Exploring the Implications of Blockchain Technology on Public Financial Management

2:15pm – 3:30pm, Wednesday December 7

International Consortium on Governmental Financial Management (ICGFM)
“The Macroeconomic Benefits of Strong PFM Practices”
ICGFM Winter Training Conference
Panel Objectives

Familiarize audience with potential implications of blockchain technology, benefits and limitations, on PFM

Provide several illustrative examples of non-financial/governmental applications
Panelists

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Opening Audience Participation Questions

To what degree are you familiar with blockchain technology?
A) Very familiar
B) Somewhat familiar
C) Not familiar

To what degree are you familiar with the concept of Integrated Financial Management Information Systems (IFMIS)?
A) Very familiar
B) Somewhat familiar
C) Not familiar
What is a Blockchain?
Quick Review: Before Bitcoin
(online) BANKING
Your electricity use at a glance
Aperçu de votre consommation d'électricité

Électricité consommée pendant le période
Relevé du compteur au 15 mai 2006
Previous reading/Relevé précédent

Equals current use of
Soit une utilisation de

$ 282.27

9.43
38.15
16.41

$ 282.27
Taylor Smith
1037 Oakley Way
Salt Lake City, UT 84120

Pay to the order of: John Doe
Fifty-six and 10/100

DATE: 10-26-13

Deseret First
Credit Union

Taylor Smith
Analog
Peter: $190

Antonie: $200

Bank of America: $190

Commerzbank: $210

ING: $210

ING: $200
Peter: $190

ING: $210

Bank of America: $190

Commerzbank: $210

Antonie: $210

ING: $190
Takes about three business days.
Takes about three seconds.
Recipe for Digital Money

Peer to Peer

Blockchain
Permissionless

Only need:
Free software.
Internet connection.

Peer to Peer Electronic Cash
Bank of America: $190
Commerzbank: $210

Peter: $190
ING: $210

Antonie: $210
ING: $190
Many ledgers becomes one super ledger, the blockchain!
Many ledgers becomes one super ledger, the blockchain.

Identical Copies of that ledger are held by every peer in the network.
The network of peers agrees (reaches consensus) on the state of that ledger.

Block chain transaction transaction transaction transaction transaction
transaction transaction transaction transaction transaction transaction
transaction transaction transaction transaction transaction transaction
transaction transaction transaction transaction
transaction transaction transaction transaction transaction
transaction transaction transaction transaction transaction transaction
transaction transaction transaction transaction
transaction transaction transaction transaction transaction
transaction transaction transaction transaction
transaction transaction transaction transaction
transaction transaction transaction transaction
transaction transaction transaction transaction
transaction transaction transaction transaction

ADD THIS NEW TRANSACTION? Y/N

Yes!

Yes!

Yes!

Yes!

Yes!
Beyond Money
Blockchains and p2p networks can help us come to an agreement on anything.
Blockchains and p2p networks can help us come to an agreement on anything.
Recipe for Internet of Trust

Peer to Peer

Blockchain

Consensus
Consensus Mechanisms

Two types of rules: **Automatic Rules** and **Decision Rules**
Consensus Mechanisms

Automatic Rules

ADD Transaction X Where I send to Peter (01XJYK) these 5 Bitcoins (that I already sent two weeks ago to someone else in Transaction Y)?
Participants disagree. There are two alternative states of the ledger and both are valid according to the automatic rules.
Consensus Mechanisms

Decision Rules

We need to pick a version that should “win” and be the authoritative record for a given period of time (a block).
<table>
<thead>
<tr>
<th>Consensus Mechanisms</th>
<th>Proof of Work</th>
<th>Proof of Stake</th>
<th>Social Network</th>
<th>Consortium</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lottery.</strong></td>
<td><strong>Lottery.</strong></td>
<td><strong>Bilateral</strong></td>
<td><strong>Lottery.</strong></td>
<td></td>
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<tr>
<td>Anyone can “buy</td>
<td>Anyone can</td>
<td>agreement among</td>
<td>Only identified</td>
<td></td>
</tr>
<tr>
<td>tickets” with</td>
<td>“buy tickets”</td>
<td>your trusted</td>
<td>consortium</td>
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<tr>
<td>computing power.</td>
<td>by staking</td>
<td>contacts.</td>
<td>members get</td>
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<td>tokens on</td>
<td></td>
<td>tickets.</td>
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<tr>
<td></td>
<td>network.</td>
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</tbody>
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*Ethereum is currently using a proof of work mechanism but anticipates moving to proof of stake in upcoming releases.*
Consensus and Corruptibility?

The nature of these rules will determine the degree to which data in the blockchain is secure, immutable, and resistant to attacks or corruption.
Consensus and Corruptibility?

**Automatic rules** can be set to determine who is and who is not allowed to have **read access** to the blockchain.

A “**public” or “open” blockchain network** sets no restriction anyone can read and maintain their own copy of the blockchain.

A “**private” blockchain network** may restrict read access to a specified few and then users must trust the honesty and incorruptibility of these few.
Consensus and Corruptibility?

Decision rules determine who is allowed to add data to the blockchain, who has “write” access.

A “permissioned” or “proprietary” blockchain network could limit write access to a set of identified users.

An open or “permissionless” blockchain network allows anyone to write data if they can provide a proof-of-work or a proof-of-stake.

In a permissioned network, those with write access could work together to block some users from adding new transactions or data or rewrite the history of the ledger selectively. They must be trusted and must not lose their keys.
Please visit coincenter.org to learn more.
Preliminary Discussion Questions:

What opportunities exist to use blockchain, or distributed ledger technology (DLT), to address or even leapfrog classic public financial management (PFM) challenges (rational, transparent, predictable) and possibly even newer PFM challenges (effective, efficient)?

What challenges exist related to the current state of DLT or PFM that might undermine, restrict, or otherwise prohibit using DLT to address PFM challenges?
Closing Audience Participation Questions

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Known non-financial and government application cases:

Resource: [Deloitte 2-pager](#) on blockchain in the public sector (important!)
Resource: [Global Blockchain Forum](#) on public policy
Resource: [article](#) about putting ballots on a blockchain
Resource: [article](#) criticizing blockchain for voting
Resource: [article](#) on land title records experimentation in Sweden
Resource: [press release](#) on notarization in Estonia
Resource: [article](#) summary: land titling in Georgia, Ghana, and Honduras
  - Sub-resource: [article](#) on land titling specifically in Georgia
  - Sub-resource: [article](#) on land titling specifically in Ghana
  - Sub-resource: [article](#) on land titling specifically in Honduras