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EUROSYSTEM

# TARGET2 analytical tools for regulatory compliance

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Payment and Settlement  
System Simulator Webinar

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*Disclaimer:*

*The authors of this presentation are members of one of the user groups with access to TARGET2 data in accordance with Article 1(2) of Decision ECB/2010/9 of 29 July 2010 on access to and use of certain TARGET2 data, as amended on 22 September 2017 by Decision (EU) 2017/2080. The Central Banks of Authors, the MIB and the MIPC have checked the paper against the rules for guaranteeing the confidentiality of transaction-level data imposed by the MIB pursuant to Article 1(4) of the above-mentioned issue. The views expressed in the paper are solely those of the author and do not necessarily represent the views of the Eurosystem.*

# Overview

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# 1

## Background

PFMIs and TARGET2 analytics

# SIPS regulation and CPMI/IOSCO principles

- As a systemically important payment system, **TARGET2 is subject to the SIPS regulation<sup>1</sup> that transposes the CPMI/IOSCO principles for FMIs (PFMIs)**, which provide a common framework to define and assess the robustness of market infrastructures in terms of risks and efficiency.
- The TARGET2 operator is requested, inter alia, to **periodically assess the resilience of TARGET2 to different types of risks.**
- As other FMIs worldwide are subject to similar provisions, the topic of **tools for regulatory compliance is a shared interest to a wide range of operators.**

<sup>1</sup> ECB Regulation on oversight requirements for systemically important payment systems (ECB/2014/28).

# TARGET2 analytical tools

- Some specific regulatory requirements need to be **supported by the analysis of the system's activity and participants at the highest level of granularity.**
- The **access to transaction-level** data offers to the TARGET2 operator the possibility to fulfil these specific regulatory requirements.
- The TARGET Analytics Group developed over time a number of **methodologies and indicators based on analytics** applied to granular data.
- This work gathers in one single paper **the Eurosystem analytical toolkit for TARGET2 regulatory compliance.**

# 2

## Principle 3: Framework for the comprehensive management of risks

Interdependencies

# Interdependencies

- Principle 3 of the PFMI requires the operator to **identify and manage risks related to interdependencies**.

*3.3.7 “An FMI should regularly review the material risks it bears from and poses to other entities (such as other FMIs, settlement banks, liquidity providers, or service providers) as a result of interdependencies and develop appropriate risk-management tools to address these risks.”*

- The methodology developed identifies **three types of interdependencies**, following the CPMI/IOSCO report.
  - system-based (i.e. direct), can be horizontal or vertical
  - institutional (i.e. indirect)
  - environmental (i.e. via common dependencies)

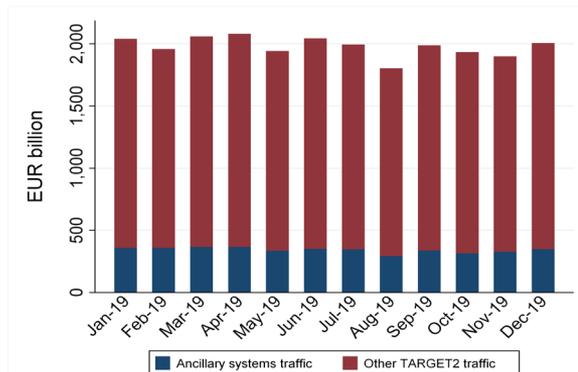
→ all types of interdependencies are investigated separately for TARGET2 with a specific focus on operational and liquidity risks emerging from them.
- The identification of interdependencies is conducted on an **annual basis**.

# Interdependencies – 1. System-based (vertical)

**Vertical:** among systems along the clearance and settlement chain, within a particular market or sector:

- TARGET2 and participating ancillary systems (AS).
- Identified using indicators of AS traffic, by type or settlement model. Section dedicated to ASI6 RT (pre-funded settlement model).

## Average daily value of ancillary systems TARGET2 traffic



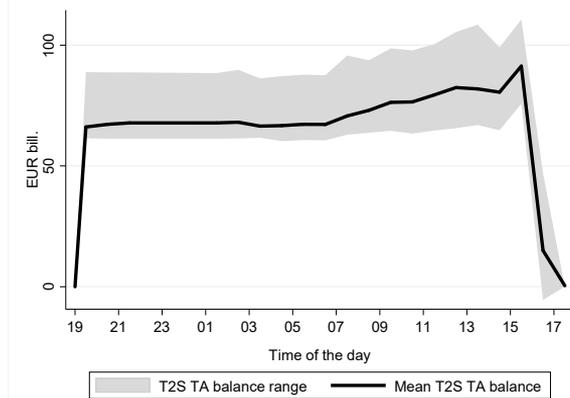
- In 2019, **ancillary systems' traffic** was on average EUR 343bn per day, ranging between EUR 293.7bn in August and EUR 367.8bn in March 2019.
- Represents a significant fraction of the overall daily value settled in TARGET2, i.e. on average 17.3%, with the peak at 18.4% in February 2019.

# Interdependencies – 1. System-based (horizontal)

**Horizontal:** between two systems operating at the same stage of the settlement chain.

- Quantification of liquidity interdependency with T2S and TIPS.

## ECB T2/T2S transit account balance by time of the day

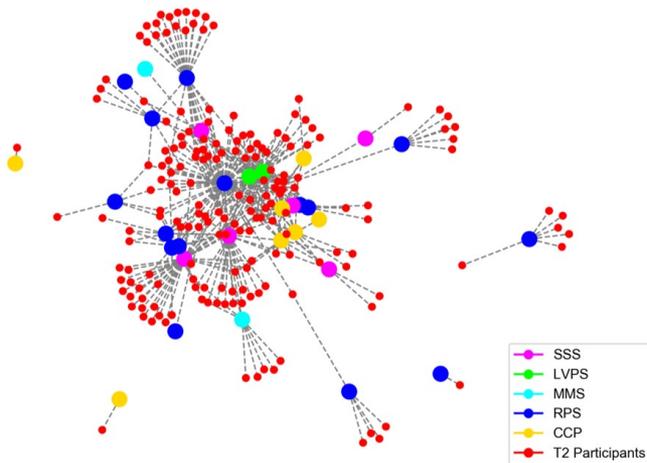


- **Shows the liquidity is held intraday in T2S**, based on the ECB T2S Transit Account balance.
- Follows the phases of the T2S business day.
- Rather stable over time, with the exceptions of periods of intensification of T2S traffic, when liquidity transferred increases.

# Interdependencies – 2. Institution-based

Indirect relationships among systems through a common financial institution.

- Identified using a connectivity measure (ratio between the number of actual connections between ASs and TARGET2 participants and the maximum possible number of such connections) and network-based statistics.



## Network of ASs and TARGET2 financial institutions

- Overview of institution-based relationships between ASs intermediated by other institutions.
- The overall connectivity of the network is extremely low. The average number of unique ASs each TARGET2 participant is connected to in 2019 is 2.8. From the perspective of the AS, the average number of connections to TARGET2 participants equals 35.

# Interdependencies – 3. Environmental-based

Indirect relationships that arise from broader factors, including the reliance of several FMIs on a common service provider or financial market.

- A descriptive section of the report focuses on the **interdependency with the network provider and with the critical service providers**.
- TARGET2 has a very **high degree of dependency on SWIFT** for its normal operations. A number of **preventive and recovery measures** are in place which help monitor and manage this interdependency.
- TARGET2 uses different **critical service providers**, hence mitigating the impact of a potential outage of one of these providers in TARGET2.

# 3

## Principle 7: Liquidity risk

Liquidity monitoring and hoc studies

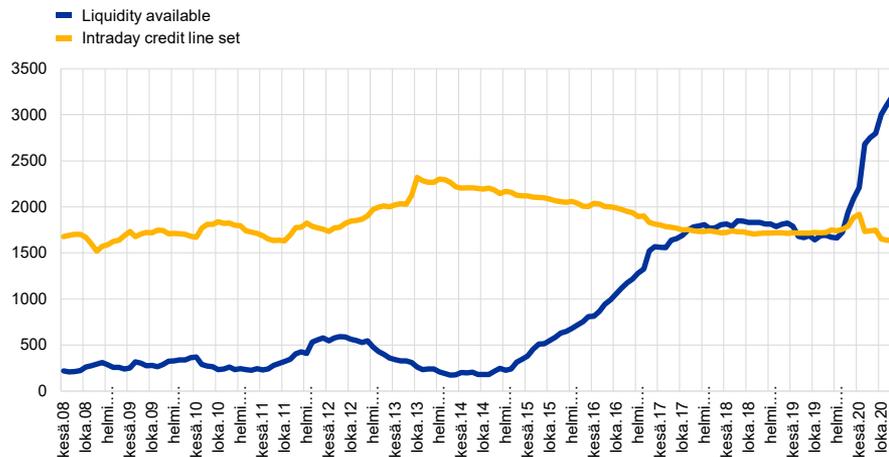
# Liquidity risk monitoring and assessment

- Principle 7 of the PFMI on “Liquidity risk” requires, inter alia, an FMI to have **effective operational and analytical tools to identify, measure, and monitor its settlement and funding flows on an ongoing and timely basis, including its use of intraday liquidity.**
- It requires also to **conduct rigorous stress testing** by considering a wide range of scenarios.
- A number of **liquidity indicators**, also focussing on the intraday, are regularly monitored and **ad-hoc studies** have been performed to address specific aspects of the liquidity risk.

# Liquidity indicators

## Start-of-day balances and intraday credit line set

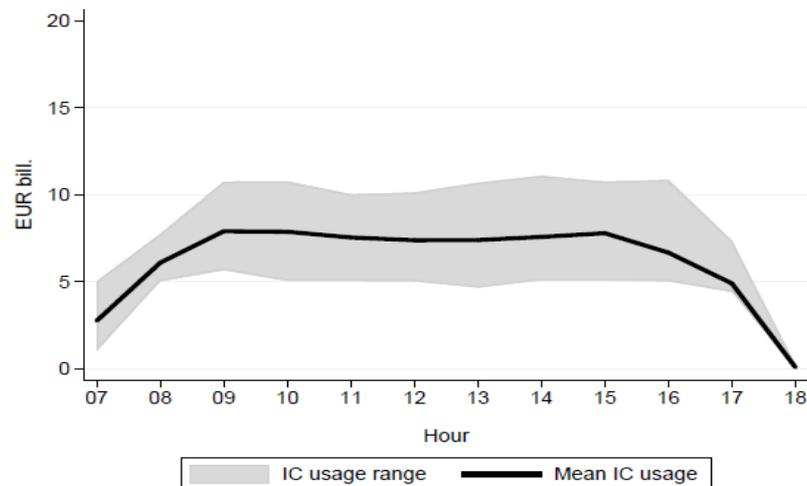
(EUR billion)



- Liquidity in TARGET2 can be measured as the sum of the liquidity held by participants on their accounts at the beginning of each day.

## Intraday credit usage (Dec 2020)

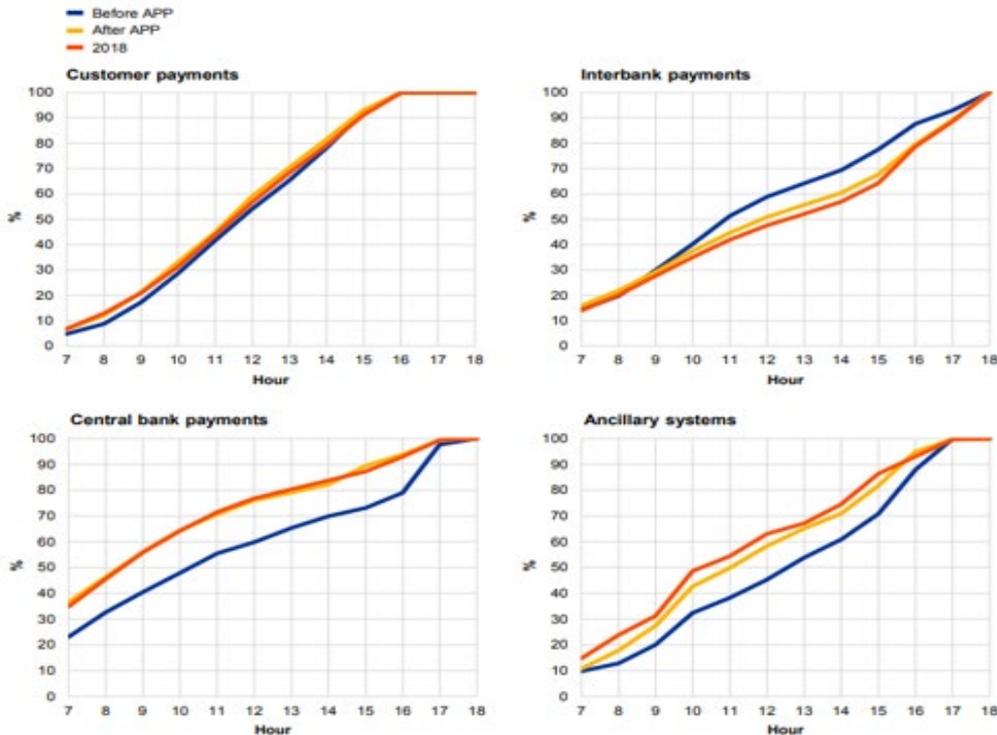
(Dec. 2020)



- Monitoring of usage of overdraft on TARGET2 RTGS accounts' in the intraday at the change of each hour.

# Liquidity indicators

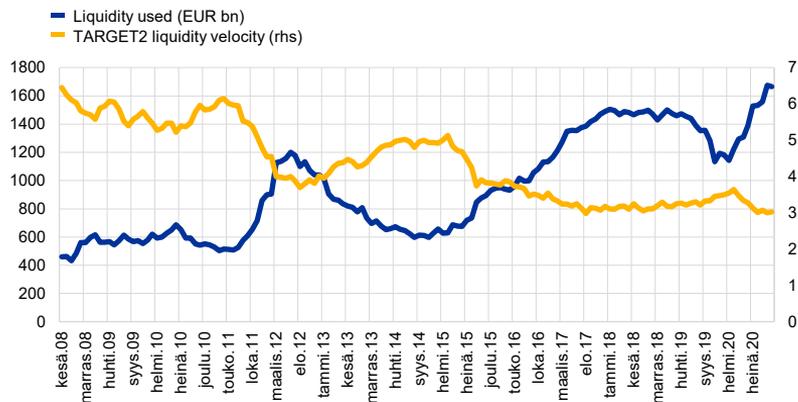
## Cumulative percentage of payments value settled in the intraday by payment type



- Payment patterns in TARGET2 have remained generally stable over time and across different liquidity levels in the system.
- The different patterns across the various payment types also indicate the existence of time-specific obligations (e.g. ancillary-system related payments).

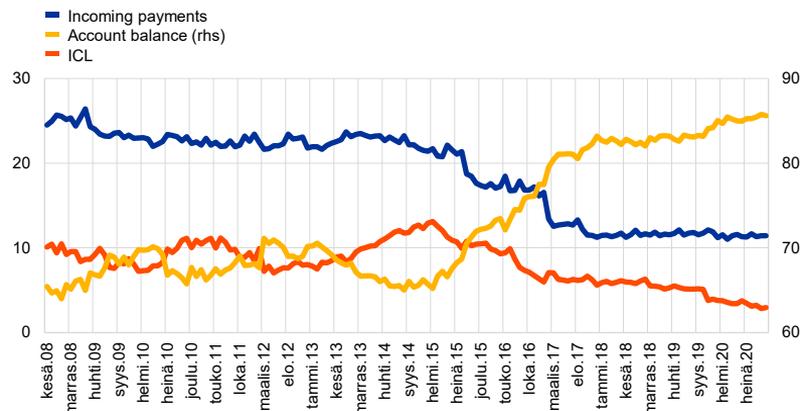
# Indicators of liquidity usage

## Liquidity used and liquidity velocity



- Liquidity velocity, i.e. the value of payments made for each unit of liquidity, fell amid the upsurge in central bank reserves.
- Liquidity used, i.e. sum of account balance and ICL<sup>1</sup> actively utilised to settle payments, stands below liquidity available since 2016.

## Funding sources of payments in TARGET2 (percentages)



- To fund their payments, TARGET2 participants can rely on three sources.
- The main funding source is account balance, 73% on avg., followed by incoming payments and ICL (respectively 19% and 8% on avg.).

<sup>1</sup> Intraday credit line.

# Ad-hoc studies

## Stress-test of liquidity risk in TARGET2 (2013)<sup>1</sup>

- Simulations of liquidity shortages deriving from scenarios of collateral deterioration of different severities with impact on intraday credit lines.
- Demonstrated that the system is resilient under stress and liquidity levels seem to be appropriate and supported by the efficient liquidity management features of TARGET2.

## Strengths of LSM in TARGET2 (2020)<sup>2</sup>

- System parameters are altered in the TARGET2 simulator removing sequentially algorithms (LSM) to provide an estimation of how much their presence improves settlement in the system.
- Shows that the presence of LSM improves the settlement efficiency of TARGET2.

## Profiling banks (2020)<sup>3</sup>

- Clustering is used to find groups of participants with a similar payment behaviour
- Participants can be grouped into ten different payment profiles, the most participants introduce their transactions in the first business hour of TARGET2 (Early and Extreme Early Birds)

<sup>1</sup> <https://www.ecb.europa.eu/pub/pdf/scpops/ecbop183.en.pdf>

<sup>2</sup> See [presentation at the Bank of Finland Seminar in 2020](#).

<sup>3</sup> [Profiling banks: how to use cluster analysis with payment system data - Journal of Financial Market Infrastructures \(risk.net\)](#)

# 4

## Principle 17: Operational risk

Critical participants and operational outages

# Identification of critical participants

- Principle 17 of the PFMI requires an FMI to **identify critical participants based on the consideration of transaction volumes and values (...) and on the potential impact on other participants and the system as a whole in the event of a significant operational problem.**
- The focus is on credit institutions. Simplified methodologies exist for ancillary systems and third-party service providers.
- **Mitigation measures** are applied for identified critical participants.
- Main **challenge: selection of indicators and definition of thresholds.**

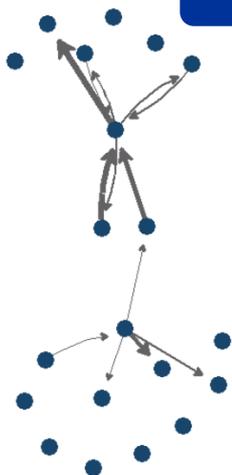
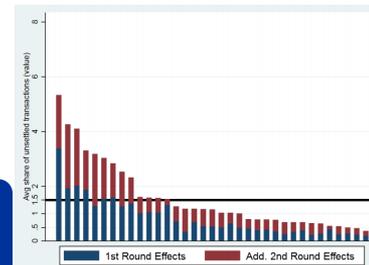
# Identification of critical participants

*Criterion 1* - Settles at least 1% of the total **turnover**

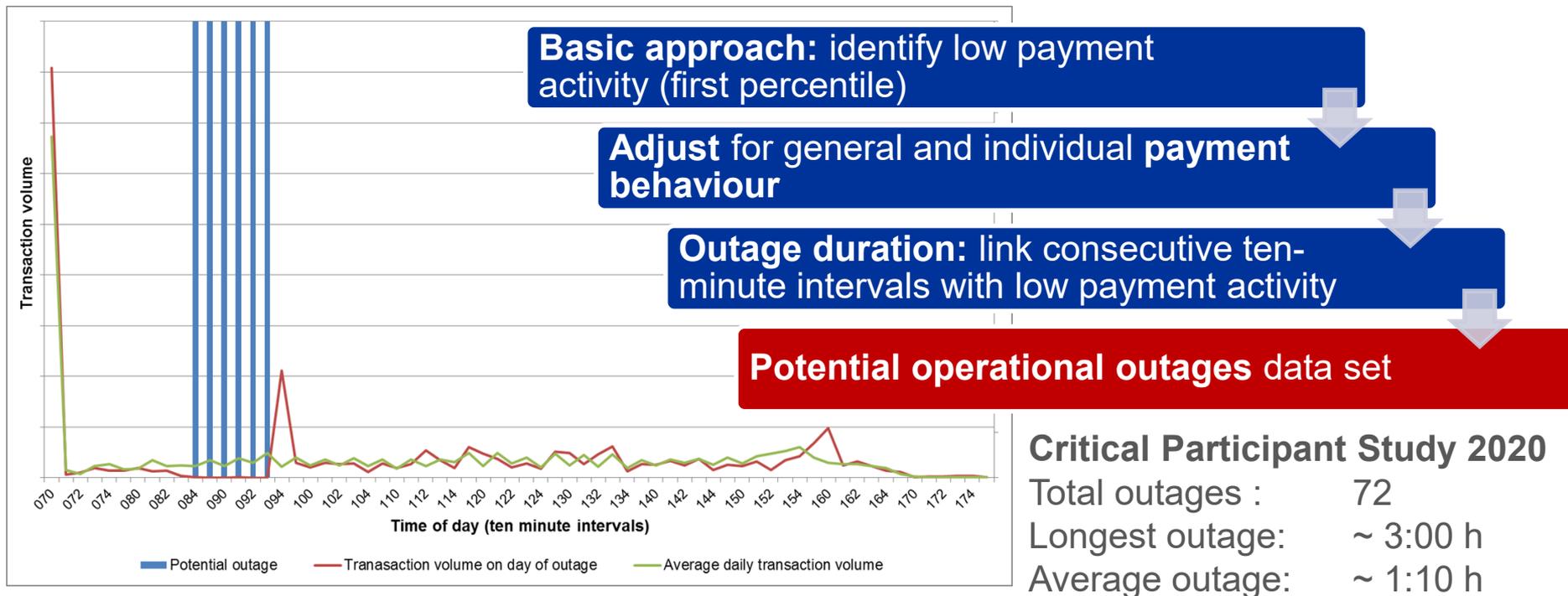
*Criterion 2* - Causes at least 1.5% of unsettled payments in value terms in the **simulation** of an operational failure

Participant is critical if at least one of the two criteria is met with an additional element of time dependency.

Additional analysis for network effects, hidden risks and „catalyst participants“ generating large second round effects. See [Simulator Seminar 2017](#)



# Operational outages



Glowka, Marc; Paulick, Jan & Schultze, Inga (2018), The absence of evidence and the evidence of absence: an algorithmic approach for identifying operational outages in TARGET2, *Journal of Financial Market Infrastructures*, Volume 6 (2/3), 63–91.

# 5

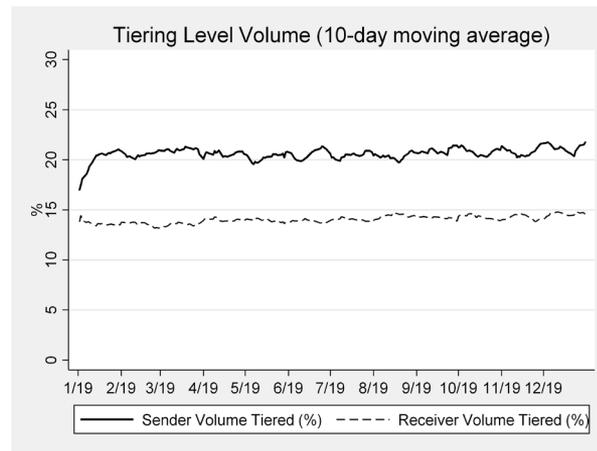
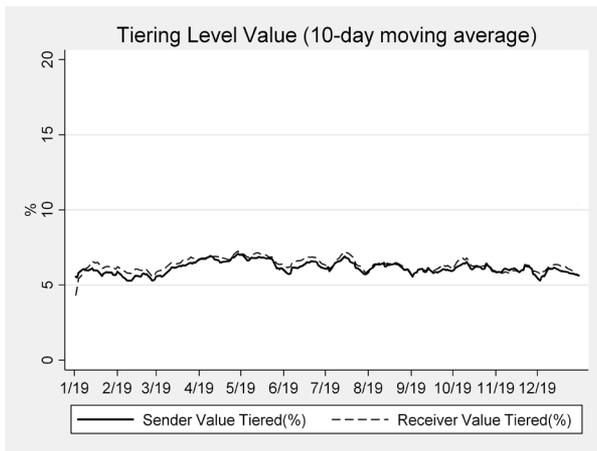
## Principle 19: Tiered participation arrangements

Tiering

# Tiering

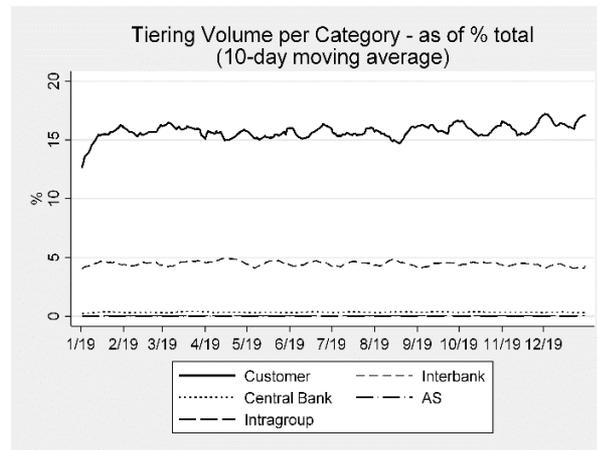
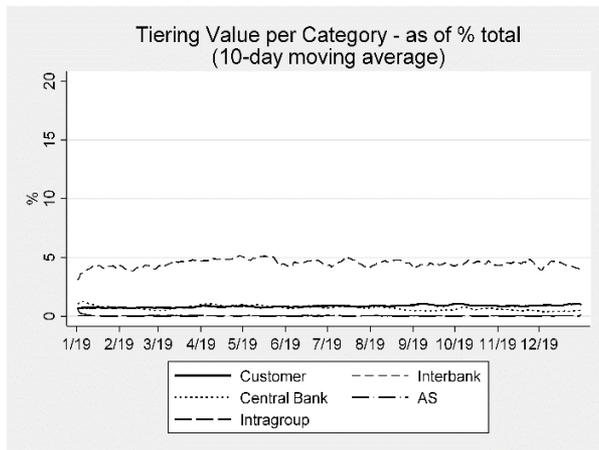
- Principle 18 of the PFMI requires an FMI to **identify, monitor, and manage the material risks to the FMI arising from tiered participation arrangements** (i.e. indirect participation in the FMI).
- In TARGET2, a **direct participant can offer services to settle transactions on behalf of another institution** (indirect participants, addressable BICs, and institutions not registered in the TARGET2 Directory)
- The methodology mainly focuses on **tiering on the sending side (originator of the payment different from sender)** as more relevant for operational risk. Aggregate statistics of tiering on the receiving side (beneficiary different from receiver) are also produced.
- Tiered payments exclude intragroup payments.

# Tiering – aggregate statistics



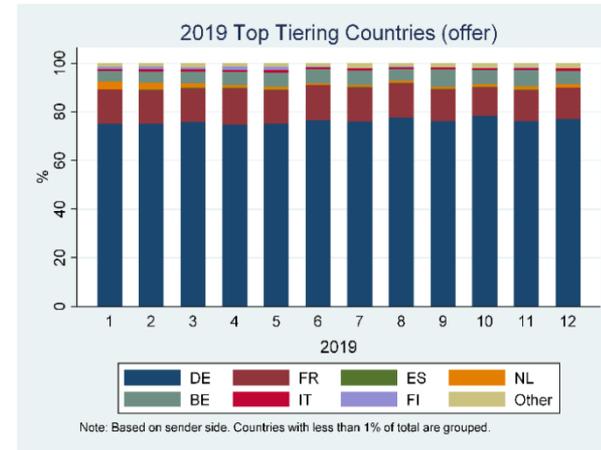
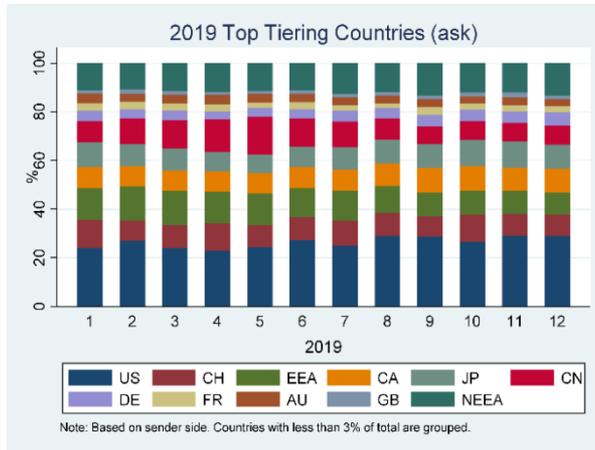
- **In value terms**, tiering levels are very similar on the sending and on the receiving side (around 6% of total settled transactions).
- **In volume terms**, the level of tiered participation arrangements differs when considering the sending (21%) or the receiving side (14%). Different composition (customer payments vs interbank transaction).

# Tiering – category split (sending side)



- Interbank transactions account for the largest share of tiering **in value terms**.
- **On the volume side**, customer transactions account for most of the tiered transactions.

# Tiering – country split (value)



- **Ask:** countries whose institutions are tiered (using a direct participants to settle their payments). Main contributors are United States, China and EEA.
- **Offer:** countries whose institutions offer tiering services (countries whose direct participants are offering tiering). Main contributors are Germany and France.

# 6

## Conclusions

# Conclusion

- The application of advanced analytics on granular data allowed the TARGET2 operator to develop a **comprehensive framework for supporting compliance with regulation**.
- The analysis offered **important insights and understanding about the functioning of the system, the liquidity circulation and the participants behaviour** in addition to the mere regulatory compliance.
- The TAG keeps fine-tuning and improving the toolkit developed; the **T2-T2S consolidation brings about important challenges** and imposes a revision of the approach taken.