Utilizing the BoF simulator in quantitative FMI analysis

Tatu Laine

Evolving Landscape of Payment Systems

Banco de México

15.10.2014

SUOMEN PANKKI
FINLANDS BANK
EUROJÄRJESTELMÄ
EUROSYSTEMET

Agenda / BoF simulator

- History, network, services
- Why simulate
- Research works
- Finnish case example
- Future challenges and trends

The opinions expressed are those of the author and do not necessarily reflect the views of the Bank of Finland.

History of BoF simulator

1998

- BoF-PSS1 was built before Finland joined EMU

2004

- First generic BoF-PSS2 was released
  - adaptability, modularity, sharing, free of charge

2005-2006

- Sponsorship by BOE, FED and BOC

2008

- Supporting services (Help desk, training and consultation)

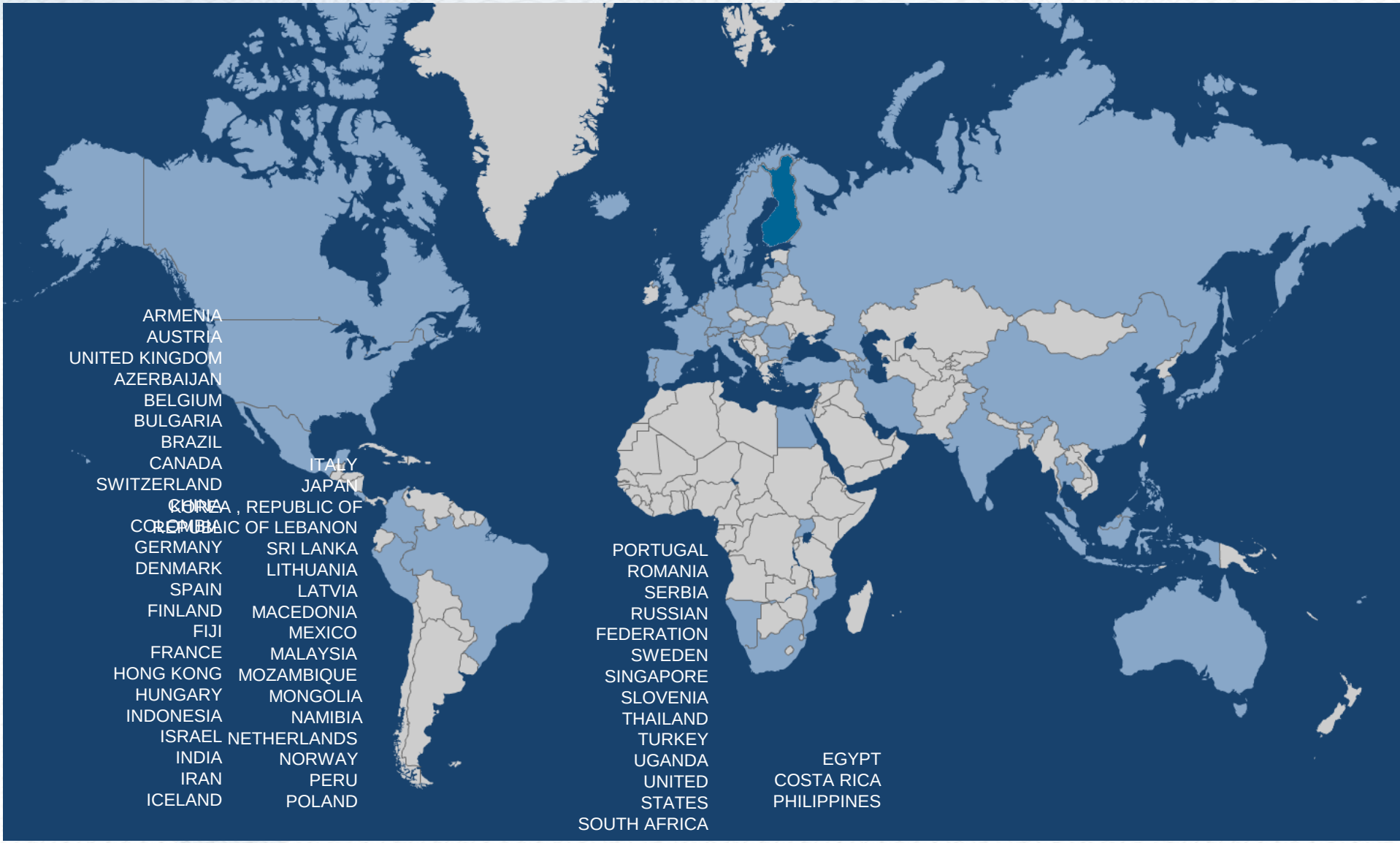
2009

- Initiation of T2 - Simulator project

2014

- Last release (ver 410) of generic BoF-PSS2

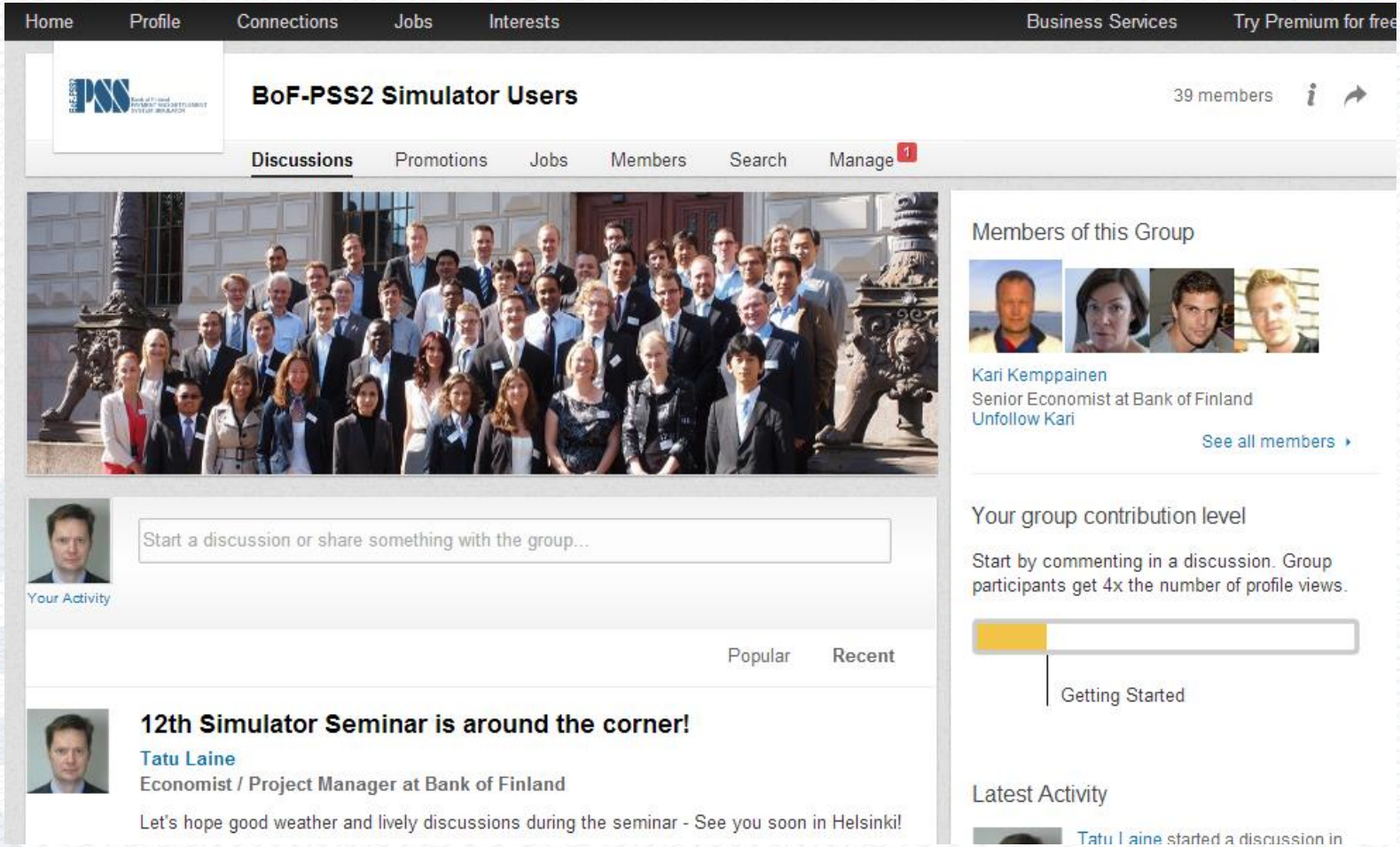
BoF distribution (August 2014)



Global cooperation

- Sponsorships from BOE, BOC, FED
- Development of T2 - Simulator jointly provided by Deutsche Bundesbank, Banque de France, Banca d'Italia and Bank of Finland
- ESCB working groups: overseers and operators
- EURO1 – Simulator: joint project with EBA Clearing

BoF simulator users - group



Services for BoF simulator users

- Training courses
  - General Training course
  - TARGET2 Simulator course
  - Tailored on site trainings
- User support
  - Help desk service
  - Extranet workspace for larger projects (confidential area)
  - Consultation and advisory services
- Feature development
  - Project estimation
  - Change implementation

Why simulate

"Simulations start where analytical methods fail"

- Systems are complex and difficult to model mathematically. Simulations allow more accurate modelling.
- Mapping and testing the current payment/settlement system. Simulations assist to find out limitations/features of payment systems.
- Simulation results contain systemic effects (data not available to participants) raising from the physics and network topology of the payment flows.

Simulator seminars books

- H. Leinonen (ed.): Liquidity, risks and speed in payment and settlement systems - a simulation approach (Bank of Finland Studies E:31/2005)
- Leinonen (ed.): Simulation studies of liquidity needs, risks and efficiency in payment networks (Bank of Finland Studies E:39/2007
- H. Leinonen (ed.): Simulation analyses and stress testing of payment networks (Bank of Finland Studies E:42/2009)
- M. Hellqvist and T. Laine (eds.): Diagnostic for the financial markets – computational studies of payment system (Bank of Finland Studies E:45/2012)

Recent work by European System of Central Banks (ESCB)

- Utilizes TARGET2 payment system data
- Done in user groups: overseers, operators
- Results only visible for PSSC (Payment and Settlement Systems Committee) - members
  - Identification of critical counterparts
  - Various collateral stress scenarios
  - Studies on use of bilateral limits and reservations

ECB (2013, December). The TARGET2 simulator. Target Newsletter No. 7, from https://www.ecb.europa.eu/paym/t2/shared/pdf/newsletter/TARGET_Newsletter_issue_number_7.pdf.

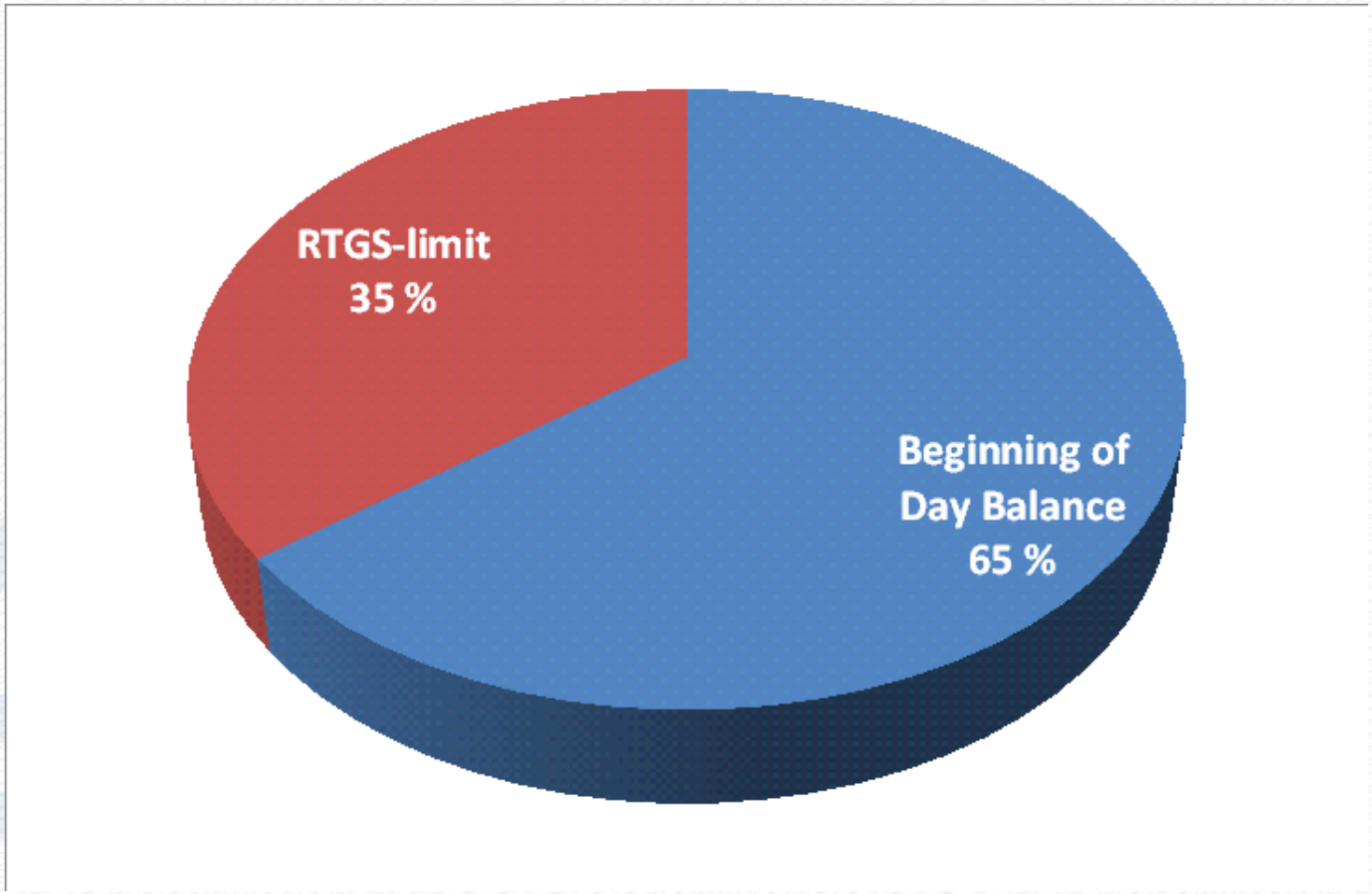
Finnish case example

- Take only customers of TARGET2 Suomen Pankki component
- Create scenarios
  - Drop out largest TARGET2 Suomen Pankki participants / cross-border transactions from countries having most payments with TARGET2 Suomen Pankki participants
  - Adjust liquidity of TARGET2 Suomen Pankki participants
- Maintain the rest of TARGET2 system same
- Analyze the scenarios / results
  - Idea: Identify the most vulnerable banks and level of additional liquidity needed

TARGET2 Suomen Pankki component

- How to select simulation day: 23.4.2013
  - No Eurosystem's tender operations on that day
- Sort out participants and their PM accounts
- Compare credit limits and BOD balances
  - Five largest ones have RTGS-limit and BOD over 1 billion
  - Average daily turnover of TARGET2-Suomen Pankki is 50 billion

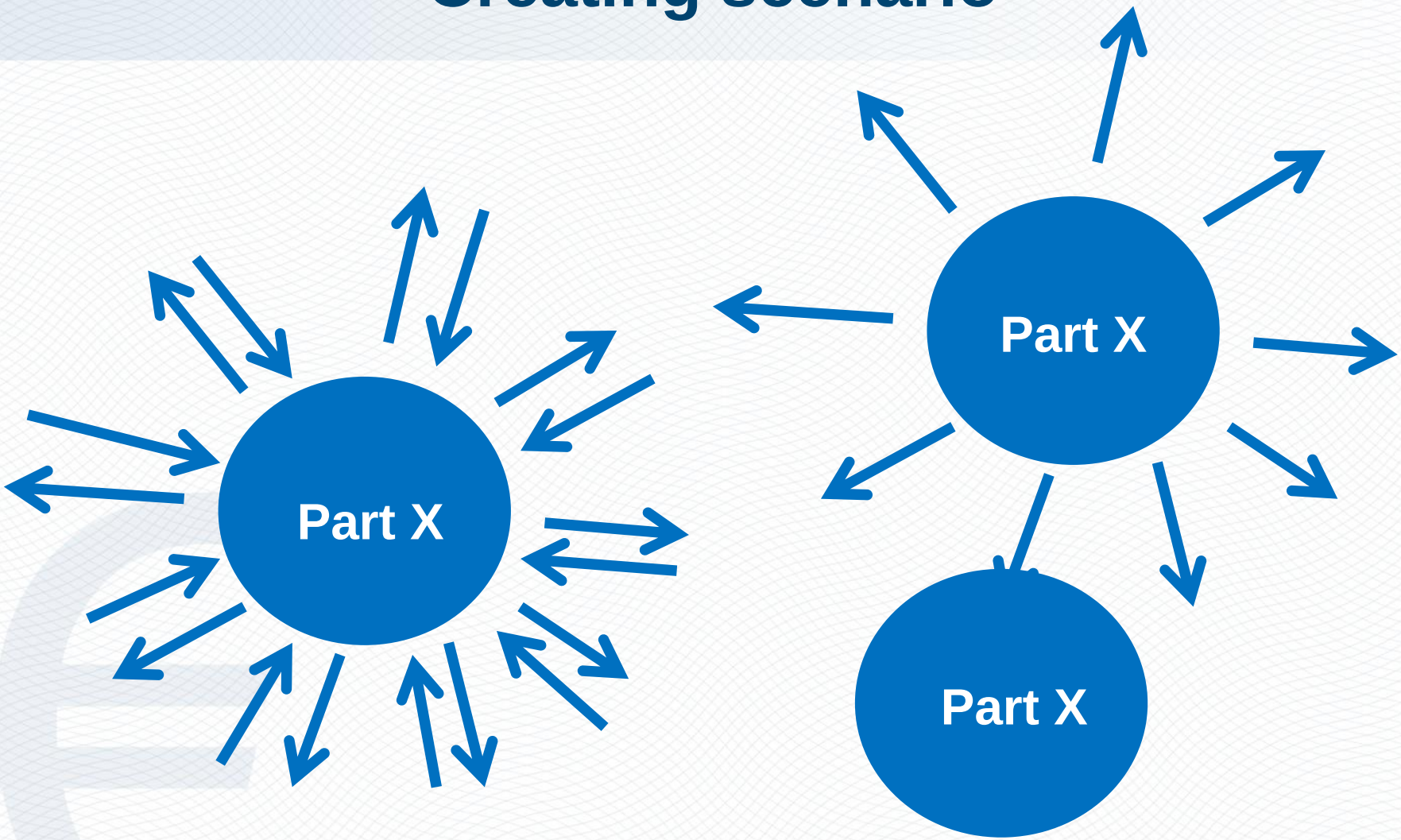
System total liquidity - six largest make 90% of that



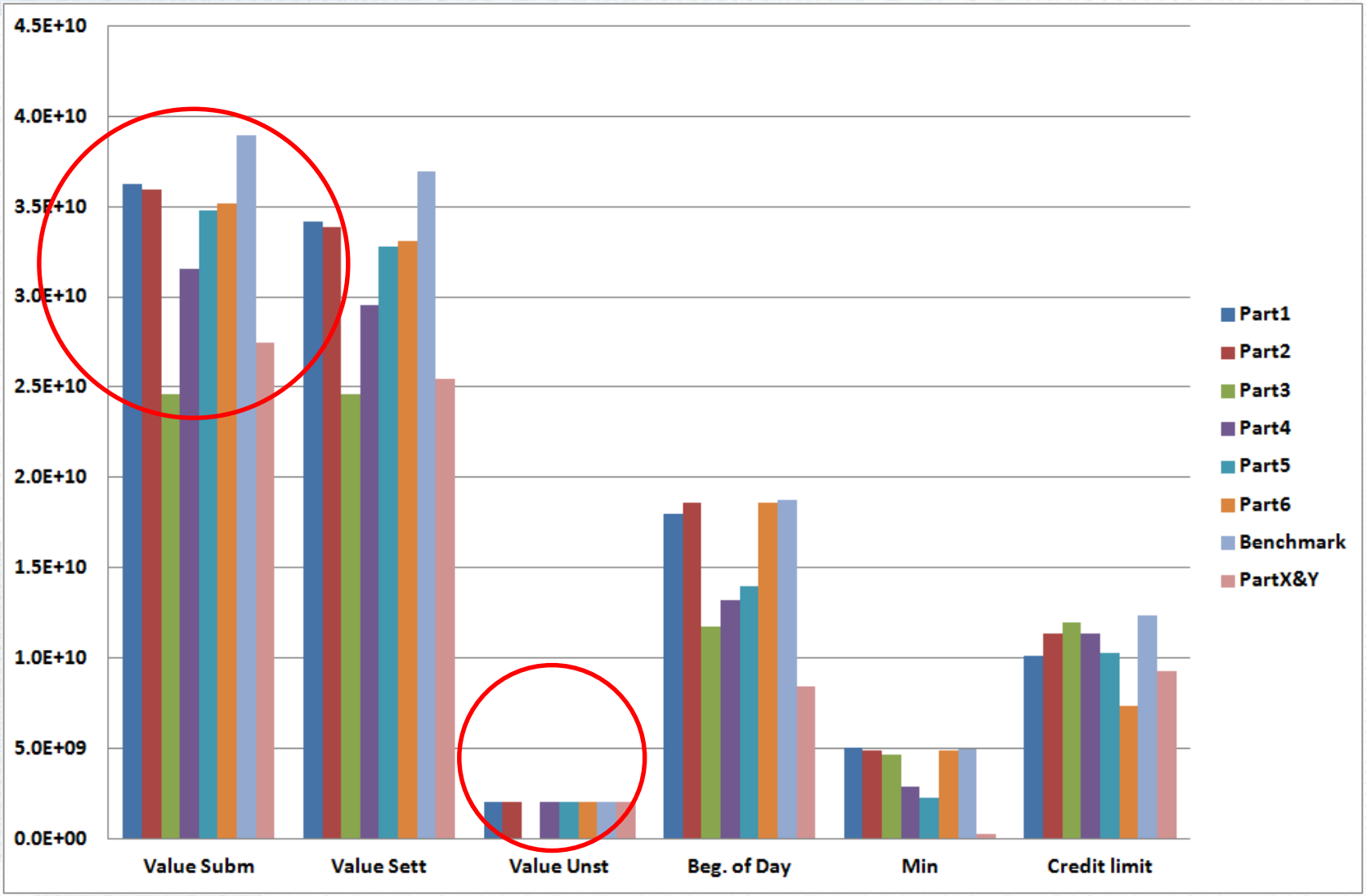
Variables

- Beginning of day balance [0, 25%, 50%, 75%,100%]
- Credit limit [0, 25%, 50%, 75%,100%]
- Cross-border transactions [DE, DK, NL]
- Domestic participant – drop out
- Domestic participant – not sending

Creating scenario



Variable – domestic participant



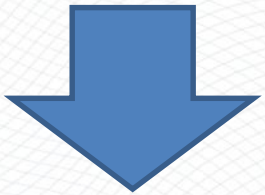
Summary

- Finnish experience - No news, good news
- Simulator studies payment profiles and reveals root cause dependencies
- This information can be used to support financial stability analysis and FSA analysis
- This analysis should be made on frequent basis

Payment system data analysis as a warning indicator

Payment system or securities settlement system data is usually:

- available and well preserved
- has high frequency and accuracy
- allows quantitative approach



Potential for warning indicator use and more up to date risk monitoring

Challenges

- Data sets can be huge
- Data manipulations and scenario generation if not automatized, take a lot of time
- Amount of computed scenarios can amount to thousand's

BIG data and data logistic challenges

Building monitoring environment

In order to support macro prudential work, FSA analysis and to meet CPSS-IOSCO and BCBS requirements:

- Dedicated staff to run and monitor
- Define a set of standard reports
- Automatization of report generation
- Possibly customization of settlement logics of the simulator

Feedback from users and joint projects will steer the development

Focus of future development

- Improve the usability and automation to obtain regular and comprehensive assessment reports faster. Monthly, even daily? Automated stress test, screening of critical liquidity levels,…
- Parallel processing of scenarios

Thank you!

Tatu Laine
Oversight of Market Infrastructure Division
Financial Stability and Statistics
Bank of Finland
tatu.laine@bof.fi