University of Basel

Center for Innovative Finance

Bitcoin, Blockchain and Cryptoassets

Monetary Control Structures

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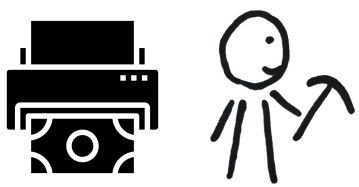
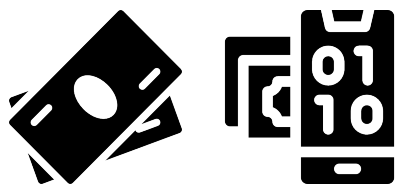
Monetary Control Structures

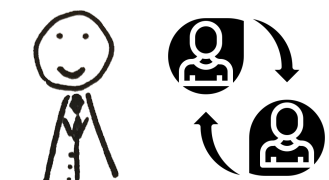
Monetary control structures can be described along three dimensions:



Creation

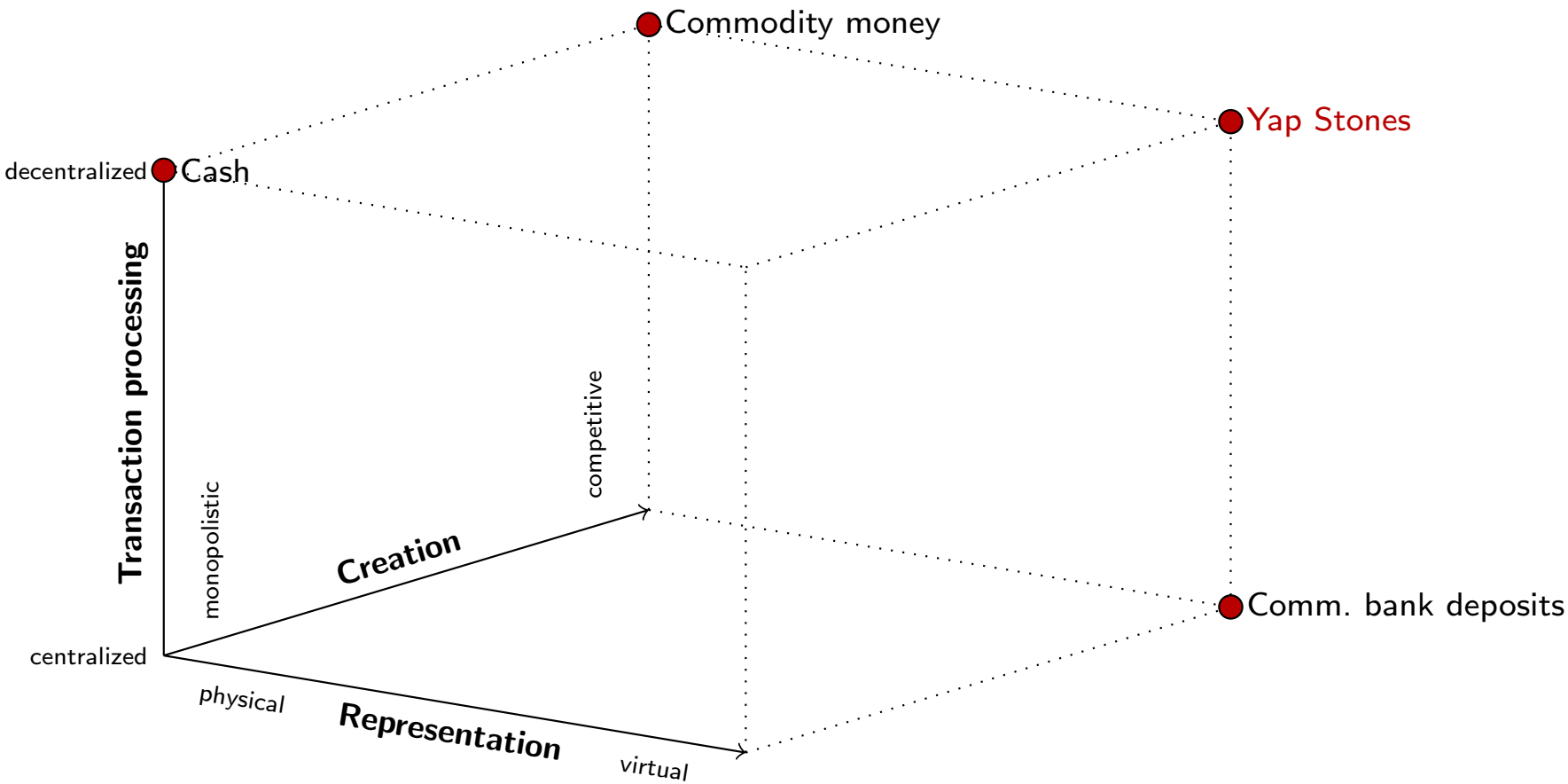


Representation



Transaction processing

Matrix of the Control Structures



Scaling the Yap Network

Large network size results in three problems:

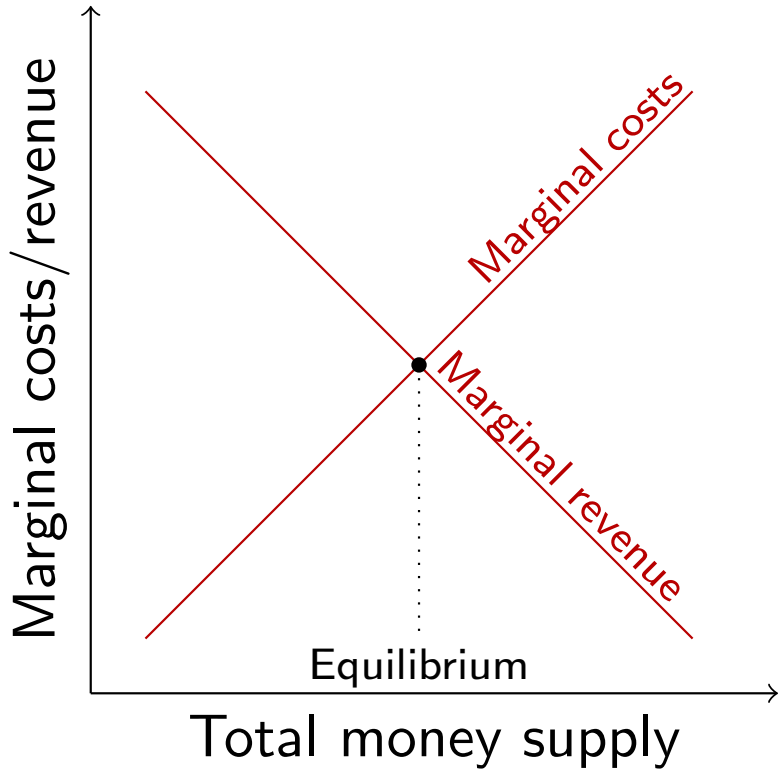
- Transaction capacity
- Transaction legitimacy
- Transaction consensus

Competitive Creation

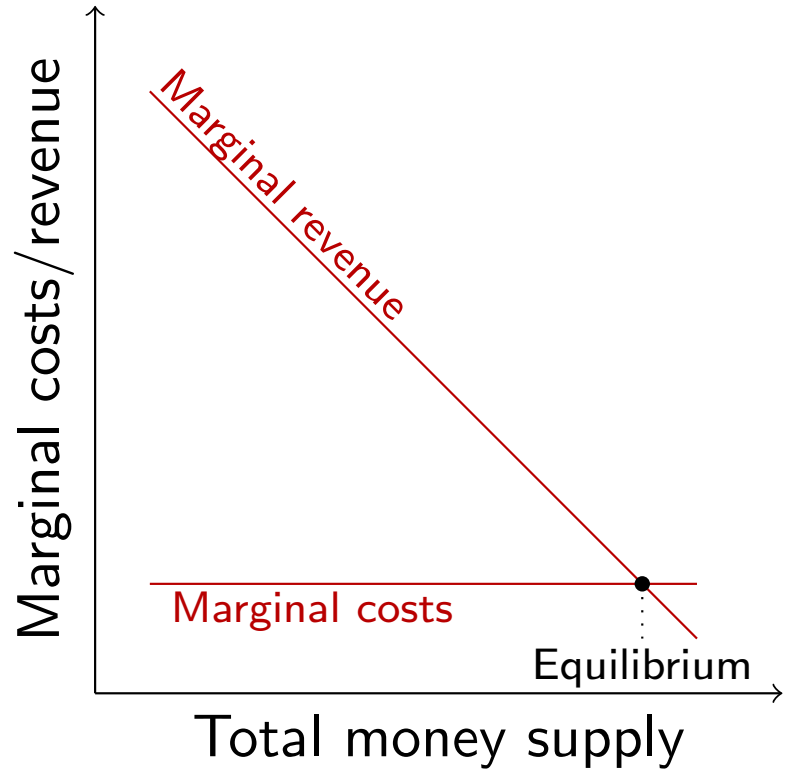
The graphs show how the marginal costs and marginal revenue of creating money vary depending on the total money supply in the market. Marginal costs are the additional costs incurred by creating one more unit of money. Marginal revenue is the additional revenue earned by creating one more unit of money.

The graphs also show the equilibrium point, where the marginal costs and marginal revenue are equal. This is the optimal point for the money creators, as they maximize their profits by creating money up to this point. If they create more money beyond this point, they will incur losses, as the marginal costs will exceed the marginal revenue.

The difference between the two graphs is that graph (a) shows a case where the marginal costs increase as the total money supply increases, while graph (b) shows a case where the marginal costs are constant regardless of the total money supply. This implies that in graph (a), there are some factors that make creating money more difficult or expensive as the market becomes more saturated, such as regulation, competition, or scarcity of resources. In graph (b), there are no such factors, and creating money is equally easy or cheap at any level of money supply.



(a) Increasing marginal costs



(b) Constant marginal costs

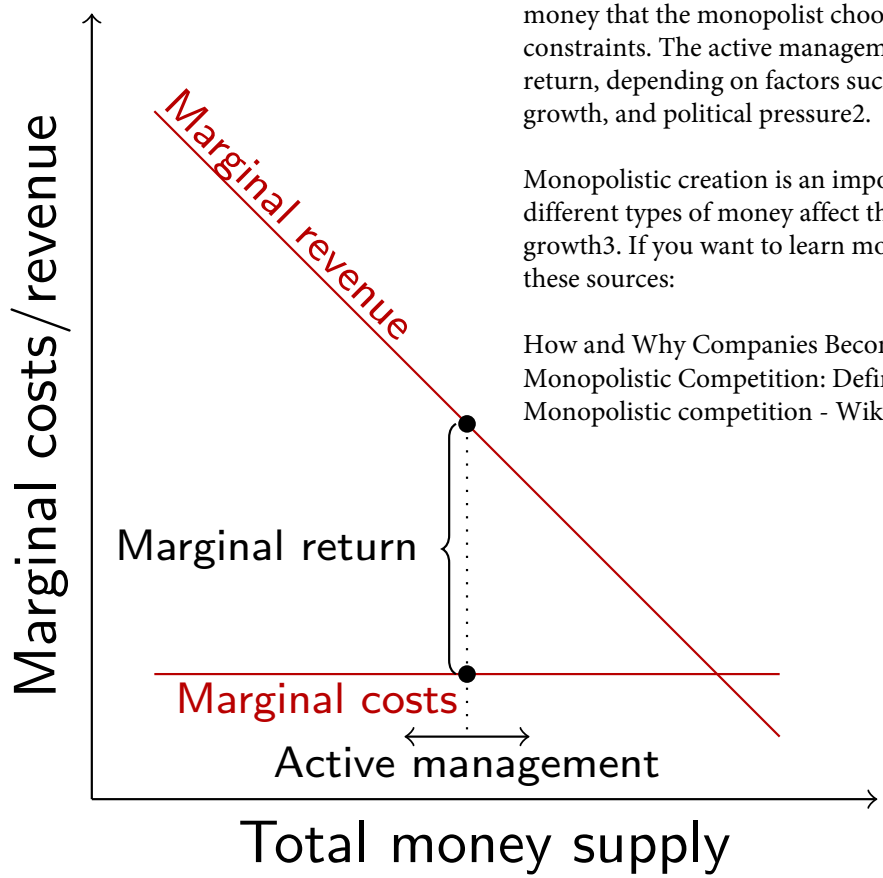
Monopolistic Creation

Monopolistic creation occurs when there is only one entity that can issue money, such as a central bank or a government1

The graph also shows the active management, which is the amount of money that the monopolist chooses to create based on its objectives and constraints. The active management may differ from the marginal return, depending on factors such as inflation, interest rates, economic growth, and political pressure2.

Monopolistic creation is an important concept to understand how different types of money affect the price level, inflation, and economic growth3. If you want to learn more about this topic, you can check out these sources:

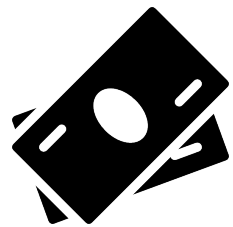
How and Why Companies Become Monopolies - Investopedia
Monopolistic Competition: Definition, How it Works, Pros and Cons
Monopolistic competition - Wikipedia



Monopolistic money creation with constant marginal costs

Physical Representation

Physical monetary units are tied to an object.



Pros:

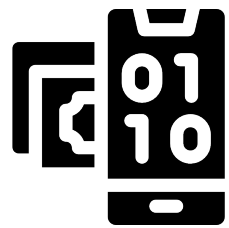
- Simple
- Clear ownership rights
- Anonymity
- No systemic dependency

Cons:

- Location bound
- Safekeeping and transport
- Counterfeiting
- Divisibility

Virtual Representation

Virtual monetary units allow the transfer of value without any change in the physical control of a particular object.



Pros:

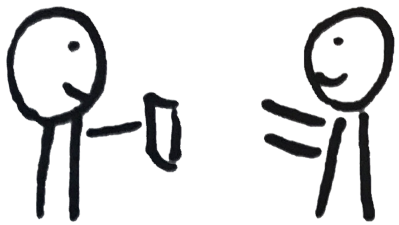
- No physical handover

Cons:

- Contestable

Transaction Processing

Decentralized

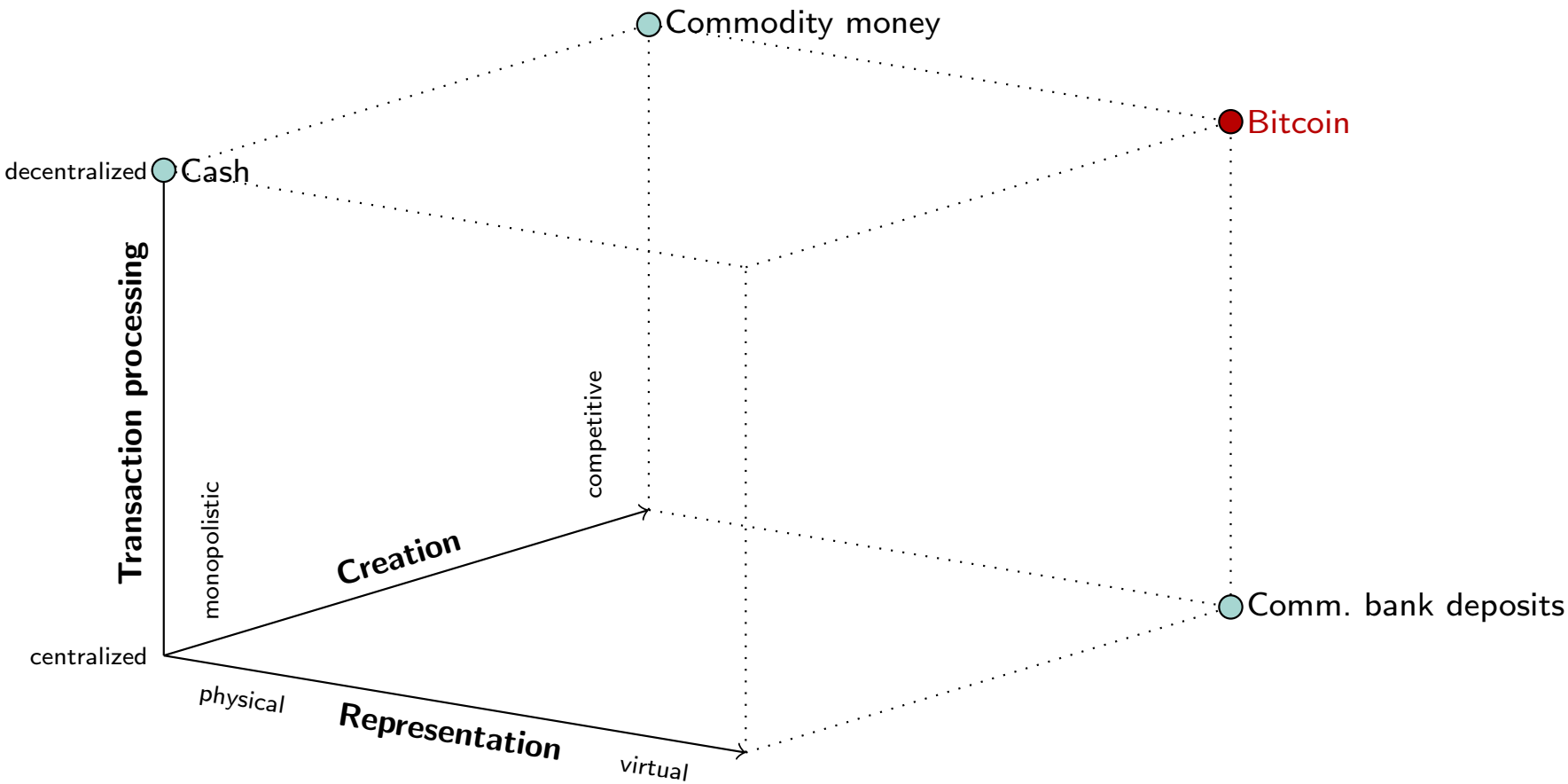


Centralized

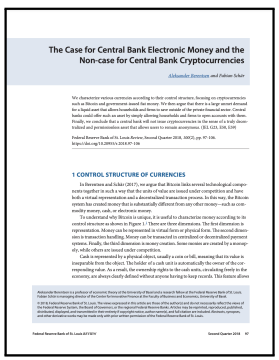
For virtual monetary units:

	Decentralized	Centralized
Transaction capacity	?	✓
Transaction legitimacy	?	✓
Transaction consensus	?	✓

Desirable Control Structures



References and Recommended Reading


The Case for Central Bank Electronic Money and the Non-case for Central Bank Cryptocurrencies

Aleksander Berentsen and Fabian Schär

We characterize various currencies according to their control structure, focusing on cryptocurrencies such as Bitcoin and government-issued fiat money. We then argue that there is a large unmet demand for a liquid asset that allows households and firms to save outside of the private financial sector. Central banks could offer such an asset by simply allowing households and firms to open accounts with them. Finally, we conclude that a central bank will not issue cryptocurrencies in the sense of a truly decentralized and permissionless asset that allows users to remain anonymous. (JEL G23, E58, E59)

Federal Reserve Bank of St. Louis Review, Second Quarter 2018, 100(2), pp. 97-106.
https://doi.org/10.20955/r.2018.97-106

1 CONTROL STRUCTURE OF CURRENCIES

In Berentsen and Schär (2017), we argue that Bitcoin links several technological components together in such a way that the units of value are issued under competition and have both a virtual representation and a decentralized transaction process. In this way, the Bitcoin system has created a money that is substantially different from any other money—such as commodity money, fiat money, or bank money.

To understand why Bitcoin is unique, it is useful to characterize money according to its control structure as shown in Figure 1.1. There are three dimensions. The first dimension is representation. Money can be represented in virtual form or physical form. The second dimension is transaction handling. Money can be transacted via centralized or decentralized payment systems. Finally, the third dimension is money creation. Some monies are created by a monopoly, while others are issued under competition.

Cash is represented by a physical object, usually a coin or bill, meaning that its value is inseparable from the object. The holder of a cash unit is automatically the owner of the corresponding value. As a result, the ownership rights to the cash units, circulating freely to the economy, are always clearly defined without anyone having to keep records. This feature allows

Alexander Berentsen is a professor of economic theory at the University of Basel and a research fellow at the Federal Reserve Bank of St. Louis. Fabian Schär is managing director of the Center for Innovative Finance at the Faculty of Business and Economics, University of Basel.

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