

Potential effect of the blockchain technology implementation on clearing and settlement procedure of IATA Clearing House

Mizgireva Yulia

Perm State University
Laboratory of Cryptoeconomics and Blockchain Systems

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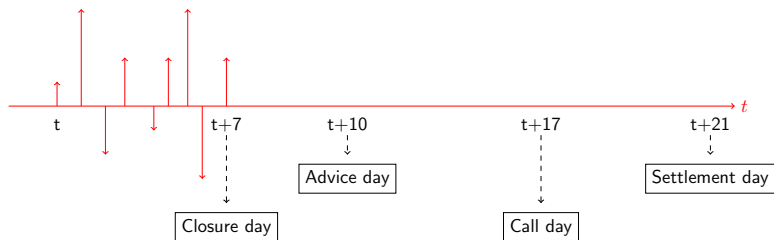
Outline

- 1 ICH's Clearing and Settlement Procedure
- 2 Airline Member's Cash Flow
- 3 Optimization Model

IATA Clearing House

- **IATA (The International Air Transport Association)** is a trade association in the airline industry.
 - more than **260** airline members, which together represent about **83%** of total air traffic.
 - IATA aims:
 - to simplify processes by developing the commercial standards for the airline business,
 - to increase passenger convenience;
 - to reduce costs by improving efficiency.
- **IATA Clearing House (ICH)** is an organization serving the air transport industry which provides clearing and settlement services for its members.
 - about **275** airline members (both IATA and non-IATA members)
 - **75** non-airline members.

ICH's Clearing Procedure



Closure day ($t+7$) : deadline for submission of claims to ICH;

Advice day ($t+10$) : net balance advised to all members of ICH;

Call day ($t+17$) : settlement of receivables to ICH, and payables to Airline Members;

Settlement day ($t+21$) : settlement of payables to Associate Members.

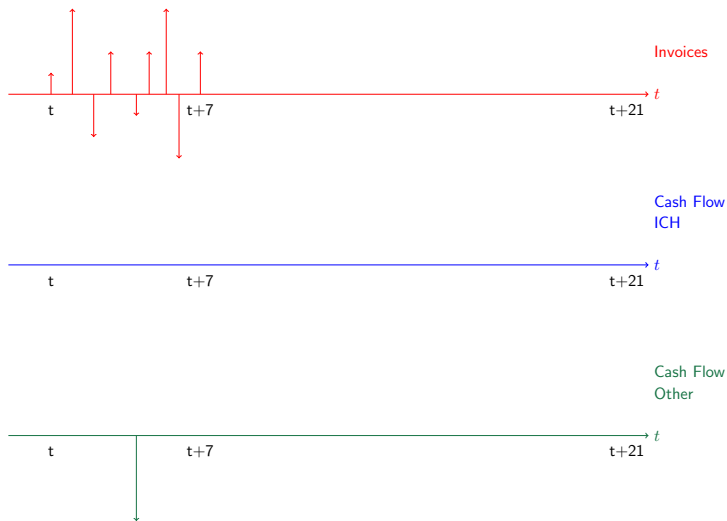
ICH's Current Clearing Procedure: Some Numbers

- the total volume of billings: about **\$ 54.3 B**
- the offset ratio (the relation between the volume of billings and the amount of cash required to settle them): about **64%**
- the cash-out: about **\$ 19.5 B**.
- the commission for transactions: **1% (\$ 195 M)**
- the time needed for making payments:
 - **14 days** of Clearing cycle
 - **1-3 days** for SWIFT transfers

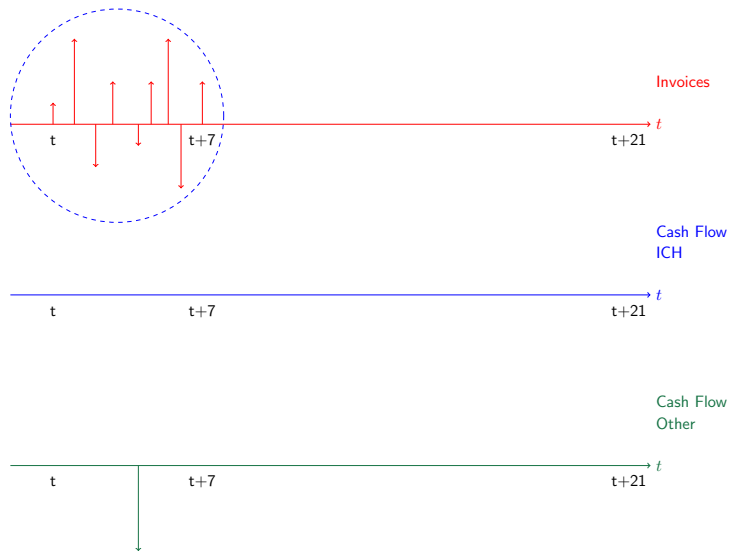
Potential Improvement

- Creating a new industrial digital asset (IATA Coin), as the means of payment between ICH members
- Potential benefits:
 - Cash flows acceleration (almost immediate settlement and confirmation on the blockchain)
 - Offset ratio increase
 - Transaction cost reduction (the amount of SWIFT transfers will decrease)
 - Providing the additional liquidity for members inside the current clearing cycle

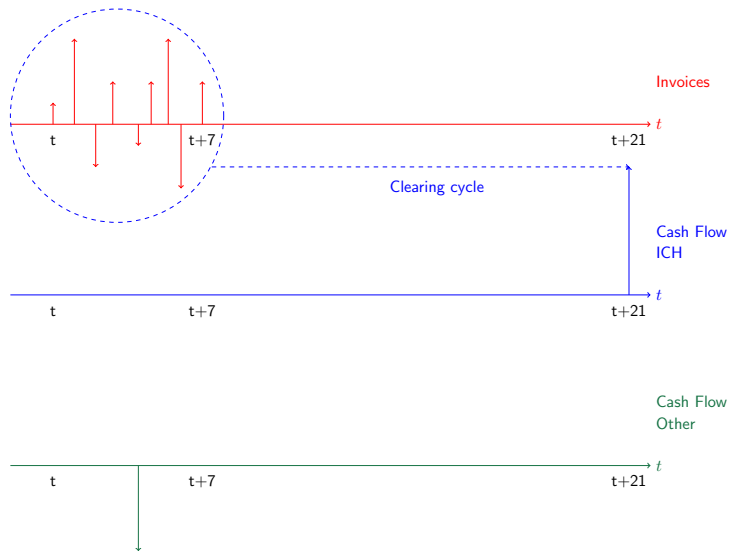
Airline Member's Cash Flow



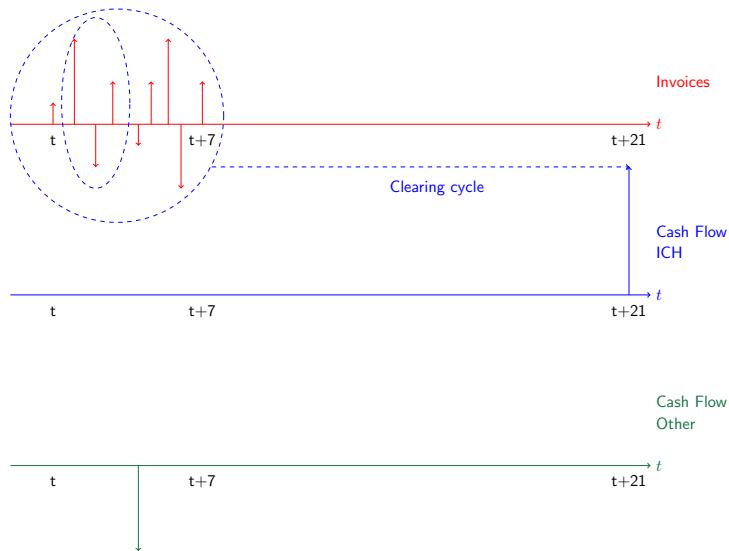
Airline Member's Cash Flow



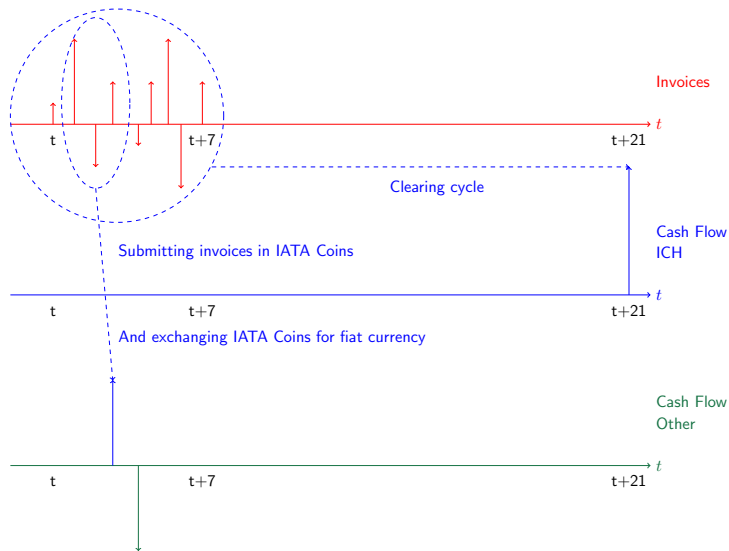
Airline Member's Cash Flow



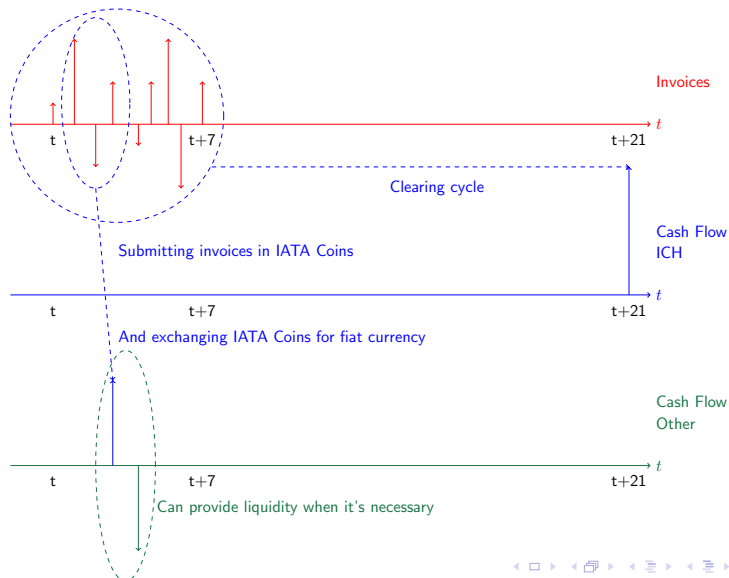
Airline Member's Cash Flow



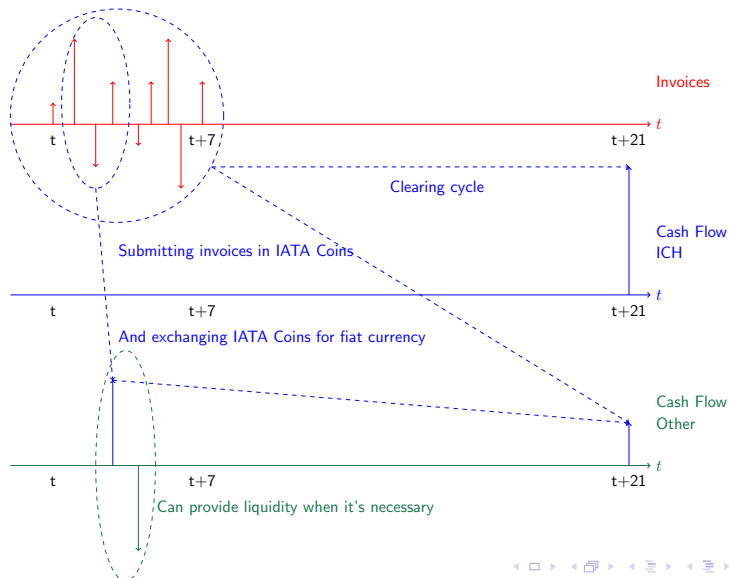
Airline Member's Cash Flow



Airline Member's Cash Flow



Airline Member's Cash Flow



Optimization Model

(For the Clearing Cycle with Closure Day = $t + 7$)

1. Offset ratio maximization

$$\frac{\left| \sum_{i=1}^N \text{Inv}_i (1 - u_i) \right| + \sum_{j=1}^M |R_j| + |Cl_{t+7}|}{\sum_{i=1}^N |\text{Inv}_i| (1 - u_i) + \sum_{j=1}^M |R_j| + |Cl_{t+7}|} \rightarrow \min$$

2. Total cash payments after IATA Coin adoption

should be not greater than before it

$$\left| \sum_{i=1}^N \text{Inv}_i (1 - u_i) \right| + \left| a \sum_{i=1}^N \text{Inv}_i u_i \right| \leq \left| \sum_{i=1}^N \text{Inv}_i \right|$$

3. The same inequality for the absolute values of invoices

$$\sum_{i=1}^N |\text{Inv}_i| (1 - u_i) + \left| a \sum_{i=1}^N \text{Inv}_i u_i \right| \leq \sum_{i=1}^N |\text{Inv}_i|$$

4. Liquidity profile is improved by using IATA Coins

$$\left| a \sum_{i=1}^N \text{Inv}_i u_i + \sum_{j=1}^M R_j + Cl_{t+7} \right| \leq \left| \sum_{j=1}^M R_j + Cl_{t+7} \right|$$

$$u_i \in \{0; 1\}, i = \overline{1, N}$$

Input variables:

Inv_i is the value of the invoice i at the time period $[t, t + 7]$, $i = \overline{1, N}$;

Cl_{t+7} is the after-clearing sum of money for the company at the time period $[t - 14, t - 7]$;

R_j is the value of fiat currency payment j which doesn't go through ICH at the time period $[t, t + 7]$, $j = \overline{1, M}$.

Control variables:

a is the proportion of IATA Coins which are exchanged to fiat currency;

u_i is the dummy variable:

$$u_i = \begin{cases} 0, & \text{if the company decides} \\ & \text{to include } \text{Inv}_i \text{ into clearing;} \\ 1, & \text{if the company decides} \\ & \text{to submit } \text{Inv}_i \text{ in IATA Coins} \\ & \text{and exclude it from clearing.} \end{cases}$$

Practical Implementation of the Model

- Parameters:
 - the number of airline companies = **3**
 - proportion of the invoices between the members of ICH = **30%**
 - the value of invoices $\sim \log N(8.190488, 2.118524)$
 - the number of invoices per day $\sim Pois(\lambda)$
 - the number of simulations = **1000**
- The model is implemented for one clearing cycle and for each company.
- Every company chooses its optimal strategy independently from the others.
- For each invoice the opinions of the both counterparties (the payer and the payee) are compared.
- If the both companies decided that the submission of a particular invoice in IATA Coins is more profitable for them, then it will be excluded from the clearing procedure and submitted in IATA Coins.

Model Results

Table: Average offset ratios for different λ

λ	Offset (invoices between ICH members)		Δ volume	Δ cash-out
	Current	Using IATA Coins		
1	45.8%	59.2%	-29.9%	-42.4%
2	52.8%	63.9%	-29.4%	-42.2%
3	58.9%	66.6%	-27.7%	-43.2%
4	62.3%	69.9%	-19.3%	-33.1%
5	64.1%	70.6%	-17.2%	-29.4%
6	64.7%	70.9%	-17.7%	-30.3%
7	67.4%	72.9%	-15.4%	-28.1%
8	68.6%	73.6%	-12.6%	-24.0%
9	69.8%	75.4%	-14.0%	-29.0%
10	71.0%	76.3%	-10.4%	-24.0%

Model Results

In the current assumptions the model have shown that:

- More than **10%** of the total billing volumes are submitted in IATA Coins (**\$ 54.3 B** \longrightarrow **\$ 48.9 B**)
- More than **24%** reduction of the cash-out (**\$ 19.5 B** \longrightarrow **\$ 14.9 B**)
- Reduction of the commission fee (**\$ 195 M** \longrightarrow **\$ 149 M**)

Summary

- The main result is a practical evidence that using the IATA Coins can help to:
 - increase the offset ratio,
 - reduce the transaction costs,
 - improve the liquidity profile,

assuming that all the members of the financial network are acting rationally.

In Conclusion...

