

Financial Innovation and Payment Systems: Discussion of Three Papers

- “Making Money: Commercial Banks, Liquidity Transformation, and the Payment System”
By Christine A. Parlour, Uday Rajan, and Johan Walden
- “Can Currency Competition Work?”
By Jesús Fernández-Villaverde and Daniel Sanches
- “The Macroeconomics of Central Bank Issued Digital Currencies”
By John Barrdear and Michael Kumhof

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Common Themes

Use conventional theoretical models of banking, money, and monetary macroeconomics to model financial innovations in payment systems using electronic money like bitcoin.

Distinguishing technological features in three papers:

- Paper 1: Bitcoin provides more efficient payments and cheaper settlement.
- Paper 2: Bitcoin is a costlessly verifiable claim on means of payment.
- Paper 3: Bitcoin provides more efficient store of value when payments needed.

Paper 1: “Making Money”

Model has flavor of international trade theory applied to domestic fractional reserve banking markets.

- Banks are monopolists over payment zones, which trade with one another.
- Banks cover imbalances with transfers. Transfers are costly because banks face liquidity regulation, collateral requirements, and transactions fees.
- Bitcoin promotes trade by making payments more efficient.
- Bitcoin improves efficiency of clearing and settlement.

Efficiency improvements in payments and settlement systems promote commerce.

Paper 1: Equilibrium

Analogy with trade models:

- Reduced shipping costs promotes more trade.
- More capital mobility increases production in higher efficiency areas.

Banking frictions interact with banks' monopoly power over customers.

- Leverage increases when payments efficiencies increase.
- Increased leverage spills over into trade flows.
- Increased capital mobility affects interbank rate and investment.

Paper 1: Comments

- Model feels like it describes early 20th century environment in which branch banking is not allowed. Bitcoins allow efficiencies which bank mergers could also accomplish.
- Model has multiple periods but is not a steady state model in which value of money is sustained by expectations of how value evolves in the future.

Paper 2: “Currency Competition”

Paper has flavor of old-fashioned economic model in which government fiat money competes with gold and silver.

- “Entrepreneurs” are miners of tokens (bitcoins). Analogous to miners of gold or silver. Not like bankers.
- Tokens have value as medium of exchange because it is costless to verify authenticity their authenticity and circulate them from one person to another electronically. Gold would have similar economic properties.
- Private money competes with government money; both can coexist.

Paper 2: Model's Economic Assumptions

- Demand function for monetary services is constant over time, but quantity demanded can fall if costs of holding money are high due to inflation.
- Competing currencies are perfect substitutes. Buyers and sellers do not “prefer” one currency to another.
- Exchange rate among competing currencies is indeterminate.
- Superior currencies have lower inflation rates.
- Traders only willing to hold superior currencies (opposite of Gresham's law?). Expected return on all currencies held is the same (negative of inflation rate).
- Value based on self-fulfilling expectations with infinite horizon and perfect foresight.

Paper 2: Economic Efficiency with Government Money

Model has traditional flavor of Friedman's optimal quantity of money.

- Economically efficient currency has value which increases at rate of interest (optimal deflation).
- Nominal quantity must therefore fall over time.
- Government must buy back currency over time for supply of currency to equal demand along optimal deflationary path.

Efficient equilibrium requires government to commit to levy taxes to buy back currency at optimal rate.

Paper 2: Inefficiencies of Private Money

Private money will never achieve optimal deflation but may achieve price stability if a credible mechanism can cap supply.

- Miners keep producing tokens, equating marginal cost to price of tokens.
- Value of tokens falls towards zero over time (hyperinflation), unless total quantity is credibly capped, which results in zero inflation equilibrium.
- Mathematically, cost function must be exactly linear around origin to give incentives to produce a supply of currency early on, then stop producing it to maintain constant value.
- Value of tokens maintained by expectations over infinite horizon; some currencies may be worth zero due to expectations.
- Miners will never buy back currencies in equilibrium.

Paper 2: Practical Implications

- Since Bitcoin has effectively limited supply due to increasing costs of producing more Bitcoins, the intuition of the paper implies Bitcoins might survive competition with government currencies.
- Paper implies bitcoins would be worthless if all countries adopted efficient monetary policies, but bitcoins may have value if governments pursue inefficiently inflationary policies and cannot outlaw bitcoins.
- In reality, countries force local transactions to be in official fiat currency, private money may be deemed illegal. Money creation becomes a national monopoly. Can government enforce its monopoly on money issuance in an age of bitcoins with distributed ledgers which are offshore?

Paper 2: Crises and Money Production

Dynamics of crises lie outside of model.

- Private money handles business cycles and credit crunches poorly. In 2008-style credit crunch, the economy would require a massive increase in tokens which private producers could not produce. Similarly, gold standard collapses in credit crunch.
- In crises, problems occur is sovereign countries cannot produce government money for free. Euro has major problems. It is moving towards a fixed exchange rate system with lack of convertibility even within EU, e.g., between Greek and German Euros.

Conclusion: Big advantage of government fiat money is that as much as needed can be produced instantaneously for free.

Paper 3: Central Bank Digital Currency (CBDC)

Paper outline:

- Intuition for CBDC.
- Map intuition into central banker thinking.
- Plug CBDC into OLG macro model with Keynesian flavor.
- Calibrate model to reasonable parameters

Key assumption: Replacement of government debt by CBDC lowers equilibrium interest rate on government debt. Is this assumption realistic?

- Maybe CBDC is very close substitute for government debt and therefore has little effect on equilibrium interest rates.

Paper 3: CBDC

CBDC backed by credibility of government. Government prevents competition from private money.

- Digital currency is electronic money with distributed ledger and decentralized payments system.
- From perspective of households and firms, “an online-only, reserve-backed, narrow bank”. Final settlement between payer and payee, no counterparty risk, no posting of collateral.
- Cryptocurrencies use verifiable proof of work to make digital ledgers honest. Current approach consumes too many resources to be practical.
- Footnote 12: A permissioned system of licensed verifiers would be cheaper than proof of work used by Bitcoin, cheaper than regulating bank solvency, and cheaper than physical storage and exchange of banknotes.

Paper 3: Existing Tiered System

Existing electronic payments systems are tiered and therefore centralized: Depositors, banks, clearing banks, central banks.

- Necessary costly regulation to prevent single point of failure creates barriers to entry which allow banks to exploit monopoly power.
- Exchange rate between CBDC and regular currency should be one-to-one.
- Would CBDC make bank runs easier in financial crisis?
- Would CBDC be issued by strong reserve currencies? Reserve currencies are good for borrowing because investors want to own them.

Paper 3: Comments

- CBDC is like a decentralized government-security ETF. Central bank managers create-and-redeem by exchanging baskets of government securities for CBDC and sets interest rate on CBDC to maintain outstanding target supply.
- Why not allow private sector to offer decentralized government-security ETF? Similar to money market funds holding government securities.
- Is rule of law needed to prevent massive failure and expropriation?
- Should competing government agencies act like licensed verifiers?

Paper 3: Comments

Why should CBDC financed purchases of government debt lower interest rate on government debt, except by raising interest rates on private debt?

Consider run on money market funds which moved assets from funds investing in private debt to funds investing in government debt.

- This raises spread between government debt and private debt.

Now consider switching directly holding of government debt to CBDC.

- This will probably have minimal effect on interest rates on government debt, even if CBDC interest rate is slightly lower due to operational efficiencies of transferring CBDC.

Implications from My Own Research

- My research on smooth trading (with Anna Obizhaeva and Yajun Wang) and continuous exchanges (with Jeongmin Lee) implies that traders demand to make many small transactions continuously, not large block trades.
- While Blockchain may provide security for settlement, its high costs make it impractical for processing a plethora of tiny transactions.
- Solution may be to have exchanges which process clear small trades but settle only very large trades with blockchain.
- Exchanges, which trade assets, suffer stability problems due to outside hacking and internal fraud. This requires costly regulation.

Caveats for the Future: Savings Glut and Credibility

- The savings glut is still with us, but it might go away when political or demographic trends reverse.
- This will raise real interest rates and lead to inflationary pressure.
- Governments will respond by trying to prevent use of digital currencies to force use of local currencies.
- Less credible governments will try to do this anyway.
- But why not use dollars, Euros, or yen as reserve currencies rather than bitcoin.

Caveats for the Future: International Regulation

There is a trend towards powerful governments (US, EU) using control over international payments mechanisms for strategic purposes such as economic sanctions, while less powerful governments (China, Russia, Iran, North Korea) use cyberwarfare for strategic purposes.

- Will these trends make US and EU want to use distributed ledger technologies as tool against cyberwarfare while simultaneously prohibiting private currencies which can be used to evade sanctions?

These strategic concerns, combined with government credibility, may result in US and EU trying to control digital currencies with regulations applied internationally.

Conclusion

Three interesting papers suggest that traditional economic models may incorporate new currency technologies, but these three papers do not based their analysis on specific technological features of digital currencies, such as encryption and blockchain.

IT IS NOW TIME FOR QUESTIONS!