A Primer on Central Banks and Digital Currencies

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Conference on “Digital Finance, market disruption, and financial stability”
Banque de France and Toulouse School of Economics
Paris, November 12, 2018

Any views expressed in this presentation are those of the presenter and not necessarily those of the BIS
Payments are digitalising but cash still rules...

AU = Australia; BR = Brazil; CA = Canada; CH = Switzerland; EA = euro area; GB = United Kingdom; IN = India; JP = Japan; KR = Korea; MX = Mexico; RU = Russia; SA = Saudi Arabia; SE = Sweden; SG = Singapore; TR = Turkey; US = United States; ZA = South Africa.

1 2007–16 changes. The start/end of an arrow represents 2007/2016, respectively. 2 For South Africa, 2009–16 change.

...yet, are trends in Nordic countries a sign of things to come?
And what should be central banks’ response?

- Central bank’s current focus is on monetary policy and financial stability
- But their fundamental product is money, ie easy record keeping/memory for society (ie Kocherlakota, (1996))
  - ...and also privacy (Kahn et al. (2005))!
- The rise of distributed ledger technology – distributed record keeping – in cryptocurrencies and CBDCs puts this back to the fore:
  - What are micro implications (**acceptance/convenience, inclusion, resilience, privacy**)
  - and what are the macro implications (**monetary policy, financial stability**)?

➢ A primer on cryptocurrencies, as well as wholesale and retail CBDCs
Nakamoto (2008) introduced a radically novel concept

Cryptographically chained, valid blocks of transactions form Bitcoin’s blockchain

Graph 3

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>9708a0e43...</td>
<td>z5h21cf...</td>
<td>1 MB block size limit allows for about 2000 transactions</td>
</tr>
<tr>
<td>93fe37f5d...</td>
<td>7d097947...</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.45...</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.08...</td>
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</tr>
<tr>
<td>1</td>
<td>0.63...</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.78...</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.01BTC from A to C</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.001BTC from D to G</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.06...</td>
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<tr>
<td>2</td>
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Cryptocurrencies in the money flower (BIS AER (2018)/Bech and Garrat (2017))
Bitcoin is all the rage, but its use for payments is limited...

Global interest in Bitcoin has exceeded that of sovereign currencies and gold...¹

...but actual usage in retail payments remained small²

...because a payment is cumbersome, slow, and costly

1. Run a full node (200 GB) or use a SPV
...because a payment is cumbersome, slow, and costly

1. Run a full node (200 GB) or use a SPV
2. Specify fee (yesterday: 1.3 USD, Dec 17: 55 USD) and enter a waiting pool for 5 min or 1 day
...because a payment is cumbersome, slow, and costly

1. Run a full node (200 GB) or use a SPV
2. Specify fee (yesterday: 1.3 USD, Dec 17: 55 USD) and enter a waiting pool
3. Wait for 1h/ 6 confirmations
We do not know whether cryptocurrencies will have a legal economic use case in payments any time soon

- There are fundamental economic reasons behind the operational shortcomings
  - **BIS AER, 2018, Chapter V: “Cryptocurrencies: looking beyond the hype”**
  - (Auer R, “The technology and the economics of decentralised trust in Bitcoin and its blockchain” (forthcoming))

- Claims regarding new technologies need to be evaluated carefully: Lightning Network, Proof-of-stake, etc.

- Overarching issue: *payments must be final, fast, cheap and scale with activity, which is not the comparative advantage of the blockchain*
If not cryptocurrencies, what about the potential for CBDCs?
Wholesale CBDCs are less controversial than retail CBDCs, but have not proven their superiority

- Retail CBDCs raise particular concerns regarding:
  - Disintermediation of financial sector
  - Susceptibility to runs on the private financial system

- Wholesale CBDCs/Settlement:


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1 Includes the CPMI jurisdictions: AU, BE, BR, CA, EA, FR, DE, IN, IT, JP, KR, MX, NL, RU, SA, SG, ZA, SE, CH, TR, GB and US.

Sources: World Payments Report, CPMI (2017): Statistics on payment, clearing and settlement systems in the CPMI countries, no 172, December; authors’ calculations.
RTGS shows that widespread adoption of new technologies requires early adopters

Diffusion of real-time gross settlement (RTGS) systems

Central banks that adopt an RTGS system

Share of adopters by state of development

Number per 2 years

87-88  91-92  95-96  99-00  03-04  07-08  11-12  15-16

% 100  75  50  25  0

Europe  Asia  Oceania  Africa  Advanced economies  Emerging market economies
Some policy conclusions

1. Cryptocurrencies:
   - Need to restore AML/KYC standards
   - For wider regulatory framework, technology needs to develop further

2. Wholesale CBDC are being tested

3. What about retail CBDC?

Ergo ?
The Lightning Network: Bitcoin’s second layer

Representation of the Lightning Network

A test version is already in use

Currently, only small payments can be routed

Number of BTC

Number

Q1 18 | Q2 18 | Q3 18 | Q4 18

0 | 50 | 100 | 150

100 | 1,200 | 1,600

100 | 75 | 50 | 25

0 | 400 | 800 | 1,200 | 1,600

Probability of success (%)

0.06 | 1.23 | 4.39 | 25.25

Total committed bitcoin (lhs)

Nodes with channels (rhs)

USD

Probability to successfully route a payment between random nodes

Price of bitcoin reacts to regulatory news events

“U.S. SEC rejects application to list Bitcoin ETF”


“Japan FSA says ordered 6 cryptocurrency exchanges to improve business, over lax money laundering measures”
Markets are still somewhat segmented

The ‘Kimchi’ premium

Bitcoin premium in China

Bitcoin trading volume by currency

1 AUD, CHF, CAD, GBP, HKD, ILS, INR, PHP and SGD.

Source: Auer, R. and S. Claessens, Regulating cryptocurrencies: assessing market reactions, September 2018 Quarterly Review
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