# Decentralized Finance (PHDBA297T4.)

## Introduction

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# What is Decentralized Finance?

**Traditional finance**

- **Permissioned**
  - Closed-source system, built on top of centralized databases
  - Needs approval & agreement for third-party to use & build on
- **Custodial**
  - Assets are custodied by licensed third-parties
- **Centralized trust & governance**
  - Single entity responsible for upgrade decisions & admin privileges
- **Real identity**
  - Users register with real identity, e.g., for KYC/AML compliance

**Decentralized finance**

- **Permissionless**
  - Open-source system; built on top of permissionless blockchains
  - Anyone can use/ interoperate or build on top without third-party approval & agreeement
- **Non-custodial**
  - Assets are not custodied by a single third-party
- **Decentralized trust & governance**
  - No single entity responsible for upgrade decisions & admin privileges
- **Pseudonymous**
  - Users usually do not provide real identities

# Why Decentralized Finance?

- ## Efficiency
  - Removing rent-seeking intermediaries

- ## Open finance & transparency
  - Inclusive, interoperable

- ## Automation & programmable

- ## Innovation
  - DeFi applications often are much simpler and faster to develop than CeFi counterparts
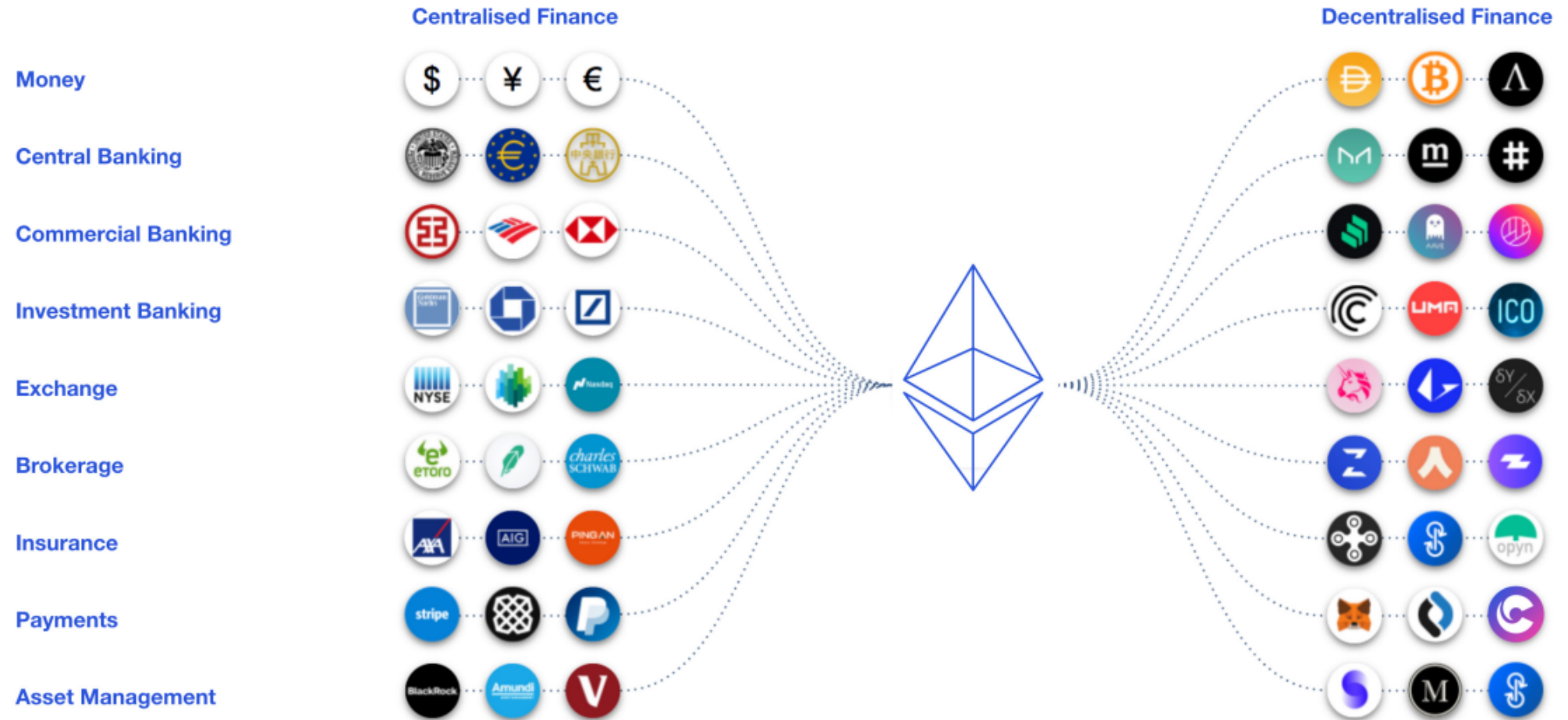    - E.g., Uniswap vs. CEX

# Fast Growth

# Centralized vs. Decentralized Finance



Credit: Consensys Codefi

# Course Overview

- Explore open research questions in DeFi

  - For each financial function, investigating CeFi & DeFi options:
    Is either one of these optimal? We will evaluate both through the lens of CS and finance. Is the application computable (efficiency, decidable), programmable (automatic)? Is the application welfare-enhancing and stable (not a source of systemic risk). How do the new and old systems interact?

- Intersection of Finance & Computer Science

  - Investigate through both lenses

# Course schedule (subject to change)

| Date | Topic |
| --- | --- |
| 04/01 | Introduction to traditional financial systems |
| 04/08 | Introduction to blockchain and smart contracts supporting DeFi applications |
| 04/15 | New ways to organize existing financial functions<br>Part I: Stable coins<br>Part II: DEX (decentralized exchanges) |
| 04/22 | New ways to organize existing financial products<br>Part I: Lending<br>Part II: Insurance |
| 04/29 | New ways to issue assets and trade risks: synthetics and derivatives, portfolio management |
| 05/06 | Auditable privacy; decentralized identity (DID); decentralized reputation; related regulation |
| 05/13 | Information markets: oracles, prediction markets, data market, data valuation, data tokenization |
| Bonus | Security issues and countermeasures in DeFi |

# Course Goals & Expectations

- First DeFi course

- Highly exploratory & experimental
  - Limited enrollment & participation (by instructor approval)
  - Comments & feedback welcome

- Identify open research questions & foster research projects in DeFi & intersection of CS & Finance

- Grading:
  - A short writeup on an open research question in this area
  - Due May 14