FNA

Interconnectedness in the Global Clearing Network

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Motivation

The **New Systemic Risk**

Three CCP failures in the past (Paris, Kuala Lumpur and Hong Kong)

Interest by regulators, CCPs and members.

Especially with tie in to Cyber, IT and other operational risks.

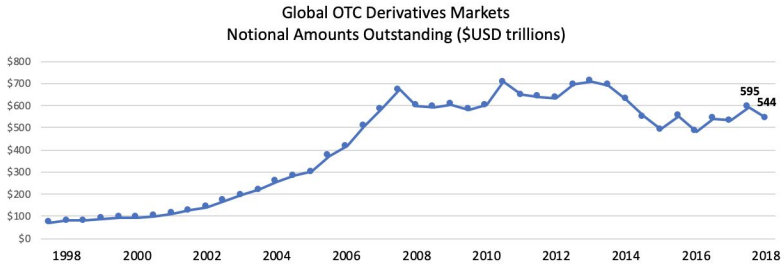
"*They [CCPs] are not equipped, however, to test the impact of their failure on the financial system as a whole nor are they equipped to assess the potential contagion effect on other members of a given member's failure.*"

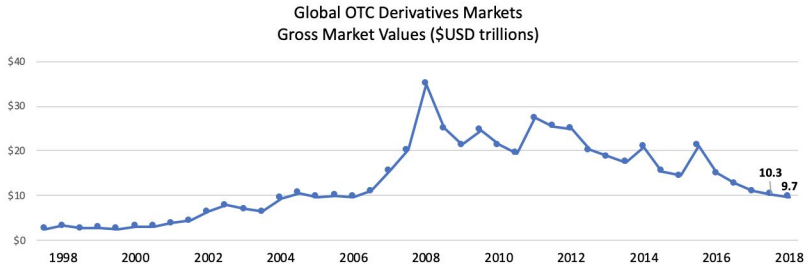
Cox & Steigerwald (2018)

Background

In response to the 2008 global financial crisis, the G20 leaders committed to reduce systemic risk in the global financial system. Specifically, in order to reduce the risk in the OTC derivatives markets they introduced the clearing mandate, which requires a shift from bilateral clearing, of standardized OTC derivatives contracts, to central clearing.

Let's consider some commonly quoted statistics about these markets:





Source: BIS Semiannual OTC derivatives statistics.

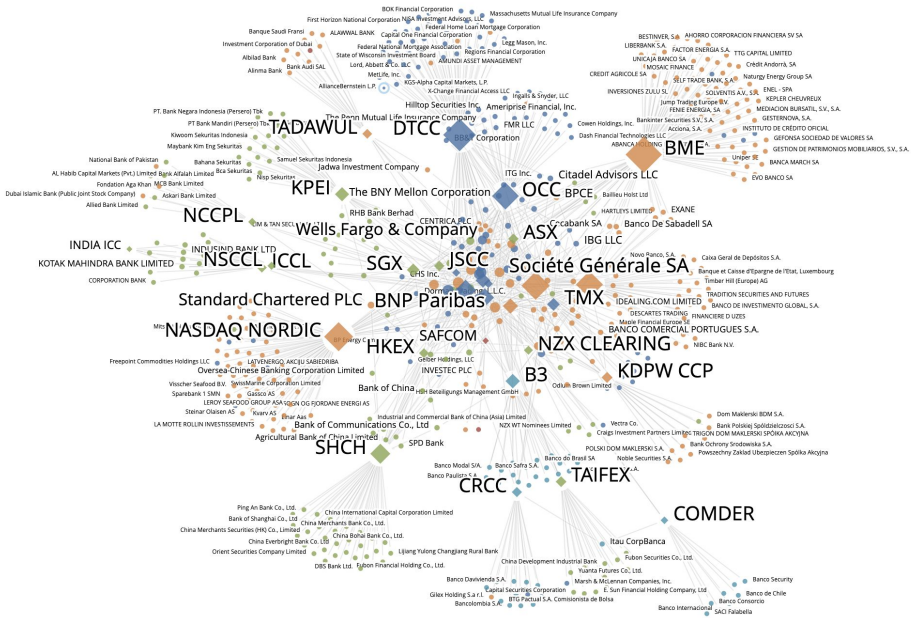
This paper

In this paper, we :

(1) determine the network structure of the global clearing system of CCPs and their CMs (including the CM holding companies), and

(2) augment it with CCP quantitative disclosure data, and other publicly available information for both CCPs and CMs.

(3) take first steps into simulate this as a system and carry out stress tests to rank the importance of clearing members

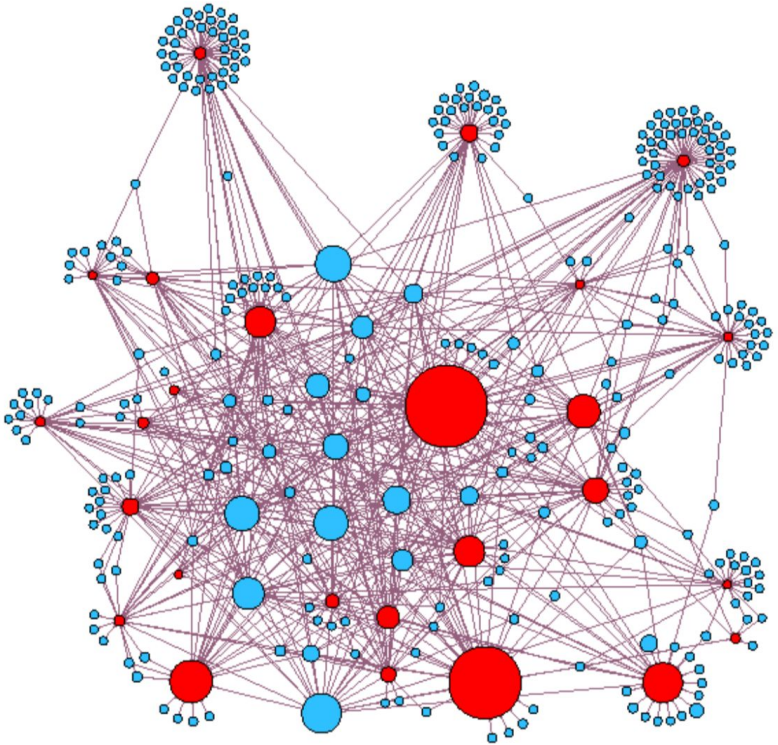


Scope of Analysis

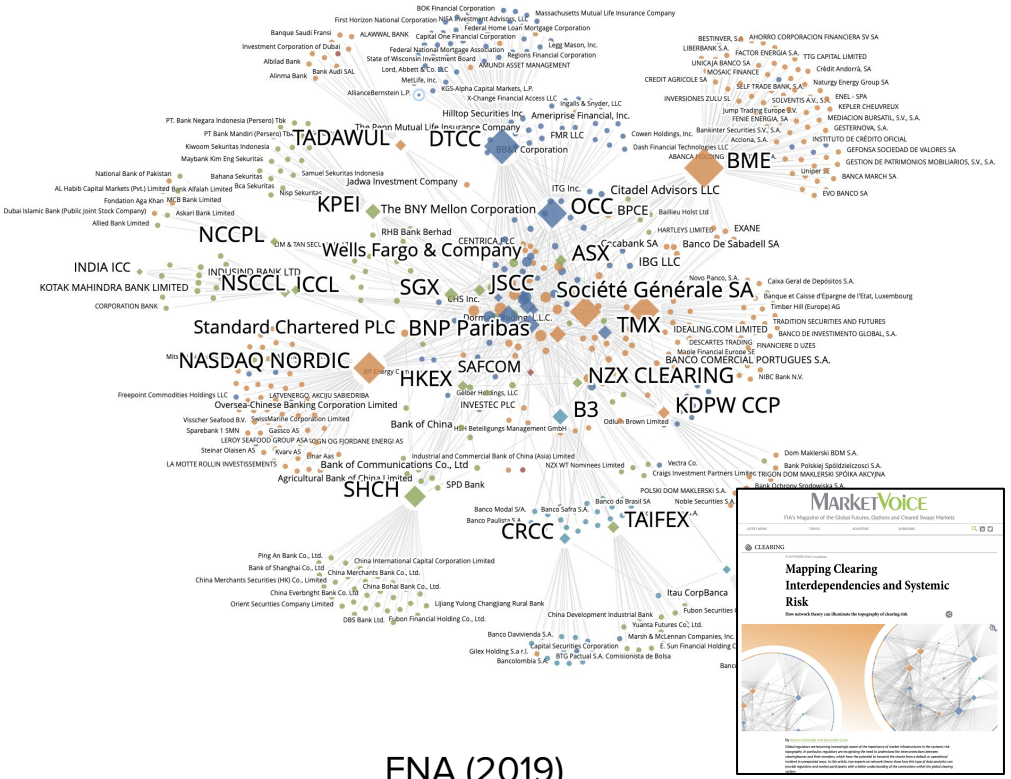
Comparison with BIS "Analysis of Central Clearing Interdependencies" (2018)

	BIS (2018)	**FNA (2019)**
CCPs	26	30
Clearing Members	n/a	847
Parent Organizations	306	495
Roles	7 (member, settlement, LOC, ...)	1 (member)

Private vs Public Data



BIS (2018)



FNA (2019)

Coverage

Our dataset captures over 98 percent of the total worldwide centrally cleared activity:

- There is a number of small CCPs, however the largest ones dominate the market. Eg. Clarus FT aggregates centrally cleared data reported by all CCPs that clear interest rate derivatives (IRD)

- Table 1 illustrates that over 98 percent of the globally cleared IRD market was cleared by 4 CCPs that are in our sample - LCH Ltd., CME, JSCC and ASX.

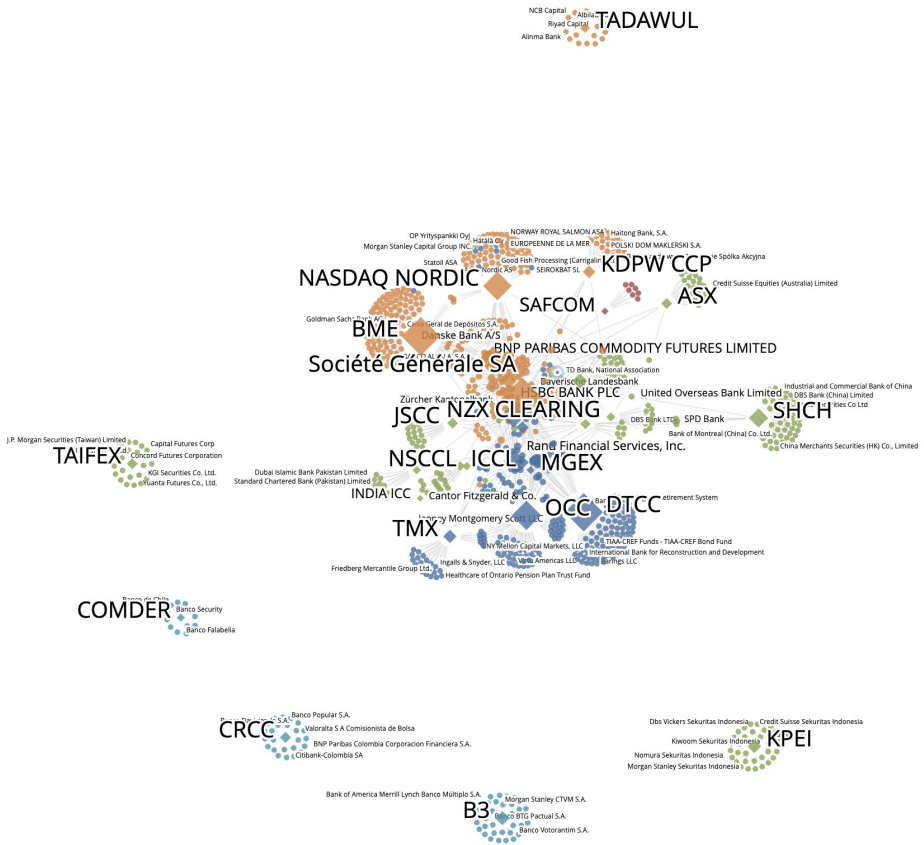
CCP	Currency	Percentege of Market Share
LCH Ltd.	USD	91.5
CME	USD	8.4
LCH Ltd.	CAD, EUR, GBP, and EMEA	over 98
LCH Ltd.	AUD	88
ASX	AUD	11.6
JSCC	JPY	56
LCH Ltd.	JPY	44

CCP Interconnectedness - Subsidiary Level

We see CCPs (diamonds) and their members (circles) from different regions:

- North America (blue)
- Europe and Middle East (orange)
- Asia and Pacific (green)
- Latin America (light blue)
- Africa (red)

On subsidiary level, we see a tight core with peripheral CCPs and a number of completely disconnected CCPs from Latin America and Middle East.

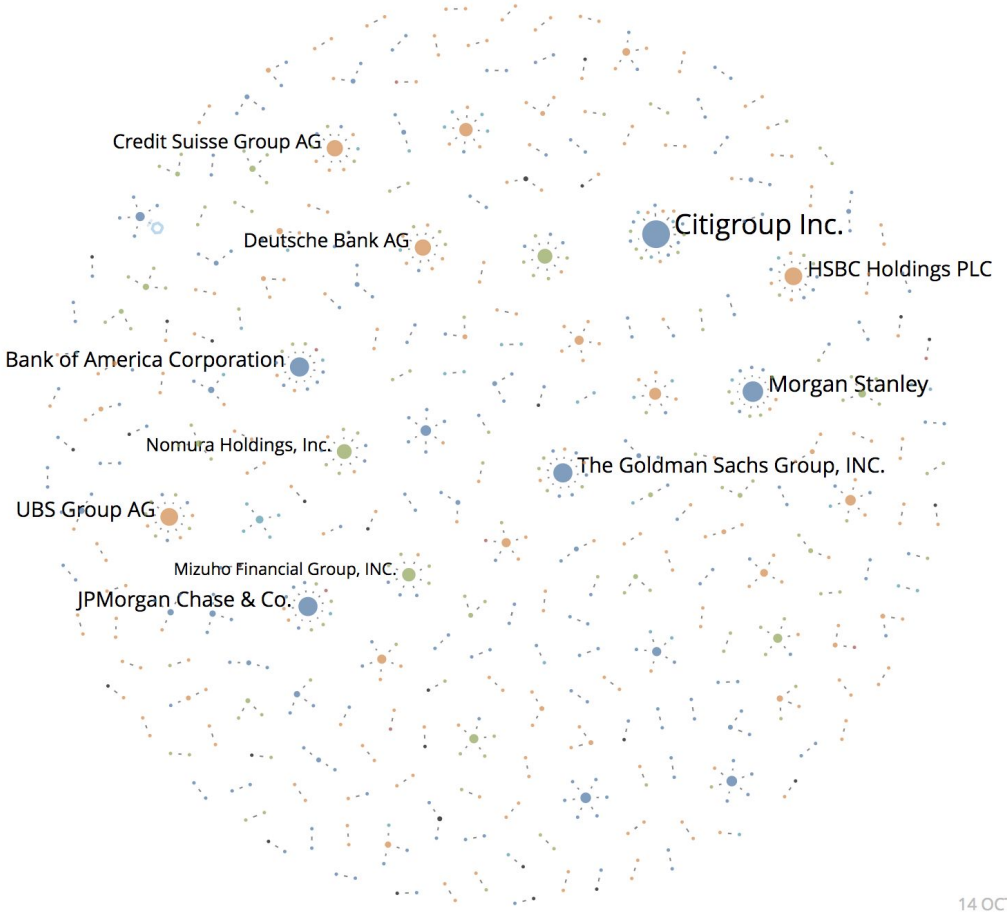


Banking Groups

210 Banking Groups

Largest (# of entities):

1. Citigroup (18)
2. Morgan Stanley (13)
3. Goldman Sachs (12)
4. JPMorgan Chase (12)
5. Bank of America (12)
6. HSBC (11)
7. UBS (11)
8. Deutsche Bank (10)
9. Credit Suisse (10)
10. Nomura Holdings (9)



CCP Interconnectedness on Parent Level

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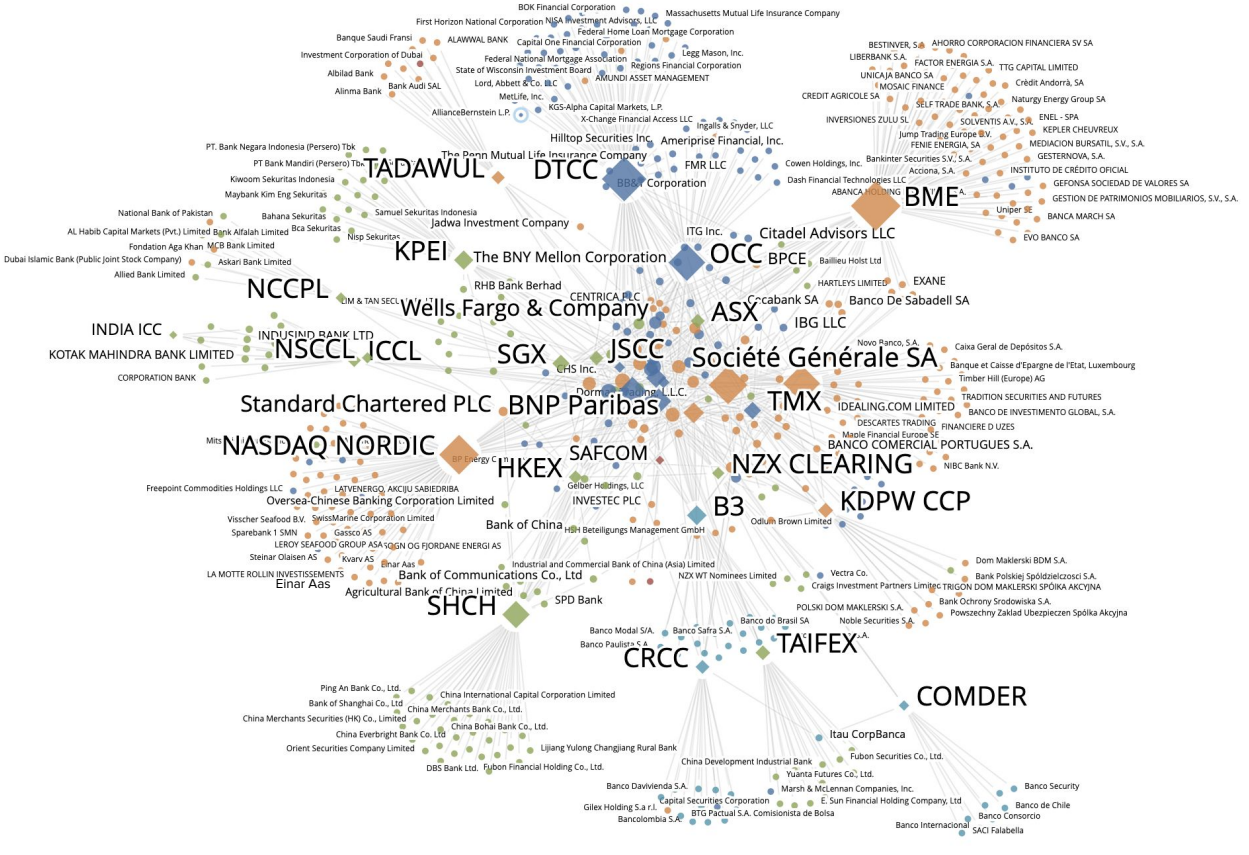
On parent level we see a completely connected network dominated by a core consisting of CCPs from North America and Europe and global banks.



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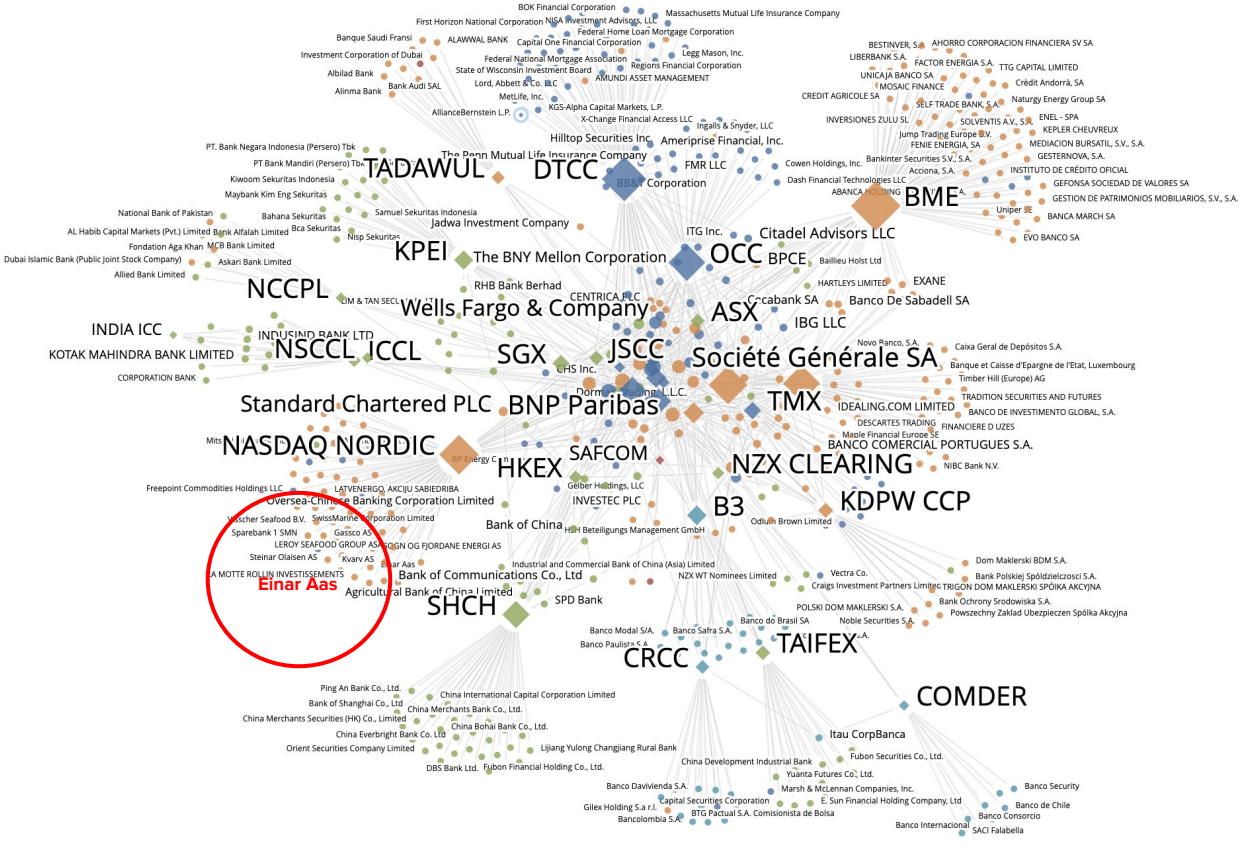
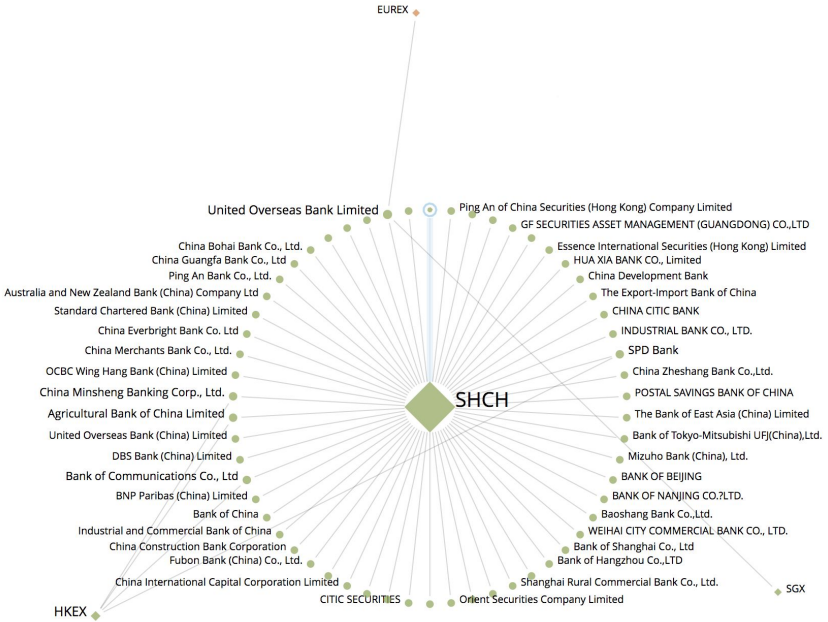
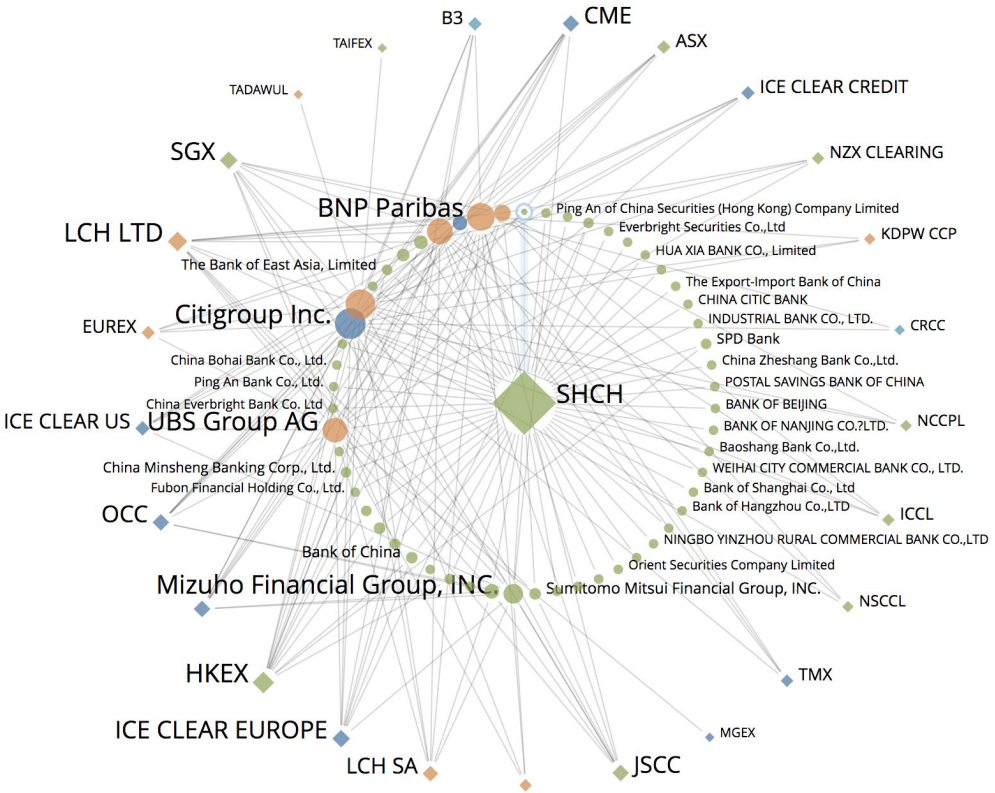


CCP Interconnectedness on Subsidiary vs Parent Level - Example

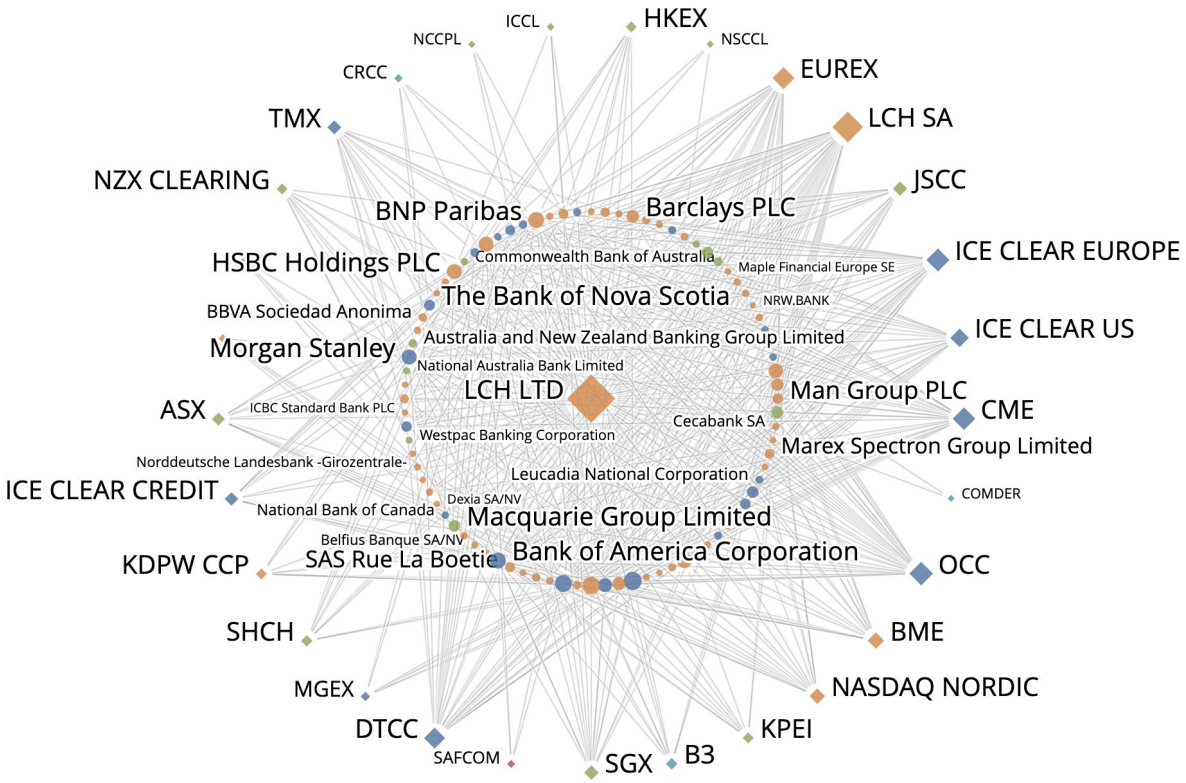


Subsidiary Level
(Connected to 3 CCPs)



Parent Level
(Connected to 25 CCPs)

Visualisations - LCH LTD ego network

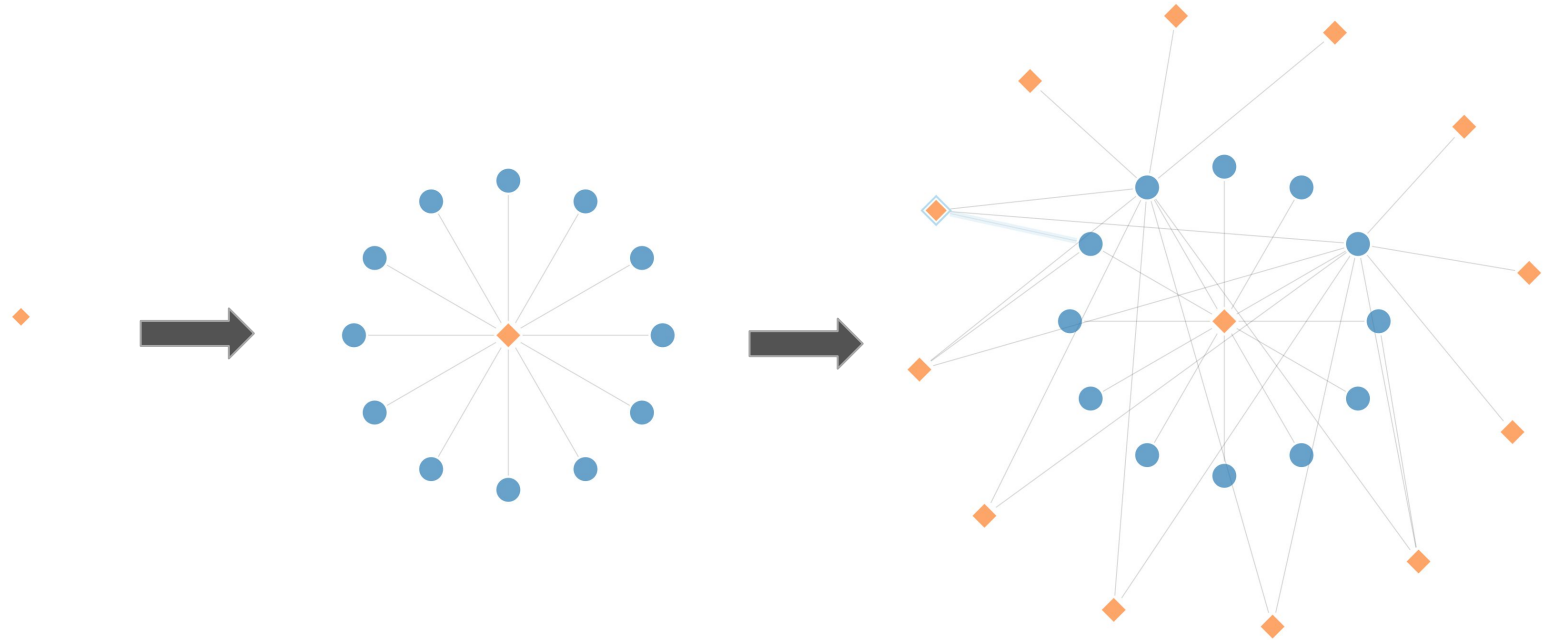


Ego network representations for LCH LTD (focal point), the participating CMs (level 1) and the indirectly connected CCPs (level 2).

The network is constructed on LEI LV.2 data.

Contagion - Member Disruption

A disruption in a member would affect all of the CCP's where it participates, thereby affecting the other CCP's members, possibly creating a cascading cycle as disruption is propagated across members and CCPs

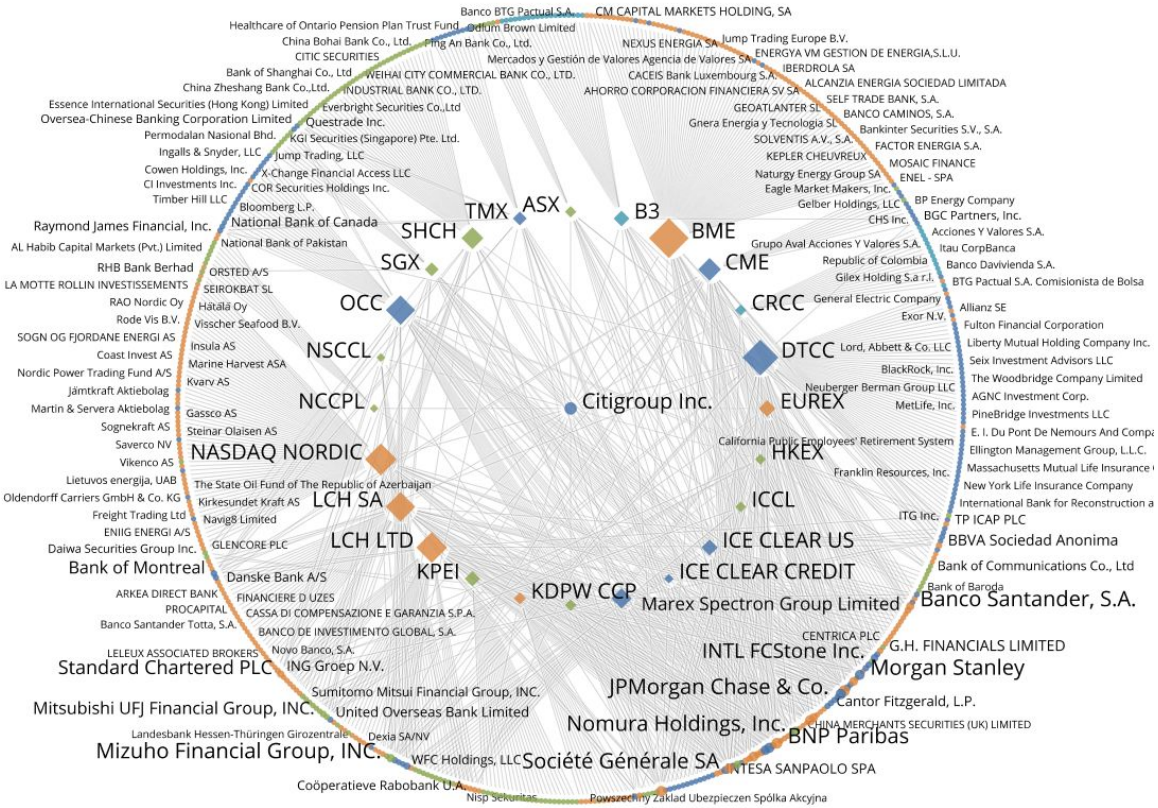


Member

Propagates to all CCPS

Propagates to other members

Visualisations - Citigroup Inc. ego network



Ego network representations for Citigroup, Inc. (focal point), the participated CCPs (level 1) and the indirectly connected CMs (level 2).

Simulation model

Initial event
We reduce each GSIB cash by 60% in turn, see if any of these amounts are more than cash & cash equivalents, if yes -> round 1

Round 1
- we calculate the amount needed to replenish the fund
- and divide this among surviving member (to replenish pro-rata by assets)
- see if theses amount are more that cash & cash equivalents
- no auctions, no partial payments

Round 2
- we distribute the 2nd defaulters position across surviving members (like before)
- see if these amounts are sufficient ...

Round n
We continue until no more defaulters

We run 100 simulations for 12 GSIBs, varying which CCP get paid in full and which not.

Data sources
- CCP disclosures
- GSIB disclosures
- CFTC Financial Data for FCMs

Preliminary Results

GSIB: sort and order in which we selected to run simulations is based on the interconnectedness.

Degree: is the number of total direct and indirect distinct legal entity connections.

% contagion waves: Percentage of runs creating round 2 failures or more

Preliminary score: Degree * % contagion waves

Rank: translates the score into ordinal rank.

GSIB	Degree	Contagion waves	Score	Rank
1	470	3%	14.1	3
2	426	2%	8.52	7
3	418	3%	12.54	4
4	414	5%	20.7	1
5	413	1%	4.13	11
6	400	4%	16	2
7	393	2%	7.86	8
8	379	2%	7.58	9
9	361	3%	10.83	5
10	356	1%	3.56	12
11	351	2%	7.02	10
12	349	3%	10.47	6

Degree correlates only weakly with score or rank

Conclusions

- Network analysis can help overcome the limitations of the current framework for CCP risk management, which is mainly focused on the risks affecting individual CCPs.
- Using the approach outlined here, supervisors can identify the institutions that have the greatest potential impact on the clearing system as a whole, rather than focusing on a single CCP.
- This could help improve the design of supervisory stress testing exercises involving multiple CCPs, and could serve as a practical basis for dialogue between CCPs, their members, and their regulators.

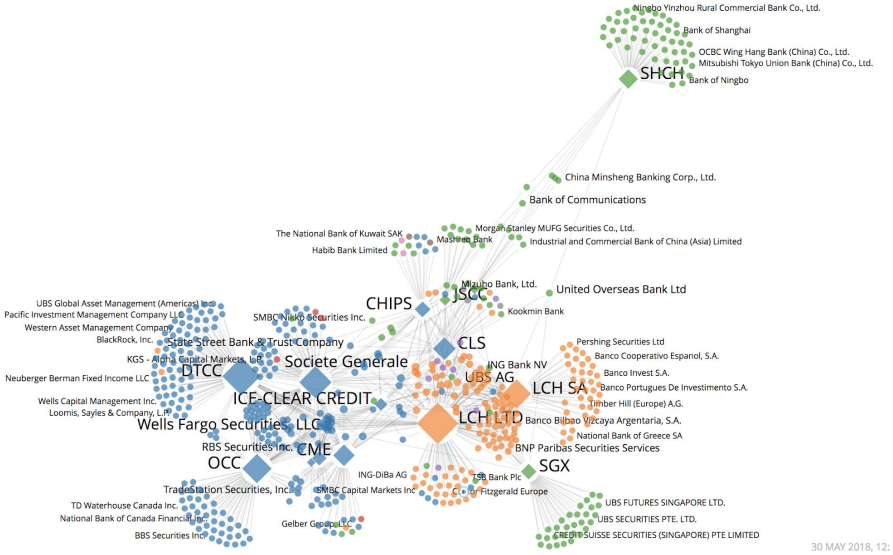
Next Steps

We need to run simulations for all GSIBs and CMs that are publicly traded.

We need to evaluate our assumptions in assessment of systemic importance of CCPs: preliminary results point to only a small subset of CCPs being systemically important for the global financial system.

We plan to update the data set on a quarterly basis and run our simulations to observe how the rank and score change over time.

Consider non-CCPs



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Annex: CCPs

We created our own data set from publicly available data on 30 CCPs and their 847 legal entity level Clearing Members across the Americas, EMEA, and Asia/Pacific.

CCP	Country	Region	Participants
ASX	AU	Asia and Pacific	23
B3	BR	South America	37
CME	US	North America	67
COMDER	CL	South America	12
CRCC	CO	South America	24
DTCC	US	North America	138
EUREX	DE	Europe and Middle East	43
HKEX	HK	Asia and Pacific	20
ICCL	IN	Asia and Pacific	19
ICE CLEAR US	US	North America	37
ICE CLEAR CREDIT	US	North America	29
ICE CLEAR EUROPE	US	North America	77
INDIA ICC	IN	Asia and Pacific	5
JSCC	JP	Asia and Pacific	23
KDPW CCP	PL	Europe and Middle East	30
KPEI	ID	Asia and Pacific	34
LCH LTD	GB	Europe and Middle East	153
LCH SA	FR	Europe and Middle East	99
MGEX	US	North America	12
NASDAQ NORDIC	SE	Europe and Middle East	97
NCCPL	PK	Asia and Pacific	13
NSCCL	IN	Asia and Pacific	13
NZX CLEARING	NZ	Asia and Pacific	16
OCC	US	North America	100
SAFCOM	ZA	Africa	8
SGX	SG	Asia and Pacific	41
SHCH	CN	Asia and Pacific	58
TADAWUL	SA	Europe and Middle East	19
TAIFEX	TW	Asia and Pacific	24
TMX	CA	North America	33