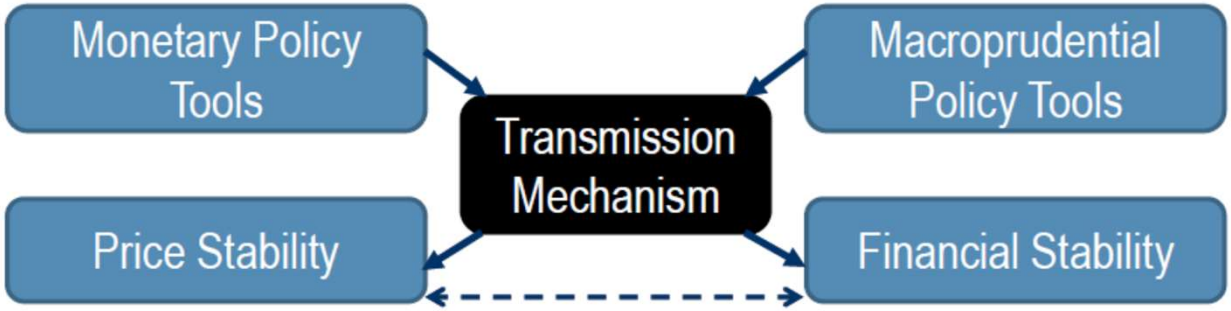
$$GDP = C + I + G + NX$$

3. Monetary policy

Transmission mechanism as black box

- Monetary authority´s dream:

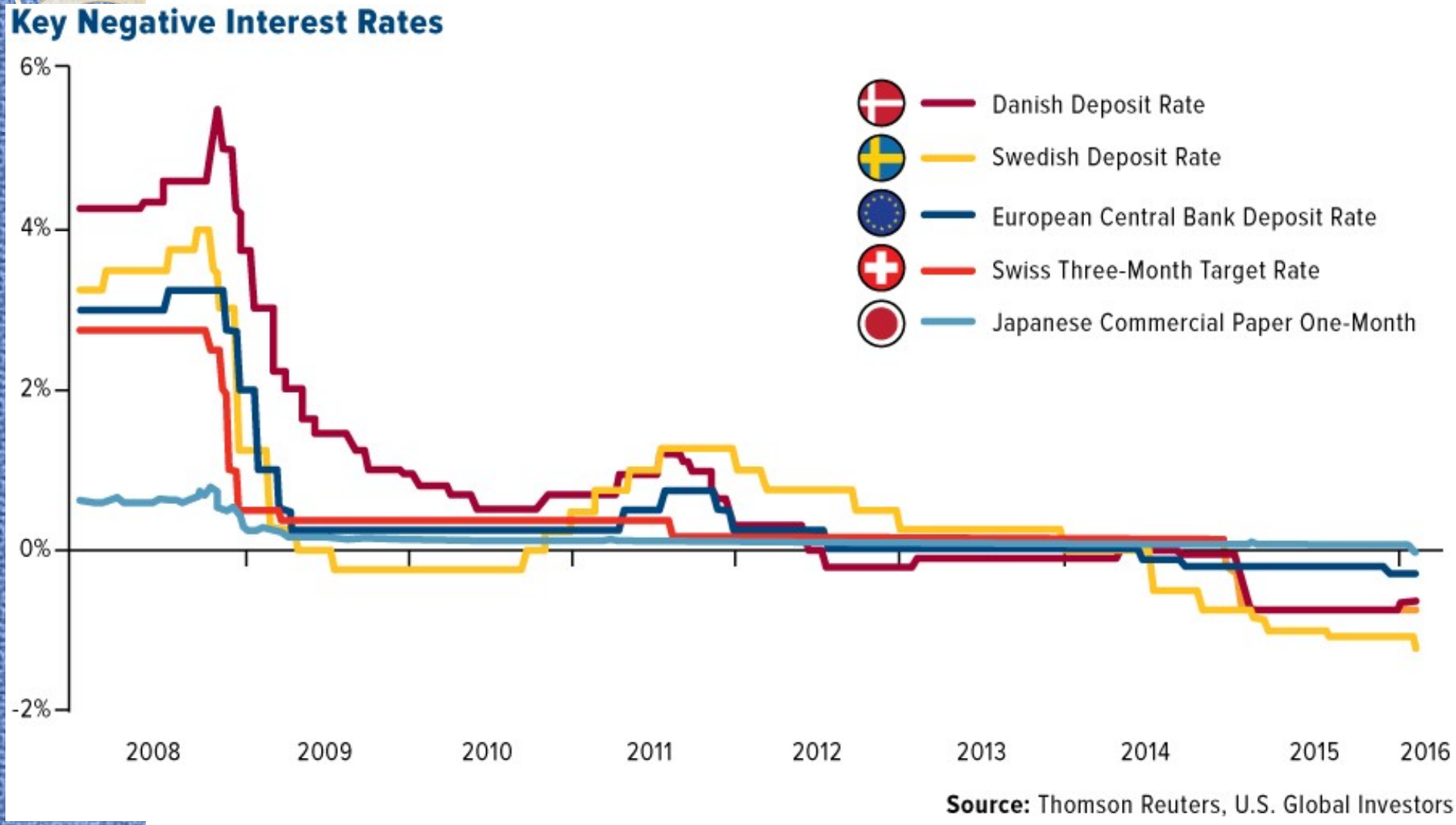
- The reality:



- The black box is always complex – various stages and channels.

Source: Tomšík, V. (2016). Coordinating Monetary And Macroprudential Policies In Low Interest Rate Environment

Negative interest rates (NIRs) in practice



3. Monetary policy

2 reasons for NIRs: inflation and exchange rate

$$negative\ i \rightarrow \downarrow cash\ in\ banks \rightarrow \uparrow credit \rightarrow \uparrow GDP \rightarrow \uparrow inflation$$

- European Central Bank (ECB)
- Sveriges Riksbank (SR)
- Bank of Japan (BoJ)

$$negative\ i \rightarrow \downarrow value\ of\ FX\ rate\ (currency\ depreciation)$$

- Danmarks Nationalbank (DN)
- Swiss National Bank (SNB)

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Basic terms

- An interest rate is the "rental" price of money; it is the price paid for the use of money for a period of time
- Real interest rate vs. nominal interest rate

$$i_r = i_n - \pi^e \qquad \text{Fisher equation}$$

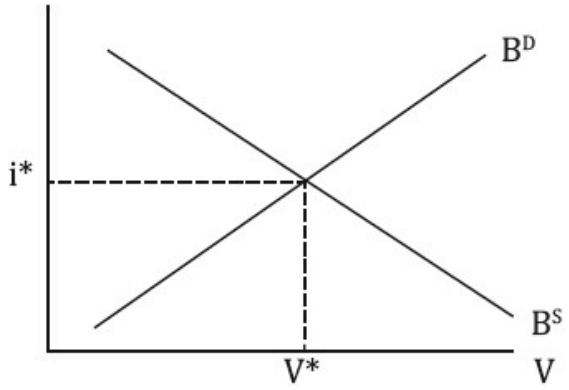
i_r – real interest rate
i_n – nominal interest rate
π^e – expected inflation

$$i_r = i_n - \pi^e + CPR + MP + LP + OP$$

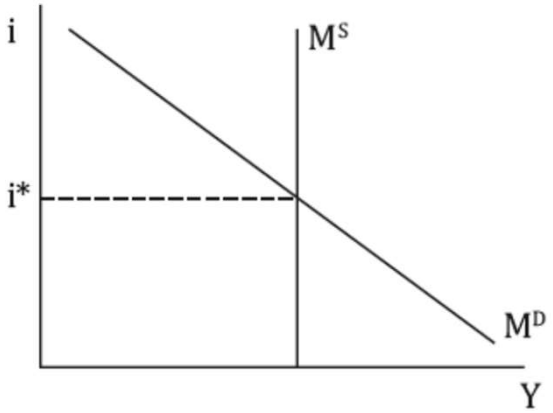
i_n – nominal interest rate
i_r – real interest rate
π_e – expected inflation
CRP – credit risk premium
MP – maturity premium
LP – liquidity premium
OP – optionality premium

Theories of interest rates

1) THE LENDING CAPITAL MODEL



2) THE IS-LM MODEL



3) THE TIME STRUCTURE OF INTEREST RATES (yield curve)

8. Why is the yield curve important in banking?

Yield curve in theory

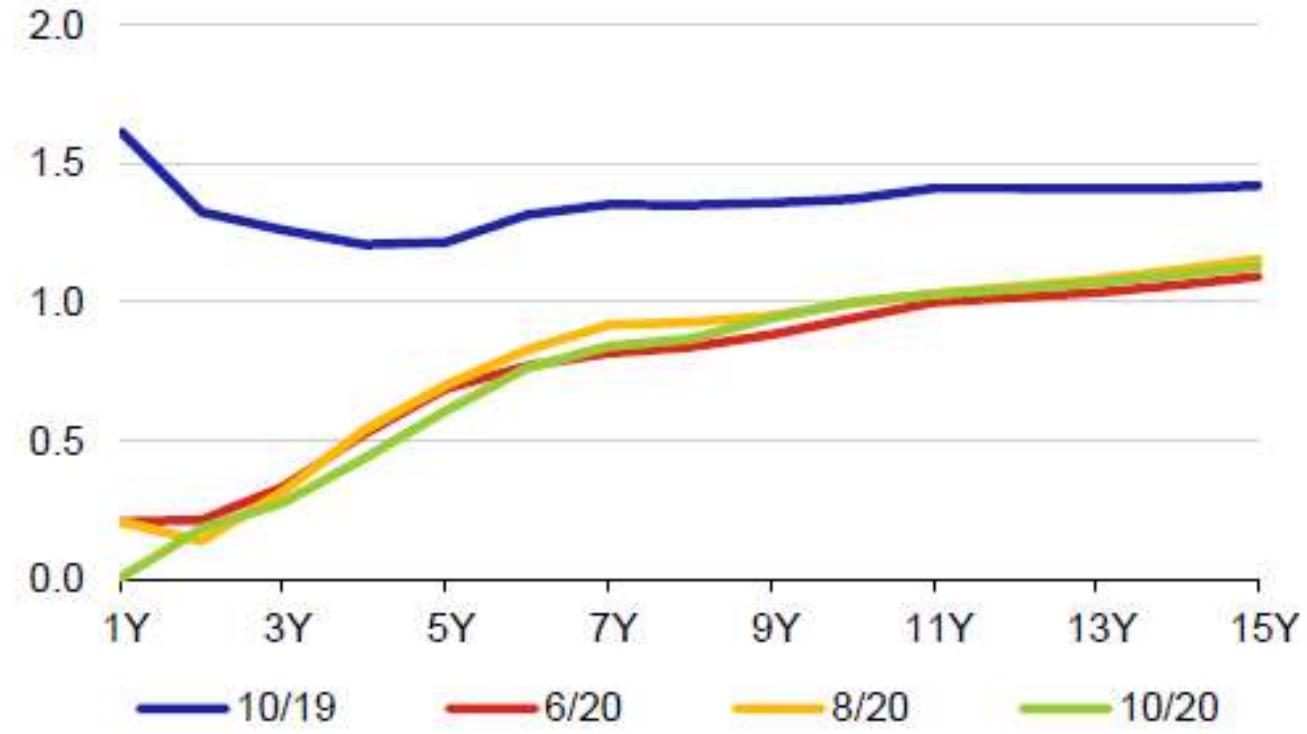
- **Yield curve** shows the relationship between maturity and interest rates (yields on bonds against bond maturities)
- It is constructed from the bonds of the same risk – usually from government (Treasury) bonds.
- Four main types of the yield curve: normal, inverted, flat and bulge.
- Understanding the behaviour and properties of the yield curve is an essential part of the ALM process:
  1) Changes in interest rates have a direct impact on bank revenue and the yield curve present **the current market expectation of future interest rates**.
  2) **The interest rate gap** is sensititve to changes in the shape and slope of the yield curve.
  3) Current and future bank´s trading strategy will impact **interest rate risk exposure** and therefore will take into account the shape and behaviour of the yield curve.

Source: Choudhry, M. (2007). Bank Asset and Liability Management: Strategy, Trading, Analysis. Wiley

Government bond yield curve in practice

The slope of the yield curve is slightly positive

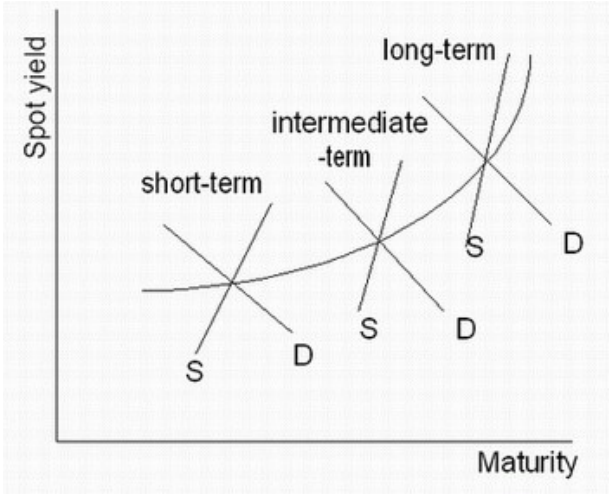
(percentages)



Source: CNB (2020). Inflation Report III

Theories explaining the shape of a yield curve

- **Expectations theories**
  - Pure expectations theory
  - Liquidity-preference theory
  - Preferred habitat theory
- **Market segmentation theory**



Pure expectations theory (1/3)

- Long-term rates are the geometric average of short-term rates

$$(1+s_T)^T = (1+s_1)*(1+{}_1f_2)*\ldots*(1+{}_{T-1}f_T)$$

$$s_T = \sqrt[T]{(1+s_1)*(1+{}_1f_2)*\ldots*(1+{}_{T-1}f_T)} - 1$$

s_T – spot interest rate for period T
T – point of time
${}_1f_2$ – forward interest rate from time 1 until time 2
${}_{T-1}f_T$ – forward interest rate from time T-1 until T

Pure expectations theory (2/3)

$$(1+s_2)^2 = (1+s_1)(1+{}_1f_2)$$

where:

s_2 – 2-year spot interest rate

s_1 – 1-year spot interest rate

${}_1f_2$ – forward interest rate from time 1 until time 2

$$ {}_1f_2 = \frac{(1+{}_0s_2)^2}{1+{}_0s_1} - 1 $$

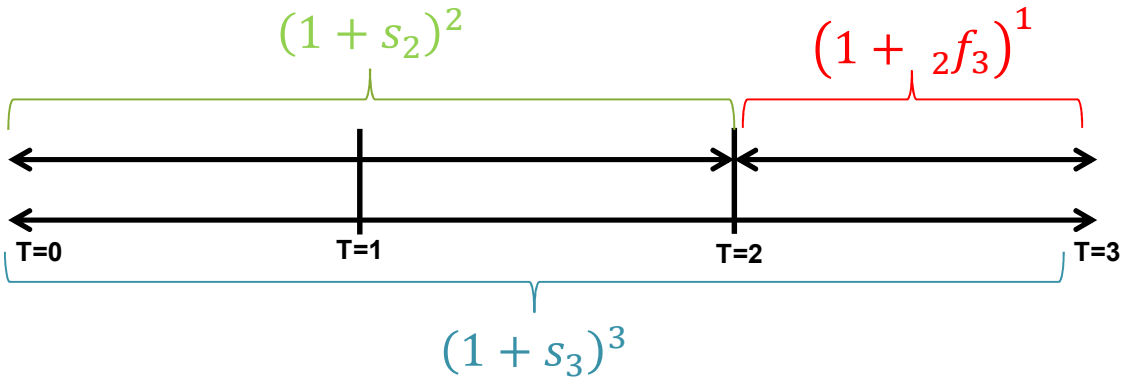
$$ {}_{T-1}f_T = \frac{(1+{}_0s_T)^T}{(1+{}_0s_{T-1})^{T-1}} - 1 $$

Pure expectations theory (3/3)

Table III.S-2: Yields to maturity, spot rates and forward rates (%)

Maturity	YTM	Spot rate	1-year forward rate
1	5.00%	5.00%	5.00%
2	5.25%	5.26%	5.51%
3	5.40%	5.41%	5.73%
4	5.50%	5.52%	5.84%
5	5.60%	5.63%	6.06%

$$ {}_2f_3 = \frac{(1+5.41\%)^3}{(1+5.26\%)^2} - 1 = 5.73\% $$



Liquidity-preference theory

- Forward rates are biased forecasts of expected future rates due to a liquidity (or maturity) premium.
- According to this theory, investors prefer short-term instruments and require compensation for longer maturities

$$_1f_2 = E(_1r_2) + LP_1$$

$$_2f_3 = E(_2r_3) + LP_2$$

$$LP_2 \rangle LP_1$$

$_1f_2$ – forward interest rate from time 1 until time 2
$E(_1r_2)$ – expected interest rate from time 1 until time 2
LP_1 – liquidity premium$_1$
$_2f_3$ – forward interest rate from time 2 until time 3
$E(_2r_3)$ – expected interest rate from time 2 until time 3
LP_2 – liquidity premium.

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5. Low interest rates in practice

Three relevant papers on impact of the low interest rate environment (LIRE)

1) Goodhart, C., Schulze, T., Tsomocos, D. (2020). Time inconsistency in recent monetary policy. VOX, CEPR Policy Portal **(Obligatory Reading 3)** – general effects
2) Carletti, E. et al. (2020). The Bank Business Model in the Post-Covid-19 World. Centre for Economic Policy Research – bank profitability
3) Borio, C., Gambacorta, L. Hofmann, B. (2017). The influence of monetary policy on bank profitability. International Finance. 20: 48–63 – impact of the yield curve

9. What are positives and negatives of LIRE?

Paper 1: Goodhart et al. (2020)

- A decade of near-zero, and even negative, interest rates in advanced economies has both encouraged the continued accumulation of debt and **a search for yield in riskier assets**, while at the same time **eroding bank profitability** in the retail business.
- This paper discusses some of the palliative **measures that central banks** have taken to offset the erosion of bank profitability, and raises the question of whether, and how, **the longer term implications of the excessive accretion of debt** will be handled.

Source: Goodhart, C., Schulze, T., Tsomocos, D. (2020). Time inconsistency in recent monetary policy. VOX, CEPR Policy Portal

5. Low interest rates in practice

Short-run effects and longer-term problems of LIRE

A. Short-run positive effects

1) yield curve management (intercept)
2) term premium (higher slope of the yield curve)
3) lending activity (increase)
4) net worth (higher revenues)

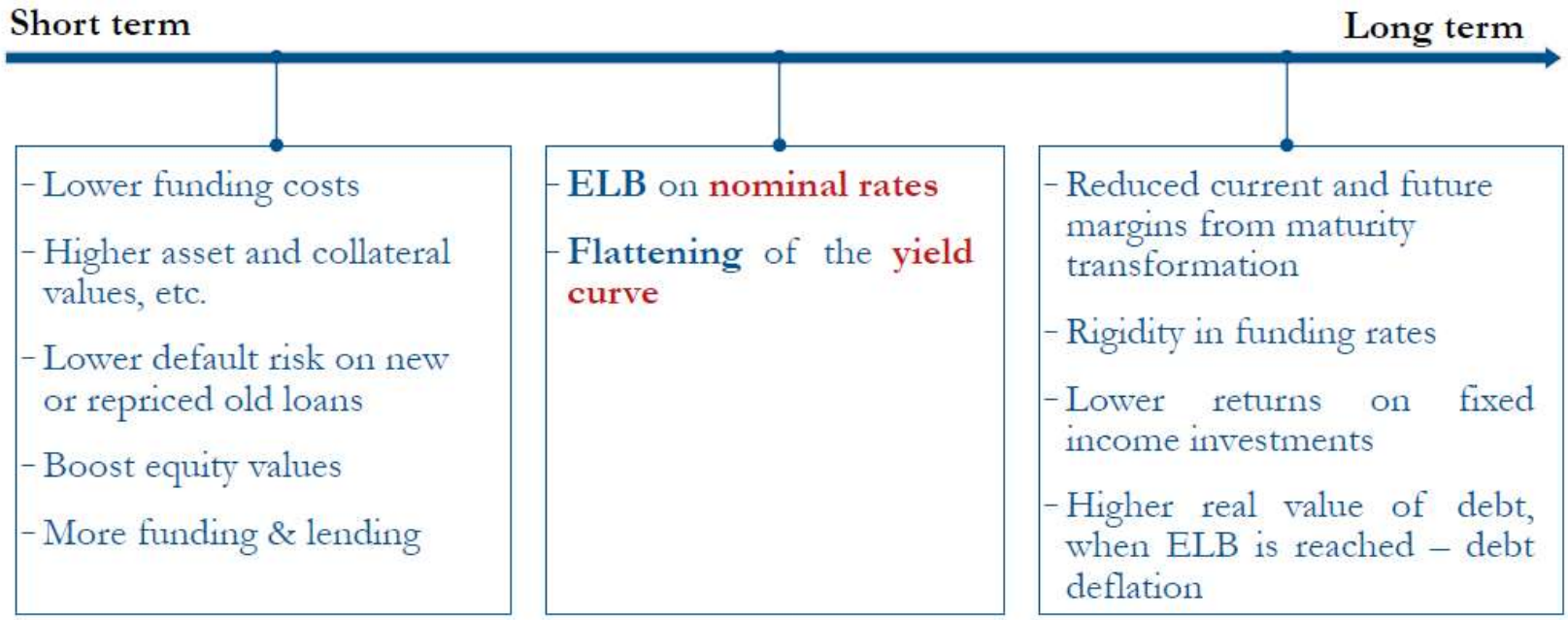
B. Longer-term problems

1) debt trap
2) poor credit allocation
3) allocation of resources and productivity
4) profitability of banks

10. Is LIRE always positive for bank profitability?

5. Low interest rates in practice

Paper 2: Carletti et al. (2020): Summary of effects of LIRE on bank business and profitability



Source: Carletti, E. et al. (2020). The Bank Business Model in the Post-Covid-19 World. Centre for Economic Policy Research
Notes: LIRE = the low interest rate environment, ELB = the effective lower bound

5. Low interest rates in practice

Impact of low/negative interest rates on banks' profitability and its components:

Direction of impact	Outcome variable	Paper(s)	Geographic coverage
↓	Net interest income	Claessens et al. (2018), Coleman and Stebunovs (2019), Urbschat (2018), Borio et al. (2017), Lopez et al. (2018), Altavilla, Boucinha and Peydro (2018)	Advanced economies, Europe, Germany, Japan, euro area
↓	Deposit expenses	Lopez et al. (2018)	Europe and Japan
↑	Non-interest income	Borio et al. (2017), Lopez et al. (2018)	Advanced economies
0	Non-interest income	Altavilla, Boucinha and Peydro (2018), Urbschat (2018)	Euro area, Germany
↓	Loan loss provisions and non-performing loans	Borio et al. (2017), Altavilla, Boucinha and Peydro (2018), Urbschat (2018)	Advanced economies, euro area, Germany
↓	Overall profitability	Coleman and Stebunovs (2019), Borio et al. (2017)	Europe, advanced economies
0	Overall profitability	Lopez et al. (2018), Claessens et al. (2018), Altavilla, Boucinha and Peydro (2018)	Europe and Japan, advanced economies, euro area

Source: Carletti, E. et al. (2020). The Bank Business Model in the Post-Covid-19 World. Centre for Economic Policy Research

5. Low interest rates in practice

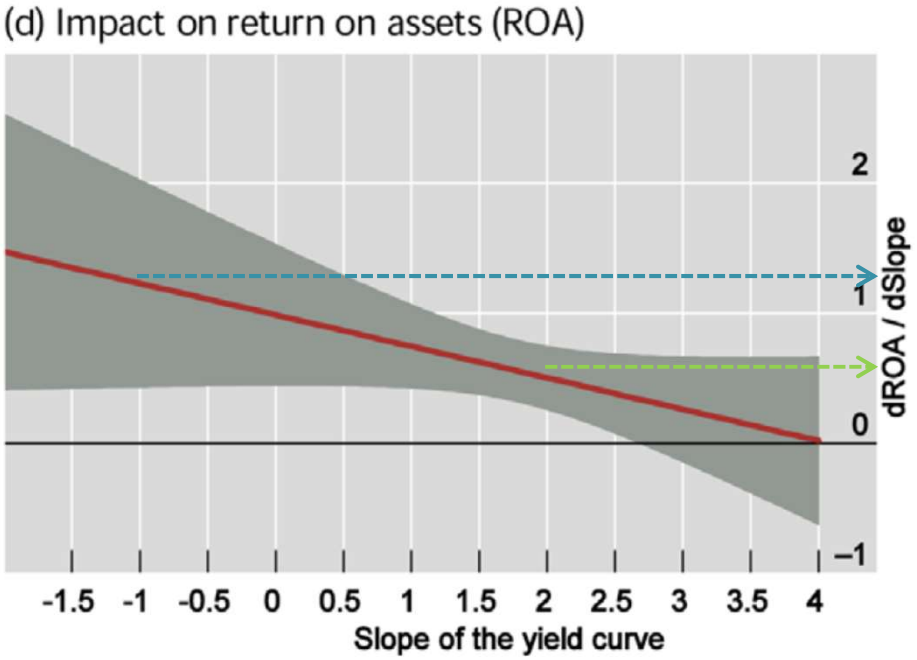
Paper 3: Borio et al. (2017)

- This paper investigates how monetary policy affects bank profitability. We use data for 109 large international banks headquartered in 14 major advanced economies for the period 1995–2012.
- Overall, we **find a positive relationship between the level of short-term rates and the slope of the yield curve** (the 'interest rate structure', for short), on the one hand, and bank profitability—return on assets (ROA) —on the other. This suggests that the positive impact of the interest rate structure on net interest income dominates the negative one on loan loss provisions and on non-interest income.
- We also find that the effect is stronger when the interest rate level is lower and the slope less steep, that is, when **non-linearities** are present. All this suggests that, over time, **unusually low interest rates and an unusually flat term structure erode bank profitability.**

Source: Borio, C., Gambacorta, L. Hofmann, B. (2017). The influence of monetary policy on bank profitability. International Finance. 20: 48–63.

5. Low interest rates in practice

Non-linear (concave) relationship between ROA of banks and the slope of the yield curve*

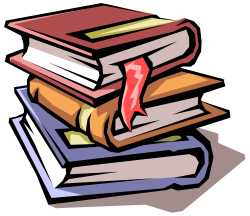


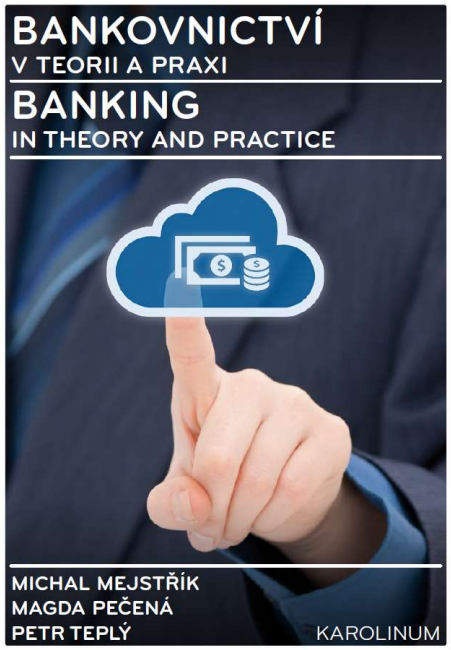
- An increase in the slope of the yield curve from −2% to −1% raises the ROA by 1.2% over one year, while the effect is 0.6 % points if the slope goes from 1% to 2%

Source: Borio, C., Gambacorta, L. Hofmann, B. (2017). The influence of monetary policy on bank profitability. International Finance. 20: 48–63.

* The horizontal axis shows possible values for the slope of the yield curve (the difference between the ten-year government bond and the three-month interbank rate, in percentage points). The vertical axis shows the derivative of each bank profitability component with respect to the slope. The shaded area indicates 95% confidence bands

Reading for the this lecture





✓**Chapter III/Central banking**

Time inconsistency in recent monetary policy

Charles Goodhart, Tatjana Schulze, Dimitri Tsomocos 04 August 2020

A decade of near-zero, and even negative, interest rates in advanced economies has both encouraged the continued accumulation of debt and a search for yield in riskier assets, while at the same time eroding bank profitability in the retail business. This column discusses some of the palliative measures that central banks have taken to offset the erosion of bank profitability, and raises the question of whether, and how, the longer-term implications of the excessive accretion of debt will be handled.

Discussion

Thanks for your attention.
Let´s discuss it now!

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