

Blockchain & Money



Class 15

November 6, 2018

Class 15 Overview

- Readings and Study Questions
- Fiat Currency and Central Banking
- Central Banking Approaches to Blockchain Technology
- Payment System and Blockchain Technology Initiatives
- Central Bank Digital Currency and the ‘Money Flower’
- Conclusions

Class 15 (11/6): Study Questions

- What strategic considerations should go into Central Banks thinking of expanding access to digital reserves through central bank digital currency (CBDC)?
- How might design considerations – retail vs wholesale access; token or account based; interest bearing and level of service – weigh in such decisions?
- What are the challenges CBDCs might pose to commercial banking models, monetary policy implementation, payment systems resilience and financial stability?

Class 15 (11/6): Readings

- *'Central Bank Digital Currencies'* BIS
- *'The Future of Money: Digital Currency'* Garratt
- *'Central Banks and Digital Currencies'* Broadbent
- *'A Perspective on electronic alternatives to traditional currencies'* Camera
- *'Bitcoin is Fiat Money, Too'* Economist

Guest – Robleh Ali



- *Research Scientist at the Digital Currency Initiative working on how to reform the financial system through digitizing fiat currencies and the role of central banks in such a system*
- *Before MIT, he was Manager, Digital Currencies at the Bank of England, where he led the research into central bank issued digital currency*

Guest – Simon Johnson



- *Ronald A. Kurtz Professor of Entrepreneurship at the MIT Sloan School of Management, head of the Global Economics and Management group and chair of the Sloan Fellows MBA Program Committee*
- *Advisor to Digital Currency Initiative and Founder/Sponsor of MIT Blockchain Seminar*
- *Senior Fellow, Peterson Institute*
- *Former Chief Economist, IMF*

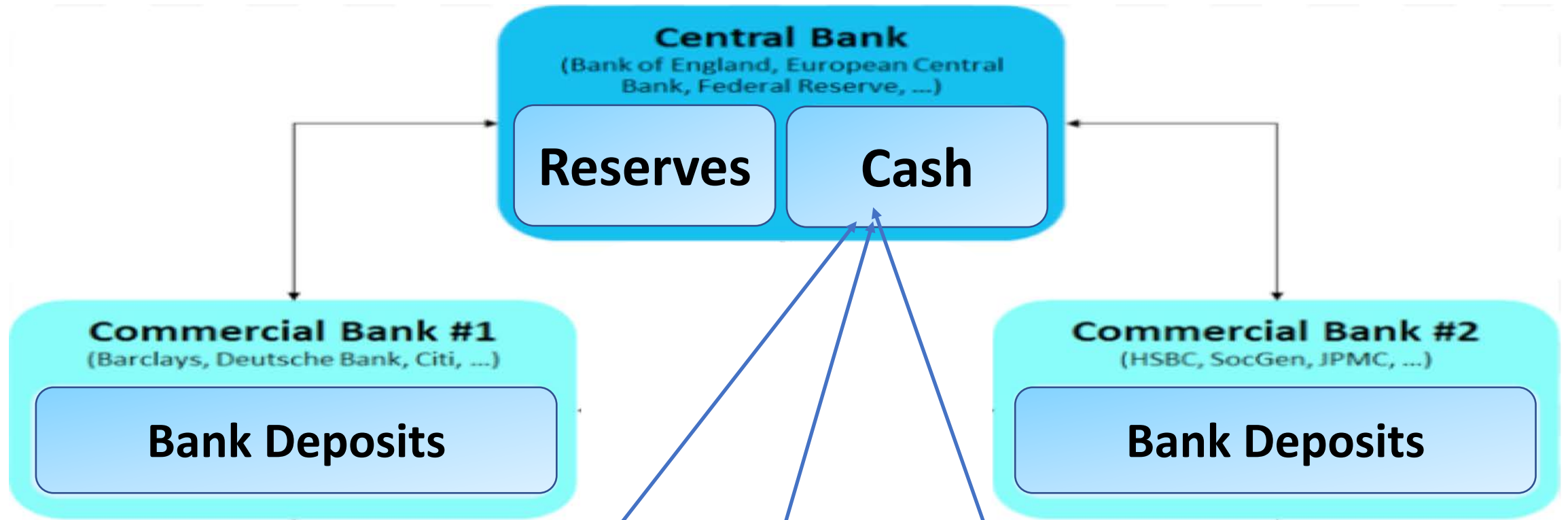
Fiat Currency

- Represented by Central Bank Notes & Commercial Bank Deposits
- Relies upon System of Ledgers
- Accepted for Taxes
- Legal Tender for All Debts Public & Private

Central Bank and Commercial Bank Ledgers

(Reserves & Cash)

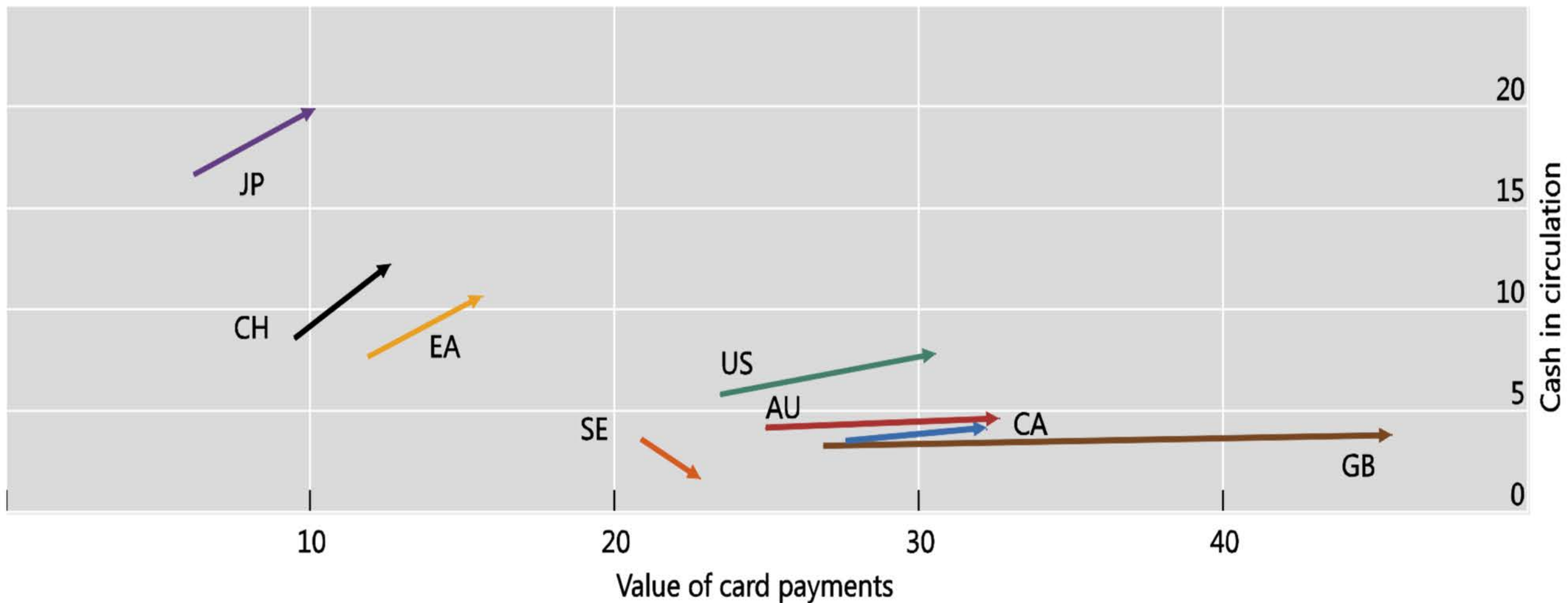
(Bank Deposits)



Card payments and cash demand, change 2007–16¹

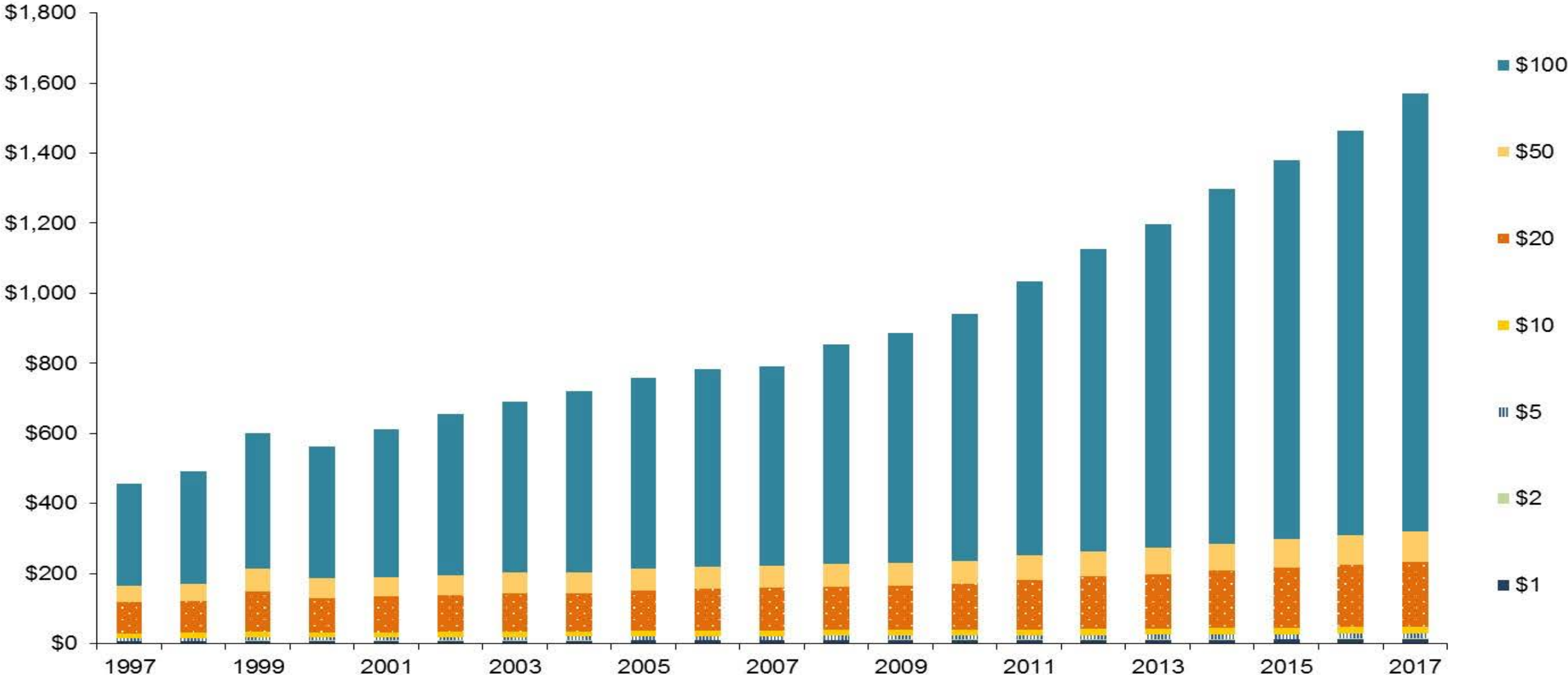
Graph 2

As a percentage of GDP



¹ The start of an arrow represents 2007 data while the end represent 2016

Value of Currency in Circulation*
(Billions of dollars, as of December 31 of each year)



*Includes Federal Reserve notes, U.S. notes, and currency no longer issued, but does not include denominations larger than the \$100 denomination.

Courtesy of the [Federal Reserve](#) and is in the public domain.

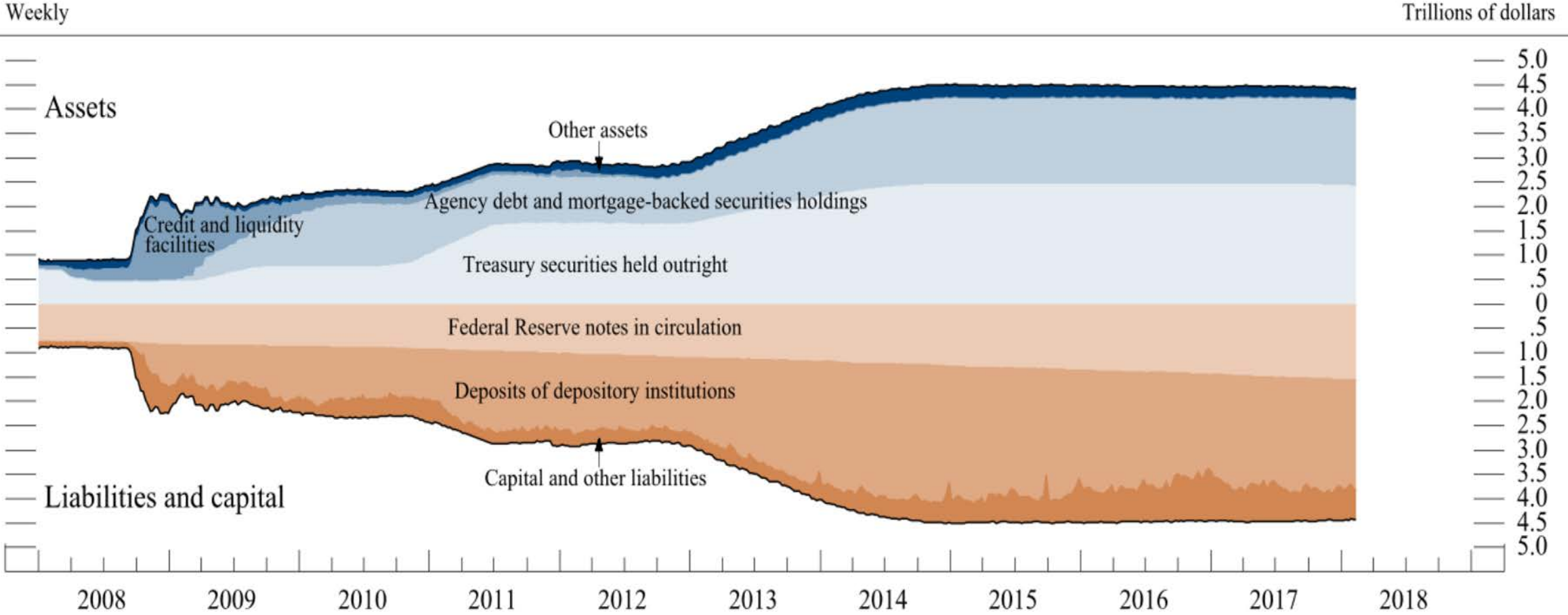
Central Banking Goals and Functions

- Economic Policy Goals
 - e.g. U.S. Federal Reserve so-called 'Dual Mandate':
"promote effectively the goals of maximum employment, stable prices, and moderate long term interest rates"
- Manage Fiat Currency
 - Supply
 - Physical Cash and Monetary Base
 - Reserve and Capital Requirements
 - Price
 - Interest Rate Open Market Operations
 - Foreign Exchange Interventions
 - Exchange Controls

Central Banking Goals and Functions

- **Oversee Fractional Banking System**
 - Provide Reserves
 - Regulate and Supervise Banking System
 - Promote Safe and Efficient Payment System
 - Lender of Last Resort
- **Banker to the Government**
 - Manage Foreign Exchange Reserves
 - Conduct Government Bond Auctions
 - Lender of Last Resort

U.S. Federal Reserve Balance Sheet



Note: As of 10/31/18, Treasuries \$2.3, MBS \$1.7, Federal Reserve Notes \$1.6, Bank Reserves \$1.8 & Treasury Reserves \$0.4

Courtesy of the Federal Reserve and is in the public domain.

Central Banks, Cryptocurrencies, and Blockchain Technology

- Monitor and Study
- Restrict Use
- Payment System Experimentation
- Central Bank Digital Currency Initiatives

Payment System 'Pain Points'

- Costs
- Delayed Settlement
- Chargebacks
- Fraud
- Privacy
- Availability
- Financial Inclusion
- Cross Border Payments
- Centralization of Ledgers
- Complexity

Public Sector General Payments Initiatives

- European Union – Target Instant Payment Settlement & Payment System Directive II
- India – Immediate Payment Service
- U.K. – Updated Real-Time Gross Settlement system & Open Banking
- U.S. – Faster Payment Task Force

Central Bank Blockchain Technology Real Time Gross Settlement Initiatives

THE FIRST WAVE

Project Jasper 1  Canada  <ul style="list-style-type: none"> • RTGS PoC • Key issues: privacy & settlement finality 	Brazil 1  Brazil  <ul style="list-style-type: none"> • RTGS PoC • Key issue: privacy 	Project Ubin 1  Singapore  <ul style="list-style-type: none"> • RTGS PoC • Explored implications of production
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THE THIRD WAVE

Stella 2  Japan  Europe   <ul style="list-style-type: none"> • DvP PoCs 	Project Jasper 3*  Canada  <ul style="list-style-type: none"> • Will focus on the securities settlement process 	Project Ubin 3*  Singapore <div style="border: 1px solid black; padding: 2px;">Tech not announced</div> <ul style="list-style-type: none"> • Investing cross-border payments with DLT
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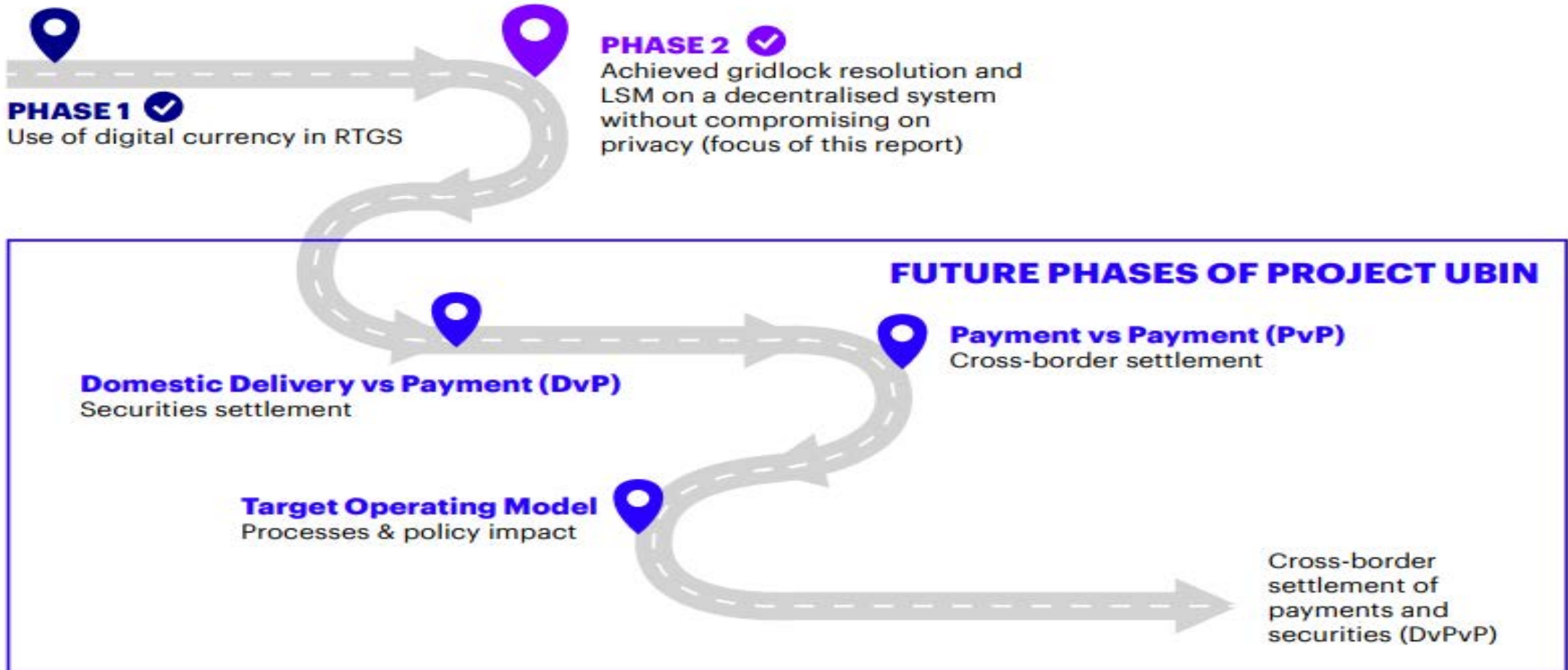


Brazil 2  Brazil   <ul style="list-style-type: none"> • Compared technologies • Privacy still a main challenge 	Project Jasper 2  Canada  <ul style="list-style-type: none"> • Evaluated scalability & flexibility of DLT prototype • Implemented LSMs 	Stella 1  Japan  Europe  <ul style="list-style-type: none"> • RTGS with LSMs PoC • Performance testing done 	Project Ubin 2  Singapore   <ul style="list-style-type: none"> • Compared technologies • Implemented LSMs 	Project Khokha  South Africa  <ul style="list-style-type: none"> • RTGS PoC • Evaluated performance in realistic setting • Achieved privacy with scalability
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THE SECOND WAVE

Singapore - Project Ubin

Project Ubin



Project Ubin - Phase 2



- Developed and Tested 3 Prototypes
 - Corda
 - Hyperledger Fabric
 - Quorum
- Against 6 Key Criteria
 - Digitization of Payments
 - Decentralized Processing
 - Payment Queue Handling
 - Privacy of Transactions
 - Settlement Finality
 - Liquidity Optimization

Central Bank Digital Currency

- Central Banks Currently Issue Digital Reserves to Commercial banks
 - And Physical Tokens (Cash and Coin) to Public
- Commercial Banks Provide Digital Currency (Deposits) to Public
 - Essentially a form of Intermediated CBDC
- Private Sector is Experimenting with Stable Value Tokens
- Strategic question: Should Direct Access to Digital Reserves be Expanded?

CBDC – Opportunities

- Continue Government Provision of a Means of Payment
- Promote Competition in Banking System
- Promote Financial Inclusion
- Address Payment System ‘Pain Points’
- For Some Nations, Avert Sanctions

CBDC – Blockchain Technology

- Fiat Currency is Recorded on Ledgers:
 - Central Bank and Commercial Bank Ledgers
 - Non-Bank Ledgers
- Verification and Networking Critical to Economics of Money

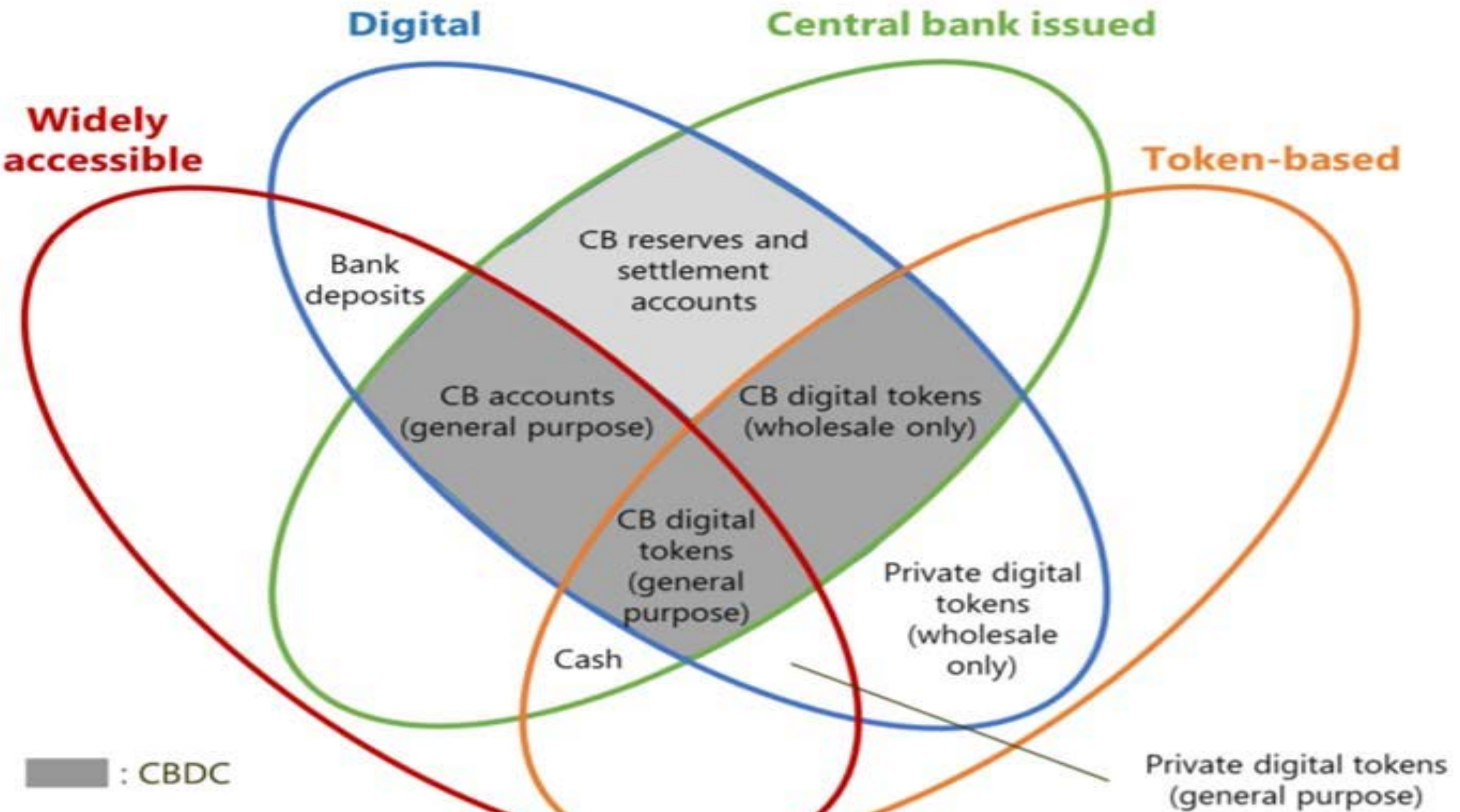
CBDC - Challenges & Uncertainties

- Financial Stability and Potential to Increase Ease of Bank Runs
- Changes to Commercial Banks' Deposits and Funding Models
- Effects on Credit Allocation and Economy
- Monetary Policy Implementation & Transmission
- Resilience of Open Payment Infrastructures

CBDC – Design Considerations

- Widely Accessible vs. Wholesale
- Token (e-Money) or Account (e-Deposit) based
- Issuer – Central Bank, Commercial Bank or Others
- Degree of Anonymity
- Transfer Mechanism
- Limits or Caps
- Interest Bearing and Level of Account Services

The Money Flower



Official Sector Digital Currency Initiatives

- Dubai – emCash project
- Ecuador - Dinero Electrónico - U.S. \$ electronic currency
- Iran – Indigenous Cryptocurrency backed by Iranian Rials
- Senegal - eCFA
- Sweden - E-Krona initiative
- Tunisia – e-Dinar
- U.K. – Royal Mint Gold
- Uruguay – 6 Month Pilot for Digital Uruguayan Peso
- Venezuela - Petro Oil backed Initial Coin Offering

Class 16 (11/8): Study Questions

- What lessons, if any, can be drawn from related experimentation – Ecuador, Senegal, Philippines - to date?
- Might stable value coins spur central banks into adopting CBDCs? What might Mastercard be considering with their patent for 'blockchain currency' fractional reserves?
- What recommendations would you have for Sweden's Riksbank (dating from 1668, the world's first central bank) for possible adoption of e-krona?

Class 16 (11/8): Readings

- *'The Riksbank e-krona project Action plan for 2018'* Sveriges Riksbank
- *'The World's first Central Bank Digital Currency Has Come – and Gone: Ecuador, 2014 - 2018'* Alt-M
- *'Stable Coins Analysis: Is there a Viable Vision for the Future?'* Coin Telegraph
- *'PH Moving to Test Digital Fiat Currencies with RCBC's e-Piso'* Entrepreneur
- *'eCurrency Mint Limited and Banque Regionale de Marches Launch New Digital Currency in Senegal'* Business Wire

Conclusions

- Central Banks Play an Important Role in Economy
- We Already Live in an Electronic Currency Age
- Payment Systems and Fiat Currency have had Challenges
- Blockchain Technology can be a Catalyst for Change
- Central Banks Monitoring Crypto Finance & Exploring Payment System Uses
- Central Bank Digital Currency debate focused on Opportunities & Challenges
- Central Bank Digital Currency, though, likely will be seen in Adoption



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