OFFICE OF FINANCIAL RESEARCH

Assessing the Safety of Central Counterparties

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Financial Research Advisory Committee Meeting

September 29, 2021

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Layers of Protection: CCP Default Waterfall

Initial Margin of Member

- Initial margin covers potential shortfalls in Variation Margin and is held in segregated accounts.

CCP Capital

- CCP Capital covers losses beyond the contributions of defaulting members.

Guarantee Fund

- Guarantee Fund is collected across members and is mutualized.

Assessments

- Assessments on members are made to cover losses beyond those of CCP capital + guarantee fund.

Source: Authors' creation.

Layers of Protection: CCP Default Waterfall

Data: CPSS-IOSCO Public Quarterly Disclosures:

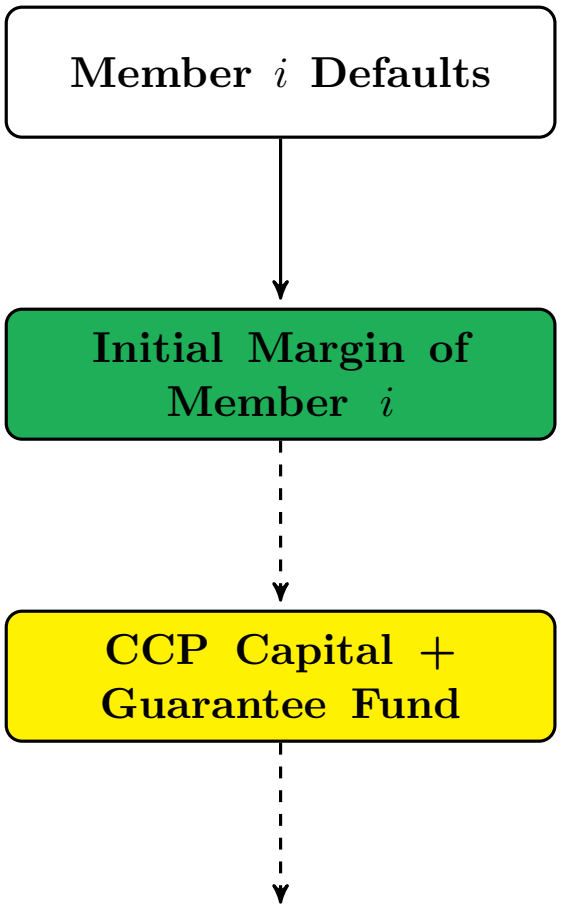
- CPSS-IOSCO provides a framework for CCPs to provide relevant information to participants, authorities and public.
  - Quarterly filings 2015 Q3 - 2020 Q1.

Percent of Funded Resources By Region

	All	Asia-Pacific	Europe	North America
Number of CCPs	59	27	20	12
Funded Resources				
Initial Margin	77.6	76.9	79.1	74.7
CCP Capital	2.8	6.0	1.3	0.7
Guarantee Fund	19.6	17.1	19.7	24.6

Sources: CCPView Clarus Financial Technology; authors' analysis.

Breaches in the CCP Default Waterfall



- Member i defaults on its VM payment

- An **Initial Margin Breach** occurs when the variation margin owed is larger than the initial margin held

- A **Guarantee Fund Breach** occurs when the aggregate initial margin breaches exceeds the CCP paid-in capital plus guarantee fund

Initial Margin Breaches are in line with CPMI-IOSCO

- Public Quarterly Disclosures provide the number of initial margin breach events at an individual account level per quarter.

	All	Asia-Pacific	Europe	North America
Daily VaR	99.79%	99.78%	99.78%	99.83%
Quarterly IM Breach Probability	12.46%	12.66%	12.89%	10.15%
CCP Sample	77	26	41	10

Source: CCPView Clarus Financial Technology; authors' analysis.

- Daily initial margin breach probabilities are in line with CPMI-IOSCO Principle minimum standards of 99%.
- Nevertheless **quarterly probabilities** are quite substantial.

Initial Margin Breaches Increased in mid-March

- There was a significant increase in the frequency of initial margin breaches for March 2020.

	All	Asia-Pacific	Europe	North America
Quarterly Account Probability:				
2015 Q3 - 2019 Q4	8.23%	12.22%	5.55%	8.88%
2020 Q1	20.25%	15.81%	21.79%	27.07%
CCP Sample	77	26	41	10

Source: CCPView Clarus Financial Technology; authors' analysis.

- In Europe and North America initial margin breach probabilities more than tripled in the first quarter of 2020.
  - Suggests there is strong positive correlation in stresses experienced by CCPs.

Guarantee Fund Breach Estimate

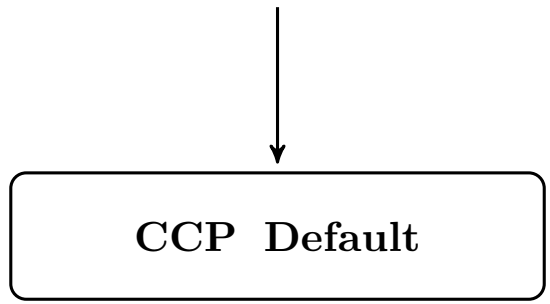
- A guarantee fund breach occurs if total initial margin breaches exceed the CCP's paid-in capital plus the guarantee fund.

GF Breach Likelihood of Largest 10 CCPs by Region				
	All	Asia-Pacific	Europe	North America
Estimated Number of GF Breaches				
2015 Q3 - 2019 Q4:	0	0	0	0
2020 Q1:	3	1	0	2
Estimated Annual Frequency Per CCP (%)				
Model w/o 2020 Q1:	0.96	1.43	0.32	1.55
Model w/ 2020 Q1:	3.20	3.63	0.48	6.67

Source: CCPView Clarus Financial Technology; authors' analysis.

- In 2020 Q1 probabilities increased markedly, suggesting there is strong positive correlation in stresses experienced by CCPs.
- Note that a guarantee fund breach does not imply default, but it does signify severe stress relative to pre-funded resources.

Supervisory CCP Default Estimates



CCP Default Member Estimates

Data: CCAR Y-14Q Schedule L

- Quarterly US GSIB disclosures provide estimated 5-year CDS spreads for 106 CCPs as estimated by their member US GSIBs.
  - Quarterly filings 2016 Q2 - 2020 Q1.

Annual Default Probabilities Statistics

Default Probability	All	Asia-Pacific	Europe	North America
All	2.47%	3.12%	2.53%	1.34%
Top 10	1.26%	1.70%	0.88%	1.19%
Top 5	1.25%	1.79%	0.79%	1.18%

Source: Federal Reserve Y14 Q Schedule L; authors' analysis.

- These numbers must be viewed with caution, as members' estimation methodologies are not specified.

Conclusion

A CCP default would have systemic consequences, due to losses by member firms, clients, and spillover effects. Our analysis highlights:

1. large jurisdictional variation in CCP risk management from public data sources.
2. larger CCPs are relatively safer, as seen in both the guarantee fund breach and default probabilities.
3. high correlation in CCP risk exposure, as measured by initial margin breaches, guarantee fund breaches, and default probabilities.
4. under extreme stress multiple CCPs could default due to network contagion and exposures to common shocks.