Discussion on
Currency Stability Using Blockchain Technology

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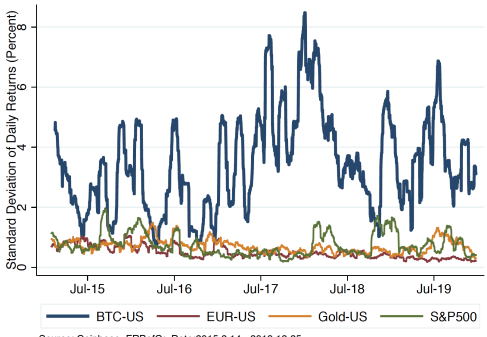
If you think that my views necessarily reflect the views of
the Federal Reserve Bank of Richmond or the Federal Reserve System, you are insane

What do they do?

Crypto currencies tend to be volatile

Figure 1: Daily Volatility



Source: Coinbase, FRBofG; Date:2015.2.14 - 2019.12.25

The 30-day (rolling) standard deviation of daily USD price changes of Bitcoin, Euro, S&P500 stock, Gold.

Affecting its ability to be a medium of exchange or a store of value

What do they do?

Common solution for exchange rate volatility is to peg the exchange rate

- Brazil, Mexico, Argentina, etc
- Tether claim to be backed 100% by US reserves

If not 100% backed by reserves, it is vulnerable to speculative attacks

- Obstfeld (1996)

These attacks are similar to bank runs—caused by fixed exchange rate (redemption)

The authors try a preventing bank-run approach. They propose a sophisticate contract

- Builds on Green and Lin (2003)

What do they do?

But why crypto currencies? There are two main reasons

The first is commitment

- Ennis and Keister (2009)

Block-chain technology circumvents the commitment problem

- Once the contract is distributed using the distributed-ledger blockchain technology, it is irreversible

The second is more practical, changing the exchange rate after every redemption is a complicated task to communicate and perform

- It requires a script, or algorithm, not necessarily blockchain
- But if the code is decentralized, then there is little doubt of what is going on

Model

Environment

Build on Green and Lin (2003)

There are J agents and two periods , $t =, 1$

There are two goods

- Crypto good (C), price normalized to one
- Foreigner (F), price e_t (endogeneous) in crypto good

With probability μ_F the trader is type F and cares only about the F good in period 0

- This is our *impatient* depositor

With probability μ_C the investor is type C and cares about period 1 bundle

- This is our *patient* depositor

Environment

There is a level of reserve R_0 of foreign good and traders can always buy F at price e_f

A policy is a family $\{e_0(D^j), e_1(D^J)\}$, where $D^j = (d^1, \ldots, d^j)$ is the conversion history

A policy is feasible if it satisfies

$$e_0(D^j) \leq R_0^{j-1}(D^{j-1}), \quad \text{where} \quad R_0^j(D^j) = R_0^{j-1}(D^{j-1}) - e_0(D^j)$$

Key: investors can convert F goods to C goods back and forth at cost t

A policy is incentive compatible is it satisfies

$$\mathbb{E}\left[u\left((1-\lambda)e_1(D^J) + \lambda\right)\Big|D^j\right] \geq \mathbb{E}\left[u\left(\left[(1-\lambda)e_1(\hat{D}^J) + \lambda\right]\left[\frac{e_0(\hat{D}^j)}{e_1(\hat{D}^J)} - t\right]\right)\Big|D^j\right]$$

Main result

The planner solves

$$\max_{\{e_0(D^j),e_1(D^J)\}} \mathbb{E} \sum_j \left[d^j u\left(e_0(D^j)\right) + (1-d^j) u\left((1-\lambda)e_1(D^J)+\lambda\right)\right]$$

subjected to feasibility and incentive compatibility

Results:

- For $N = 3$ and some parameter restrictions, the solution to the above problem admits a unique equilibrium
- For $N > 3$ the authors study numerical examples and argue this tend to hold.

Logic follows backward induction. Last trader has no reason to speculate, etc

Discussion - Information structure

> *"Smart contracts are digital contracts allowing terms contingent on decentralized consensus that are tamper-proof and typically self-enforcing through automated execution."* *Cong and He (2019)*

Cong and He (2019) build on Green and Porter (1984) and show how the information content of blockchain *consensus* can induce collusion

- Incentive compatibility constraint has to hold for each information set
- In Cong and He (2019), more information allow firms to punish deviations
- Here information can lead to induce conversions which limits the contract space
  $\Longrightarrow$ potentially reducing welfare

Discussion - CBDC and smart contracts

A lot of the discussion on CBDC goes around currency

Maybe the reason we want to have a CBDC is because of smart contracts

Government side

- Government bonds can be smart contracts—can be traded within the network
- Sophisticated QE policies/balance sheet reduction, Reverse repos

Private side

- Build on the availability of currency and bonds to design contracts
- The peg discussed here could be of a CBDC if it is part of the network

Not science fiction: Bank of Thailand has done both, CBDC and Bond issuance

PS: CB tend to be so conservative that I find more likely that we go back to use gold

Wrap up

Very nice paper

Showcases the potential of smart contracts in an application to exchange rate pegs

The authors put up a nice online tutorial and GitHub repository

- Even if you didn't like the paper, check it out!
- It is a great service to the profession that they are doing that

There are a lot of potential benefits coming from smart contracts

Blockchain requires more information, it can be welfare reducing

- Many papers in the workshop are about information
- I am looking forward to seeing them!

Bibliography I

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