



# Financial Economics

## ECON2103

Lecture 9:

*Financial Regulation &  
Introduction to Cryptocurrency*

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# Introduction

In this lecture, we will explore the consequences of financial crisis and how government's safety net has been designed. Also, by studying the history of a central bank, we can learn how a central bank plays an important role in the economy. Later, as a new financial innovation, we will also learn about digital currency, and study the basic function of Bitcoins.

# Agenda

Introduction

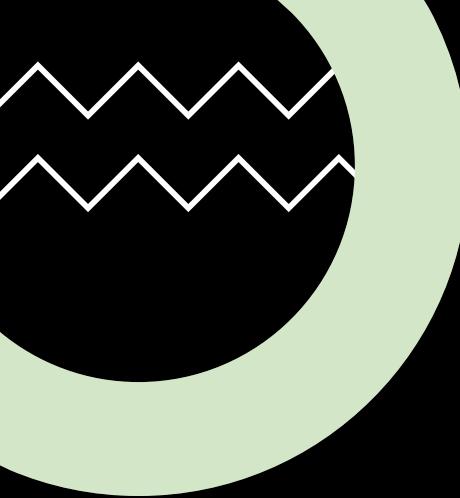
Topic one: Government safety net

Topic two: Government intervention

Topic three: Introduction to Cryptocurrency

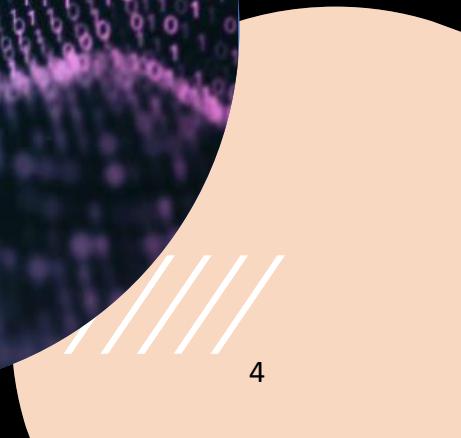
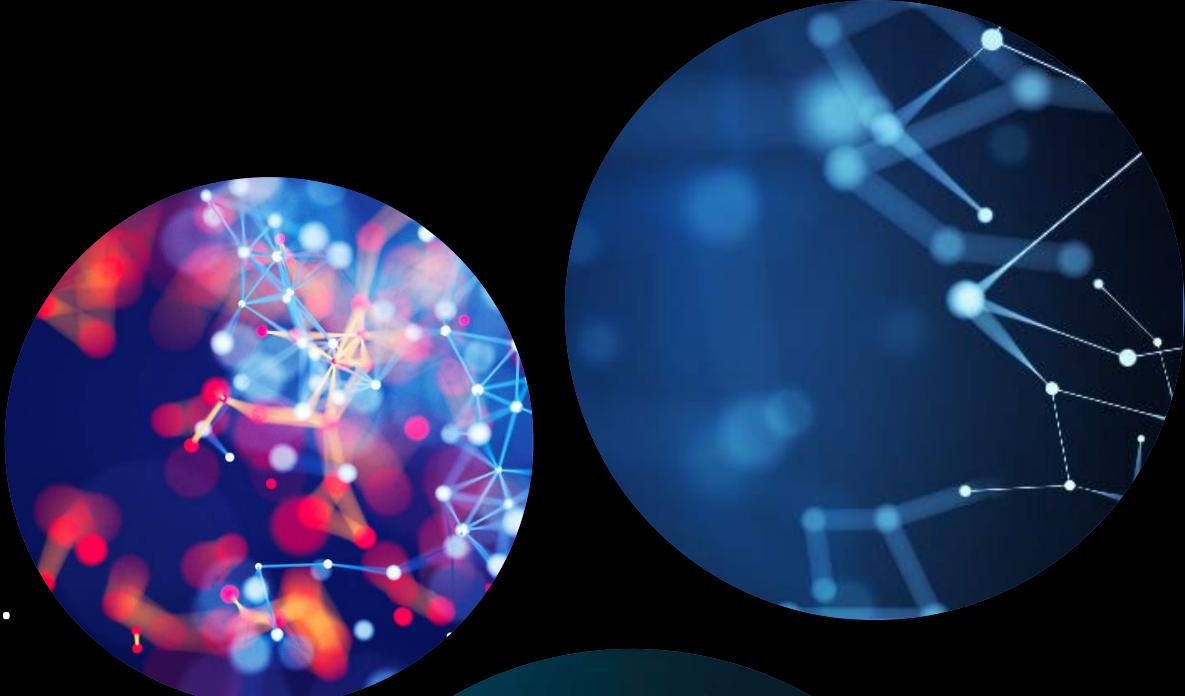
Summary





# Learning Objectives

- Identify the reasons for and forms of a government safety net in financial markets.
- List and summarize the types of financial regulation and how each reduces asymmetric information problems.
- Explore what a digital currency is.
- Study how Bitcoin works

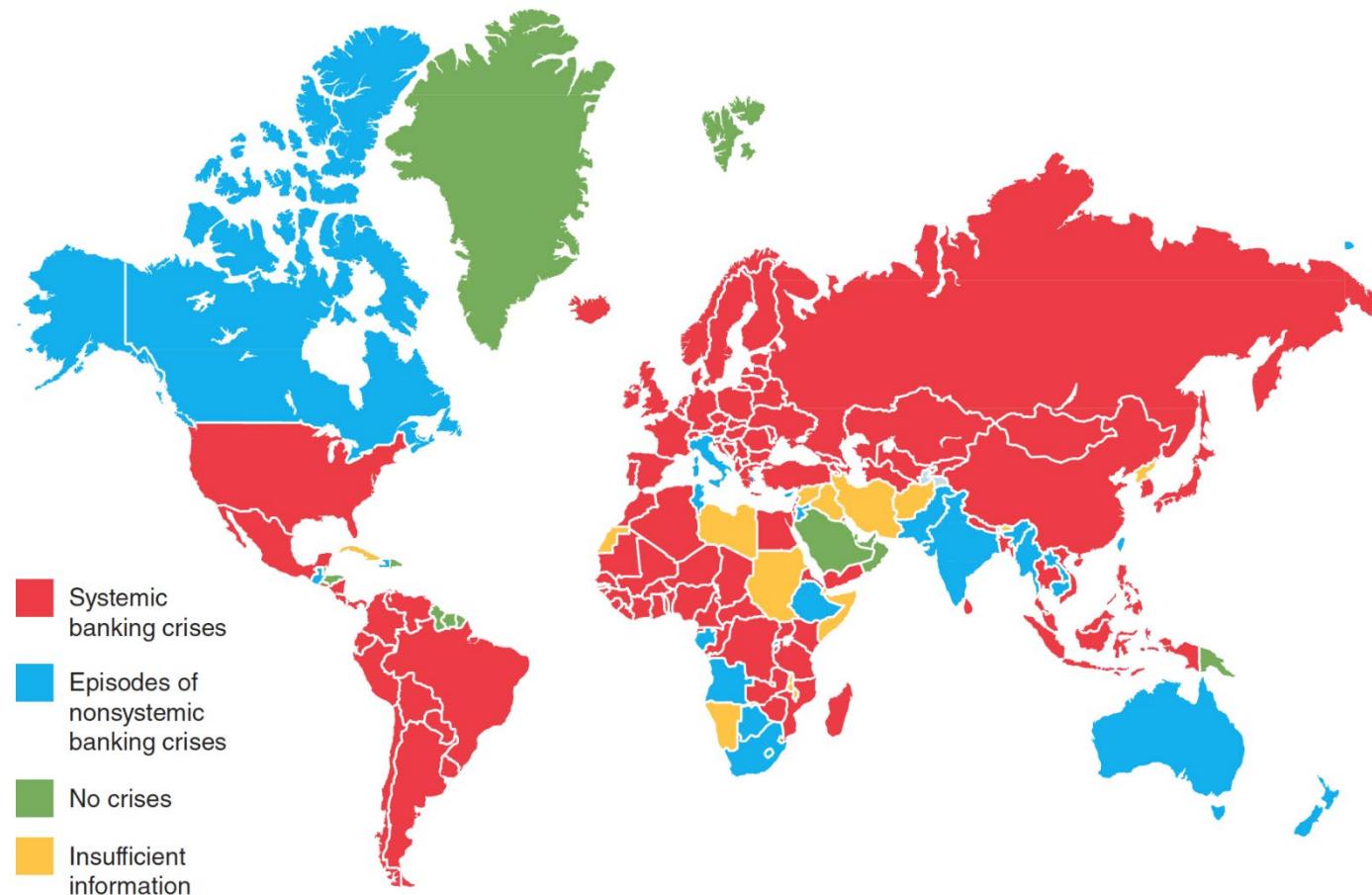


# Topic one

Government safety net



## Figure 2 Banking Crises Throughout the World Since 1970



Sources: Luc Laeven and Fabian Valencia, "Resolution of Banking Crises: The Good, the Bad and the Ugly," IMF Working Paper No. WP/10/46 (June 2010), and Luc Laeven, Banking Crisis Database at <http://www.luclaeven.com/Data.htm>.

# Origin of the central bank: the case of the US

- **Resistance to establishment of a central bank**
  - Fear of centralized power
  - Distrust of moneyed interests
- **No lender of last resort**
  - Nationwide bank panics on a regular basis
  - Panic of 1907 so severe that the public was convinced a central bank was needed



*Crowd on Wall Street during the Panic of 1907. (Photo: New York Public Library via Wikimedia Commons)*

# Asymmetric Information as a Rationale for Financial Regulation

- Bank panics and the need for deposit insurance:
  - FDIC (Federal Deposit Insurance Corporation): short circuits bank failures and contagion effect
  - Australian Government Deposit Guarantee Scheme (AGDGS): Introduced in October 2008 in response to the global financial crisis and is designed to provide protection to depositors in Australian banks, and credit unions.
- Other form of government safety net:
  - Lending from the central bank to troubled institutions (lender of last resort)

# “Too Big to Fail”

- **Moral Hazard & Adverse Selection**
  - Financial institutions have an incentive to take on greater risk
  - Risk-lovers find banking attractive
- Government provides guarantees of repayment to large uninsured creditors of the largest financial institutions even when they are not entitled to this guarantee.
- Increases moral hazard incentives for big banks
- Larger and more complex financial institutions pose challenges for regulatory oversight due to their scale and interconnectedness.

# Macroprudential Vs. Microprudential Supervision

- Before the global financial crisis, the regulatory authorities engaged in **microprudential supervision**, which is focused on the safety and soundness of *individual* financial institutions.
- The global financial crisis has made it clear that there is a need for **macroprudential supervision**, which focuses on the safety and soundness of the financial system *in the aggregate*.

# Topic two

Government Intervention



# Short-Term Responses and Recovery

- Financial bailouts aim to save financial sectors and to avoid contagion.
- Financial support was provided by many governments to bail out banks, and other financial institutions.
- Even the so-called “too-big-to-fail” firms were severely affected by the financial crisis.
- American International Group (AIG) was one of the world's largest insurance and financial services companies.
- The bailout included an \$85 billion loan from the Federal Reserve, as well as an additional \$49.1 billion capital injection from the U.S. Treasury.

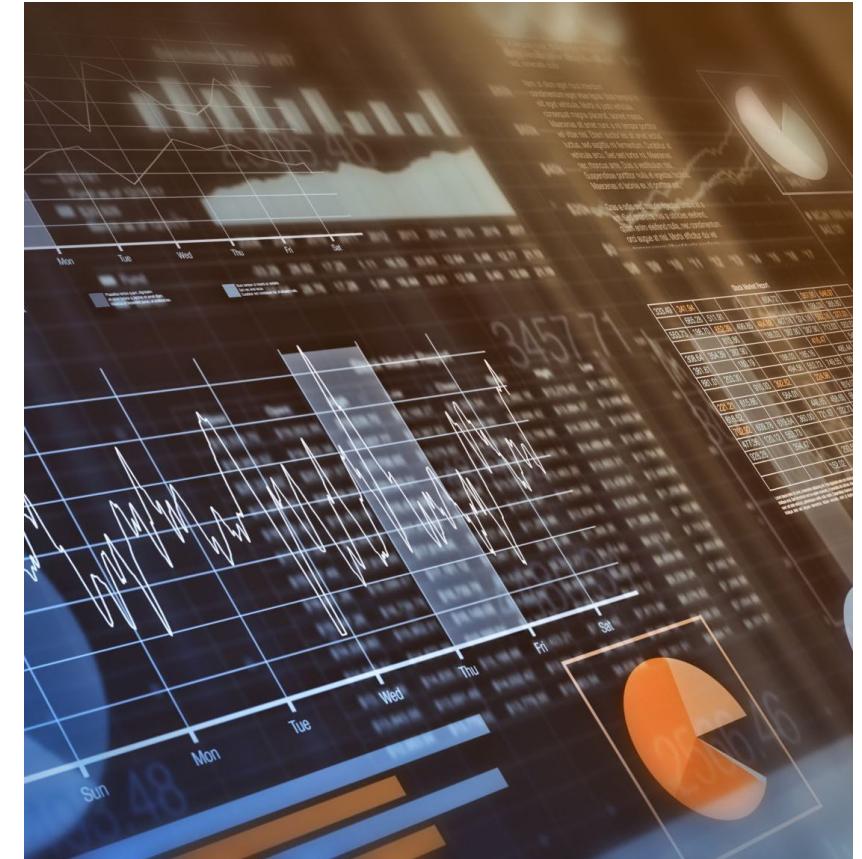
# Fiscal Stimulus Spending

- Fiscal stimulus spending aims to boost individual economies.
- Most governments used fiscal stimulus packages that combined **government expenditure** and **tax cuts**.
- Japan's consecutive stimulus packages, totaling \$568 billion, were among the highest during the crisis, but these proved largely ineffective.
- European nations showed moderate success.

# Long-Term Responses

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- Global leaders looked to building a more stable and robust global financial system.
- Steps taken by governments included
  - Implement sound macroeconomic policies
  - Enhance their financial infrastructure
  - Develop financial education and consumer protection rules
- The first ever of these is the Mutual Assessment Process launched in 2009 by the G20.



Do you think that those regulations are enough to prevent another financial crisis? Why?

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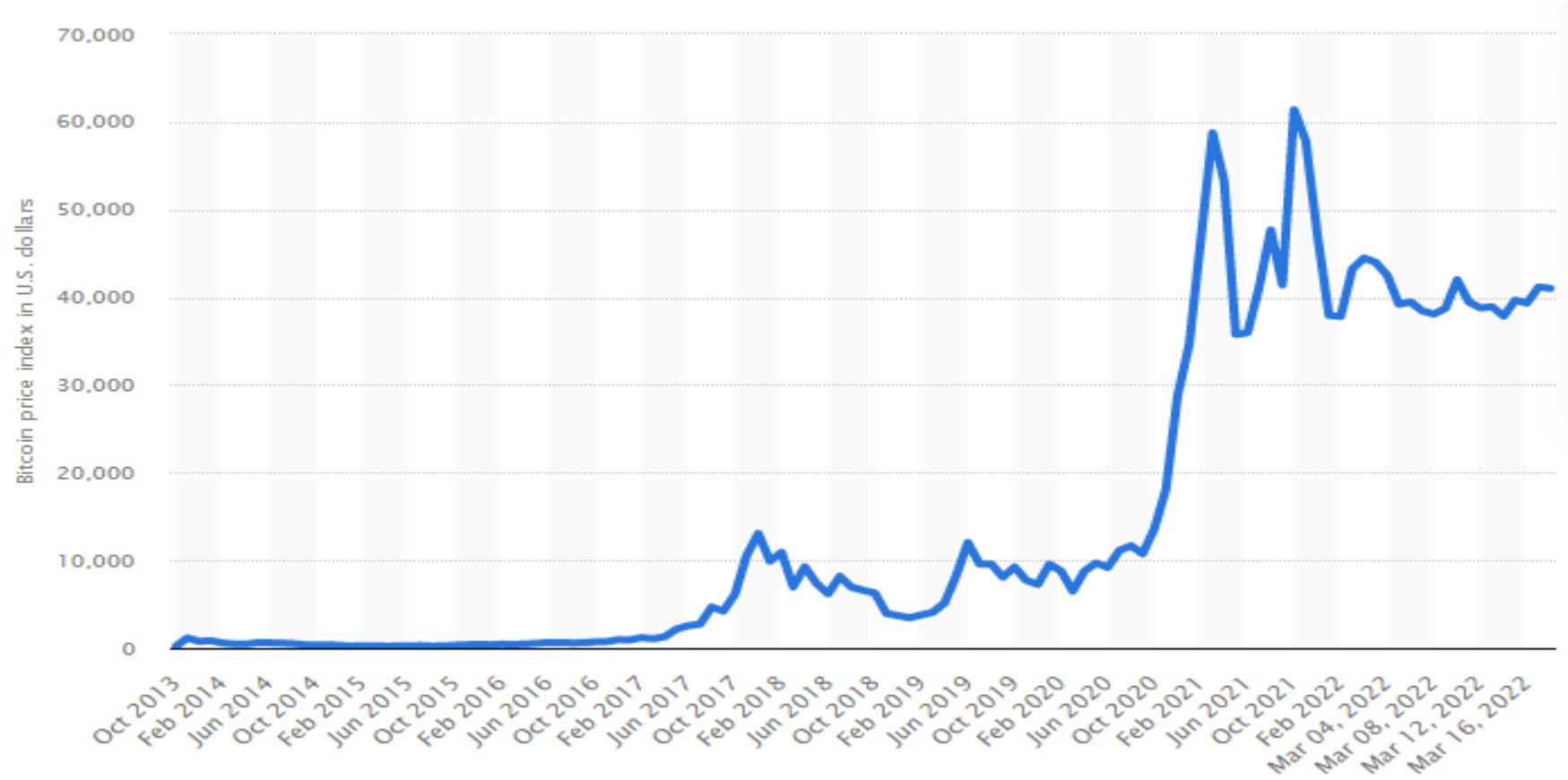


# Topic three

## Introduction to Cryptocurrency

# Data (source: statista.com)

- Bitcoin price \$41,001.71 (18/3/2022)



# Cryptocurrency?

- The novel feature of Bitcoin as a currency is that it is designed to be *decentralized*.
- “*Decentralized*” means that it runs without using a central bank or any centralized point of control.
- Bitcoin is one example of *Cryptocurrency*.
- Cryptocurrencies are protocols for reaching consensus over a decentralized network of users.

# Central Bank Digital Currency



- Some central banks are considering the issuance of their own **Central Bank Digital Currency (CBDC)**.
- With CBDC, consumers open accounts with the central bank, not commercial banks.
- CBDC is **centralised**, while cryptocurrency is **decentralised**.



# Implementing a Digital Currency

- Two aims that need to be achieved:
  1. Only the owner of the coin can use it;
  2. The owner cannot double spend.

# Decentralisation: Removing the Central Bank

- A **universal ledger** records what happens to all coins.
- Each user stores a **universal ledger**, which is a chain of signed transactions.
- A **tamper-proof ledger**: We do not want a malicious user to be able to remove intermediate transactions and produce a version of the universal ledger which looks valid.

# Consensus Algorithm

- Consensus algorithms are used to validate and confirm transactions.
- Examples:
  - Proof of Work (PoW)
  - Proof of Stake (PoS)

# Proof of Work (PoW)

- **Mining:** Participants in the network, called miners, compete to solve complex mathematical puzzles.
- **Validation:** When a miner successfully solves the puzzle, they broadcast the solution to the network. Other nodes can quickly verify the solution's correctness.
- PoW has been criticized for its **energy consumption**, as the mining process requires powerful hardware and consumes a significant amount of electricity.

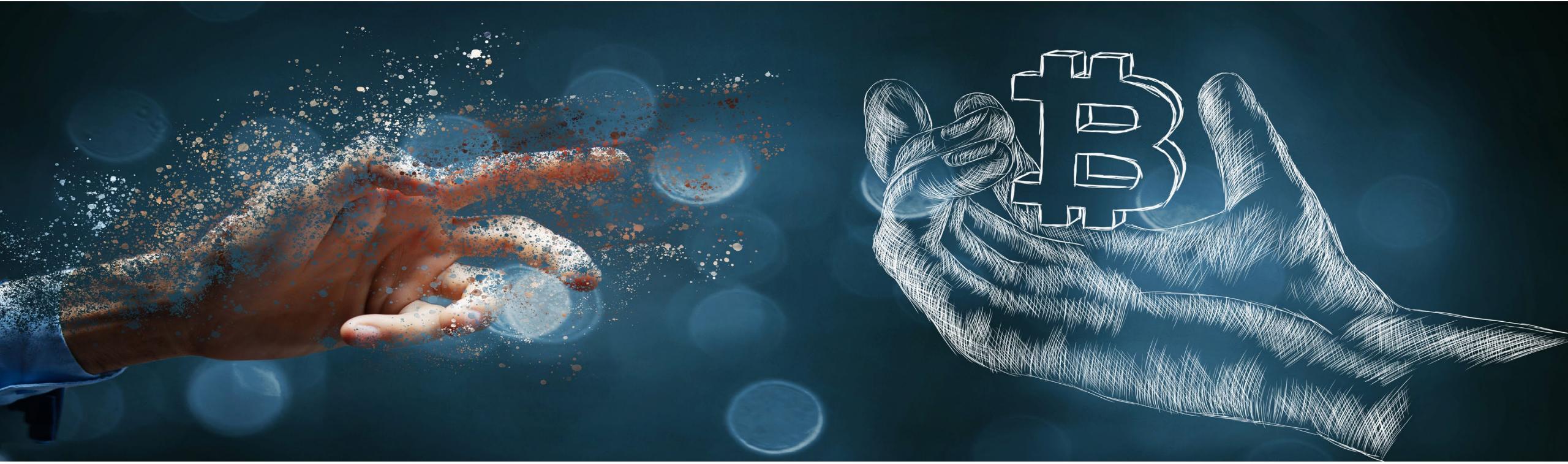
# Poof of Stake (PoS)

- Proof of Stake is another consensus algorithm used in blockchain networks as an alternative to Proof of Work (PoW).
- In a **Pos** system, validators are chosen to create new blocks and validate transactions based on the amount of cryptocurrency they hold and are willing to "stake" as collateral.



# Bitcoin

- How does it work?
- We need two basic tools: *digital signature (signature scheme)* and *hash functions*.
  - When one user wishes to send a message to another, the signature scheme digitally produces a signature.
  - This signature is specific to the message and the user.



## Two Basic Tools: Hash Functions

- Hash functions take binary strings (0 or 1) of any length as input and produce strings of a fixed length as output.
- Hash functions normally produce 256-bit strings.
- The 256-bit output is referred to as the hash of the input string.
- In practice, we will never find two strings that has the same value.

# Example



We consider what will happen to a single coin.



There are three individuals, Frank, Alice and Bob.

1

First, Frank owned the coin.

2

Second, Alice owned the coin.

3

Third, Bob owned the coin.



The coin records the sequence of owners – ledger (account record).

# Example: With a central bank

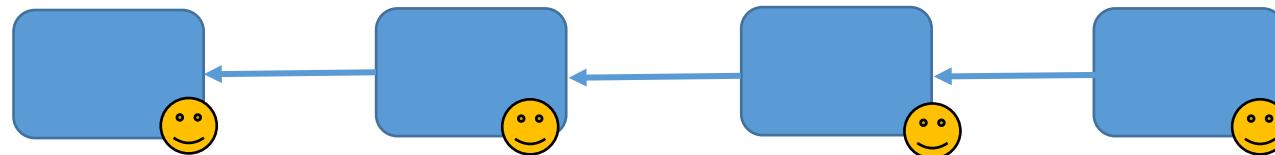
- A coin is a binary (made up of only two numbers) record identifying the sequence of owners.



- 😊 indicates “signed.”
- The central bank checks the signature and confirms the record once the signature is verified.

# A Tamper-proof Ledger

- Each transaction points to the previous transaction.



- Each signed transaction includes the hash of the previous transaction as part of its data.
- Because hash values are in effect unique, this hash value serves as a unique identifier.

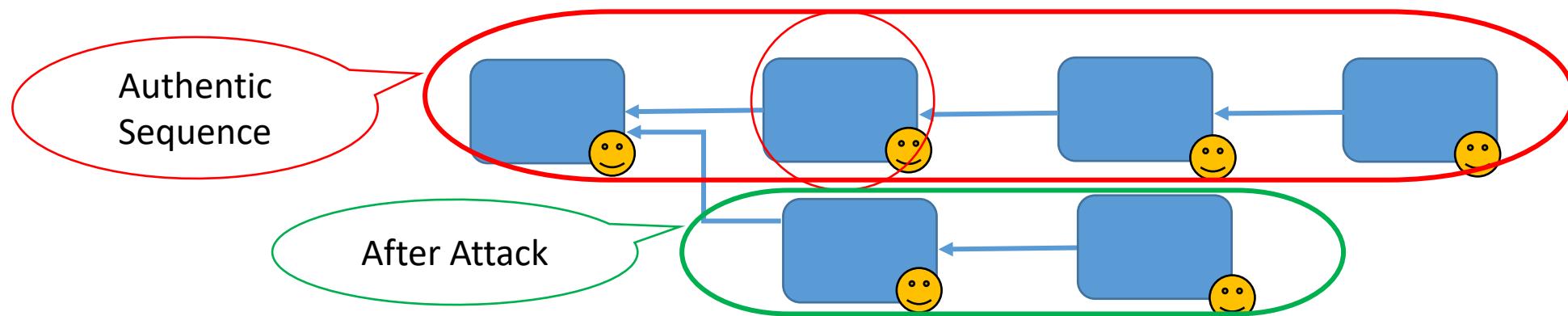
# Essence

- What we want to verify could be a message such that:  
Alice pays Frank \$100. *Alice*
- Each produces public key and secret (private) key.
  - pk: 00011001.. sk: 00011001 (Frank)
  - pk: 00011000.. sk: 00011000 (Alice)
- Different messages produce different signatures:  
 $\text{Sign}(\text{Message}, \text{sk}) = \text{signature};$   
 $\text{Verify}(\text{Message}, \text{signature}, \text{pk}) = \text{T/F}.$



# Example

- Suppose that Alice wants to reverse the red-circled transaction ( $t = 2$ ).



- Alice has to form a new chain that does not include  $t=2$ .
- While Alice is building her new chain, the rest of the network combined is working to build the other chain – **Alice needs more computational power than the rest of the network combined!**



# Q. Can we call Bitcoin money?

<https://app.sli.do/event/mXcGV4r4v6tWtgdnjQD4Yy>

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A complex network graph composed of numerous small, glowing nodes (red, blue, white) connected by thin lines, set against a dark blue background.

# Summary

The global financial crisis has left us with invaluable lessons. Global cooperation and proactive monitoring are essential to prevent future crises. We studied the dynamics of financial crises and regulations to prevent further crises. In the end, as a new financial innovation, we have also learnt about cryptocurrency and Central Banks.

# Feedback for Topic 9

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- [https://padletuq.padlet.org/Shino/econ\\_2103-shared-thoughts-topic-9-crt84lfhk48axko4](https://padletuq.padlet.org/Shino/econ_2103-shared-thoughts-topic-9-crt84lfhk48axko4)



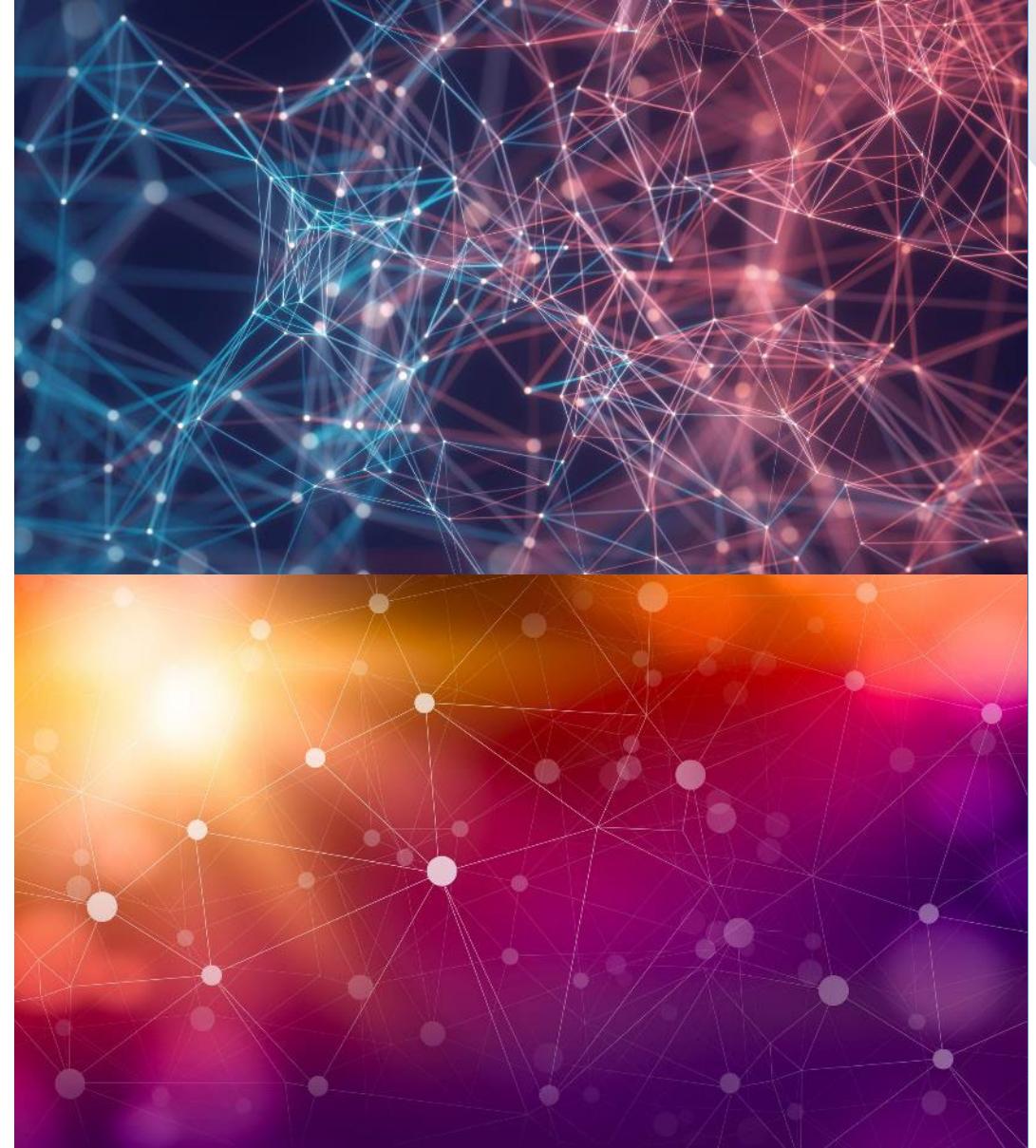
# Thank You

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# Source

- Chapter 11, “Banking Industry: Structure and Competition,” in *“The Economics of Money, Banking, and Financial Markets,”* by F. S. Mishkin, Pearson, Twelfth Edition.
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- “Central Bank Digital Currency,” by Reserve Bank of Australia, <https://www.rba.gov.au/payments-and-infrastructure/central-bank-digital-currency/>
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