Digitalization on Financial Services and Implications for Monetary Policy in Thailand

Thitima Chucherd
Acharawat Srisongkram
Thosapon Tonghui

Natta Piyakarnchana
Suparit Suwanik
Thanaphol Kongphalee

Bovonvich Jindarak
Thiti Tosborvorn
Aniya Shimnoi

Monetary Policy Group, Bank of Thailand

December 2018
Motivation

Financial innovation has been evolved over time e.g. e-Payment, e-Wallet, digital currencies

in parallel with technological development e.g. high-speed internet, smartphones, information technology, block chain, and digital ledger technologies (DLT)

Barter - Gold/coin - Paper Money - e-Payment - Cryptocurrency


618 AD - 1960s - 1970s - 1980s

Cellphone - Smartphone

1G - 2G - 3G - 4G - 5G

Internet world-wide-web

Personal computer

WiFi

Social media

e-Payment has become increasingly important in most countries

Remark: size of bubble = value of non-cash payment/GDP in 2016

Sources: BIS statistics on payments and financial market infrastructures in the CPMI countries (Red Book statistics), Bank of Thailand
Scope of study

A taxonomy of money

Electronic/Digital

Central bank-issued

Universally accessible

Virtual currency

Peer-to-peer

Bank deposit, Mobile money, e-Money

Deposited currency accounts

Local currency

Crypto-currency

CBDC (wholesale)

Crypto-currency (wholesale)

Cash

Commodity money

Reserve accounts

Source: BIS (2017)

Electronic payment (e-Payment)

- payment method has been developed and widely used, commonly linked to either bank or the 3rd party account

Retail e-payment
Card payments
Internet and mobile banking e-money

Digital currencies

- An asset stored in electronic form that can serve essentially the same function as physical currency, namely, facilitating payments transactions

e-money
Crypto-currency
CBDC

‘Digitalization’ in this paper

Source: BIS (2017)
Objectives, Research questions, and Methodology

Objectives

This paper aims to evaluate the impacts of digitalization in financial services on monetary policy in Thailand:

1. Understanding new development and trends pertaining to the digitalization including e-Payment and digital currencies and assessing its potential to permanently replace cash
2. Analyzing the implications for transmission and effectiveness of monetary policy

Research questions

e-Payment

- How much retail e-Payment could substitute cash usage in Thailand?
- How would e-Payment affect monetary aggregates, central bank’s balance sheet, velocity of money, money multiplier? How would this affect the transmission of monetary policy or monetary operations?

Digital currencies

- How would the emergence of private digital currencies affect transmission of monetary policy in 5 traditional channels?
- What are the policy options available to central banks, and how would this change the transmission of monetary policy?

Methodology

e-Payment

- Literature review
- Descriptive and empirical analysis
  - Monetary statistics
  - Substitution effect between cash and e-Payment (GMM)
  - Monetary policy effectiveness with and without e-payment (FAVAR)

Digital currencies

- Literature review
- Scenario analysis
Outline

Part I e-Payment

I. I Development of cash usage behaviors and challenges in Thailand

I. II Empirical analysis of e-Payment and monetary policy
Daily transactions in Thailand are mostly in cash. Teenager and early working-aged groups are more welcome to non-cash usage, especially mobile/internet banking.

### Cash usage in selected countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Period</th>
<th>Cash usage (% of transactions)</th>
<th>Cash usage (% of value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thailand</td>
<td>2017</td>
<td>93</td>
<td>-</td>
</tr>
<tr>
<td>Euro area</td>
<td>2014–2016</td>
<td>79</td>
<td>54</td>
</tr>
<tr>
<td>Greece</td>
<td>2015–2016</td>
<td>88</td>
<td>75</td>
</tr>
<tr>
<td>Italy</td>
<td>2015–2016</td>
<td>86</td>
<td>68</td>
</tr>
<tr>
<td>Germany</td>
<td>2014</td>
<td>80</td>
<td>55</td>
</tr>
<tr>
<td>France</td>
<td>2015–2016</td>
<td>68</td>
<td>28</td>
</tr>
<tr>
<td>Finland</td>
<td>2015–2016</td>
<td>54</td>
<td>33</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2016</td>
<td>45</td>
<td>27</td>
</tr>
<tr>
<td>UK</td>
<td>2016</td>
<td>44</td>
<td>15</td>
</tr>
<tr>
<td>US</td>
<td>2016</td>
<td>31</td>
<td>8</td>
</tr>
<tr>
<td>Denmark</td>
<td>2017</td>
<td>23</td>
<td>16</td>
</tr>
<tr>
<td>Sweden</td>
<td>2018</td>
<td>13</td>
<td>-</td>
</tr>
<tr>
<td>Norway</td>
<td>2017-2018</td>
<td>11</td>
<td>6</td>
</tr>
</tbody>
</table>

Part I e-Payment

Development of cash usage behaviors and challenges in Thailand

e-Payment usage in Thailand still be in the early stage esp. Internet/mobile banking
Value of payment per each transaction has been declined recently reflecting greater adoption of e-Payment in daily use

Source: Gresvik and Owre (2003), Rungsun Hataiseree (2008), and author’s estimates.
Part I e-Payment
Development of cash usage behaviors and challenges in Thailand

Cash transaction has declined continuously consistent with decelerating growth of cash in circulation.

Growth of payment services

- Internet&Mobile
- Debit card
- e-Money
- Credit card
- Counter transfer
- ATM transfer
- Cheque
- Counter withdraw
- ATM withdraw

Cash in circulation (classified by holders)

- Currency held by Depository Corp.
- Currency held by Gov.
- Currency outside DCs & Gov.
- Share of Currency outside DCs & Gov. (แกนขวา)

Cash deposit and withdrawal

Source: Bank of Thailand
Despite slowdown in cash usage, velocity of money and money multiplier in Thailand are quite stable.

**Monetary aggregate (seasonally adjusted)**
- Broad (RHS)
- Narrow
- CIC

**Growth of monetary aggregate**
- Broad
- Narrow
- Avg. 8.6%
- Avg. 5.3%

**Velocity of money**
- Broad (RHS)
- Narrow
- Base

**Money multiplier**
- Broad (RHS)
- Narrow

Source: Bank of Thailand and authors’ calculation
Part I e-Payment
Monetary statistics

Unlike Sweden, cash in circulation continuously declines and velocity of money rises fast

Transition towards a cashless society in Sweden

<table>
<thead>
<tr>
<th>Cash/GDP</th>
<th>Velocity of M0</th>
<th>Velocity of M1</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEK bil.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Dalebrant (2016)
Our empirical study also shows that e-Payment usage in Thailand slightly substitutes cash. If Thai people use 1% more for retail e-Payment, demand for money will decline by 0.05 - 0.1%. However, e-Payment shows smaller impact on cash compared to economic activities and opportunity cost.

### Table: Coefficient Estimates

<table>
<thead>
<tr>
<th></th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
<th>Model IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coincident economic index</td>
<td>0.497 ***</td>
<td>0.517 ***</td>
<td>0.491 ***</td>
<td>0.211 *</td>
</tr>
<tr>
<td>ST interest rate</td>
<td>-0.012 ***</td>
<td>-0.014 ***</td>
<td>-0.012 ***</td>
<td>-0.013 ***</td>
</tr>
<tr>
<td>Retail e-payment</td>
<td>-0.058 **</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Card payment</td>
<td></td>
<td>-0.089 ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet and mobile banking</td>
<td></td>
<td></td>
<td>-0.054 **</td>
<td></td>
</tr>
<tr>
<td>e-money</td>
<td></td>
<td></td>
<td></td>
<td>0.023</td>
</tr>
<tr>
<td>SET return</td>
<td>-0.085 ***</td>
<td>-0.090 ***</td>
<td>-0.083 ***</td>
<td>-0.087 ***</td>
</tr>
<tr>
<td>C</td>
<td>0.060 ***</td>
<td>0.060 ***</td>
<td>0.059 ***</td>
<td>0.048 ***</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.393</td>
<td>0.344</td>
<td>0.394</td>
<td>0.358</td>
</tr>
</tbody>
</table>

Source: Authors’ calculation

Remark: This study employs generalized method of moments (GMM) approach, using monthly data from Jan10 to Jun18. ***, **, * = statistical significance at 0.01, 0.05, and 0.1 respectively.

All variables, except for deposit rates, are in real terms and expressed in log with the first-difference form.
Past studies in e-Payment and implication on monetary policy are mostly descriptive and focus in digital money. Growing use of digital money could lessen central bank’s ability to control money supply under monetary targeting framework. However, it will not affect monetary policy under inflation targeting.

<table>
<thead>
<tr>
<th>Area of study</th>
<th>Implications for monetary policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monetary operation</td>
<td>- Reduce central bank’s control over money supply and complicate monetary operation under monetary targeting due to higher and more volatile velocity of money and money multiplier (Neda popovska-Kammnar 2014, Qin 2017)</td>
</tr>
</tbody>
</table>
| Central bank independence     | - Decline in CIC led to smaller amount of asset-backed currency and smaller size of central bank’s balance sheet that could affect monetary operation (Barentsen 1997, Rogoff 2014)  
- Decline in CIC could lessen seigniorage that could affect central bank’s revenue to pursue its mission (Fung et al 2014, BOK 2005). However, no central bank reported that its balance sheet has been effected from decline in CIC (BIS Survey 2000) |
| Monetary policy transmission  | - Credit channel e-money will turn cash usage in deposit transfer that could promote money creation process (ธรรมรักษ์ 2011, Payment system insight 2013)  
- Information-based lending could facilitate greater credit approval (นันทวัลลิ์ 2018)  
- Digital money issuer (non-bank) and disintermediation (Lagard, 2017)  
- Exchange rate channel e-Payment supports international trade via e-commerce. However, buyers and sellers might reduce their FX risk by using foreign currencies for domestic spending (dollarization). If this behavior becomes more popular, policy rate could have smaller impact on domestic spending (only via its local currency)  
- Asset price channel e-Payment reduces transaction cost that could make money demand more sensitive to interest rates (flatter money demand curve). When policy rates change, demand for money will adjust faster (IMF, 2004) |
Greater use of e-payment in Thailand has no direct impact on monetary operation under inflation targeting using short-term interest rate as operational target. However, it will affect central bank under monetary targeting framework since velocity of money and money multiplier are more unpredictable.
Part I e-Payment
Monetary policy implication

Central bank independence

Despite more popular use of e-Payment in Thailand, cash still grows and seigniorage has not declined yet. The BOT’s balance sheet expands overtime from FX reserve accumulation. However, decline in cash could impact BOT balance sheet by changing structure of liabilities with greater composition of interest-bearing liabilities from OMOs and smaller portion of cash (non-interest bearing) with lower seigniorage.

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign assets</td>
<td>Current account (CA)</td>
</tr>
<tr>
<td>Domestic assets</td>
<td>Notes issued</td>
</tr>
<tr>
<td>...</td>
<td>OMOs</td>
</tr>
</tbody>
</table>

Customers convert their cash to prepaid e-money (less cash usage)

E-money issuers are required to deposit prepaid cash at the bank

Payment system Act B.E. 2560 said that the e-money issuers have to deposit the float to the commercial bank only e-money spending purpose.

Under excess liquidity condition, banks will deposit this extra liquidity in CA at BOT and invest in OMOs to earn interest income.

Seigniorage

\[
\text{Seigniorage} = \frac{\Delta \text{money reserve} - \text{cost of issuing money}}{\text{consumer price index}}
\]

Monetary seigniorage

<table>
<thead>
<tr>
<th>Year</th>
<th>% of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980-1985</td>
<td>0.3</td>
</tr>
<tr>
<td>1999-2001</td>
<td>0.1</td>
</tr>
<tr>
<td>2006-2017</td>
<td>0.08*</td>
</tr>
</tbody>
</table>

Source: Bank of Korea (2005)

* Bank of Thailand and authors’ calculation
Part I e-Payment

Monetary policy implication

<table>
<thead>
<tr>
<th>Channels</th>
<th>Effectiveness of monetary policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest rate</td>
<td>Status quo depending on Banks’ balance sheet, the elasticity of interest rate on demand for deposits and the competition in banking sector.</td>
</tr>
</tbody>
</table>
| Credit        | Slightly more effective
1. Banks can reduce cash operation and allocate larger amount of money kept in bank accounts for lending
2. Digital banking help facilitate banks to gain benefit from information-based lending |
| Asset price   | More effective Saver can switch their saving into various forms of financial assets easily with lower transaction cost |
| Exchange rate | Tend to be more effective e-Payment facilitates cross-border capital flows movement and promotes e-commerce transaction across countries. Exchange rate could be more volatile by greater volume of transactions |
| Expectation   | Status quo depending on business and households’ views on economic outlook and policy rate path |
Empirical study of MP transmission mechanism in Thailand

Factor-Augmented Vector Autoregressive (FAVAR) model:

\[
\begin{bmatrix}
F_t \\
Y_t
\end{bmatrix} = \Phi(L) \begin{bmatrix} F_{t-i} \\
Y_{t-i}
\end{bmatrix} + \nu_t
\]

where

- \(F_t\) = unobserved vector (k x 1)
- \(Y_t\) = observed vector (m x 1)
- \(\Phi(L)\) = coefficient matrix of lag order
- \(\nu_t\) = error term (zero mean with constant covariance matrix)

### Observed Variables

<table>
<thead>
<tr>
<th>Observed Variables</th>
<th>113 Unobserved Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation, CEI, RP</td>
<td>11</td>
</tr>
<tr>
<td>Production, Expectation and Labor indicators</td>
<td>22</td>
</tr>
<tr>
<td>Real estate and Price indicators</td>
<td>18</td>
</tr>
<tr>
<td>Interest rates</td>
<td>22</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>7</td>
</tr>
<tr>
<td>Money and credit quantity aggregates</td>
<td>10</td>
</tr>
<tr>
<td>External sector and capital flow</td>
<td>7</td>
</tr>
<tr>
<td>Government sector</td>
<td>7</td>
</tr>
<tr>
<td>Stock price, Oil price, Global policy rates</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>113</td>
</tr>
</tbody>
</table>

### Impulse response of selected variables to policy rate shock (+100 basis points)


The result shows Median and 90% Confidence Interval. Source: BOT Staff’s calculations.
Impulse response of selected variables to policy rate shock (+100 basis points)

The result shows Median and 90% Confidence Interval. Source BOT Staff’s calculations.
Promoting digital payment amid an increasing role of non-bank and FinTech

• Streamline laws and regulations to support innovations
• Build Interoperable Payment Infrastructures to support all sectors and further development
• Enhance cross-border payment efficiency
• Strengthen cyber resilience to maintain stability and trust
• Increase adoption as well as improve literacy for a sustainable development

“We with the amount of electronic money still very small ..., the effect on monetary policy is not yet absolutely determinable. However, the central banks and economists must try to anticipate the effects before it becomes more significant.”

Reynolds G. and Stephen F. (2013) Electronic money and monetary policy
Outline

Part II Digital currencies

II.I Current situation and looking ahead

II.II Policy options
Part II Digital currencies

Definitions and current situation

Digital Currency (DC)
An asset stored in electronic form that can serve essentially the same function as physical currency, namely, facilitating payments transactions (BIS 2015)

Crypto-currency
• a separate sub-class of digital currencies, with their distinguishing feature depending on the consensus mechanism applied for updating the ledger (Barrdear and Kumhof, 2016)

Crypto-currency => Non-fiat backed currency

Current situation
• Crypto-currency performs very poorly the 3 functions of money (Ali et al., 2014)
  □ Medium of exchange: very few merchants accept them
  □ Unit of account: ambiguous as some merchants adjust prices according to exchange rate fluctuations vis-à-vis fiat currencies
  □ Store of value: more volatile than national currency pairs
Uses of Digital Currency (not mutually exclusive)

I. Wholesale (B2B)

II. Retail (B2C and C2C)

III. New Asset Class

Means of exchange

Note: limit scope to exclude lending/borrowing of digital currencies
Digital currencies are popular among businesses, while regular people still use cash at large.

- DLT’s efficiency and traceability prompt some businesses to adopt crypto as their means of exchange.
- This has already happened in some business sectors, e.g. Ripple.

Possibility: Very likely

How to get here?

- We’re already here!
- If people trust this alternative system more, then more businesses will move here.
Digital currencies become a popular means of payment in everyday transactions due to their ease of use and side benefits like tracking expenses, information-based lending, etc.

1. Pegged to THB => e-payment alike
2. Non-pegged to THB => we focus on this case

**Spectrum:** Various degree of popularity and functions of money

- Possibility: Likely (without central bank’s intervention)
- How to get here?
  - Non-banks are more superior than banks in creating the required network effects

---

**Scenario II: Retail**

<table>
<thead>
<tr>
<th>Transmission channels</th>
<th>Scenario II (Retail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest rate</td>
<td>Less effective: smaller portion of monetary instrument is affected by interest rate</td>
</tr>
<tr>
<td>Credit</td>
<td>Less effective: less demand for THB credit</td>
</tr>
<tr>
<td>Asset price</td>
<td>Less effective: smaller portion of people’s wealth is affected by MP</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>Less effective: improvement of entrepreneur’s competitiveness via THB exchange rate is lessened</td>
</tr>
<tr>
<td>Expectation</td>
<td>Indeterminate</td>
</tr>
</tbody>
</table>
Scenario III: New Asset Class

- Digital currencies become digital assets instead
  - e.g. cryptocurrencies, no longer functioned as means of exchange, become a conventional asset like stock, gold, or other commodities

✓ Possibility: Likely
✓ How to get here?
  - Cryptocurrencies cannot become means of exchange
  - The market becomes thicker, reducing the volatility of the asset

<table>
<thead>
<tr>
<th>Transmission channels</th>
<th>Scenario III (New Asset Class)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest rate</td>
<td>Status quo</td>
</tr>
<tr>
<td>Credit</td>
<td>Status quo</td>
</tr>
<tr>
<td>Asset price</td>
<td>Indeterminate:</td>
</tr>
<tr>
<td></td>
<td>• more asset choice for people to invest in (Hawkins 2017)</td>
</tr>
<tr>
<td></td>
<td>• the value of digital assets depend on their properties.</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>Status quo</td>
</tr>
<tr>
<td>Expectation</td>
<td>Status quo</td>
</tr>
</tbody>
</table>
### Part II Digital currencies

**Scenario III: Summary of Scenarios**

<table>
<thead>
<tr>
<th>Transmission channels</th>
<th>Scenario I (Wholesale)</th>
<th>Scenario II (Retail)</th>
<th>Scenario III (New Asset Class)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest rate</td>
<td>Status quo</td>
<td>Less effective</td>
<td>Status quo</td>
</tr>
<tr>
<td>Credit</td>
<td>Status quo</td>
<td>Less effective</td>
<td>Status quo</td>
</tr>
<tr>
<td>Asset price</td>
<td>Status quo</td>
<td>Less effective</td>
<td>Indeterminate</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>Status quo</td>
<td>Less effective</td>
<td>Status quo</td>
</tr>
<tr>
<td>Expectation</td>
<td>Status quo</td>
<td>Indeterminate</td>
<td>Status quo</td>
</tr>
</tbody>
</table>
How to deal with these scenarios then?

• Doing nothing?
• e-Payment?
• Stricter investment regulations on digital currencies?
• CBDC as a policy tool?
  • If CB offers competing products that would enhance consumers’ retail payment experience, that would curb retail use of non-bank wallets
Part II Digital currencies
Central Bank Digital Currency (CBDC)

What are CBDCs?

“central bank-issued money that combine cryptography and DLTs” (BBVA)

Why are central banks considering them?

- Digitize cash to improve efficiency in payments (BIS)
- Develop a new monetary policy tool to overcome zero-bound interest rates (BBVA, BIS)
- Maintain access to central bank money given increasing competition from private DCs and e-payment (BBVA, BIS)
- Maintain control over financial conditions (BBVA, BIS)
Types of CBDC under consideration

- Design of each case is based on their purpose
- Operational aspects will be disregarded for brevity

### 3 Design options of CBDC

<table>
<thead>
<tr>
<th>Design</th>
<th>Objective</th>
<th>Accessibility</th>
<th>Interest-bearing</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>“A”</td>
<td>For Interbank Settlement</td>
<td>Restricted: Wholesale</td>
<td>Unremunerated</td>
<td>Project Inthanon</td>
</tr>
<tr>
<td>“B”</td>
<td>Similar to cash</td>
<td>Universal: Retail</td>
<td>Unremunerated</td>
<td>E-Krona</td>
</tr>
<tr>
<td>“C”</td>
<td>Policy Tool</td>
<td>Universal: Retail</td>
<td>Remunerated</td>
<td>???</td>
</tr>
</tbody>
</table>

**Design features**

- **Accessibility**
  - Limited
  - Universal

- **Interest-bearing**
  - Zero
  - Non-zero

- **Anonymity**
  - Identified
  - Anonymous

- **Continuity**
  - 9 to 5
  - 24/7
Analysis of impact on MP transmission will focus on how each case would affect balance sheet composition of each agent, in terms of both quantity (q) and price (p)

Key assumptions

1) Supply of CBDC is controlled by the central bank through a market-based mechanism whereby cash/assets are exchanged for CBDC tokens in-kind.
2) No change in MP framework (IT). Policy rate is the main policy tool (no QE).
CBDC Designs

- Design A: Wholesale CBDC
- Design B: Unrenumerated Retail CBDC
- Design C: Renumerated Retail CBDC
Wholesale CBDC is unlikely to affect MP transmission because it does not contend with the two-tier banking system and is just a change in infrastructure intended to improve efficiency of RTGS systems (BIS, 2018).

### Implications for Monetary Policy Transmission

<table>
<thead>
<tr>
<th>MP Transmission channels</th>
<th>Case A – Wholesale CBDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest rate</td>
<td>Status quo</td>
</tr>
<tr>
<td>Credit</td>
<td>Status quo</td>
</tr>
<tr>
<td>Asset price</td>
<td>Status quo</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>Status quo</td>
</tr>
<tr>
<td>Expectation</td>
<td>Status quo</td>
</tr>
</tbody>
</table>
Part II Digital currencies
Design B – Unrenumerated retail CBDC

Unrenumerated Retail CBDC might affect MP transmission during stress because it is a safe asset that could be considered a ‘safer’ alternative to bank deposits.

### Implications for Monetary Policy Transmission

<table>
<thead>
<tr>
<th>Channels</th>
<th>Case B – Unrenumerated retail CBDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest rate</td>
<td>Status quo</td>
</tr>
<tr>
<td>Credit</td>
<td>Status quo (except during stress: Shift from deposits to CBDC could impact bank funding and credit provision especially during stress periods (bank runs).) During normal times however, such shift is unlikely since deposits still pays interest.</td>
</tr>
<tr>
<td>Asset price</td>
<td>Status quo</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>Status quo</td>
</tr>
<tr>
<td>Expectation</td>
<td>Indeterminate (but might lead to higher ELB due to less carrying cost of ‘cash’)</td>
</tr>
</tbody>
</table>
### Part II Digital currencies

#### Design C – Renumerated retail CBDC

Renumerated Retail CBDC could affect MP transmission significantly as it gives central banks stronger control over domestic financial conditions through the CBDC interest rate (policy rate).

<table>
<thead>
<tr>
<th>Central bank</th>
<th>Comm. Bank</th>
<th>Non-bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond</td>
<td>Loans</td>
<td>Deposits</td>
</tr>
<tr>
<td>Reserves</td>
<td>Bond</td>
<td>Bond</td>
</tr>
<tr>
<td>International reserves - CBDC</td>
<td>Deposits</td>
<td>Others</td>
</tr>
<tr>
<td>- CIC</td>
<td>Reserves</td>
<td>Bond</td>
</tr>
<tr>
<td>Other assets</td>
<td>- CBDC</td>
<td>Cash</td>
</tr>
<tr>
<td>Other debt</td>
<td>- Cash</td>
<td>CBDC</td>
</tr>
<tr>
<td>Equity</td>
<td>Other assets</td>
<td>Other assets</td>
</tr>
</tbody>
</table>

**Implications for Monetary Policy Transmission**

<table>
<thead>
<tr>
<th>Channels</th>
<th>Case C – Renumerated retail CBDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest rate</td>
<td>More effective: Bank rates would become more sensitive to changes in the policy rate to prevent deposit flight (<em>CPMI, 2017</em>) and minimize opportunity costs. The policy rate would act as a interest rate floor/ceiling (<em>Meaning et al, 2018</em>).</td>
</tr>
<tr>
<td>Credit</td>
<td>Less effective: Mass conversion from deposits to CBDC would affect bank’s lending capacity (<em>Stevens, 2017; BIS, 2018</em>).</td>
</tr>
<tr>
<td>Asset price</td>
<td>More effective: Changes in policy rate directly affects wealth.</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>Status quo</td>
</tr>
<tr>
<td>Expectation</td>
<td>More effective: No ELB allows central banks to send strong policy signals through extreme rate cuts, especially in the down cycle (<em>Stevens, 2017</em>).</td>
</tr>
<tr>
<td>Channels</td>
<td>Design A (Wholesale)</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Interest rate</td>
<td>Status quo</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Credit</td>
<td>Status quo</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Asset price</td>
<td>Status quo</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>Status quo</td>
</tr>
<tr>
<td>Expectation</td>
<td>Status quo</td>
</tr>
</tbody>
</table>
Part II Digital currencies
Are retail CBDCs really the solution to the autonomy problem?

Disintermediation of commercial banks / emergence of narrow-banking

- Retail banking would face direct competition from central banks → narrow banking → with the result threat to aggregate credit (BBVA, 2017)

Validity of ELB argument

- Negative interest rate policy (NIRP) not be politically feasible.
- Eliminating larger bank notes to increases costs of holding cash lowers ELB (Rogoff, 2016; Engert, 2017)

Financial stability implications

- Banks may engage in high risk lending to offset higher funding cost (BIS, 2018)
- CBDCs allow for ‘digital runs’ towards the central bank with unpredecented speed and scale (BIS, 2018)

Autonomy problem

- Loss of seigniorage income might not an issue for some central banks (Engert, 2017)
- Unlikely that cryptocurrencies will completely replace fiat currencies unless there is massive lost of trust in the central bank. Central banks must maintain trust through credible policies (He, 2018)
• With increasing competition from private DCs would force central bank to move towards CBDCs.

• However, central banks must carefully weigh the implications for financial stability and monetary policy of issuing each case of CBDC.

### Bottom line

#### Issues for consideration

<table>
<thead>
<tr>
<th>Issues for consideration</th>
<th>Case “A”</th>
<th>Case “B”</th>
<th>Case “C”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform full functions of money</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Able to compete with retail crypto-currencies</td>
<td>-</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Net Impact on MP transmission mechanism</td>
<td>Status quo</td>
<td>Status quo</td>
<td>More effective</td>
</tr>
</tbody>
</table>
| Financial stability issues                    | -        | -        | • Narrow banking  
                                          |          |          | • Moral Hazard     |
Conclusion

e-Payment & Digital Currencies

**e-Payment**

- How much retail e-payment could substitute cash usage in Thailand?
  - Small substitution effect

- How would e-payment affect monetary aggregates, central bank's balance sheet, velocity of money, money multiplier? How would this affect the transmission of monetary policy or monetary operations?
  - Not yet observe any negative impact from e-Payment on monetary operation in the transition toward less-cash society. E-payment trend strengthens MP transmission via credit and asset price channels.

**Digital Currencies**

- How would the emergence of private digital currencies affect transmission of monetary policy in 5 traditional channels?
  - Most likely affect through credit and asset price channels (depends on each scenario)

- What are the policy options available to central banks, and how would this change the transmission of monetary policy?
  - e-Payment, Regulations, CBDC
“Central banks must maintain the public’s trust in fiat currencies and stay in the game in a digital, sharing, and decentralized service economy.”

Dong He
Deputy Director, IMF

Monetary Policy in the Digital Age, June 2018
Thank you