

CCPS AND OTC DERIVATIVES REFORM: Network Analysis

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Analyses based on 41 G-SIBs used in 2013

MAGD(Macroeconomic Assessment Group on Derivatives)
Report for BCBS/FSB <http://www.bis.org/publ/othp20.pdf>

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Network Graphics Done by Ali Rais Shaghaghi

Motivation: For OTC Derivatives Reforms

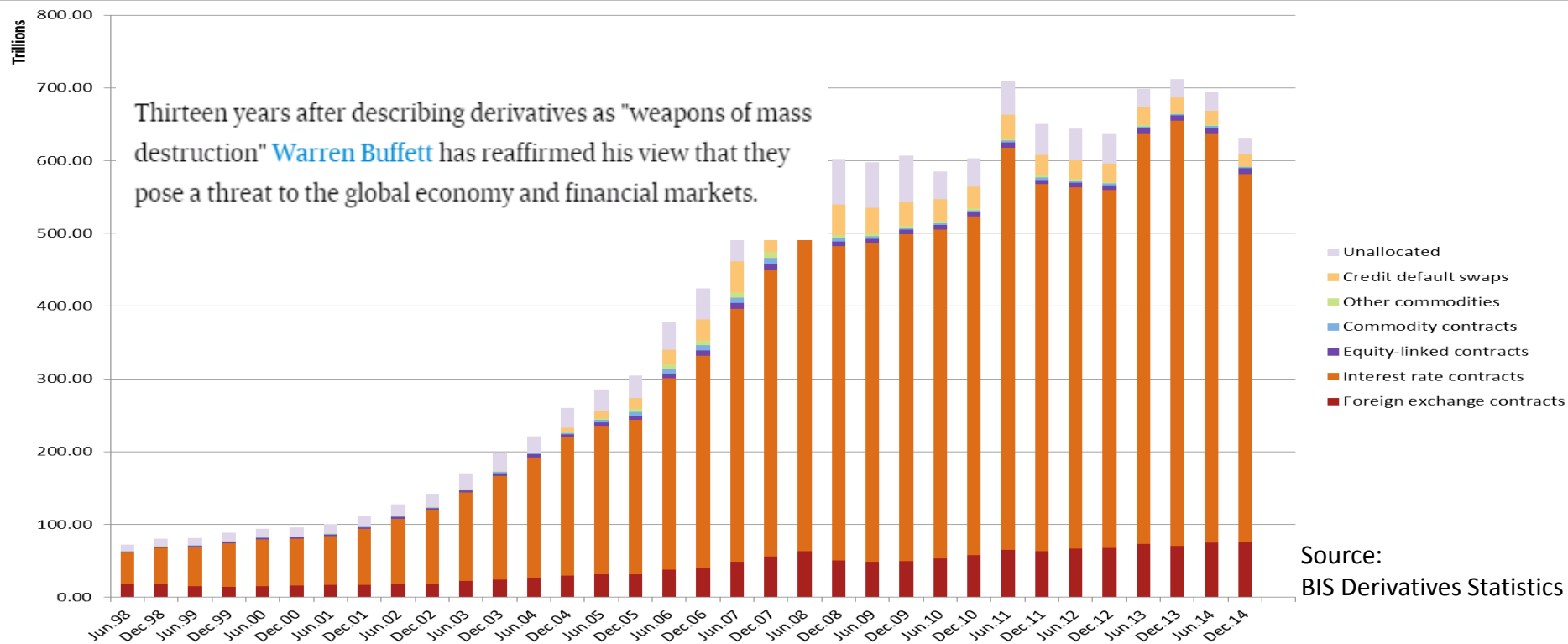
How Do We Assess G20/EMIR OTC Reforms for Efficacy and System Stability?

\$600+ Trillion OTC Derivatives

G20's ambitious program to Improve market infrastructure following the **2007-2008 crisis**,
CCPs) to help mitigate systemic risk.

Strengthen risk management; reduce interconnectedness

However: concentrate risk in one or a few nodes in the financial network and
also increase institutions' demand for high-quality assets to meet collateral
requirements resulting in funding and liquidity risk



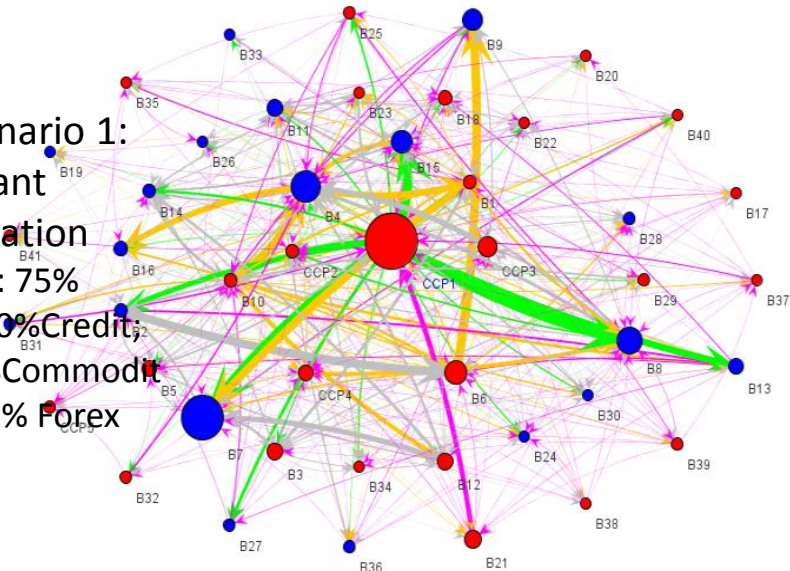
The European Union regulation on derivatives, central counterparties and trade repositories (**EMIR**)

Principles for Financial Market Infrastructures (PFMIs) (CPSS-IOSCO 2012)

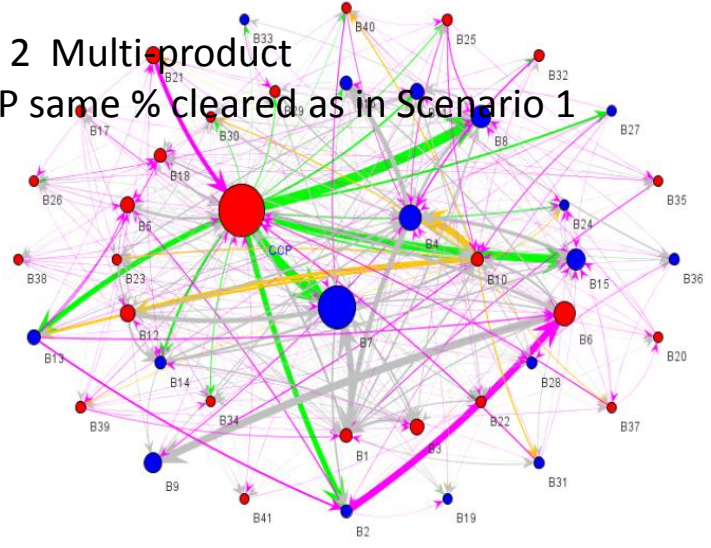
- Trading obligations of standardized OTC derivatives on exchanges
- Clearing obligation for eligible OTC derivatives through central counterparties
- Reduce counterparty credit risk and operational risk for bilaterally cleared OTC derivatives: Collateral Rules
- Reporting obligation for OTC derivatives to Trade Repositories
- Non-centrally cleared contracts subject to higher capital requirements
- Common rules for central counterparties (CCPs) and for trade repositories
- Rules on the establishment of interoperability between CCPs
- Ensure continuity of critical CCP services under extreme market conditions that could threaten CCP viability : So Called Cover 2 Default Fund Contributions
- To deal with such scenarios, the PFMIs require CCPs establish recovery and resolution plans (FSB 2013; CPMI-IOSCO 2014)

Network Topology : With CCP Penetration

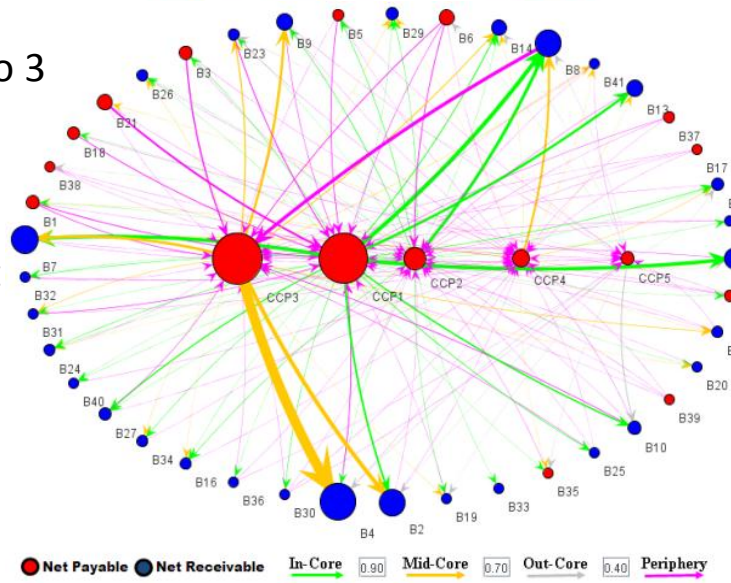
Scenario 1:
Extant
situation
CCP: 75%
IR, 50% Credit;
20% Commodity;
15% Forex



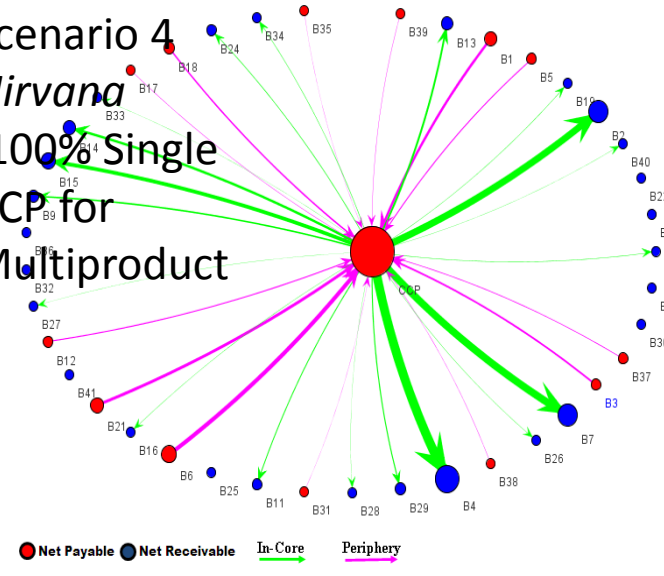
Scenario: 2 Multi-product
Single CCP same % cleared as in Scenario 1



Scenario 3
100%
Cleared
Single
Product
CCPs



Scenario 4
Nirvana
:100% Single
CCP for
Multiproduct



● Net Payable ● Net Receivable In-Core 0.90 Mid-Core 0.70 Out-Core 0.40 Periphery

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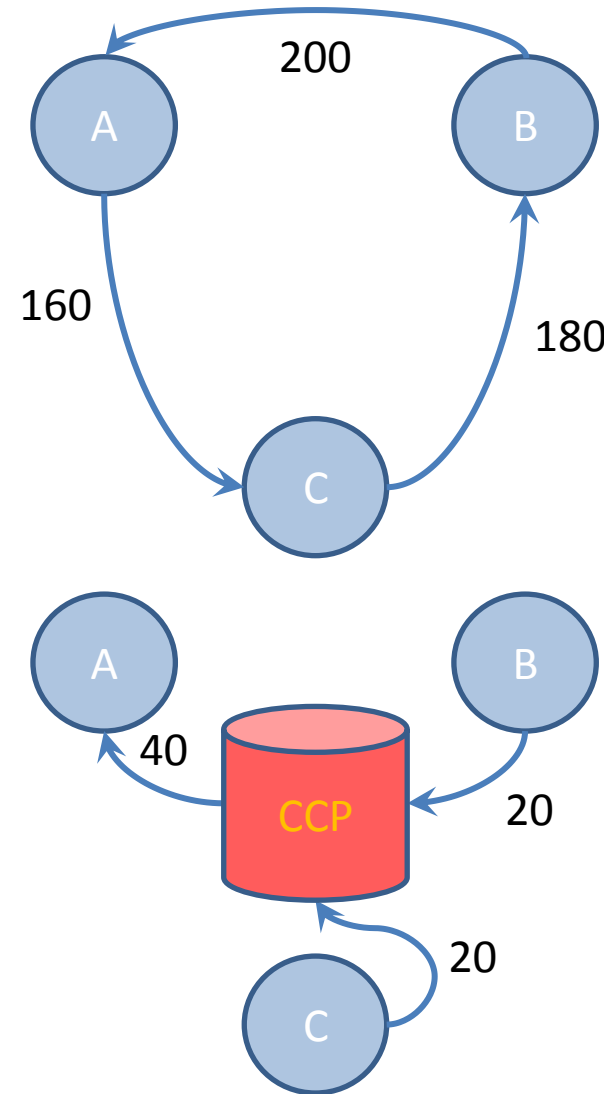
● Net Payable ● Net Receivable In-Core 0.90 Mid-Core 0.70 Out-Core 0.40 Periphery

● Net Payable ● Net Receivable In-Core Periphery

The colours of the nodes denote whether the financial institution is a net payer (red) or a net receiver (blue) of variation margin, while the size of the arrows linking the nodes is proportional to the size of the exposure between them. Note, CCPs have balanced books CCP 1 :

The Role of Central Counterparties

- **CCP** assists in the management of counterparty credit risk by interposing itself between counterparties to become the buyer to every seller, and the seller to every buyer. These arrangements support **anonymous** trading, deepen market **liquidity**, and generally maximize the **netting** of exposures across participants.
- clearinghouses are better able to manage risk than dealer banks in the over-the-counter derivatives market, and (2) clearinghouses are better able to absorb risk than dealer banks. [Adam J. Levitin](#)
- Policymakers acknowledge confidence in underlying markets could be severely tested if a CCP's activities were disrupted, leaving market participants unable to establish new positions or manage existing exposures.



Collateral Hungry System In Scenarios 1-3 (Realistic Ones): Creates Tradeoff between Solvency Risk and Liquidity Risk

- Replacement cost risk managed through
 - Variation margin: exchanged daily usually in cash – to reflect mark-to-market price changes on participants' outstanding positions.
 - Initial margin: to cover, with typically 99% Confidence level
- A CCPs initial margin is supplemented with a pool of resources from all participants known as the default fund
- Risk to CCP arises from unfunded variation margin of losing side clearing members (viz. in excess of initial margin)
- Default fund is calibrated to withstand the default of its largest two participants (Cover 2)
- CCP transfer shortfalls through Variation Margin Haircuts to winning side clearing members

OTC Derivatives Data MAGD(Macroeconomic Assessment Group on Derivatives)

- The data consists of reported balance sheet data on derivative assets and liabilities for 41 GSIBs (2012 Financial reports)
- Tier 1 capital and liquid resources (defined as the sum of cash, cash equivalents and available-for-sale assets)

(\$US trillion)	Total	Core (16 Banks)	Periphery (25 Banks)
Derivative Liabilities	14.34	12.16	2.18
Derivative Assets	14.48	12.35	2.13
Cash and Cash Equivalents	2.44	1.20	1.25
Available for Sale Assets	5.57	2.83	2.74
Tier 1 Capital	2.39	1.34	1.05

Netting: Almost a \$Trillion worth of initial margin

- Netting efficiency depends on the product and counterparty scope of a given clearing arrangement, the profile of positions, and the margining methodology applied:

Initial Margin at 99 Percent Coverage

	Total	Bank-to-bank	Bank-to-CCP	CCP-to-bank
Scenario 1	942.10	892.88	49.22	0.00
Scenario 2	930.25	892.88	37.37	0.00
Scenario 3	121.82	0.00	121.82	0.00
Scenario 4	80.76	0.00	80.76	0.00

Default Fund Size: For each CCP's default fund in each scenario

(\$US billion)	Scenario 1	Scenario 3
	CCP1 (Interest Rates)	3.86
CCP2 (Foreign Exchange)	0.45	3.00
CCP3 (Equity)	1.63	10.83
CCP4 (Credit)	0.84	1.63
CCP5 (Commodity)	0.17	0.87
Total	6.95	21.47
Total encumbrance (default fund and initial margin)	949.05	143.29
	Scenario 2	Scenario 4
CCP (Combined)	4.14	11.86
Total encumbrance (default fund and	934.39	92.62

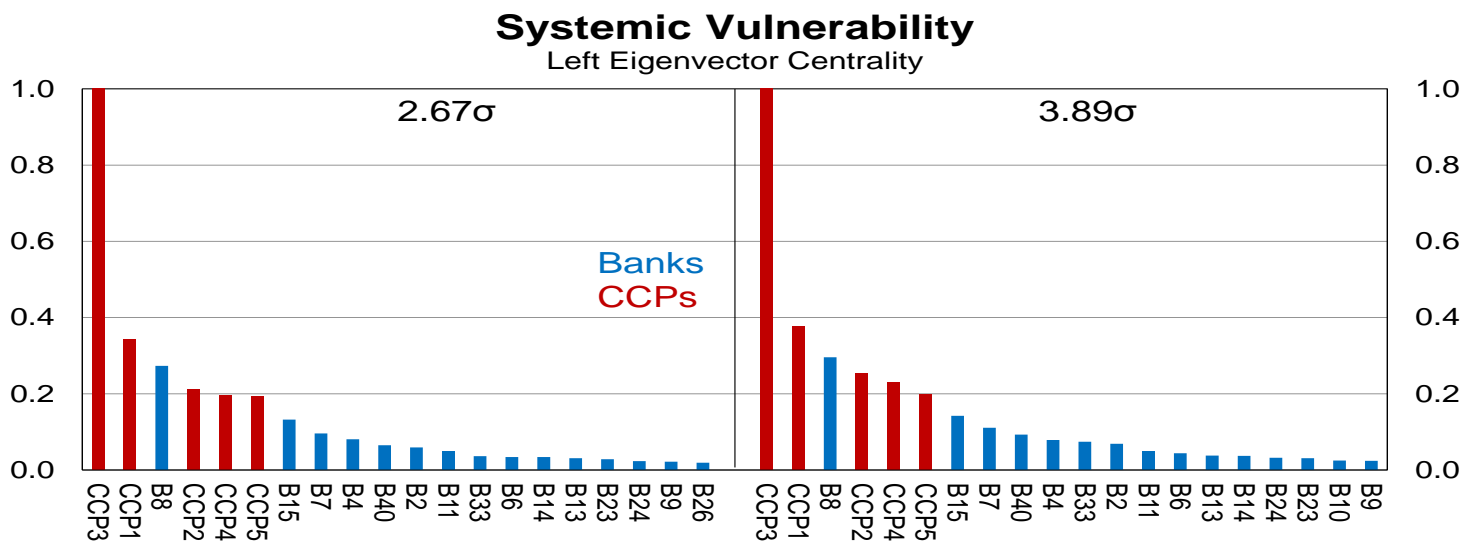
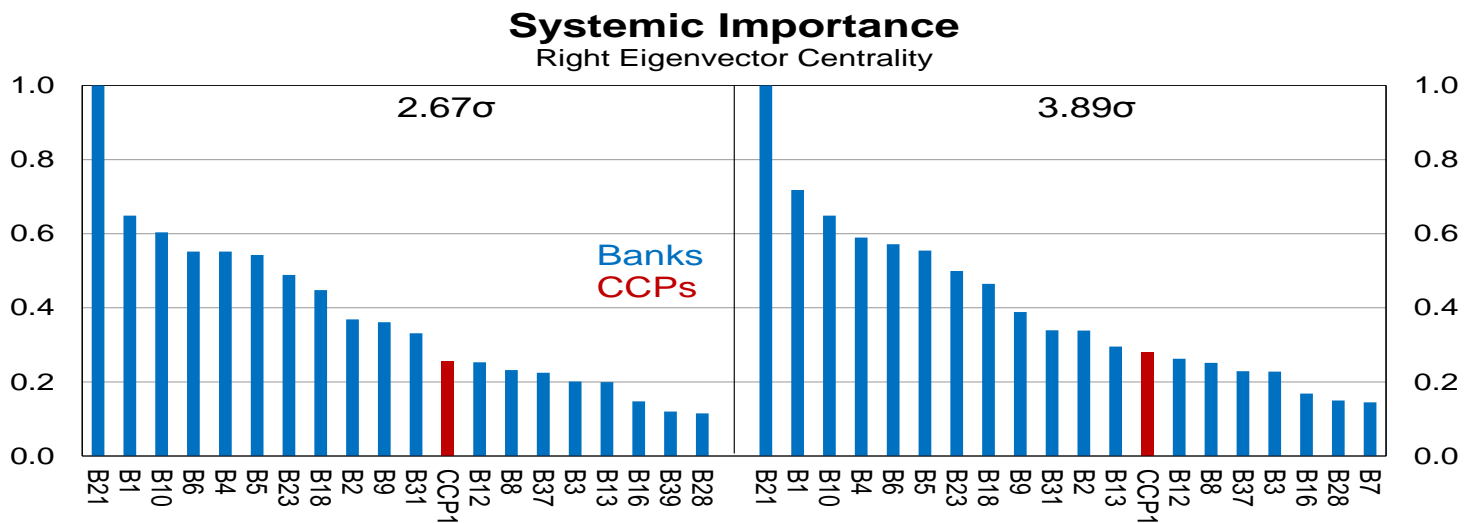
Network Stability

- Understanding the vulnerability of the system to failure
- Quantify the stability of a network system
- Adapt (*Markose 2013*)(*Markose, Giansante, Rais Shaghghi 2012*) eigen-pair method
- Simultaneous determination of the maximum eigenvalue of the network of liabilities (adjusted for Tier 1 capital or Default fund), to indicate the stability of the overall system, along with eigenvector centrality measures for systemic importance and systemic vulnerability.

Systemic Risk Indices: Liquidity and Solvency Risk Trade Off

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Liquidity Systemic Risk Index (LSRI)				
	0.83	0.83	0.27	0.15
Solvency Systemic Risk Index (SSRI)				
Realized 2.67 Volatility	0.16	0.12	0.21	0.30
Realized 3.89 Volatility	0.39	0.31	0.45	0.58
Total Systemic Risk (SSRI+LSRI)				
Realized 2.67 Volatility	0.99	0.95	0.48	0.45
Realized 3.89 Volatility	1.22	1.14	0.72	0.73

Equity and Interest Rate Derivatives CCPs found to be vulnerable



Ranking of institutions can differ in the respective 2.67 and 3.89 price volatility cases; for example, in Figure 5(a), B6 is ranked fourth for the 2.67 standard deviation case, while B4 is ranked fourth for the 3.89 standard deviation case. Eigenvectors normalized to equate highest centrality rank to 1.

Conclusions

- Large exposures of CCPs and their extensive interconnections make them systemically vulnerable
- CCPs could transmit stress widely through the system in event of extreme shock : Cover 2 not adequate and suffers from procyclicality
- Scenario 1 most closely describes the topology that is likely to be observed in the near term
- Our analysis underscores importance of understanding the stability of networks in which central clearing and non-central clearing co-exist. In such a scenario, the interaction between liquidity and solvency risks is important.
- **The heavy liquidity encumbrance of GSIBs from CCP clearing has macro-economic implications**
- Future research needed to quantify ‘skin in game ‘ capital requirements on CCPs