



EUROPEAN CENTRAL BANK

EUROSYSTEM

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# **Descriptive analysis of the client clearing network in the euro area OTC derivatives market**

**17<sup>th</sup> Payment and Settlement System Simulation Seminar**

**29-30 August 2019**

**Bank of Finland**

# Overview

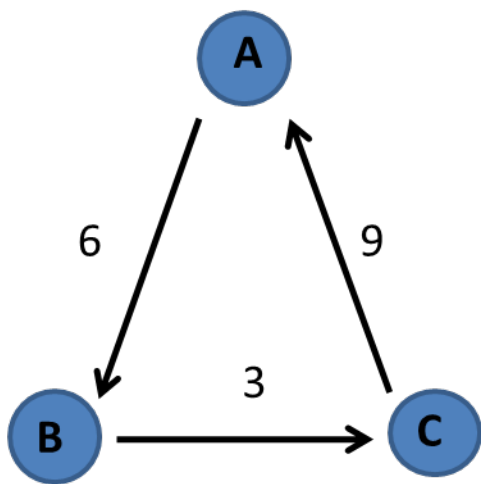
- 1 Intro to derivatives and central clearing
- 2 Extent of clearing globally and in the euro area
- 3 Client clearing
- 4 Time dimension and issues of data quality
- 5 Conclusions and future work

# Intro to derivatives and central clearing

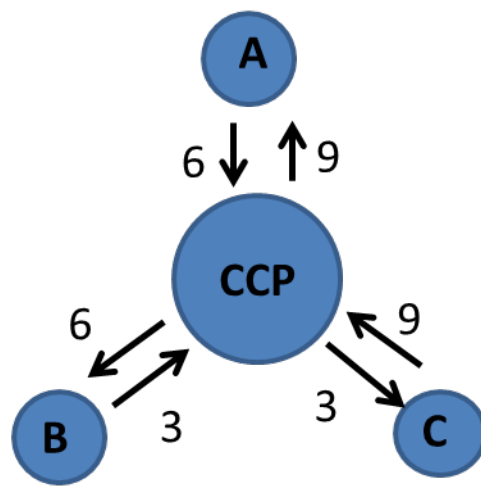
- Post-crisis reforms led, by design, to an **increase in central clearing for over-the-counter (OTC) derivatives**, especially for certain interest rate and credit asset class products.
- The implementation in the EU of the global shift towards mandatory central clearing for certain OTC asset classes and products is defined by the **European Market Infrastructure Regulation (EMIR)**.
- With the mandate to centrally clear comes a **mandate to report** trades to Trade Repositories (TRs).
- The ECB, as central bank of issue for the EUR, has access to all trades where *at least one counterparty is domiciled in the EA*.

# Intro to derivatives and central clearing

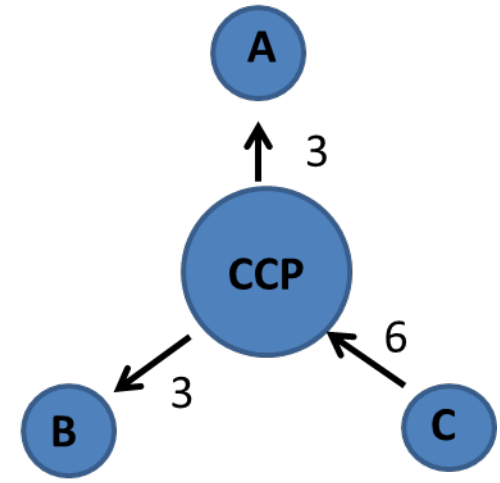
- **Novation** is the legal process through which CCPs interpose themselves between buyers and sellers, and that replaces bilateral contracts with contracts directly with the CCP.
- Central counterparties (CCPs) allow clearing members to **net positions** they may have originally had with various market participants.



*Bilateral market*



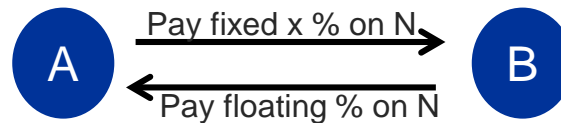
*Novation to a CCP*



*CCP netting*

# Intro to derivatives and central clearing

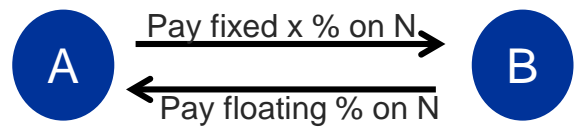
- **As an example**, a market participant could enter into a derivatives contract to hedge against a floating interest rate.
- A so-called plain vanilla interest rate swap (IRS) to be centrally cleared could look like this:



# Intro to derivatives and central clearing

- **As an example**, a market participant could enter into a derivatives contract to hedge against a floating interest rate.
- A so-called plain vanilla interest rate swap (IRS) to be centrally cleared could look like this:

**BUT...**



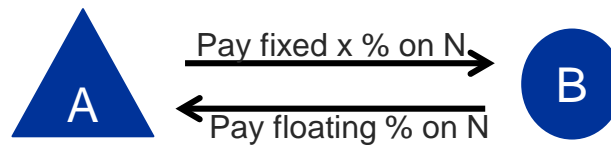
**This is valid only if both A and B are clearing members at some CCP**



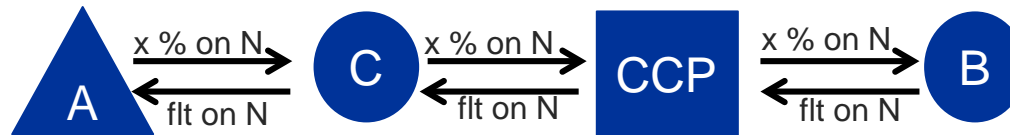
# Intro to derivatives and central clearing

- **As an example**, a market participant could enter into a derivatives contract to hedge against a floating interest rate.
- A so-called plain vanilla interest rate swap (IRS) to be centrally cleared could look like this:

Here **B is a clearing member**, but **A is not**.



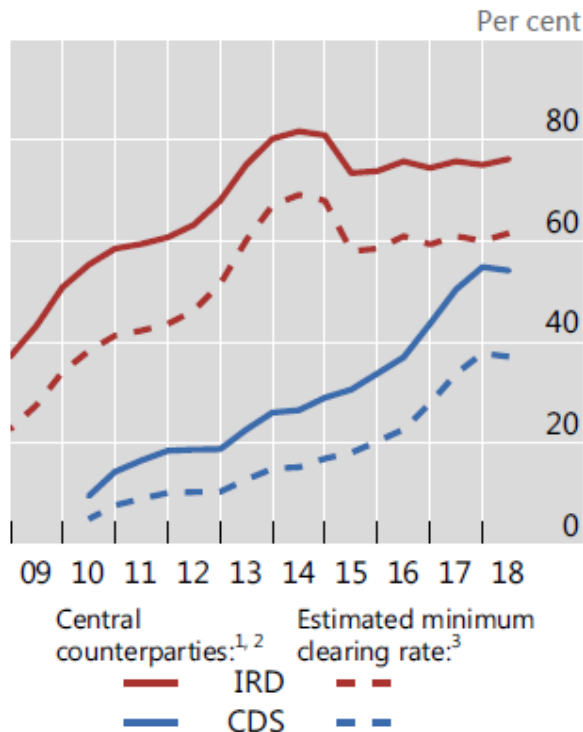
A accesses central clearing services through C as its **client**



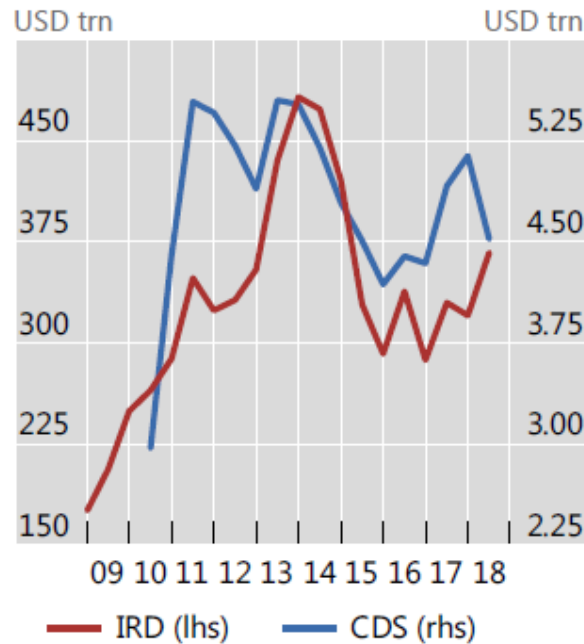
# Extent of clearing globally and in the euro area

There is continued growth in the share of global OTC derivatives clearing:

Central clearing rates in OTC derivatives markets



Banks' outstanding notional cleared by CCPs<sup>1,4</sup>



Source:

FSB/BCBS/CPMI/IOSCO [report](#) on *Incentives to centrally clear over-the-counter (OTC) derivatives*



## Extent of clearing globally and in the euro area

The **magnitude of clearing**—by notional value, broken down by asset class—carried out globally and in the euro area:

Asset Class	Total OTC Notional-Global	Total OTC Notional-All CMs	Total OTC Notional-EA CMs
Interest Rate	€ 394.40 tn	€ 91.30 tn	€ 82.70 tn
Credit	€ 7.56 tn	€ 3.44 tn	€ 1.32 tn
FX	€ 81.85 tn	€ 0.37 tn	€ 0.37 tn
Equity	€ 5.80 tn	€ 0.27 tn	€ 0.16 tn
Commodity	€ 1.72 tn	€ 0.01 tn	< € 0.01 tn
Other	€ 0.18 tn	< € 0.01 tn	< € 0.01 tn

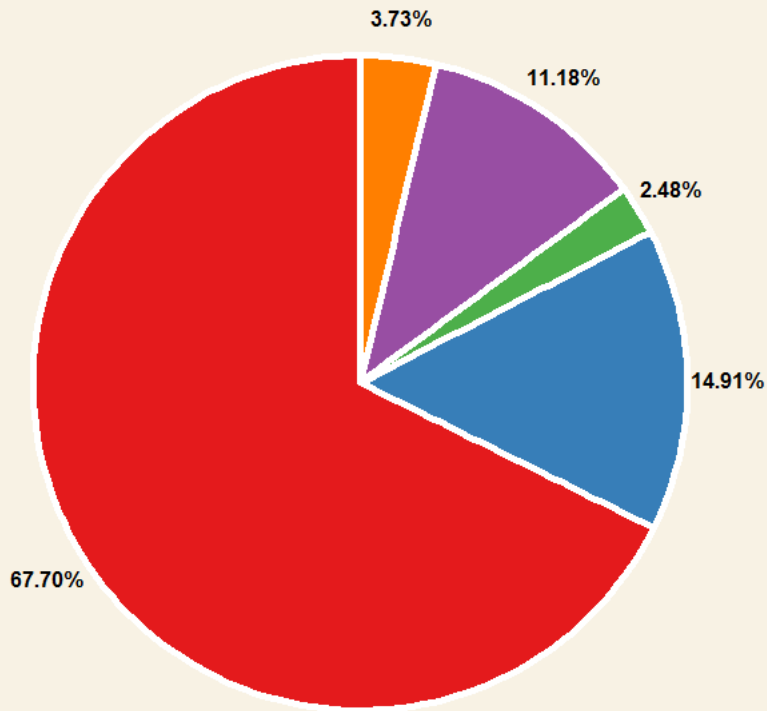
ECB calculation  
Data from [BIS](#)  
(H2 2018)

Data from ECB EMIR data access  
(July 2019)

# Client clearing

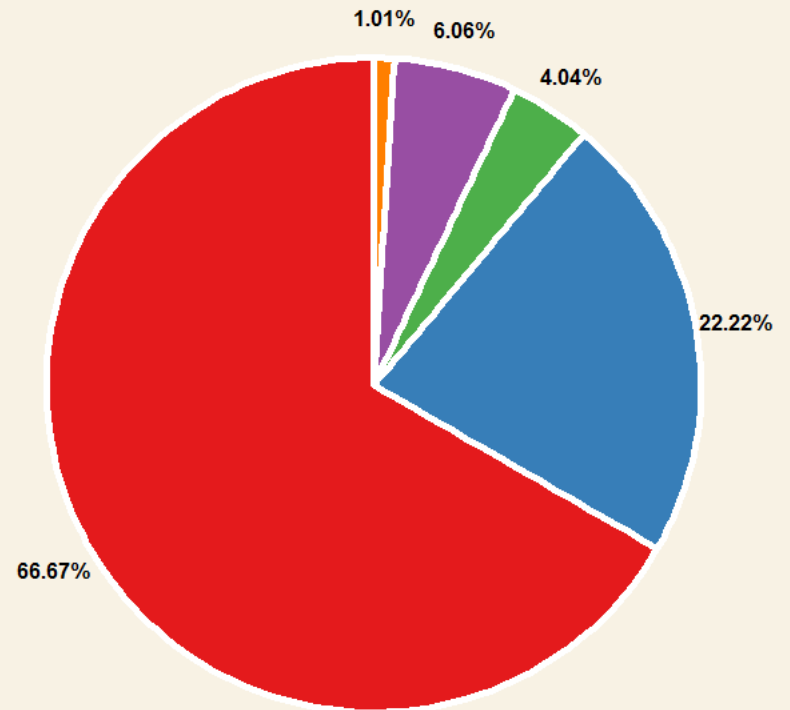
Who are the clearing members?

Clearing Members distribution by sector



■ BANK ■ IF ■ NFC ■ OFI ■ OTHR

EA Clearing Members distribution by sector



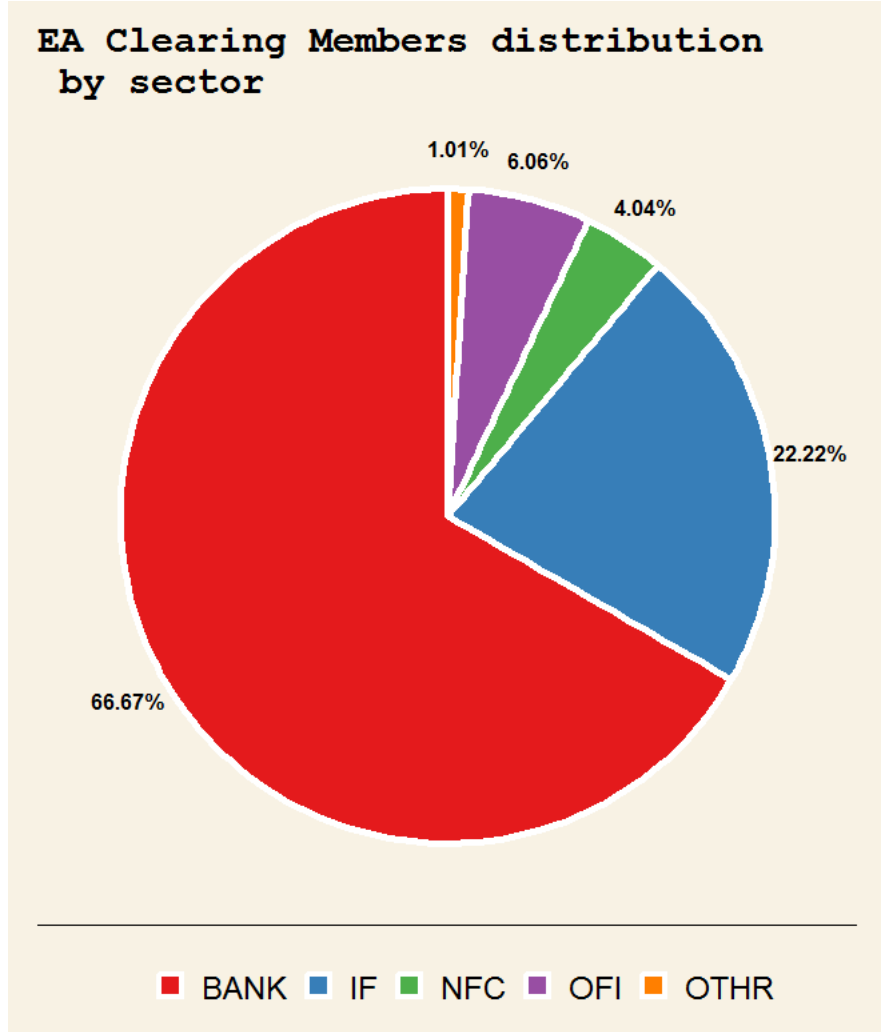
■ BANK ■ IF ■ NFC ■ OFI ■ OTHR

# Client clearing

Who are the clearing members?

As of July 2019, of the **total OTC notional cleared**—according to the ECB’s data access—the top X clearing members clear the following percentage:

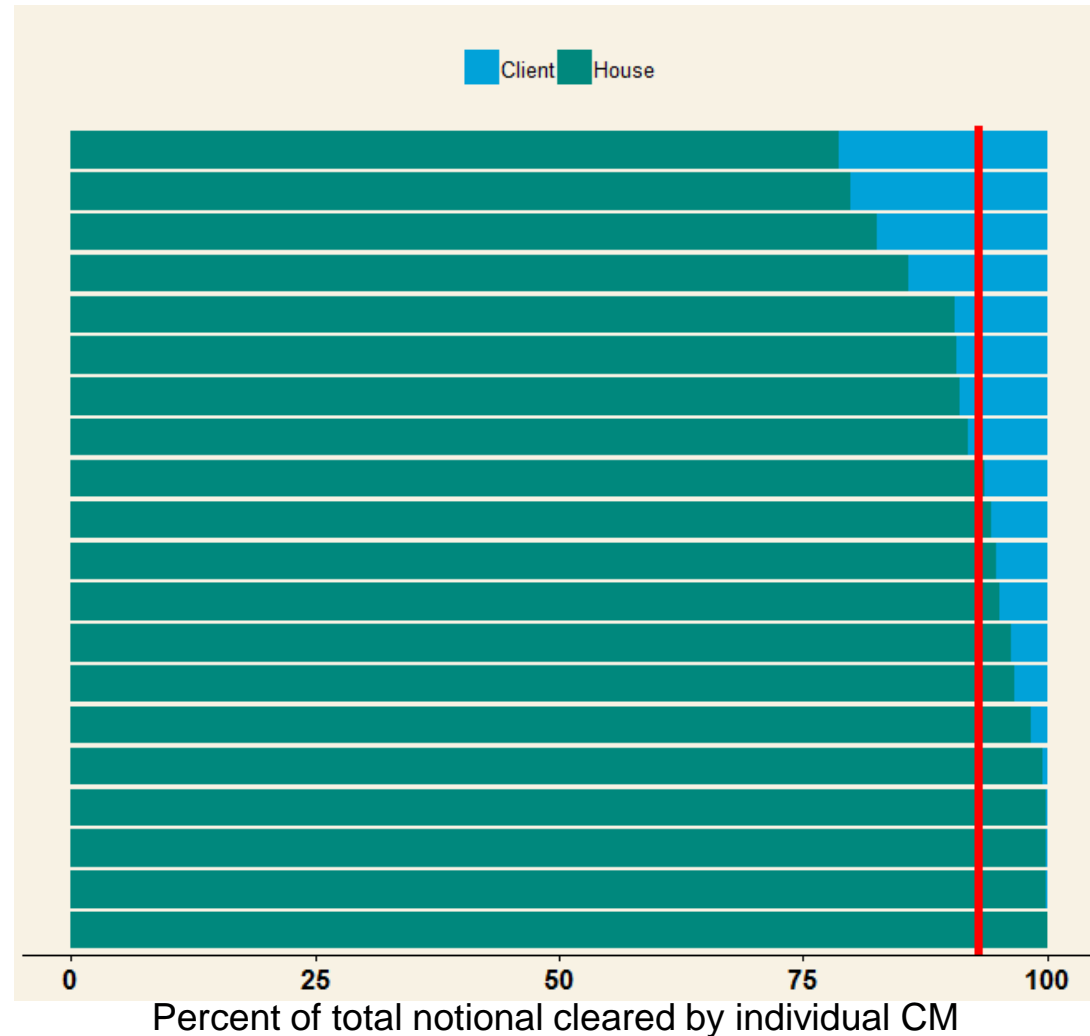
- Top 10: 71.5% (among all CMs)
- Top 10: 80.7% (among EA CMs)
  
- Top 20: 85.6% (among all CMs)
- Top 20: 96.6% (among EA CMs)



# Client clearing

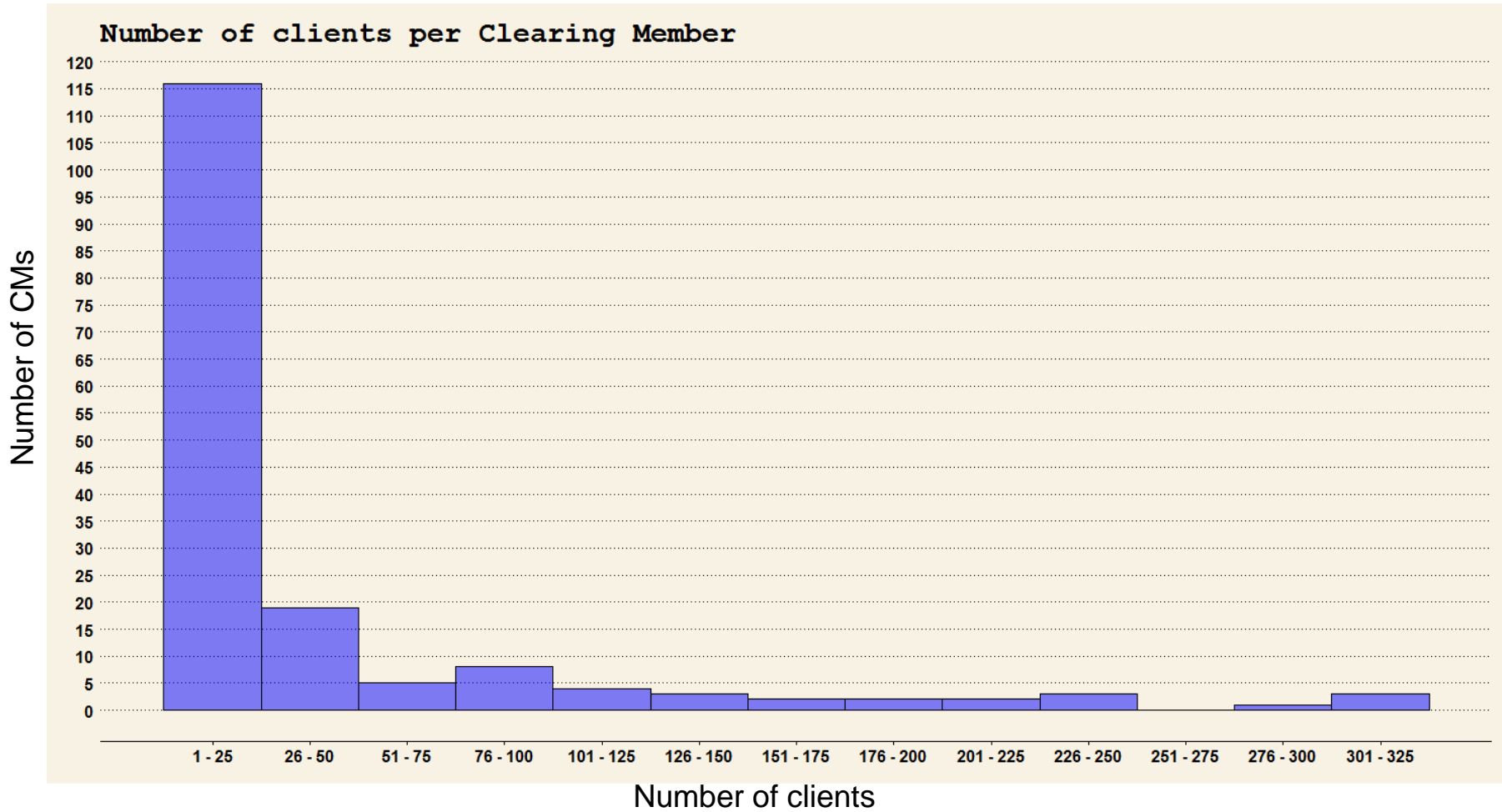
How much is cleared on behalf of clients?

- Top 20 EA CMs clear ~97% of total EA-CM-cleared notional
- Percentage (by notional) of total cleared on behalf of clients ranges from under 1% of portfolio notional up to ~25% for these CMs
- The **average percentage** of client versus house trades is 10-15% for EA CMs



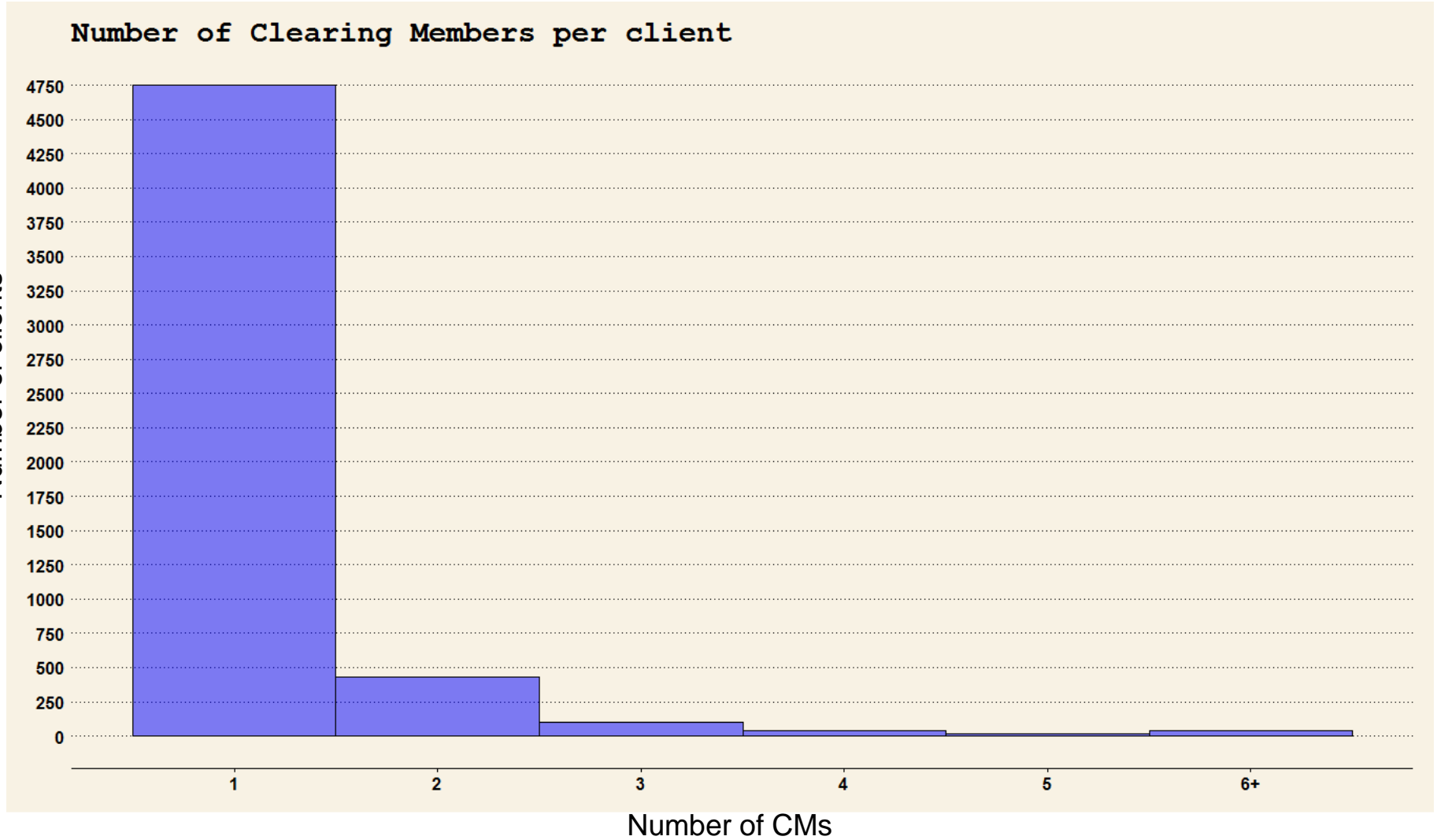
# Client clearing

How many clients do CMs have?



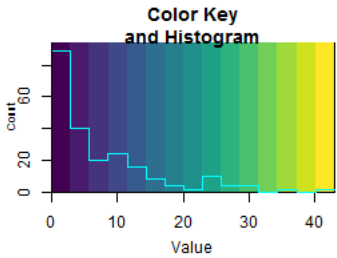
# Client clearing

With how many CMs do clients have clearing arrangements?

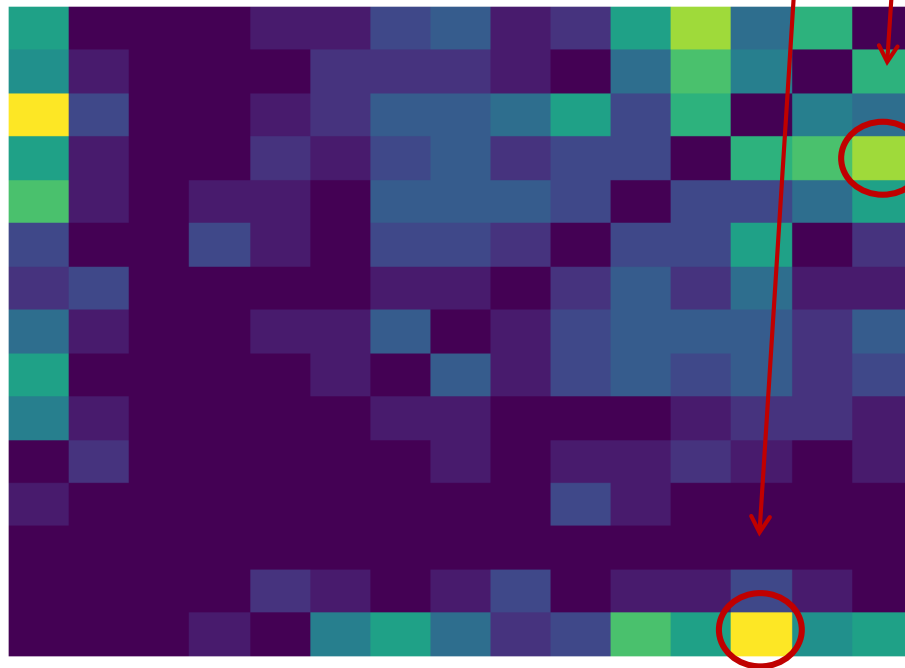


# Client clearing

How many clients do CMs have?



**Note:**  
Each column and row represents a single CM (matrix is symmetric)

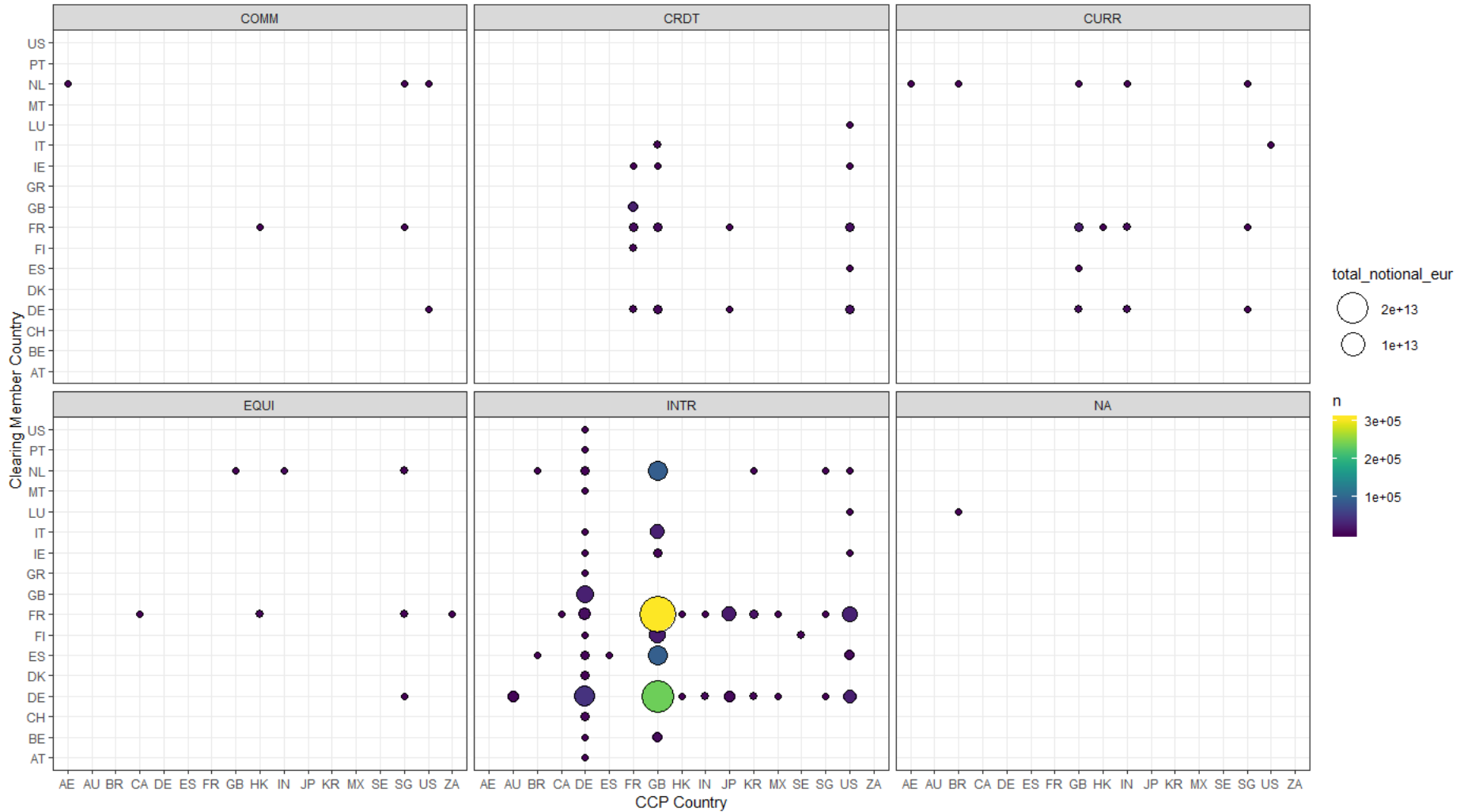


These two sets of CMs share a relatively high number of clients

- **Common clients** among top 20 EA clearing members.
- Shows **high concentration** in the provision of client clearing services.

# Client clearing

What is being cleared, by whom, and where? (CM business)





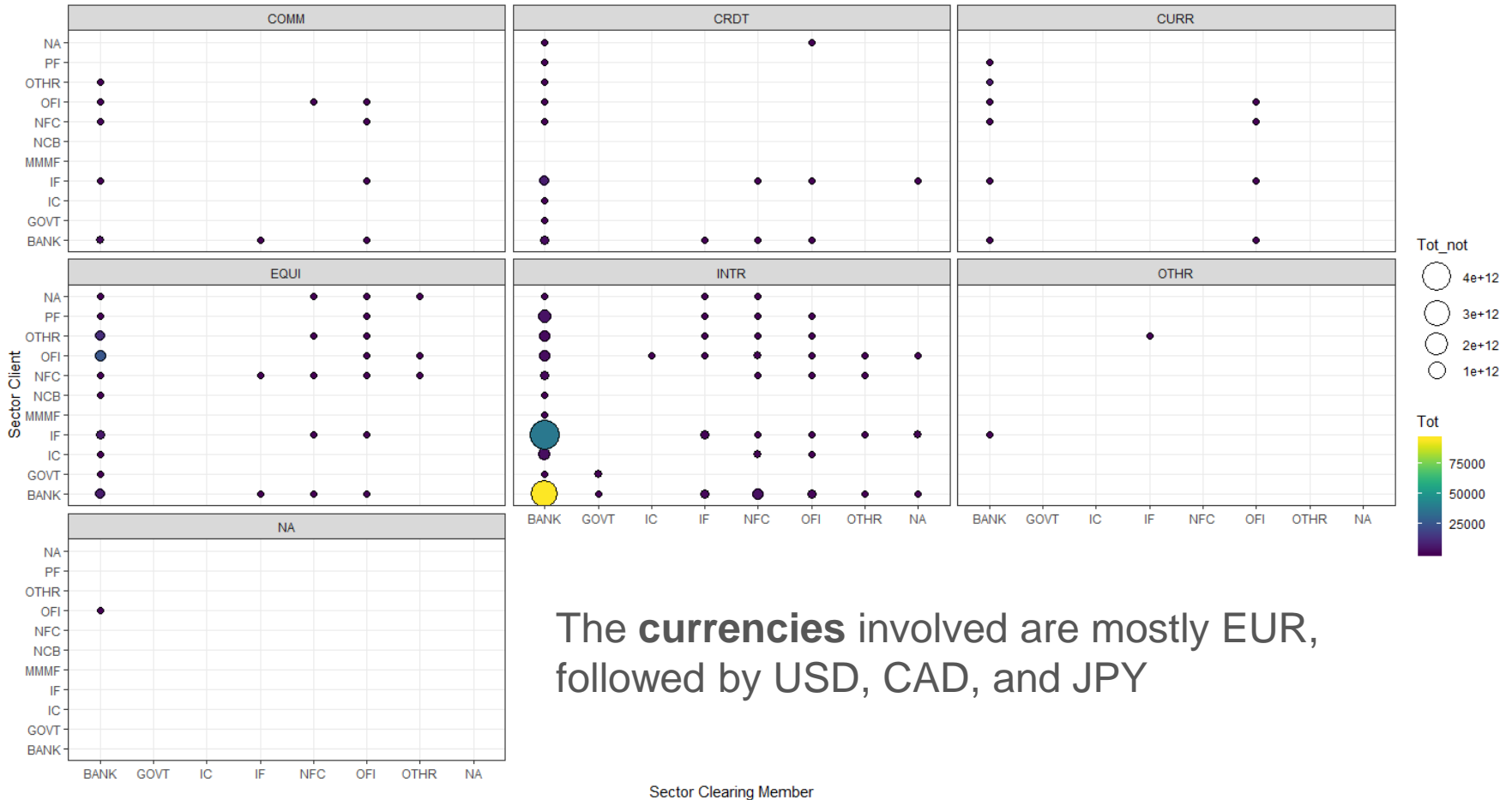
# Client clearing

What is being cleared, by whom, and where?



# Client clearing

What is being cleared, by whom, and where?



The **currencies** involved are mostly EUR, followed by USD, CAD, and JPY

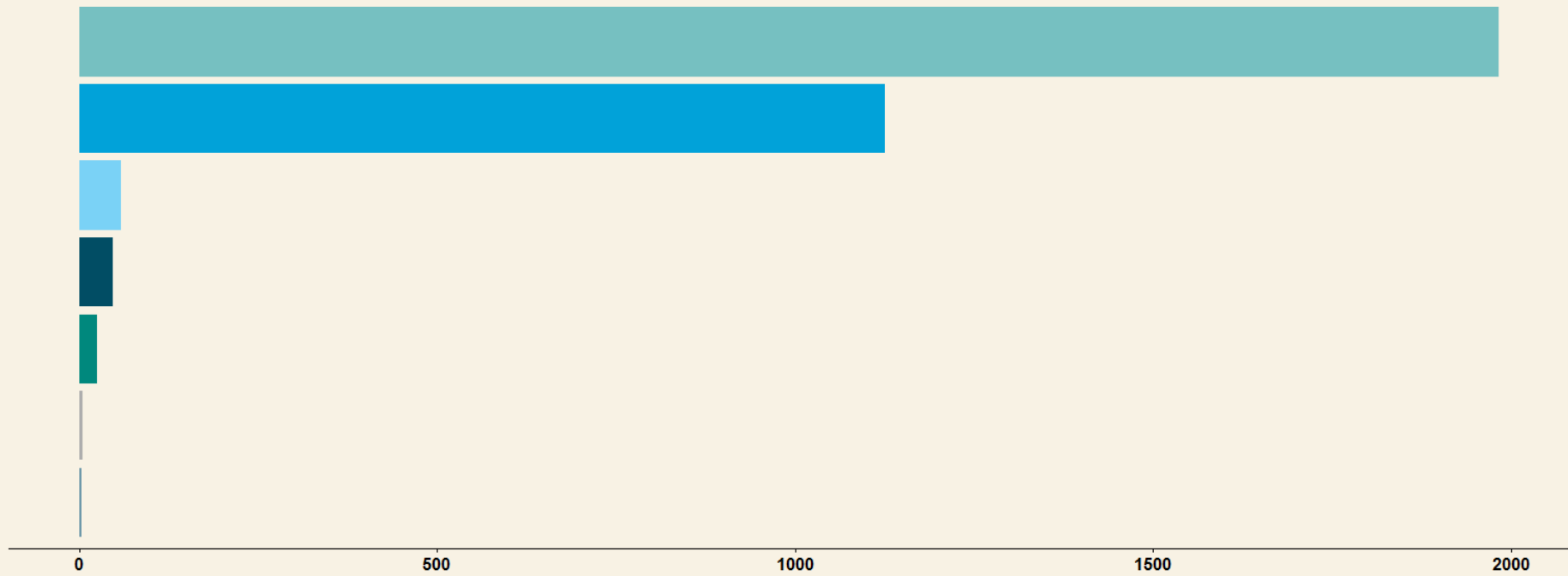
# Client clearing

What is being cleared, by whom, and where?

Number of clients trading interest rate derivatives breakdown by contract type

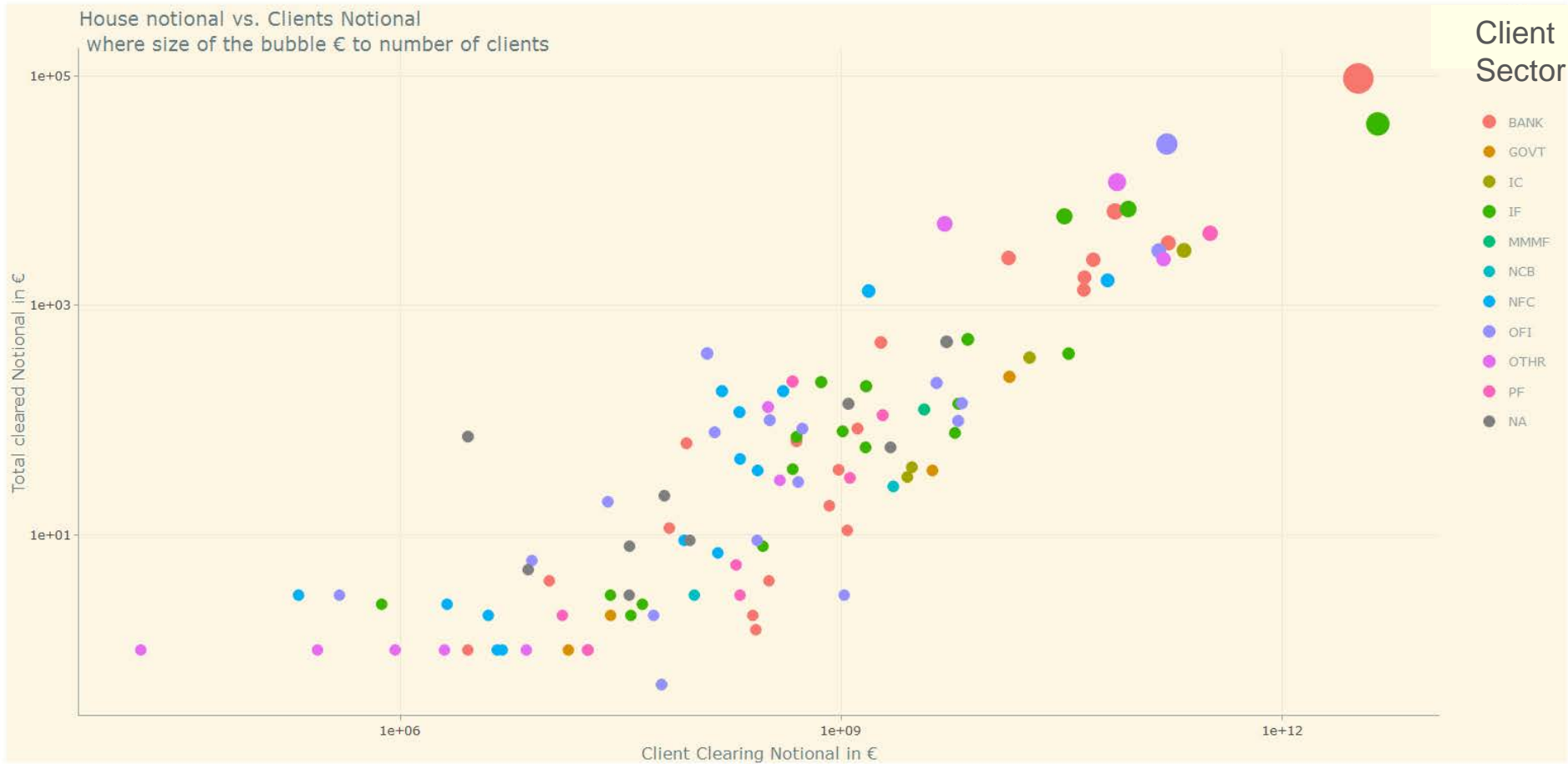
contract\_type

FORW	FUTR	OTHR	SWPT
FRAS	OPTN	SWAP	NA



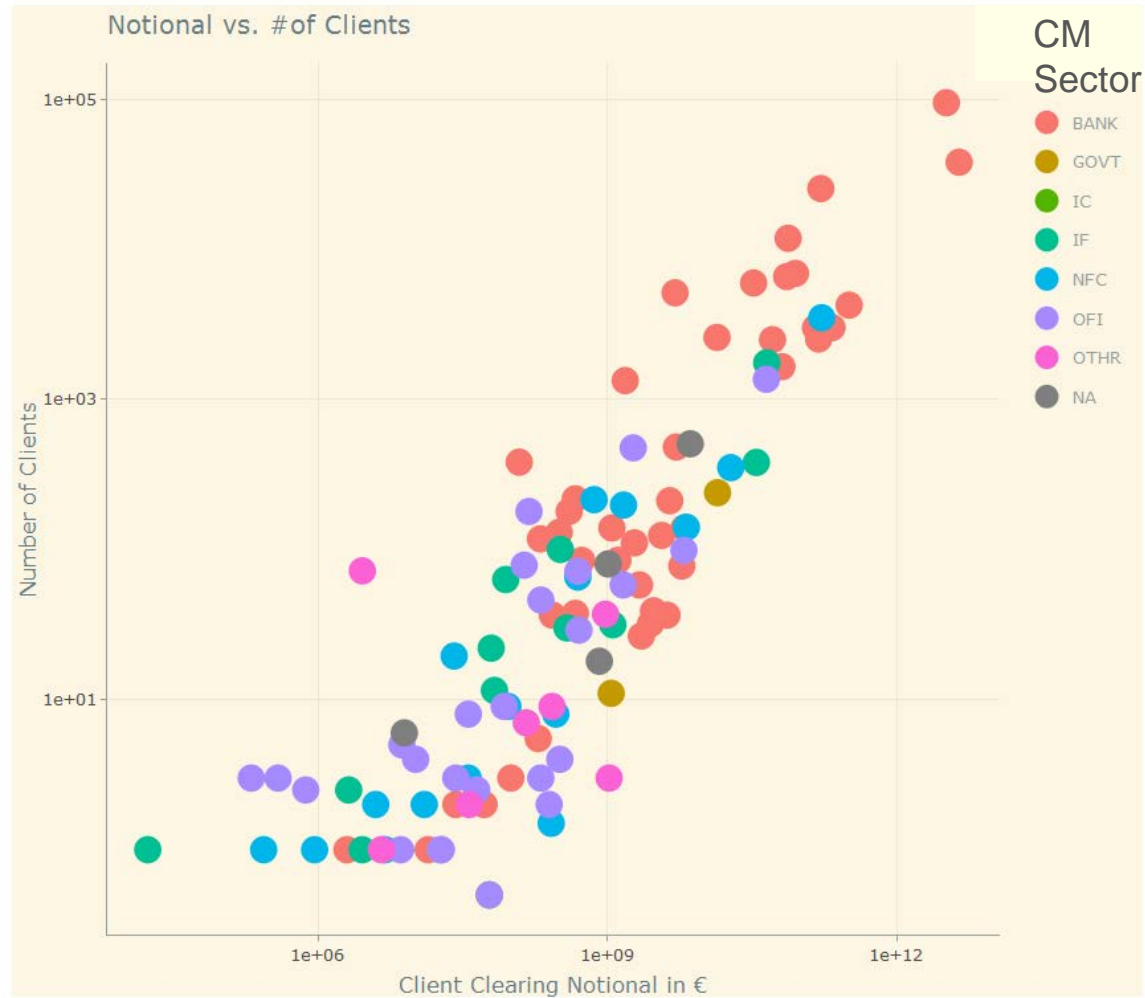
# Client clearing

## Relationship between house and client



# Client clearing

## Relationship between house and client



# Client clearing

## Network representation

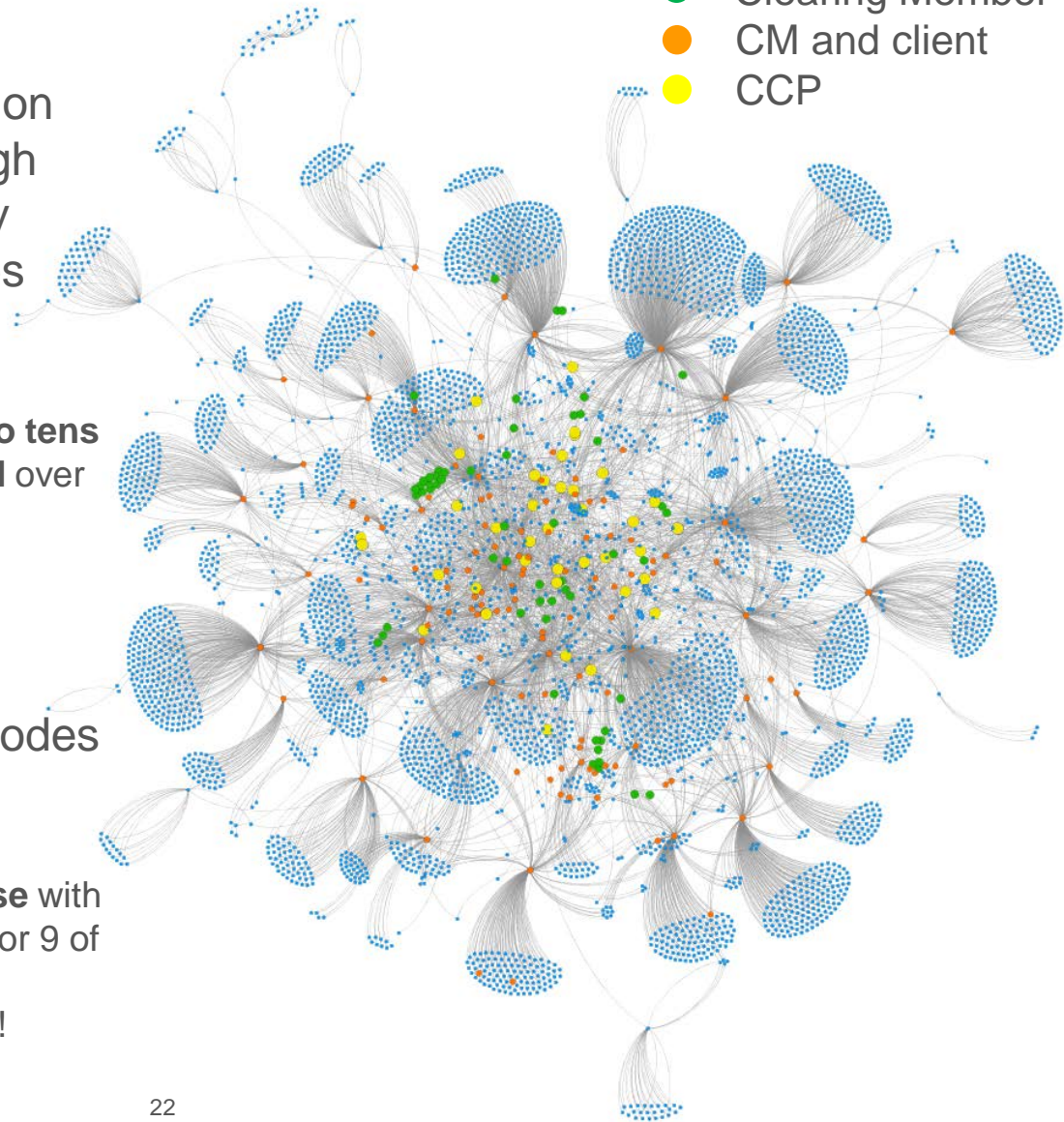
**Betweenness centrality** is based on shortest paths. This centrality is high for a certain node if there are many shortest paths between other nodes that pass through this node.

This measure **increases by a factor of up to tens of thousands** when clients are considered over when they are excluded for top 20 EA CMs.

**PageRank centrality** is based on measuring relative importance of nodes from its connections.

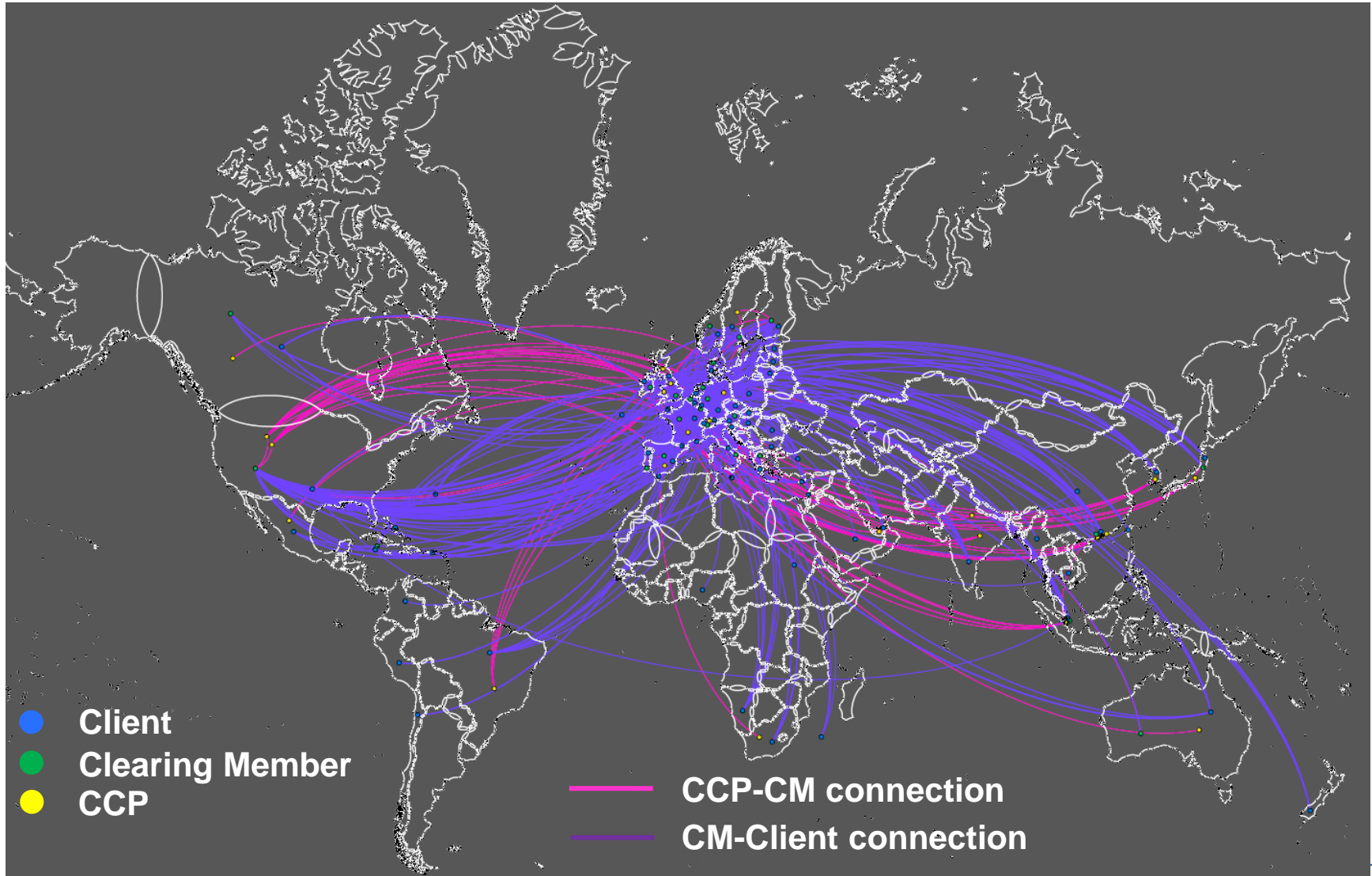
This measure **does not necessarily increase** with the same comparison. This is the case only for 9 of the top 20 EA CMs. Otherwise, this measure actually decreases by up to more than 90%!!!

- Client
- Clearing Member
- CM and client
- CCP



# Client clearing

## Network representation



# Time dimension and issues of data quality

- The OTC derivatives clearing network is **quite stable** and **non-dynamic** over time. This includes:
  - The magnitude and type of clearing
  - The number and type of CMs and clients
  - The connectivity of the network
- **Data quality** remains a serious hurdle. Filtering must be considered for reported fields, as errors can be found:
  - Invalid LEIs, CFI codes, ISINs
  - Mischaracterization of type of trade (i.e. asset class, contract type, OTC/ETD)
  - Inappropriate notional values
  - Misreport of CCPs, Clearing members
  - Matured trades still in report
  - CCP not authorised to clear reported product
  - ‘Clearing member’ not actually a clearing member



## Conclusions and future work

- Most CMs clear on behalf of a small number of clients ( $\leq 25$ ).
- Most clients access CCPs through a single clearing member.
- Among those large CMs that offer client clearing services, the percent of total notional cleared on behalf of clients ranges from  $<1-25\%$ .
- There is **high concentration in the provision of client clearing services**, with the majority being undertaken by the top 20 CMs.
- The majority of these client cleared trades are **IR**, cleared via German, French, and Dutch banks for **bank, pension fund, and investment fund clients** in the EA, EU, and beyond.
- The client clearing network, and the clearing network more broadly, is **quite stable over time**.

## Conclusions and future work

- **Betweenness centrality increases substantially** for top 20 EA CMs with the consideration of client connections. This is **not necessarily the case for PageRank** centrality because of the addition of 'non-important' client connections.
- **Data cleaning and processing** remains a serious challenge (>80% of time is spent on operationalizing data set).

In the future...

- Expand the analysis to the **ETD** space.
- Use **potential future exposure** (PFE) when mapping out 'exposure' network.
- Use connectivity network to help clean and track reported trades.
- Study **collateral arrangements** between CMs and clients.

Thank You!