INTRODUCTORY BANKING

Lecture 3A – Money and interest rates
Petr Teplý

Institute of Economic Studies, Faculty of Social Sciences
Charles University, Czech Republic

4 March 2021

Key terms from Lecture III/Financial statements

o Bank´s balance sheet, and Profit&Loss (P&L) statement

o Profitability ratios (NIM, ROE, ROA, C/I)

o Market ratios (P/E ratio)

o Liquidity ratios (LCR, NSFR)

o Leverage ratios (capital adequacy ratios, „CAD")

o 4 functions of a bank: accepting deposits, granting loans, providing payments, maturity transformation

o Continental approach of corporate governance: Board of Directors, Supervisory Board (oversight and control), Senior Management

o Front Office, Middle Office, Back Office

Contents
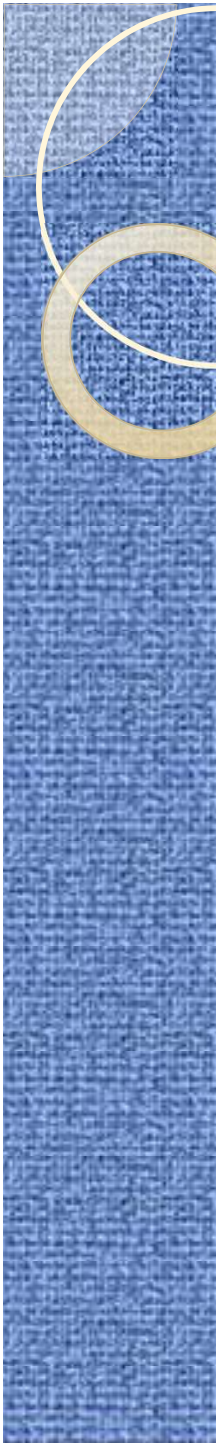
1. What is money?

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**
   o Virtual (crypto) currencies (BTC, Etherum etc.)

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

Theoretical vs empirical definition

Theoretical definition

o Money = an asset generally accepted for business transactions and used as a legal tender or for repaying debts.

o Wealth = the total collection of pieces of property that serve to store value.

o Income is a flow of earnings per unit of time (but money = stock)

Empirical definition

o Related to the need to predict economic variables, which are influenced by the amount of money (e.g. inflation).

o Covering monetary aggregates as well as money from the macroeconomic point of view

2. What are three function of money according to theoretical definition?

Three Functions of Money

1) ## Medium of Exchange

- ✓ Money used to pay for goods and services.
- ✓ Efficiency vs a barter economy (no money, transaction costs)

2) ## Unit of Account

- ✓ used to measure value in the economy/accounting

3) ## Store of Value

- ✓ a repository of purchasing power over time
- ✓ any asset— money, stocks, bonds, land, houses, art, or jewelry—can be used to store wealth
- ✓ money is the most liquid asset of all because it is the medium of exchange;

Money as legal tender for all debts

2. Basics of money
# 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	

Stability (left vertical axis)

Liquidity (right vertical axis)

- 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%)

High cash/GDP ratio in the Czech Republic compared to "cash-less" Sweden

(currency in circulation, percent of GDP, 2017)
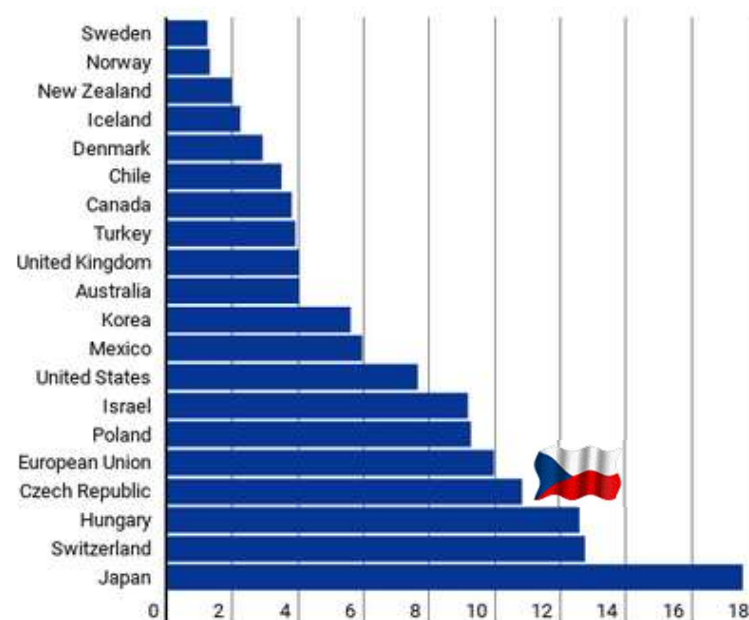
Source: National central banks.

o Limit for cash payments in the ČR = CZK 270,000 (approx. EUR 10,000) vs limits EUR 1,000-1,500 in the EU

Source: https://roklen24.cz/a/Sv4ee/bezhotovostni-cesta-do-urokoveho-zaporu-podle-mmf

Evolution of payments system

- ✓ **Commodity money**

  - o Things that have intrinsic value

- ✓ **Fiat Money**

  - o Value comes from government decree (or fiat)

  - o Covering monetary aggregates as well as money from the macroeconomic point of view

- ✓ **Checks**

  - o Instructions to the bank to take funds from your account and transfer those funds to the person or firm whose name is written in the "Pay to the Order of" line.

- ✓ **Electronic means of payments** (debit vs credit cards)

- ✓ **Digital money** (money as accounting items at banks)

- ✓ **Virtual currencies**

History of money and banking (1/2)

Date	Event	Place	Illustration
3000 BC	Barley money (Mesopotamia)		
640 BC	First coins (Lydia)		
10.century	First coins in the CR (Denar)		
1024	First banknotes (Wu Jiao)		
1118-1307	Templars (Bills of exchange)		
14.century	Early Banking (Medici)		

Source: Teplý, P. (2015). When will Google become the biggest global bank?, 9. 9. 2015

History of money and banking (2/2)

Date	Event	Place	Illustration
16. century	Schlick thaler (later named "dollar")		
1892	Koruna (crown) (Austro-Hungarian)		
1918	Koruna (Czechoslovak)		
1993	Koruna (Czech)		
2007+	Planet Ponzi (debt as source of econ. growth)		
2010+	Cloud banking (virtual money)		

Source: Teplý, P. (2015). When will Google become the biggest global bank?, 9. 9. 2015

3. Is a cash-to-total assets ratio of a commercial bank low or high?

1. Basics of money
A low share of cash on commercial bank´s assets (<1%, no 'real' money in banks)

Commercial bank´s balance sheet

Assets	Liabilities
Cash	
Claims on central bank	**Deposits**
Securities	
Loans	**Interbank market**
	Capital
Other assets	

Currency in circulation increases at lower interest rates
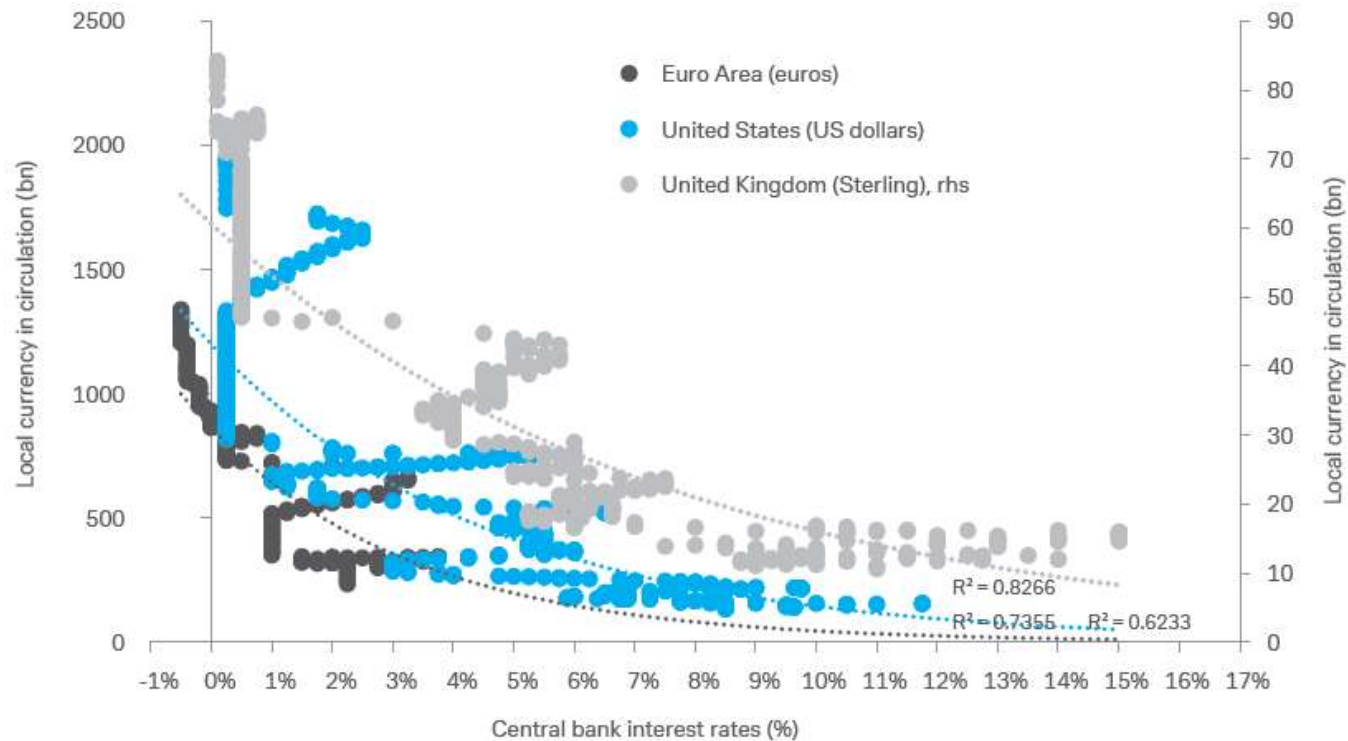
o Higher interest rates are necessary to bring the end of cash as a store of value.

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

4. What are four key functions of a bank?

Four main functions of a bank

1) accepting deposits → banks only

2) granting loans
3) providing payments ⎤ banks & nonbanks

4) maturity transformation* → banks only

o Payment as a combination of the exchange of information and money

o A bank as a family doctor (trust)

o Rising role of information/big data

Bank´s balance sheet

ASSETS	LIABILITIES	
Cash		3
Securities	Deposits	1
	+ maturity transfiormation	
		4
	+ maturity transfiormation	
Loans 2	Interbank market	
	Capital	
Other assets		
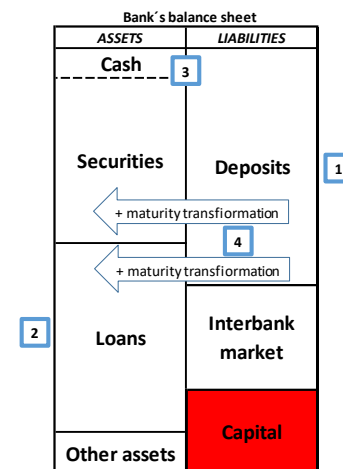
* Banks borrow short and lend long, i.e. from short-term depos they provide long-term loans and investments (=positive maturity transformation, unlike insurers that provide negative maturity transformation).

Revenues from payments (14% share on total global banking revenues)

Annual global banking revenues (in %)
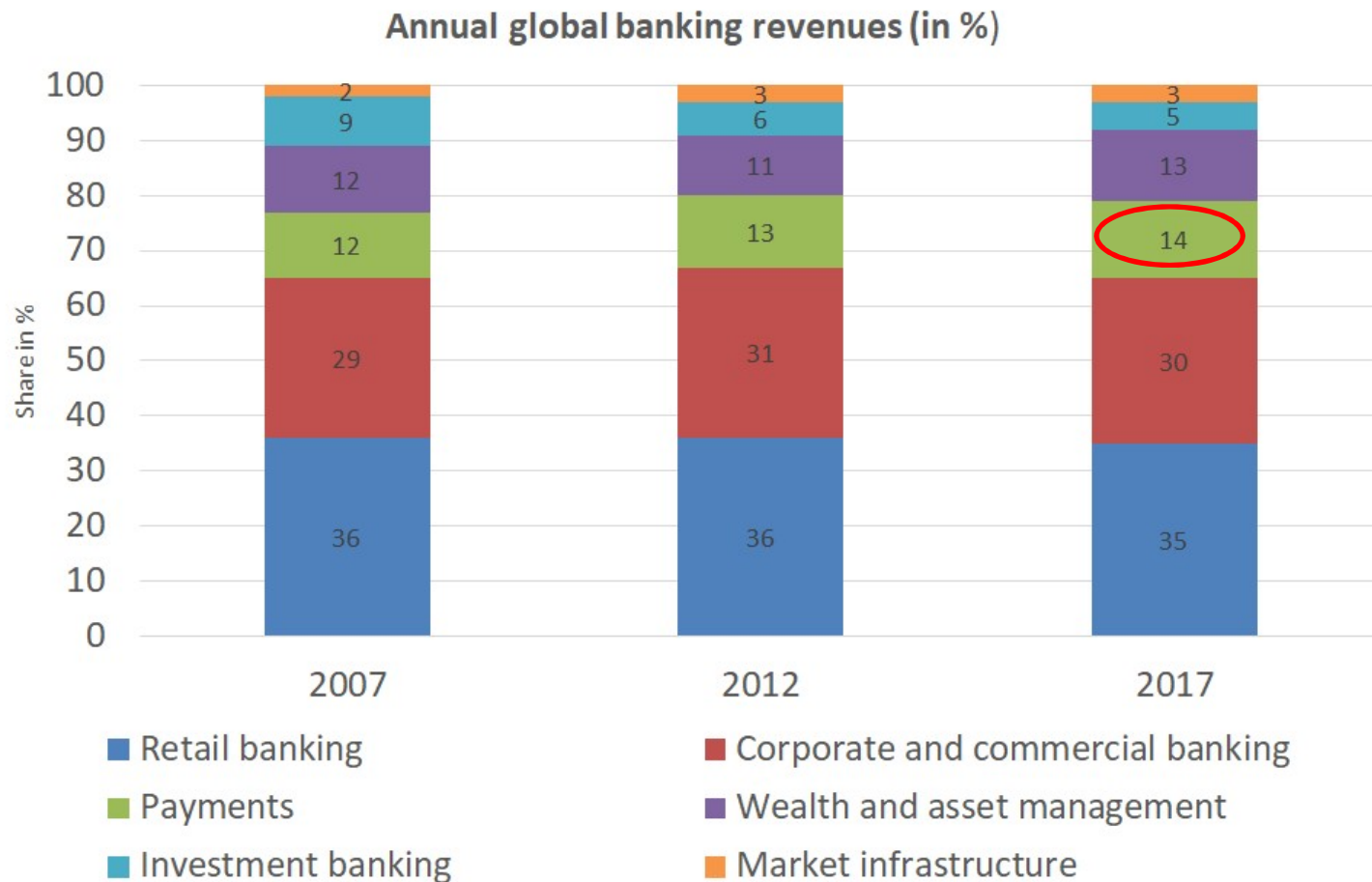
Source: Author based on McKinsey (2018). New rules for an old game: Banks in the changing world of financial intermediation

Note: Total global banking revenues in 2017: USD 5 trillion

The history of payment innovation – payments eras 1/2

o The evolution of the payments landscape can be largely categorised into three eras:

1) **eCommerce** enabling customers shopping online to directly pay with stored payment credentials: Paypal (1998))

2) **Mobile payments** typically allowing an individual to use their smartphone to store their credentials and make payments on the go: mPesa (2007)

3) **Context-based payment**s where payments become integrated into the broader customer action at hand such as getting from A to B or ordering coffee or food: Google Wallet/Android Pay (2011)

o Payments are increasingly becoming invisible to the primary customer

Source: ATKearney (2018). Towards an Internet of Payments — Global platforms redefining the payments landscape

Payments era

1958	1966	1973	1976	1994	1997
Visa	Mastercard	SWIFT	Apple	Amazon	BPAY

Contextual payments era
Mobile payments era
eCommerce era

2011	2010	2009	2007	2004	1999	1998
Google Wallet/ Android Pay	Nets	mPOS	Vocalink	Alipay	Alibaba	PayPal
	Paytm		mPesa	Facebook		Tencent
	TransferWise					Google

eCommerce era
Mobile payments era
Contextual payments era

2012	2013	2014	2015	2017	2018
Uber	MobilePay	Apple Pay	Vipps payment solution	Facebook payments	WhatsApp payments
Swish mobile payments	WeChat Pay				

Source: ATKearney (2018). Towards an Internet of Payments — Global platforms redefining the payments landscape

22

Shifts in payment dimensions
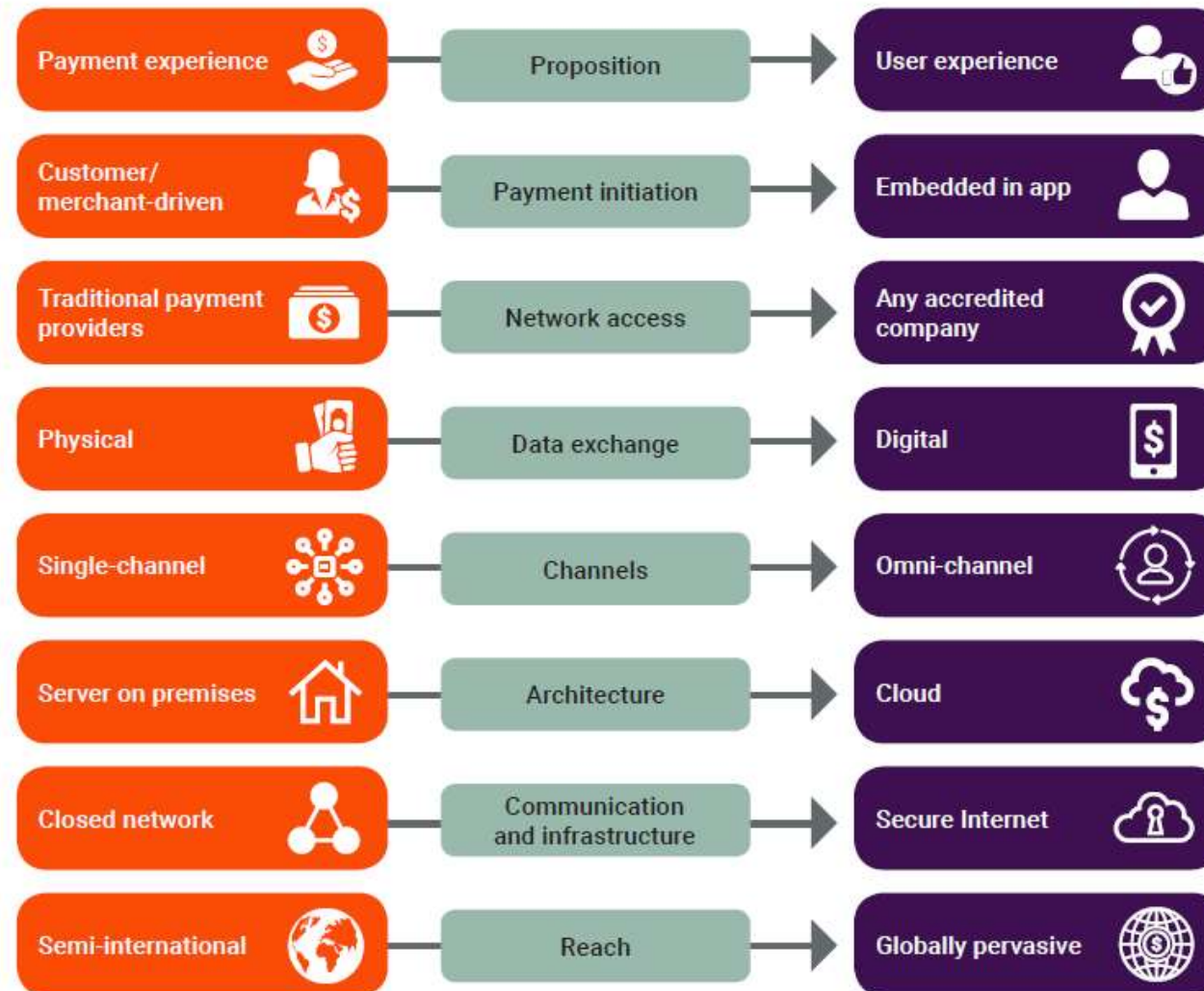
Payment experience	Proposition	User experience
Customer/merchant-driven	Payment initiation	Embedded in app
Traditional payment providers	Network access	Any accredited company
Physical	Data exchange	Digital
Single-channel	Channels	Omni-channel
Server on premises	Architecture	Cloud
Closed network	Communication and infrastructure	Secure Internet
Semi-international	Reach	Globally pervasive

Source: ATKearney (2018). Towards an Internet of Payments — Global platforms redefining the payments landscape

Speed of adoption: time it takes to reach 50 million users

Technology	Time
Airlines	64 years
Automobiles	62 years
Telephone	50 years
Electricity	46 years
Credit Cards	28 years
Television	22 years
ATMs	18 years
Computers	14 years
Mobile Phones	12 years
Internet	7 years
Facebook	4 years
WeChat	1 year
Pokemon Go	19 days
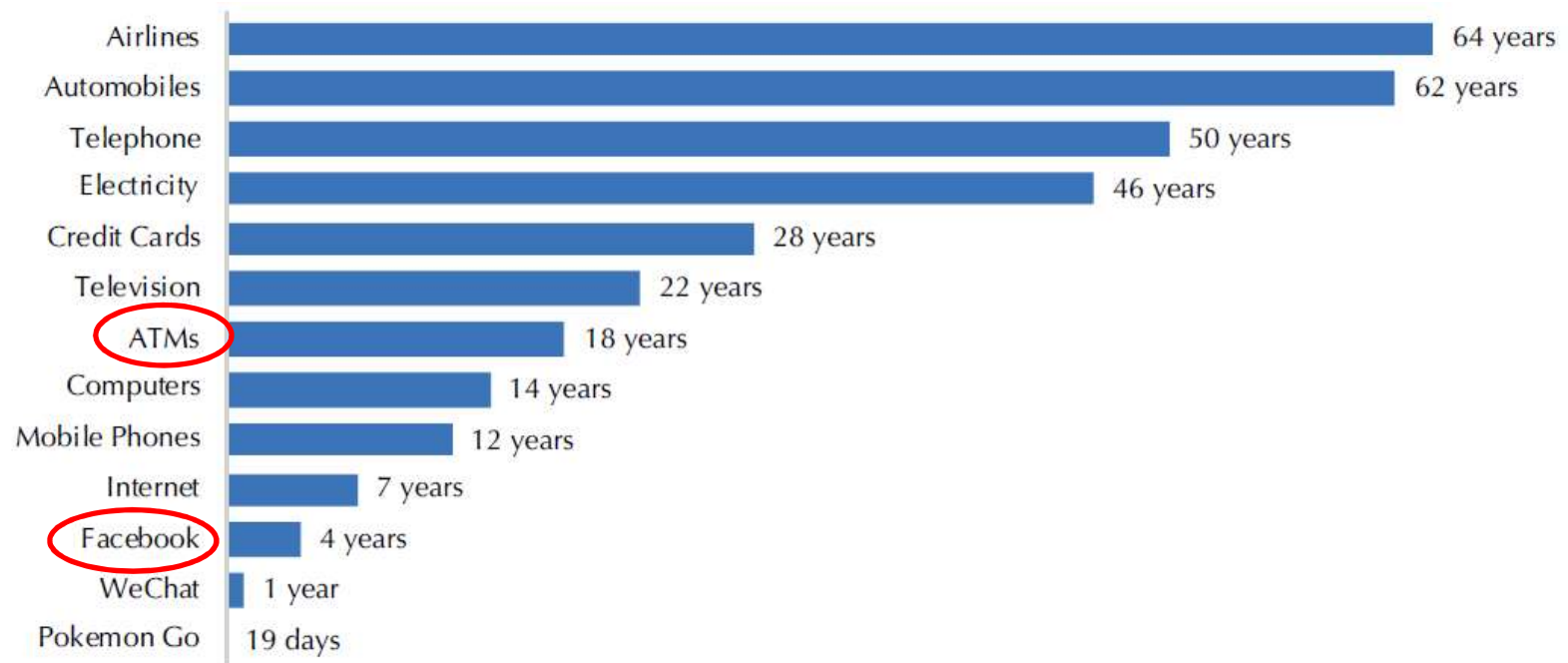
Source: Banking Disrupted? Financial Intermediation in an Era of Transformational Technology
Note: ATM = Automated Teller Machine (firstly installed in London in 1967)

24

Contents

Three basic theories of money creation/banking

1) Financial intermediation theory
2) Fractional reserve theory
3) Credit creation theory

5. Which theory of money creation is true?

1.Financial intermediation

- **only the banking system as a whole can collectively create money**.

- each individual bank is a mere financial intermediary, gathering deposits and providing loans.

- **regulation is possible**: reserve requirements, capital adequacy or interest rate regulations.

- Keynes (1936), Baltensperger (1980); Diamond and Dybvig (1983), Dewatripont, Rochet, & Tirole, (2010), Krugman (2015)

2. Fractional reserve theory of banking

- each individual bank is a financial intermediary without the power to create money

- **the banking system collectively is able to create money** through the process of 'multiple deposit expansion' (through **the money multiplier**)

- a bank needs to gather the funds first, before it can extend bank loans

- Hayek (1929), Phillips (1920), Samuelson and Nordhaus (1995), Stiglitz (1997)

3. Credit creation theory of banking

TRUE

o at odds with the other two theories by representing banks not as financial intermediaries

o **each bank can individually create money 'out of nothing' through accounting operations** (when extending loan or purchasing assets).

o Macleod (1856), Wicksell (1898), Schumpeter (1954), Moore (1988), Werner (1992, 2016)

o Werner (2016) shows on a case study of Raiffeisenbank that **this theory is true**

Contents

|	
1.	Basics of money
2.	Basic theories of money creation
3.	Virtual Currencies
4.	Measuring Interest Rates

Virtual currencies

✓ **A virtual (crypto) currency** = 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.

✓ **Bitcoin** (BTC) is a stateless, virtual and peer-to-peer currency, based on blockchain/distributive ledger technology (2009: founder Satoshi Nakamoto)

✓ it exists only digitally and associated with no sovereign, central bank or bank payments system.

✓ BTC is illiquid, extremely volatile and often caricatured (used by criminals etc.).

✓ BTC lacks trust and can be "easily" robbed (unlike central banks) such as Mt. Gox, Bitcoin exchange in Tokyo (2014) or Bitfinex (2016)

Ccryptocurriencies in a broader context
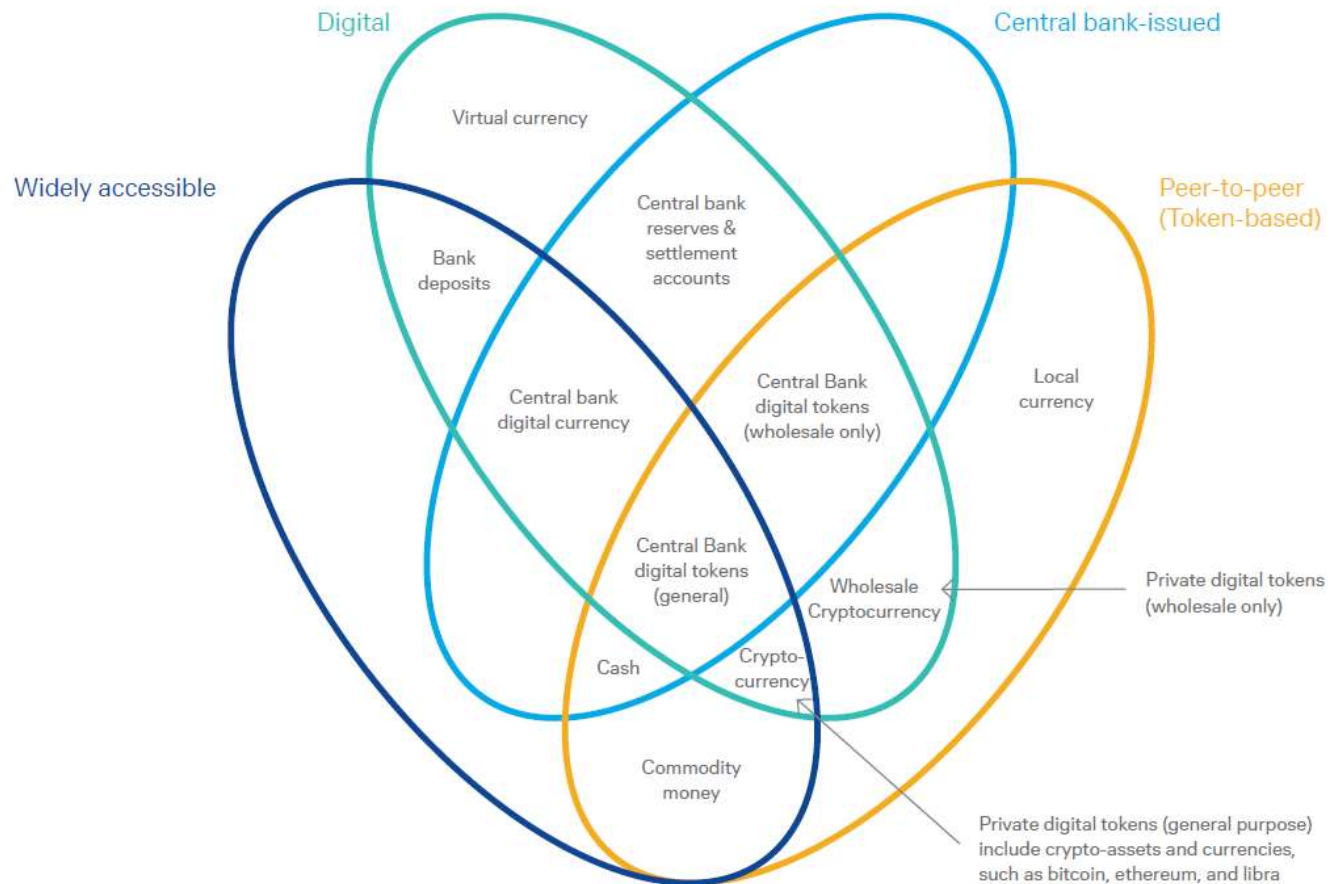
Source: Deutsche Bank (2020). The Future of Payments. Part I

6. Did Bitcoin have a market capitalization higher or lower than the most valuable global bank JPMorgan Chase in February 2021?

2. Virtual currencies
Largest banks and cryptocurrencies by market capitaliazation

Rank	Name		Market Cap	Price	Today	Price (30 days)	Country
-	Bitcoin	BTC	$911.95 B	$49,052	12.62%	* be your own bank ** not ranked	UN Worldwide
1	JPMorgan Chase	JPM	$456.17 B	$149.49	1.58%		US USA
2	Bank of America	BAC	$306.90 B	$35.55	2.42%		US USA
3	ICBC	1398.HK	$279.50 B	$0.65	-0.40%		CN China
4	China Construction Bank	CICHY	$200.62 B	$15.80	-1.62%		CN China
-	Ethereum	ETH	$177.50 B	$1,544	14.69%	* be your own bank ** not ranked	UN Worldwide
5	Agricultural Bank of China	ACGBY	$170.07 B	$8.96	-1.21%		CN China

Source: https://companiesmarketcap.com/banks/largest-banks-by-market-cap/

BTC transaction

How a bitcoin transaction is processed

2 This and other pending transactions are broadcast on the global bitcoin network.

4 Miners process the block, reaching a consensus on what the new "blockchain" should look like.

6 Miners disseminate the new blockchain to the entire network, recording the transactions in the latest block.

...Transaction 345E4K...

...763 HME... # ...34N 6FB6... #

1 Payers initiate a bitcoin payment using third-party "wallet" software.

3 Every ten minutes or so, specialised computers on this network, known as "miners", collect a few hundred transactions and combine them in a "block".

5 Miners are rewarded with newly minted bitcoin for providing vast amounts of computing power– giving them a stake in the smooth function- ing of the currency.

7 The payee can use his wallet software to see whether the bitcoin has arrived.

Economist.com

Source: http://www.economist.com/news/special-report/21650295-or-it-next-big-thing

7. Does Bitcoin fulfill all three functions of money?

BTC is too volatile to be a reliable store of value
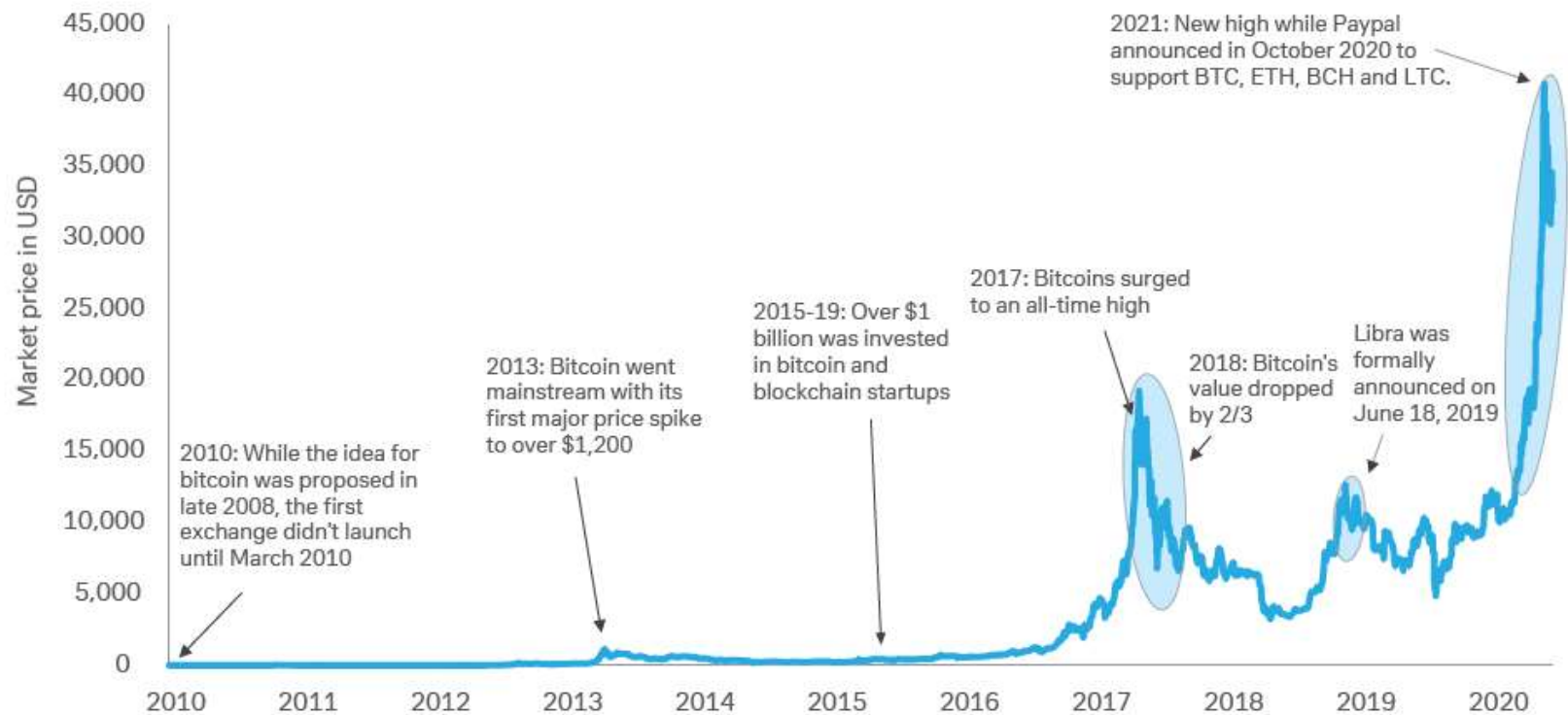
Source: Deutsche Bank (2021). The Future of Payments. Part II

Who does not like BTC?

- o **Governments** (taxes, criminality)
- o **Central bankers** (money cration process of out their control)
- o **Financial insitutions** (Western Union: payment transfer fees)
- o **Banks** (fees, keeping "out-of-fashion" cheques")

✓ Bitcoin is an innovation and a product of the recent 'virtual' word, it creates own 'Bitcoin Planet'

✓ Bitcoin is based on <u>blockchain, what is promising technology</u>!

Main appeals of BTC

✓ **Retail clients**

- o cheapness of peer-to-peer fund transfers

- o interaction of emerging markets with „the world" (vs Western Union and banks)

✓ **Corporates**

- o low transaction costs from a peer-to-peer payments system,

- o the potential brand recognition from trialing a new technology.

✓ **Investors**

- o potential long-term price rise due to limited supply

Who does not like BTC?

o **Governments** (taxes, criminality)

o **Central bankers** (money cration process of out their control)

o **Financial insitutions** (Western Union: payment transfer fees)

o **Banks** (fees, keeping "out-of-fashion" cheques")

✓ Bitcoin is an innovation and a product of the recent 'virtual' word, it creates own 'Bitcoin Planet'

✓ Bitcoin is based on <u>blockchain*, what is promising technology</u>!

Source: Blockchain - software that enables data sharing across a network of individual computers (distributed ledger technology, DLT)

8. What is Facebook´s Diem?

Facebook´s Diem (Libra until 2020)

- ✓ Libra is a permissioned blockchain digital currency backed by a basket of fiat currencies (the permissioned blockchain)

- ✓ Huge potential: more than 2 billion users (electronic Diem wallet also for the unbankable population)

- ✓ For its success, it needs to be accepted by merchants and in shops and online stores as legal tender

- ✓ Threat for banks: lower payments and deposits, lost of primary bank accounts of clients (if wages are in Diem)

- ✓ The risk of low rates of merchant and consumer adoption with the threat of regulatory action -> challenges

  1) FX risk: currency wallet vs WeChat/WePay (renminbi)

  2) Regulation: Anti-Money Laundering (AML) & Know Your Customer (KYC) Compliance

Source: Oliver Wyman (2019). Libra Faces Big Challenges. Does It Need a Rework?, updated 43

Reading 1 – Diem/Libra

Digital currencies

Facebook's Libra currency to launch next year in limited format

Long-awaited project to arrive as soon as January, with just one dollar-backed coin

Libra's exact launch date will depend on when the project receives approval to operate as a payments service © FT montage/Reuters/AFP

Contents

1.	Basics of money
2.	Basic theories of money creation
3.	Virtual Currencies
4.	Measuring Interest Rates

9. What is the concept of the present value about?

Present Value (PV)

✓ The concept of the present value (PV) is one of the key concepts in finance. **The value of the crown is higher today than tomorrow.** The aim of the PV is to estimate a value of assets such as projects, bonds and stocks.

$$PV(I_0) = \sum_{t=1}^{N} \frac{CF_t}{(1+r)^t}$$

$PV(I_0)$ – present value of investment at time 0

CF_t – cash flow from investment at time t
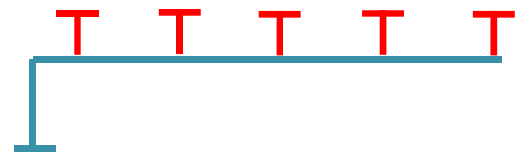
r – discount rate

Four Types of Credit Market Instruments
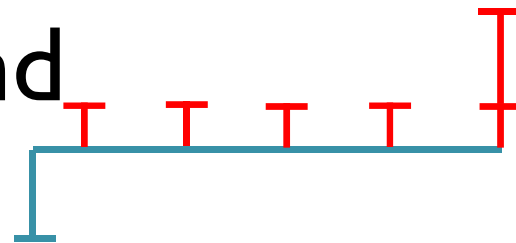
1. Simple loan

2. Fixed-payment loan contract

3. Coupon bond

4. Discount bond (zero-coupon bond)

48

1. Simple loan

- ✓ The principal (loan value) and interest are paid on the maturity day,

- ✓ For example on January 1 a bank grants a loan of CZK 100 and requires a repayment of CZK 105 on 31 August, including both the repayment of the principal and the payment of interest.

- ✓ This form can take a short term-commercial loan or various instruments of the money market.

Source: Mejstrik et al. (2008)

2. Fixed-payment loan contract

✓ The borrower (contract issuer) receives from the lender (contract buyer) a specified amount of funds (loan value) and, in return, makes periodic fixed payments to the lender until a specified maturity date.

✓ E.g. a mortgage (anuity: regular installments)

$$PV(I_0) = C\left[\frac{1}{r} - \frac{1}{r(1+r)^T}\right]$$

PV – present value of installments
C – anuity
r – interest rate
T – maturity

3. Coupon bond

✓ The borrower (bond issuer) agrees to pay the lender (bond buyer) coupon payment, C, (which is usually a fixed amount) on a periodic basis until a specified maturity date, at which time the borrower must also pay the lender the face value (or par value, M) of the bond

$$P = \sum_{t=1}^{T} \frac{C_t}{(1+r)^t} + \frac{M}{(1+r)^T}$$

P – present value of the bond
C – coupon
r – interest rate
T – maturity

Source: Mejstrik et al. (2008)

4. Discount bond (zero-coupon bond)

✓ The borrower (bond issuer) immediately receives from the lender (bond buyer) the purchase price (P) of the bond, which is less than the face value (M) of the bond. In return, the borrower promises that, at the bond's maturity date, he will pay the lender the face value (M) of the bond.
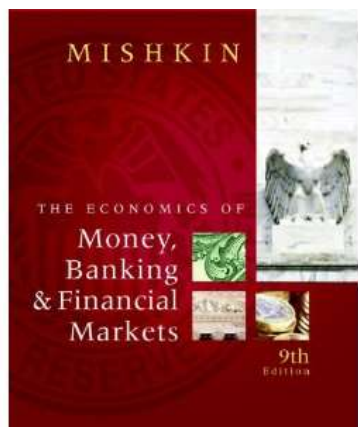
✓ Money market/Treasury bonds

$$P = \frac{M}{(1+r)^T}$$

Discussion

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

Recommended reading

✓ **Chapter 3/Basics of money**

✓ **Chapter 4/ Understanding Interest Rates**

✓ **Chapter 1/ Basic terms of financial markets**

✓ **Chapter 1.T/Financial mathematics**

Contact

Prof. PhDr. Petr Teplý, Ph.D.

Professor of Finance

Institute of Economic Studies

Faculty of Social Sciences

Charles University

Opletalova 26

110 00 Prague

Czech Republic

Tel: +420 222 112 326

e-mail: teply@fsv.cuni.cz

http://ies.fsv.cuni.cz