INTRODUCTORY BANKING

Lecture 3B – Central Banking

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Key terms from Lecture 3A/Money

- Theoretical vs empirical definition of money
- First coins in Lydia/Turkey, first banknotes in China
- Monetary aggregates, low M0/M2 ratio (currency <1% bank´s balance sheet) -> banks need trust represented by deposit insurance
- Financial intermediation theory, Fractional reserve theory, Credit creation theory
- Money with/without trusted counterparty
- Virtual currencies (Bitcoin on blockchain), Libra/Diem
- Payments are challenged by Bigtechs
- Measuring interest rates: the present value concept
- Basic instruments: simple loan, fixed-payment loan contract, coupon bond discount bond (zero-coupon bond)

Contents

Money with(out) a trusted counterparty

1) **Money with a trusted counterparty** (state/central bank*)
   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.)

* e.g. Central Bank Digital Currency (CBDC)

1. What are the motivations to issue a CBDC ?

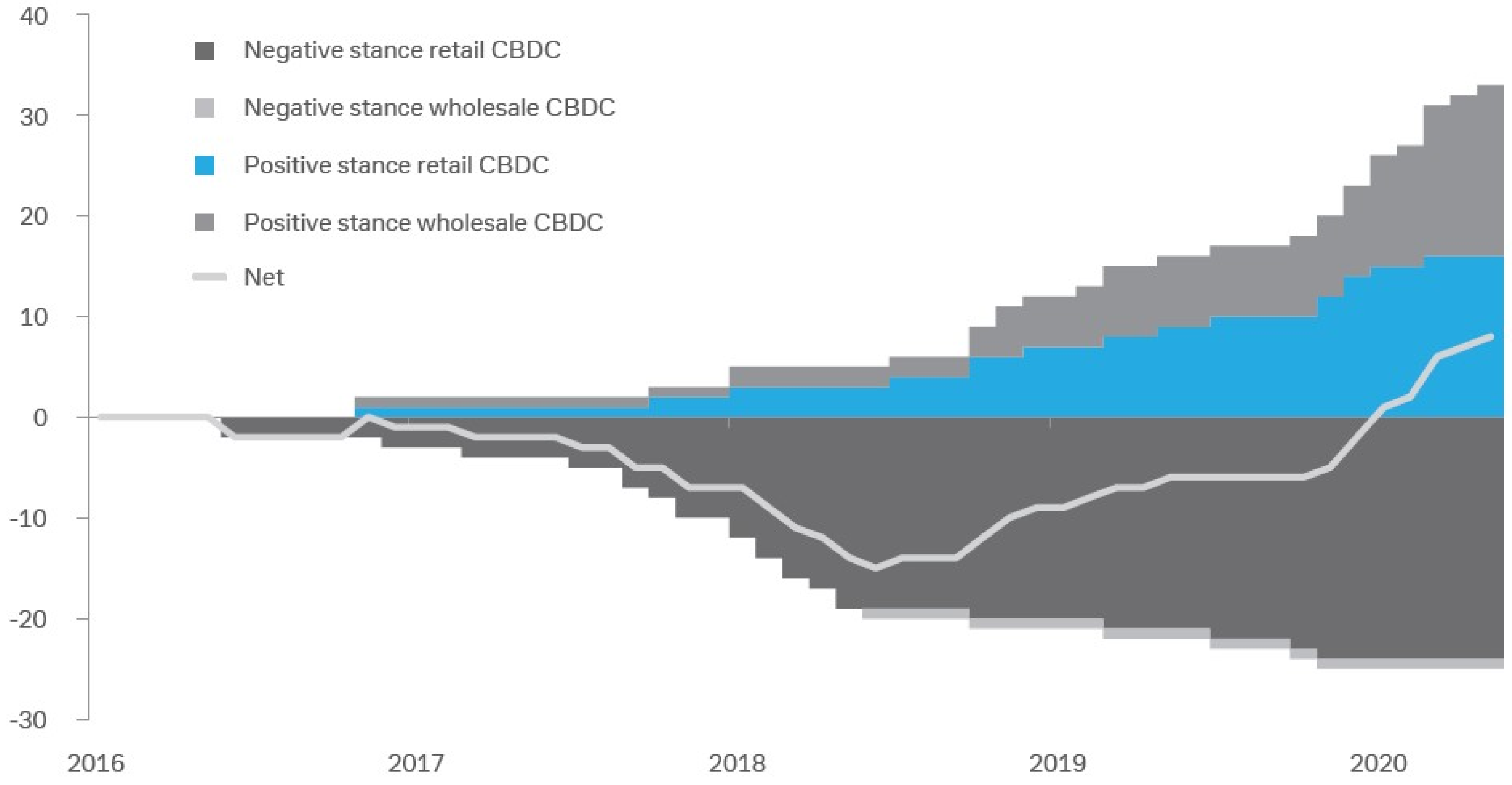
1. Central Bank Digital Currency

Motivations of CBDC

- The motivations to issue a general purpose CBDC are numerous: **financial stability, monetary policy implementation, financial inclusion, payments efficiency (domestic and cross-border), and payment security**.
- Among advanced economies, the primary motivation for developing a CBDC is to improve **payment security**.
- Emerging economies generally have a wider array of motivations, especially when a CBDC is designed to complement or substitute cash.
- The Bahamas launched the first nationwide CBDC last October, and both Sweden and China launched pilots in early 2020.
- In the long run, CBDCs will probably displace private cryptocurrencies and become the norm.

1. Central Bank Digital Currency

Central banks' speeches/work on digital currencies



Source: Deutsche Bank (2021). The Future of Payments. Part II

Two forms of CBDC

1) **Retail form**: a widely accessible and public electronic currency available for retail transactions;
2) **Wholesale form**: a restricted electronic currency available only for large business transactions.

- The retail form of a CBDC would play the same role as any **currency in circulation** today, whereas the wholesale form would be like **the reserves** held by banks and other financial institutions.

1. Central Bank Digital Currency

Key design features of CBDC

	Existing central bank money		Central bank digital currencies		
	Cash	Reserves & settlement balances	General		Wholesale only token
			Token	Accounts	
24x7 availability	✓	✗	✓	(✓)	(✓)
Anonymity vis-a-vis central bank	✓	✗	(✓)	✗	(✓)
Peer-to-peer transfer	✓	✗	(✓)	✗	(✓)
Interest-bearing	✗	(✓)	(✓)	(✓)	(✓)
Limits or cops	✗	✗	(✓)	(✓)	(✓)

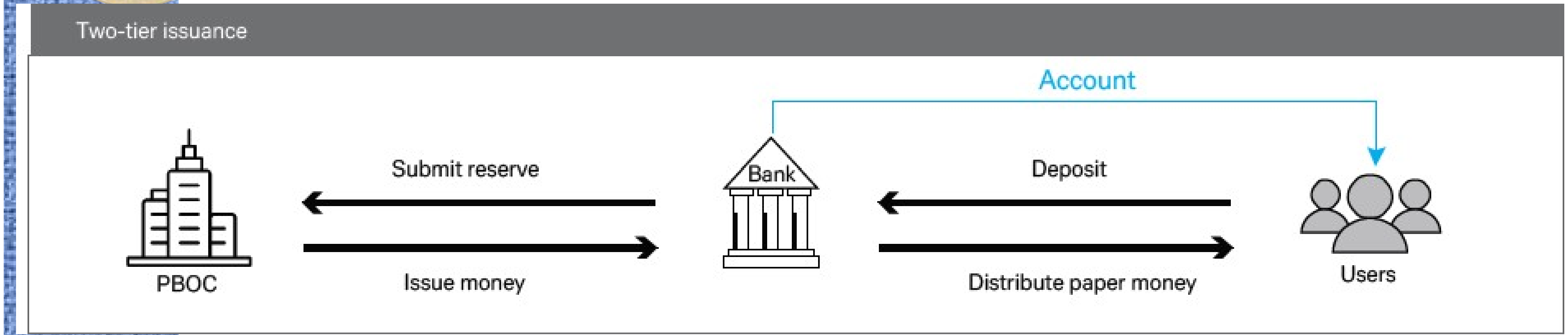
Source: Bank of International Settlements (2018). Note: X = existing or likely feature, (✓) = possible feature, ✓ = not typical or possible feature

Source: Deutsche Bank (2021). The Future of Payments. Part II

2. What central bank started to conduct research on a government-backed cryptocurrency as early as 2014?

1. Central Bank Digital Currency

Traditional two-tier paper money issuance

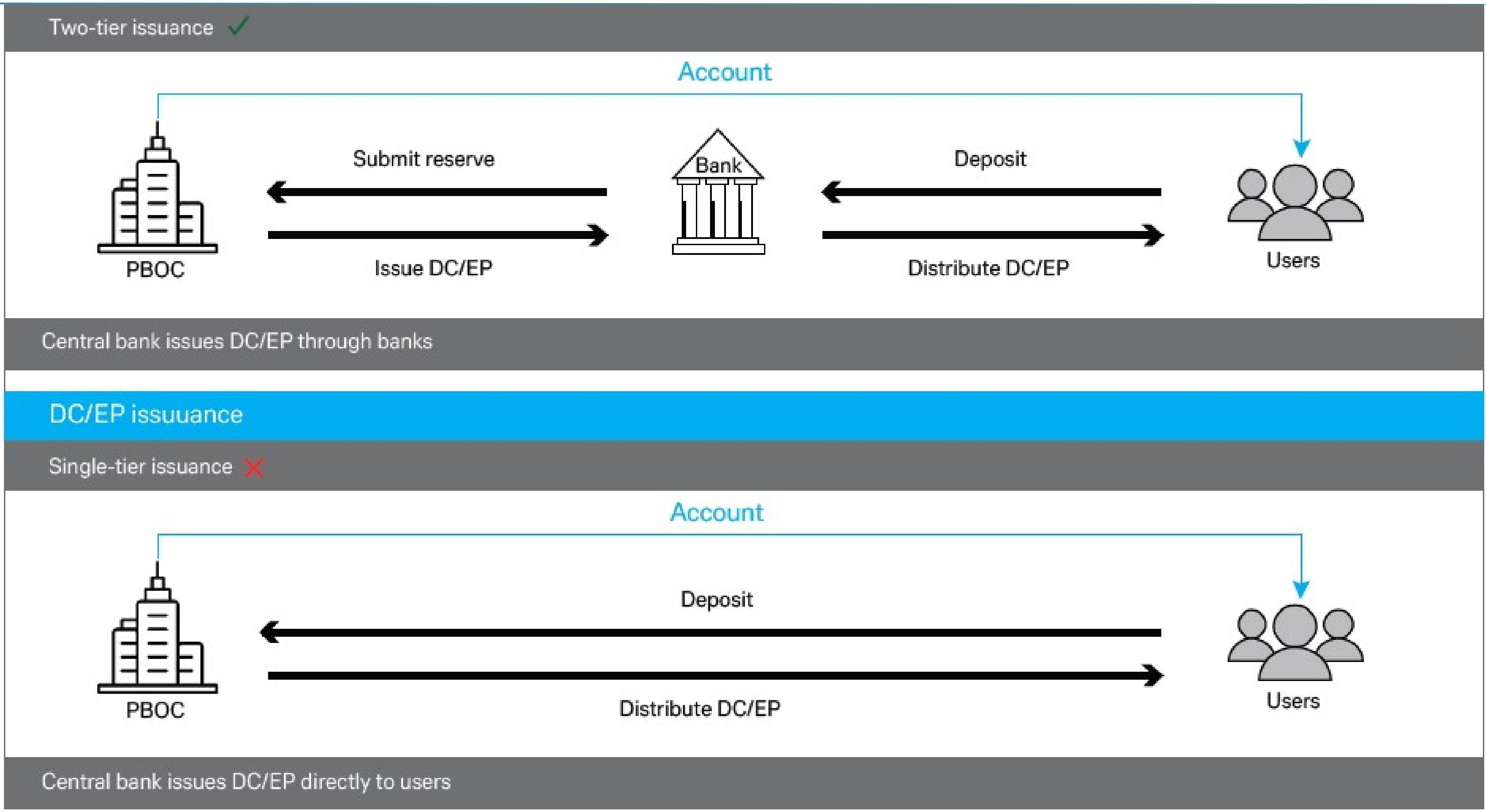


- Central bank issues money through banks (Tier 1) that distribute paper money to users (Tier 2)

Source: Deutsche Bank (2021). The Future of Payments. Part II
*PBOC = People´s Bank of China

1. Central Bank Digital Currency

New DC/EP money issuance



Source: Deutsche Bank (2021). The Future of Payments. Part II
*PBOC = People´s Bank of China
** DC/EP = Digital currency/Electronic Paymet

1. Central Bank Digital Currency
Reading 2 – CBDC

Design choices for central bank digital currency

Sarah Allen, Srđan Čapkun, Ittay Eyal, Giulia Fanti, Bryan Ford, James Grimmelmann, Ari Juels, Kari Kostiainen, Sarah Meiklejohn, Andrew Miller, Eswar Prasad, Karl Wüst, Fan Zhang 04 September 2020

Many central banks are considering, and some are even piloting, central bank digital currency. This column provides an overview of important considerations for central bank digital currency design. While central banks already provide wholesale digital currency to financial institutions, a retail central bank digital currency would expand access to more users and provide opportunities for innovative central banking. The design must balance these benefits with the potential risks created by retail central bank digital currency deployment.

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2. Central banks

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

History of central banking

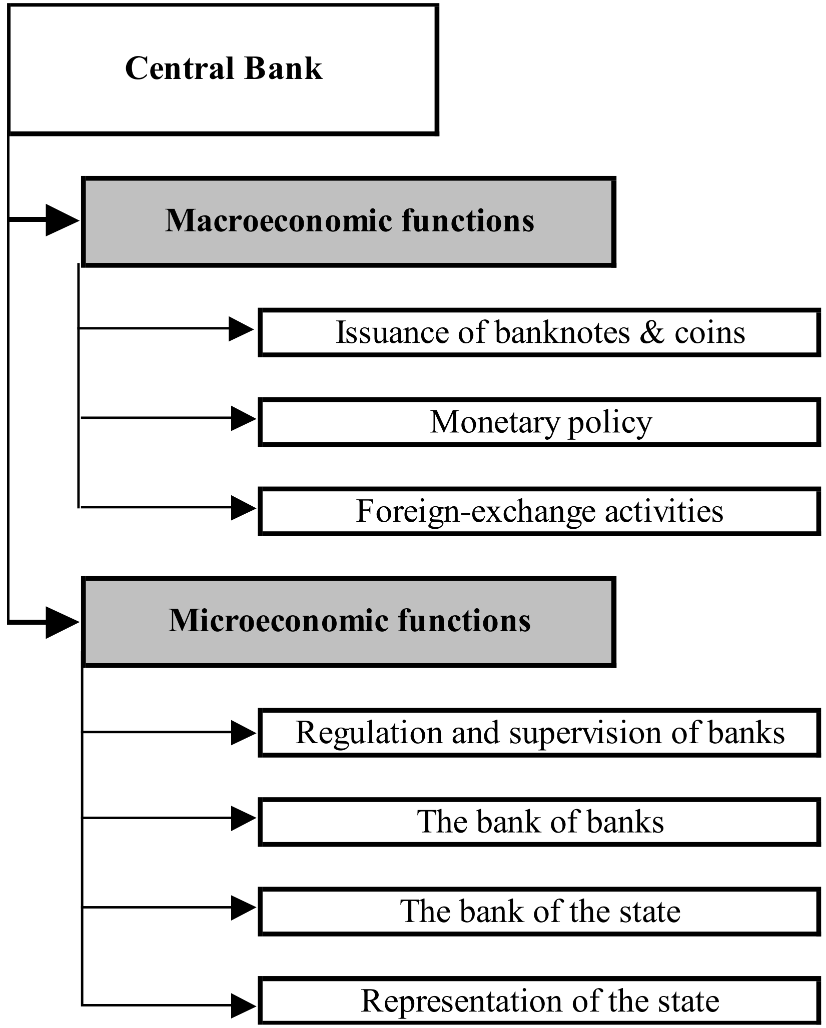
- Three main functions: i) granting credits to government institutions, ii) the management of government accounts - however, as time elapsed, such unlimited lending to a government (or ruler) became suboptimal and has even been misused by governments* and iii) **the issuance of banknotes and coins**, arose later as the need for centralisation of currency issuance occurred.
- Central banks have been founded in several ways:

  1) their conversion from a commercial bank (Sveriges Riksbank in 1697), 2) the right to issue banknotes and coins, (Banca D'Italia in 1926), 3) the foundation of a new institution (Bank of England in 1694).

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

*compare with recent Qunatitative Easing (QE)

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 are conventional instruments of a central bank?

Instruments of a central bank

A. Conventional instruments

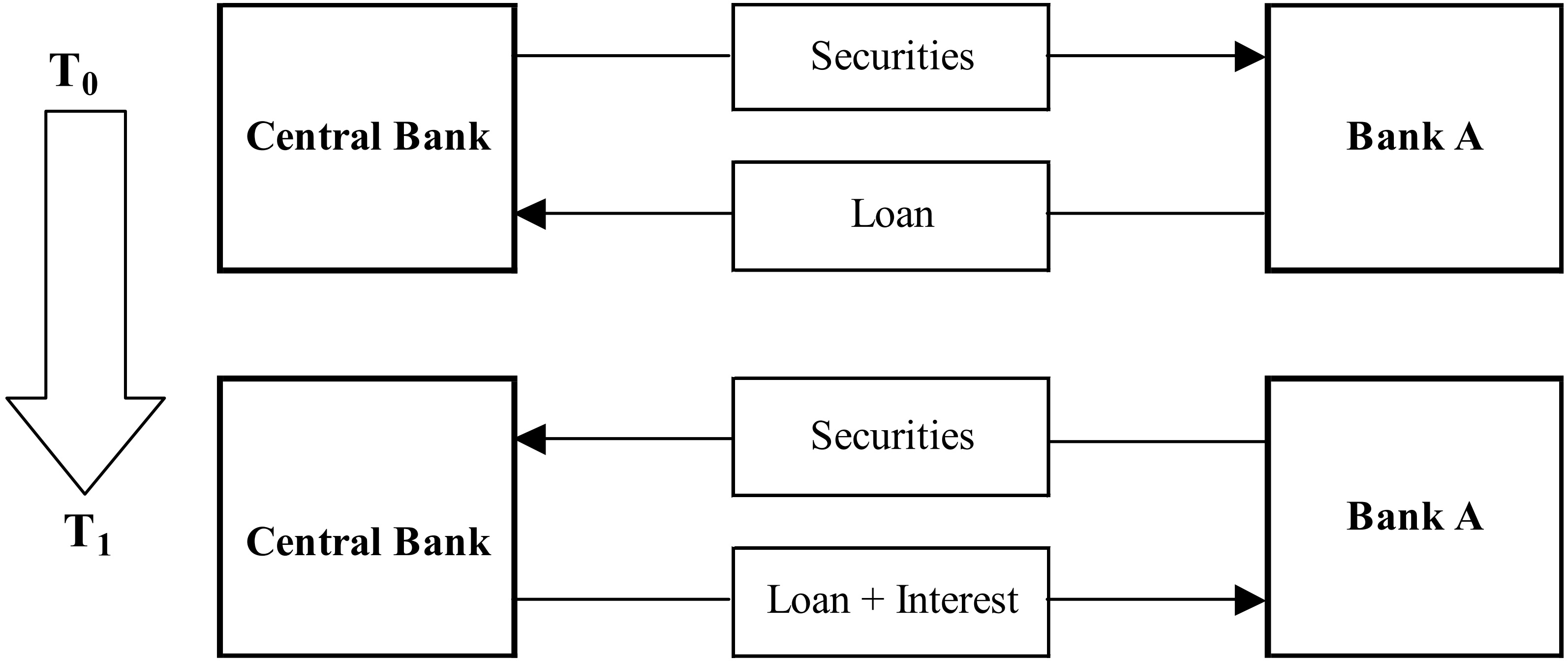
1) open market operations
2) mandatory minimum reserves
3) interest rates
4) other tools.

B. Nonconventional instruments

1) open liquidity facilities,
2) credit facilities,
3) large-scale asset purchases,
4) forward guidance.

2. Central banks
1a) OMO/Classic Repo

- a classic repo (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

Czech National Bank´s balance sheet

ASSETS	*LIABILITIES*
FX reserves	Currency & banknotes
	Liabilities to banks
	Other liabilities
Other assets	Capital

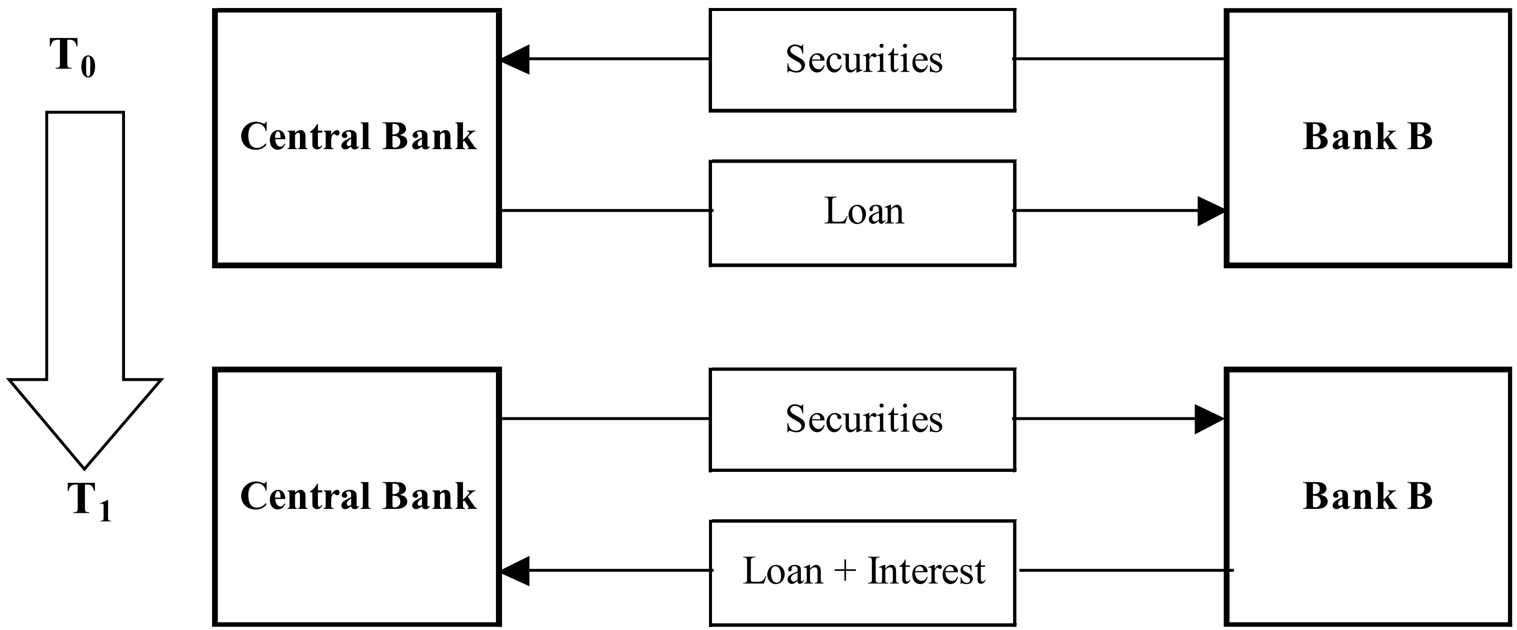
Bank´s balance sheet

ASSETS	*LIABILITIES*
Cash	Deposits
Claims on CNB	
Securities	
Loans	Interbank market
Other assets	Capital

2. Central banks

1b) OMO/Reverse Repo

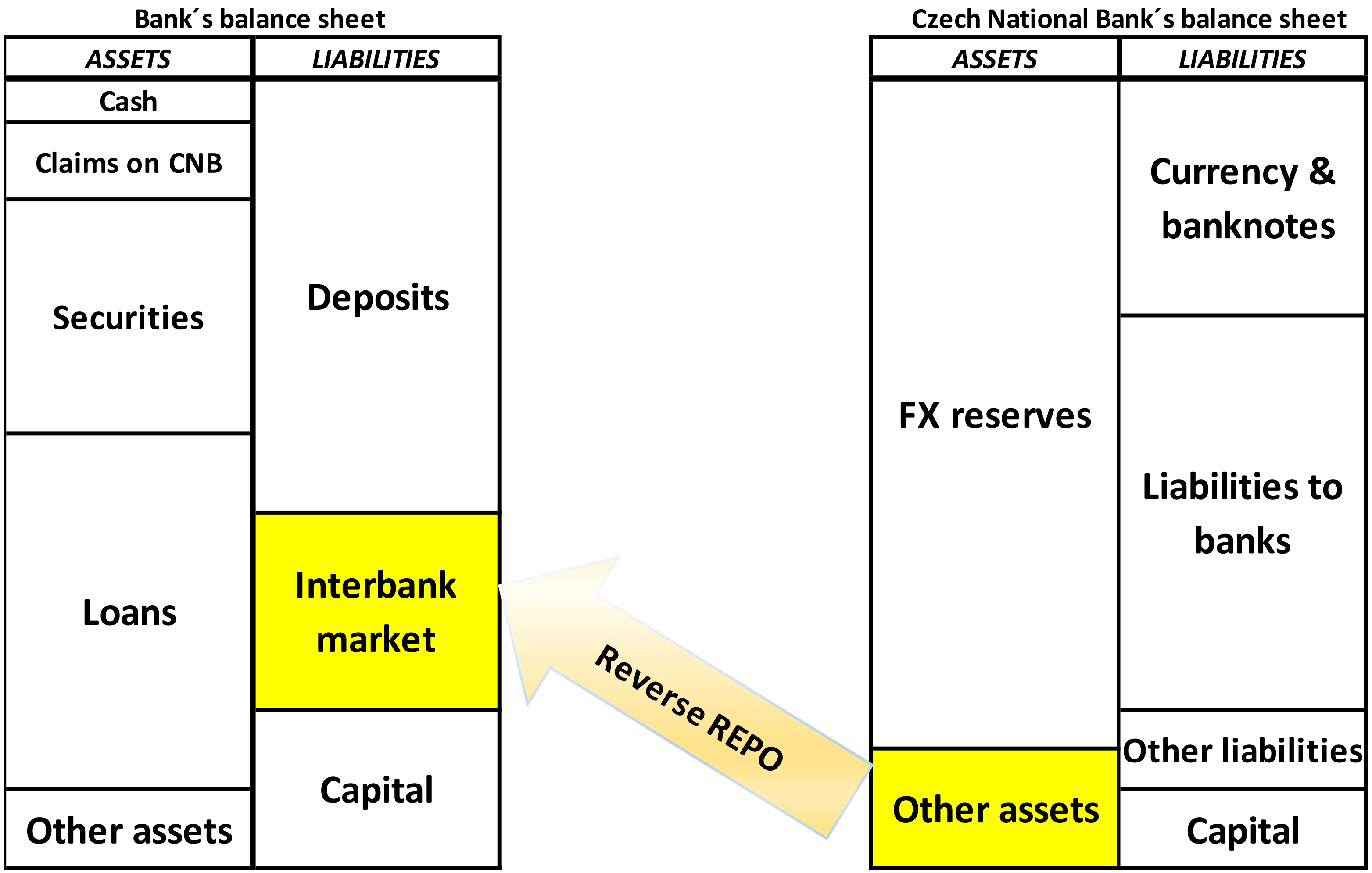
- a reverse repo (a purchase of securities followed by their future sale).



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

2. Central banks

Reverse repo on balance sheets



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** in advanced countries
- MMR in the CR: 2%, Eurozone: 1% vs. China 9.4%

(used as a tool of credit restriction, 20% in 2011)

2. Central banks

3) Interest rates 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/deposit 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).

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

2. Central banks
Interest rates set by the CNB and the European Central Bank (ECB) & bond yields

(in %)

	CNB			ECB
	from 17 March 2020 onwards	from 27 March 2020 onwards	from 11 May 2020 onwards	from 18 September 2019 onwards
2W repo rate	1.75	1.00	0.25	0.00
Deposit facility	0.75	0.05	0.05	-0.50
Marginal lending facility	2.75	2.00	1.00	0.25

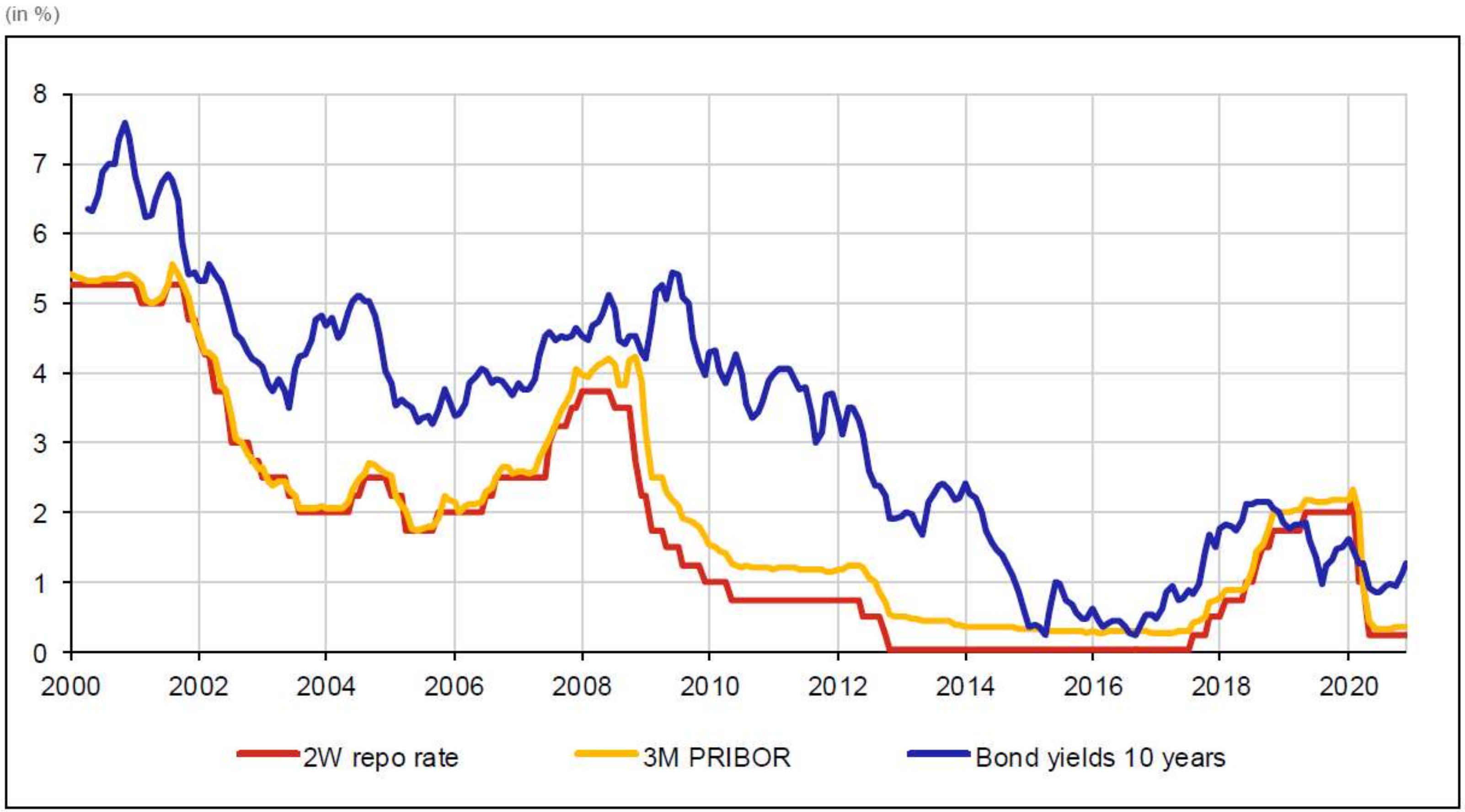
(in %, monthly average)

	2019		2020					
	December		October		November		December	
	CZ	Euro area	CZ	Euro area	CZ	Euro area	CZ	Euro area
Bond yields								
2 years	1.36	-0.43	0.00	-0.58	0.06	-0.61	0.16	-0.63
5 years	1.31	-0.08	0.54	-0.38	0.66	-0.44	0.80	-0.47
10 years (Maastricht)	1.51	0.37	0.94	0.00	1.12	-0.06	1.26	-0.09

Source: CNB (2021). Monetary and financial statistics, February 2021

2. Central banks

Financial market interest rates



Source: CNB (2021). Monetary and financial statistics, February 2021

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 (the global financial crisis) and 2020 (the COVID-19 crisis)
  - Liquidity-providing repo operations (under special conditions)

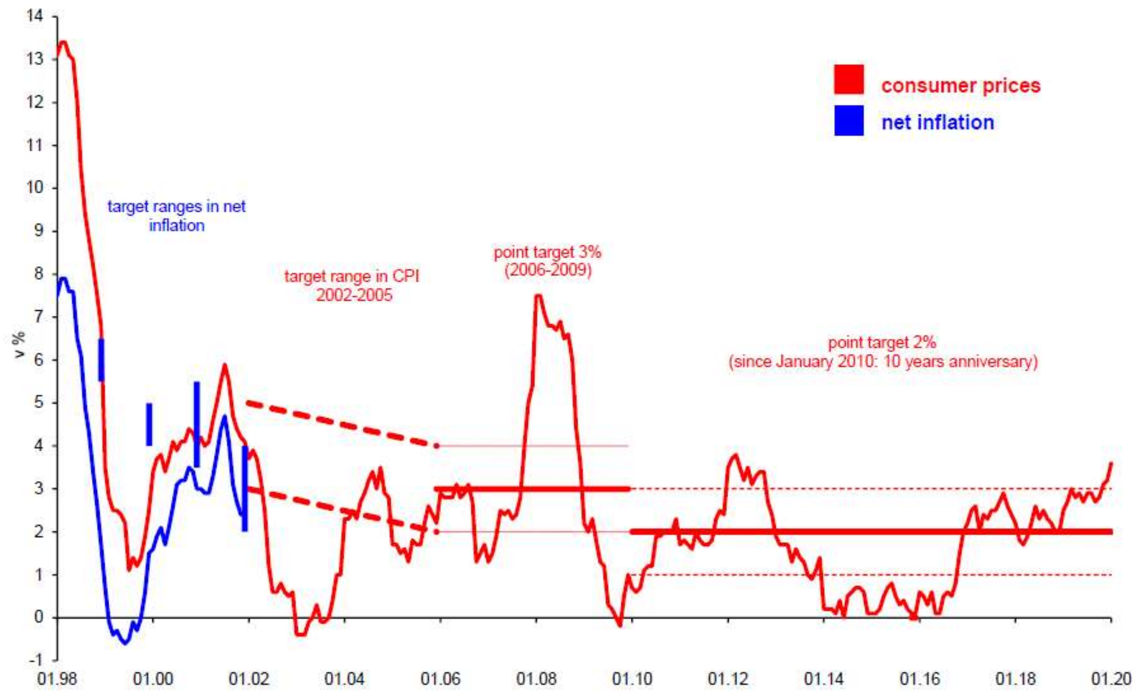
Source: www.cnb.cz

The mandate of the CNB

1) to maintain price stability,
2) to maintain financial stability and see to the sound operation of the financial system in the Czech Republic,
3) to issue banknotes and coins, manage the circulation of currency and administer clearing between banks,
4) to supervise the entities operating on the financial market.

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

2. Central banks
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

6. What are nonconventional instruments of a central bank?

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** (QE, large-scale asset purchases into a central bank's portfolio–e.g. purchases of Eurozone government bonds by 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

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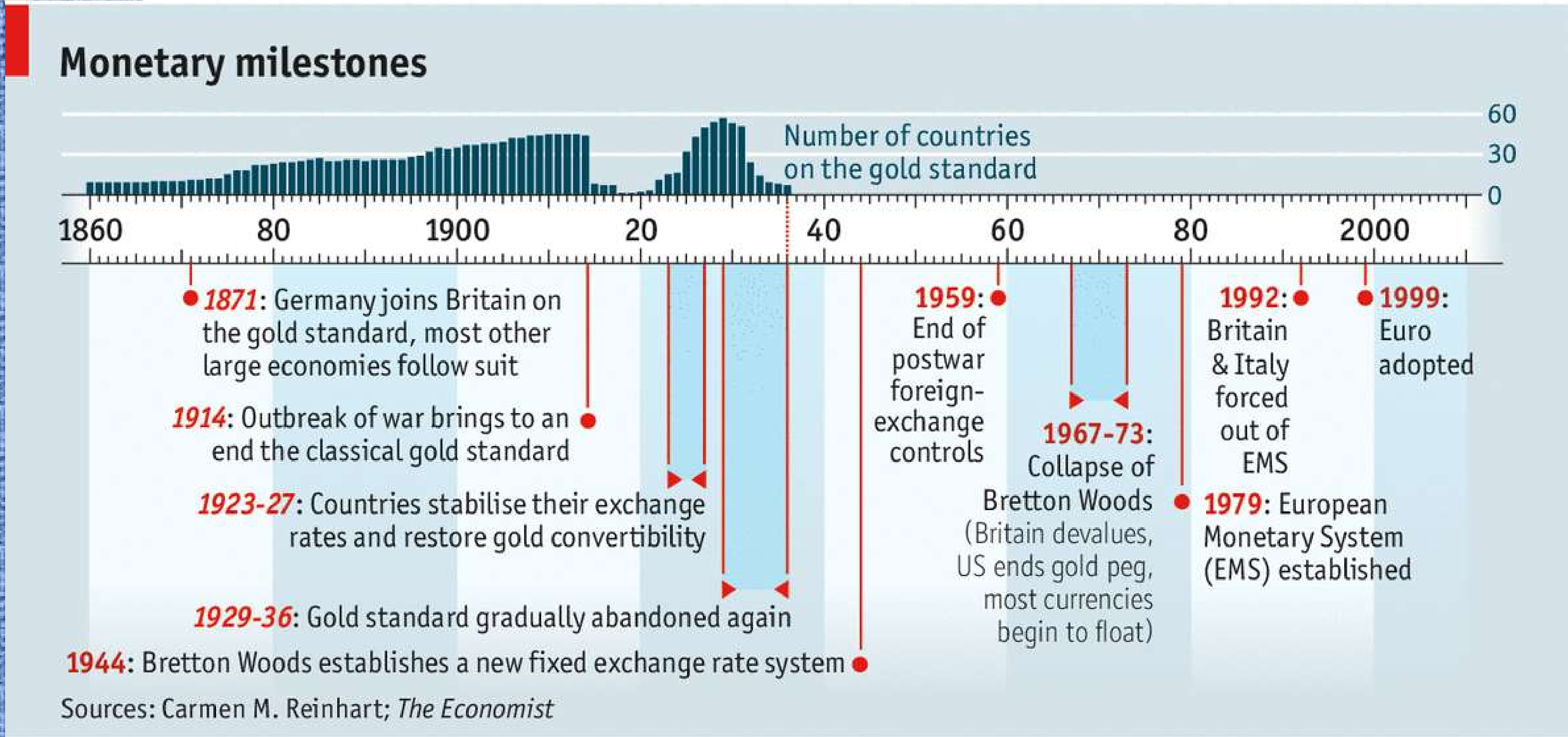
3. Monetary policy

Monetary history

(1973: collapse of the Breton Woods system)



Source: The Economist 5/7/2014

7. What is the relationship between interest rates and inflation?

3. Monetary policy

Monetary policy (MP) diagram in theory

a) Transmission mechanism: central bank

Instruments of MP

↓

Monetary base

↓

Monetary aggregates

↓

Goals of MP

$$\downarrow i \rightarrow \uparrow MB \rightarrow \uparrow M2(\uparrow credit) \rightarrow \uparrow inflation$$

$$\boldsymbol{through\ Money\ multiplier}$$
$$\boldsymbol{(in\ theory)}$$

$$\downarrow i \rightarrow \uparrow inflation$$

$$\boldsymbol{through\ short-term\ interest\ rates}$$
$$\boldsymbol{(in\ pratice)}$$

b) Transmission mechanism: economy

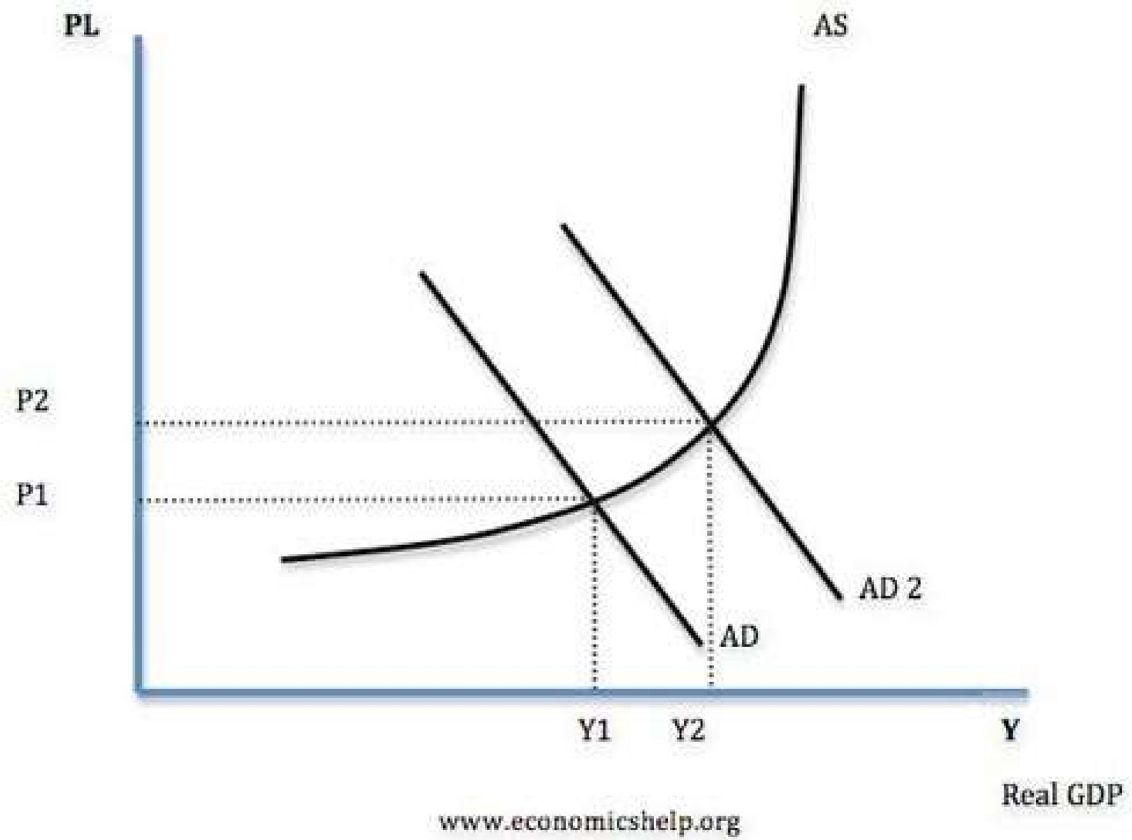
$$\downarrow i \rightarrow \uparrow credit \rightarrow \uparrow C, \uparrow I, \uparrow NX \rightarrow \uparrow GDP$$

$$\boldsymbol{Bank\ credit}$$

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

3. Monetary policy

Lower interest rates in the AS/AD model



$$\downarrow i \rightarrow \uparrow GDP \text{ and } \uparrow inflation$$

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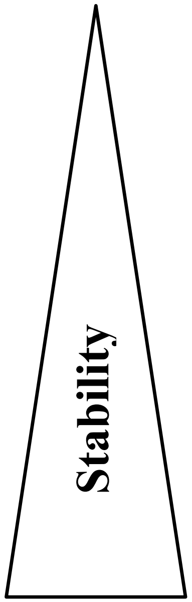
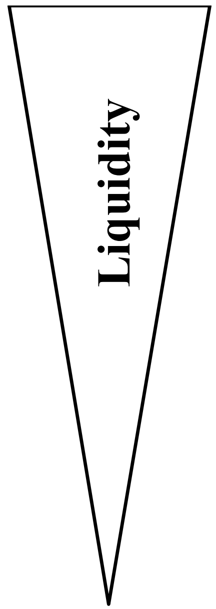
4. Monetary aggregates

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



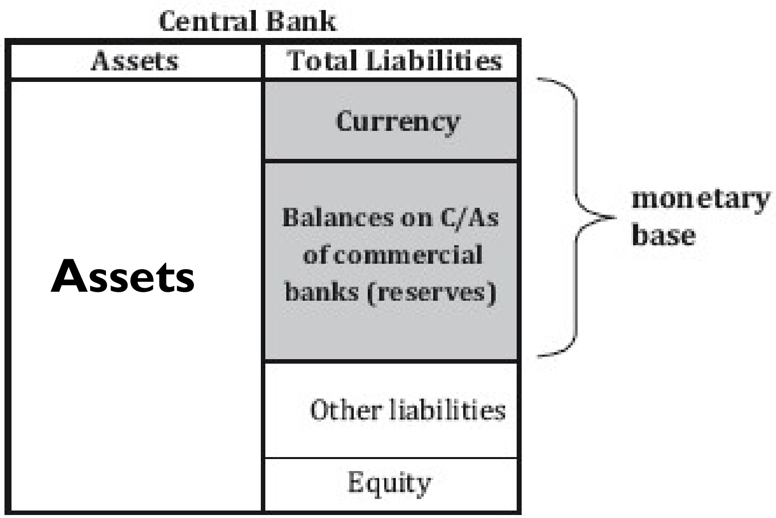
- The higher number of the aggreagate implies its higher stability but lower liquidity
- M0 is sometimes denoted for currency in circulation (banknotes+cash)
- Low M0/M2 ratio around the globe (10-12%)

8. What is the money multiplier?

4. Monetary aggregates

Money mutliplier (1/2)

- In the past, the money multiplier theory was popular in the US. As time passed, however, the theory demonstrated some weaknesses therefore <u>central bankers do not use it today</u>.
- The basic assumption is the multiplication effect of a monetary base MB on money supply M (aggregate M2).



$$M = \mu \times MB$$

M	– money supply
μ	– money multiplier
MB	– monetary base

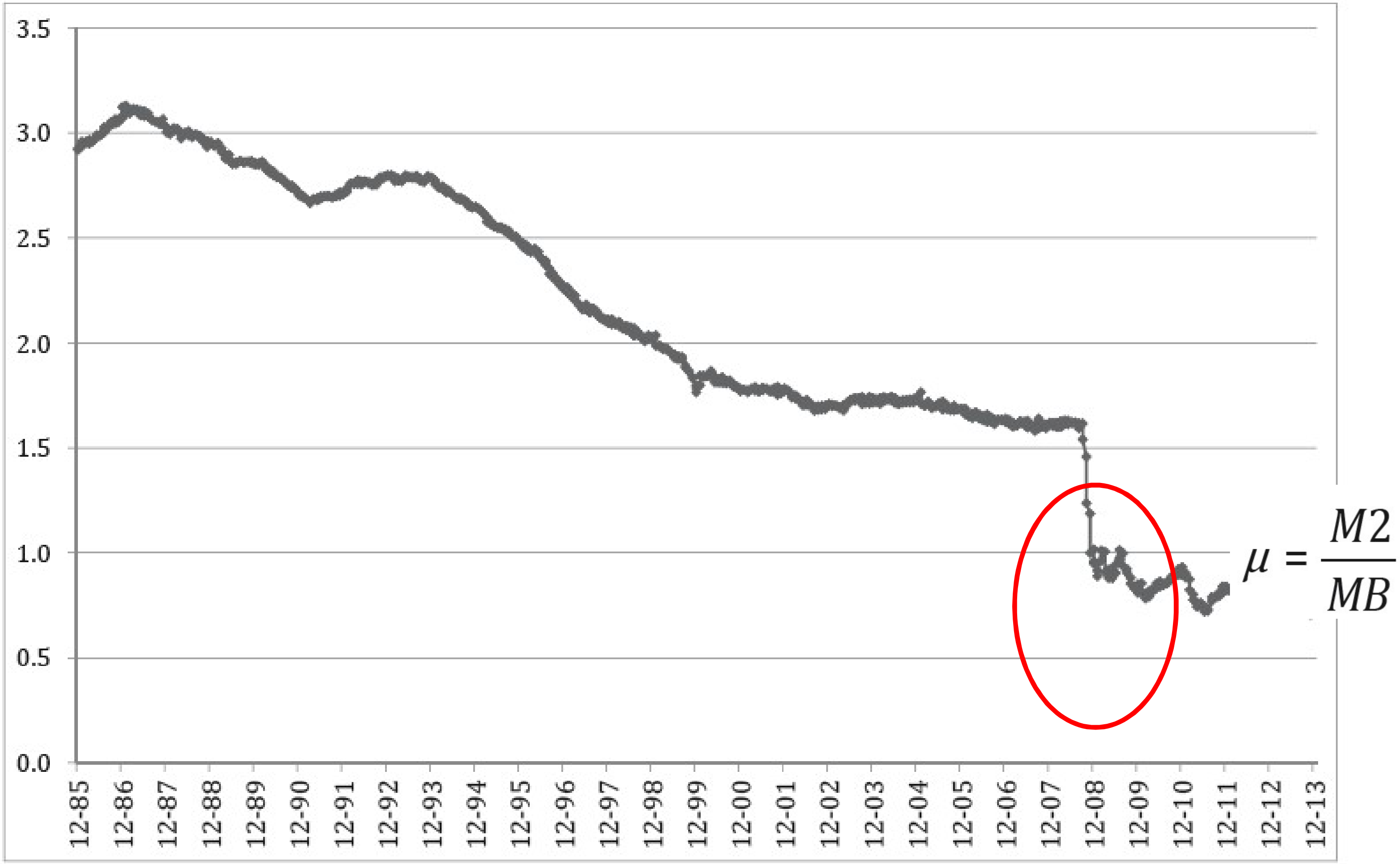
4. Monetary aggregates

Money mutliplier (2/2)

$$\mu = \frac{M2}{MB} = \frac{D + CU}{RE + CU} \cdot \frac{1/D}{1/D} = \frac{1 + cu}{cu + re}$$

µ	–	money multiplier
M	–	money supply
MB	–	monetary base
D	–	deposits
CU	–	currency
RE	–	reserves
cu	=	CU/D
re	=	RE/D

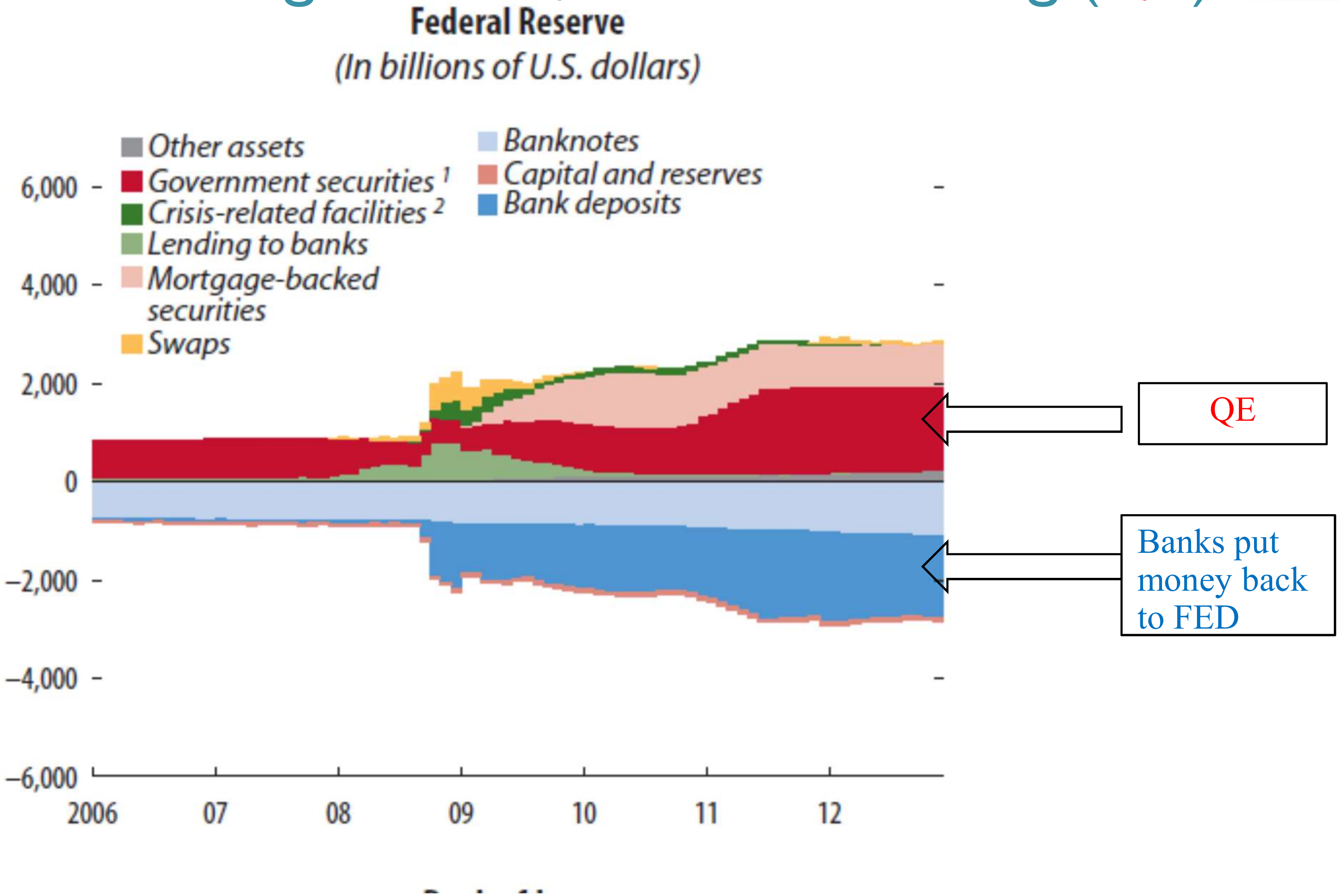
The fall of money mutliplier in the US in 2008…



- 3 reasons: 1)

4. Monetary aggregates

Printing money is not an appropriate word when talking about Quantitative Easing (QE)



Source: IMF (2013), Financial Stability Report, April 2013

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9. What is the Fisher equation?

5. Interest rates in theory

The Fisher equation

- ✓ The Fisher equation -> the nominal interest rate i equals the real interest rate i_r plus the expected rate of inflation π^e

$$i = i_r + \pi^e$$

- ✓ More precise formula:

$$i = i_r + \pi^e + (i_r \times \pi^e)$$

$$1 + i = (1 + i_r)(1 + \pi^e) = 1 + i_r + \pi^e + (i_r \times \pi^e)$$

Hyperinflation and happy debtors…

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:

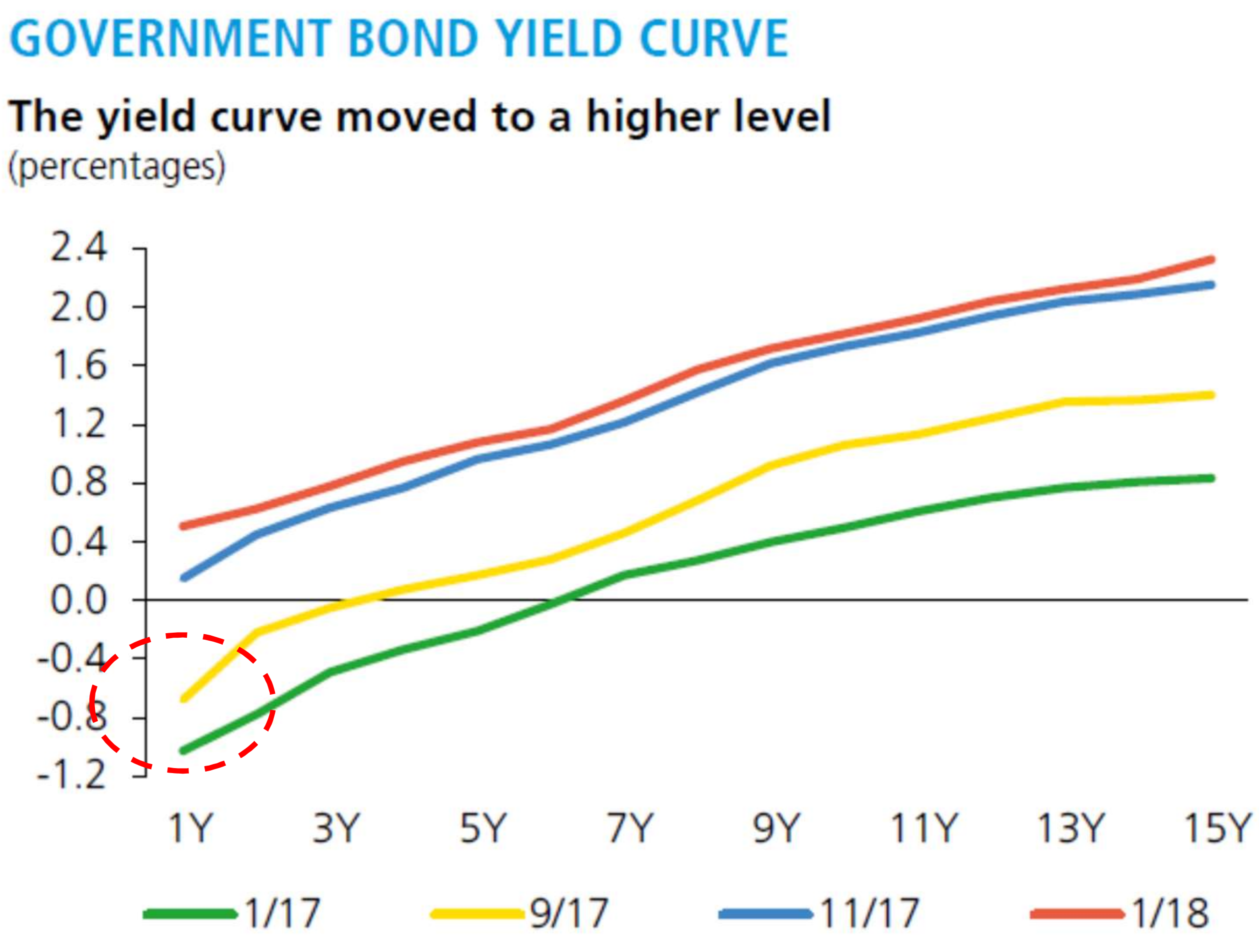
1) Changes in interest rates have a direct impact on bank revenue and the yield curve present the current market expectation of future interest rates.

2) The interest rate gap is sensitive to changes in the shape and slope of the yield curve.

3) Current and future trading strategy will impact interest rate risk exposure and therefore will take into account the shape and behaviour of the yield curve.

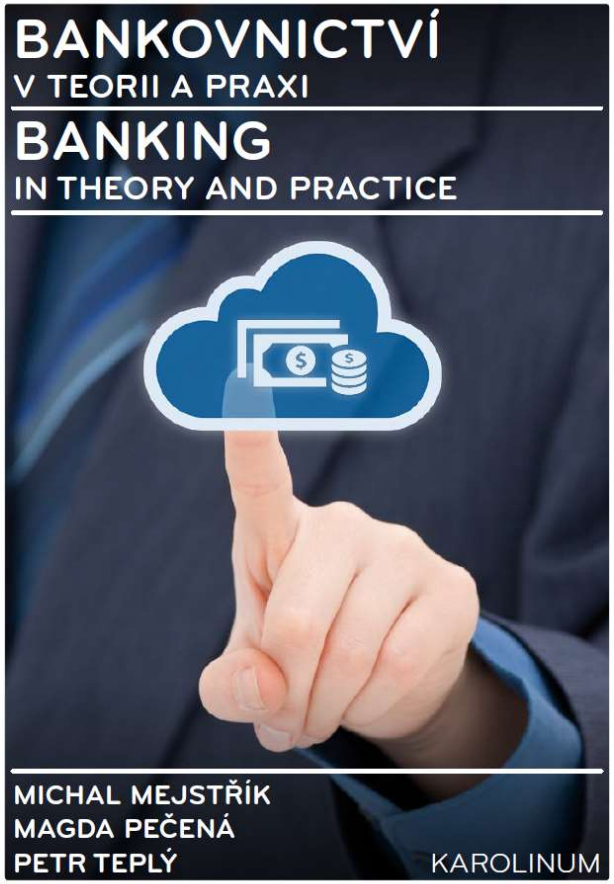
Source: Choudhry, M. (2007). Bank Asset and Liability Management: Strategy, Trading, Analysis. Wiley

Yield curves in practice (negative yields)!



Source: CNB (2018). Inflation Report I

Recommended reading



✓**Chapter III/Central banking**

Discussion

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

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