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# **Analysing credit derivatives markets: Flow of risk, notional excess and portfolio compression**

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**Special thanks to colleagues (“EMIR team”) at the ESRB secretariat for helping me to prepare this presentation, in particular, Marco D’Errico, Tarik Roukny Ornia and Sam Langfield.**

**\*Disclaimer: the views are of my own and do not necessarily represent the views of the ESRB or its member institutions.**

## Some facts about OTC derivatives markets

- Global Financial Crisis revealed the **opacity** of the Over The Counter (OTC) derivatives markets
- **G20 financial reforms:** Making derivatives markets safer through
  - subjecting **non-centrally cleared contracts** to higher capital and minimum margining requirements
  - **trading** of those contracts (where appropriate) on exchanges or electronic platforms
  - **clearing** of all standardised contracts through central counterparties
  - **reporting** of all OTC derivatives to trade repositories
- OTC derivatives are characterised by **large notional values** (IRD \$384 trn, CD \$12 trn,...), **heterogeneity**, and in some cases, **complexity of the instrument**, very large fraction of **intra-financial exposures**.



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## Work towards transparency in the EU derivatives markets: EMIR and ESRB analysis

- **EMIR** (European Market and Infrastructure Regulation) requires all EU counterparties entering a derivative (OTC and ETD) contract to report details on the contract to trade depositories. This **EU wide** data is available to ESMA and ESRB.
- ESRB has worked extensively on EMIR data with the following objectives:
  1. Developing a **data infrastructure**,
  2. Contributing to improvements in **data quality**,
  3. Conducting **policy-relevant analyses**.



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# ESRB Occasional Paper: *Shedding light on dark markets*

Focus on three types of derivatives: IR, credit and FX

Several key takeaways, including:

1. EMIR data can already provide **useful insights**
2. High level of **intra-financial exposures** (especially intra-dealer exposures)
3. The network of trades and exposures reflects **key regulatory and other changes** (central clearing obligations, compression, etc.)

[Details in ESRB OP “*Shedding light on dark markets*” by Abad, Aldasoro, Aymanns, D’Errico, Fache Rousova, Hoffmann, Langfield, Neychev and Roukny (2016)]



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# Focus of the talk today

## Flow-of-risk

1. Explain the concept, i.e. method to track the **transfer of risks**
2. Map the **global CDS network** (for 2011 – 2014 DTCC snapshots)
3. Analyse various policy relevant questions using the EMIR data, e.g. **geography of risk flows** and presence of **wrong way risk**

## Portfolio compression

1. Explain the concept, i.e. a post-trade technique aimed at **reducing gross notional** levels, while keeping net notional unchanged
2. **Implications?** Systemic risk, transparency,...



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# Overview of credit derivatives markets (single name CDS)

- Used primarily by banks and non-bank, non-insurer financials (e.g. asset managers) [Data as of Nov 15].

Buy \ Sell	G16 Dealers	Banks	Other financials	ICPFs	Non-financial	Other	Total
<b>G16 Dealers</b>	29.5%	17.4%	7.1%	0.3%	4.2%	2.4%	<b>60.9%</b>
<b>Banks</b>	18.5%	1.9%	0.9%	0.0%	0.1%	0.0%	<b>21.3%</b>
<b>Other financials</b>	8.2%	1.1%	0.4%	0.0%	0.1%	0.1%	<b>10.0%</b>
<b>ICPFs</b>	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	<b>0.5%</b>
<b>Non-financial</b>	4.4%	0.1%	0.2%	0.0%	0.0%	0.0%	<b>4.6%</b>
<b>Other</b>	2.5%	0.0%	0.1%	0.0%	0.0%	0.0%	<b>2.7%</b>
<b>Total</b>	<b>63.5%</b>	<b>20.6%</b>	<b>8.6%</b>	<b>0.4%</b>	<b>4.4%</b>	<b>2.5%</b>	<b>100.0%</b>

Note: "Other" includes Government, Central Bank, CCPs and empty or unidentified sectors. The red squares refer to the intensity of the respective sector-to-sector relationship.  
 Source: DTCC OTC credit derivatives single-name dataset (based on the processed 02/11/15 trade state report).

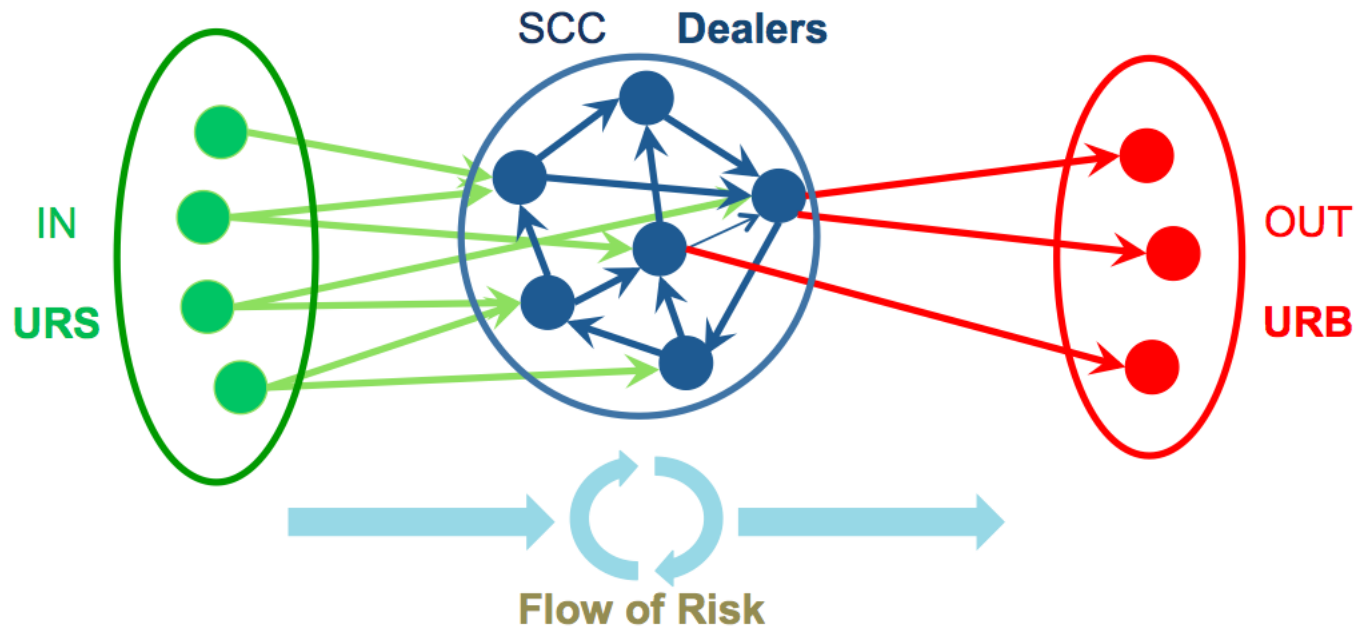


Source: ESRB OP "Shedding light on dark markets" by Abad et al. (2016).



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# Flow-of-risk



OTC CDS market is largely intermediated with a **bow-tie network architecture**,

Where the **underlying credit risk** is transferred from **Ultimate Risk Sellers** (URS, who “buy protection via CDS”) to **Ultimate Risk Buyers** (URB, who “sell protection via CDS”) through a series of dealers which form **closed intermediation chains**. This introduces **counterparty risks that move to the other direction**.



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# Examples of policy questions that can be analysed using the flow of risk approach

For instance, flow-of-risk approach allows to

1. Map the **geography of risk flows** (e.g., cross-border exposures, exposure to different types of counterparties, etc.)
2. Analyse how market participants **make use of OTC positions** (e.g. hedging, synthetic,...)
3. Understand the potential sources of **wrong-way risk** (PD of CDS protection sellers is correlated with the underlying credit risk)



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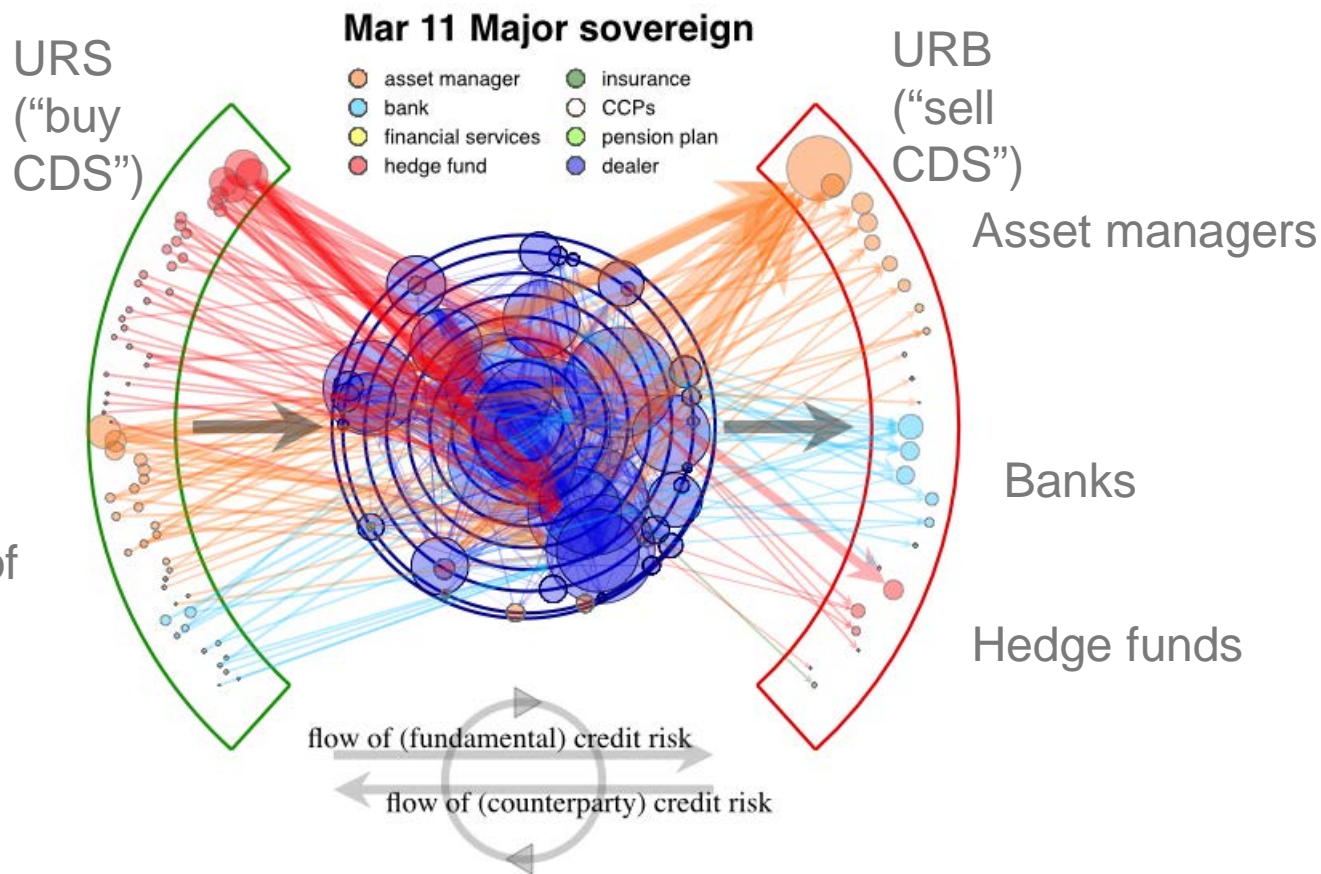
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# Mapping the global CDS network

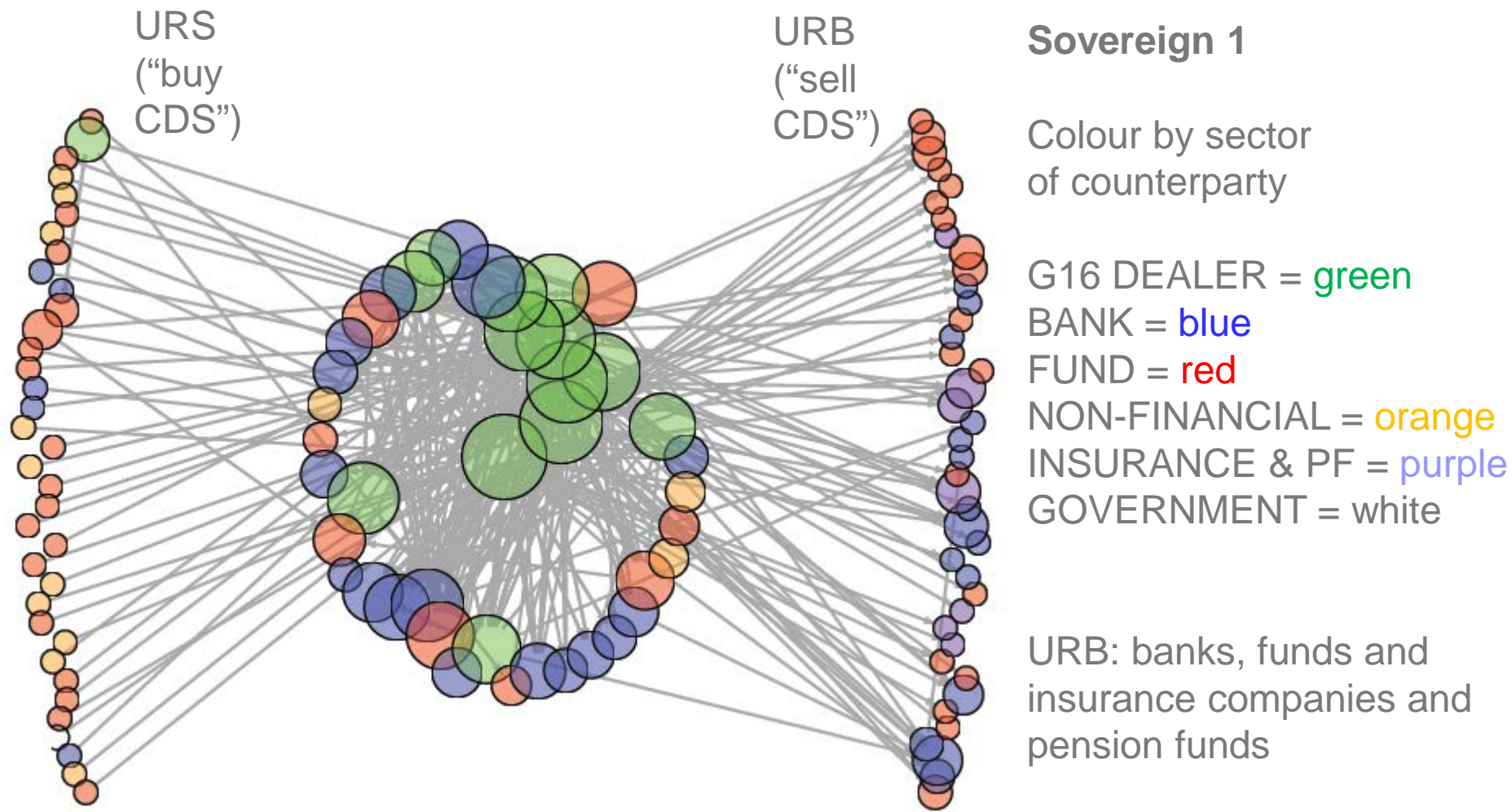
- Risk flows from URS (Ultimate Risk Sellers) to URB (Ultimate Risk Buyers)
- Large positions in the LSCC (~70/80% of total notional)
- Concentration of ultimate risk buyers (URB)
- Presence of non-bank intermediaries (also in the LSCC)



Source: D’Errico, Battiston, Peltonen, Scheicher (2016). How does risk flow in the CDS market?, ESRB WP forthcoming.



# Visualise the geography of risk flow using EMIR CDS data

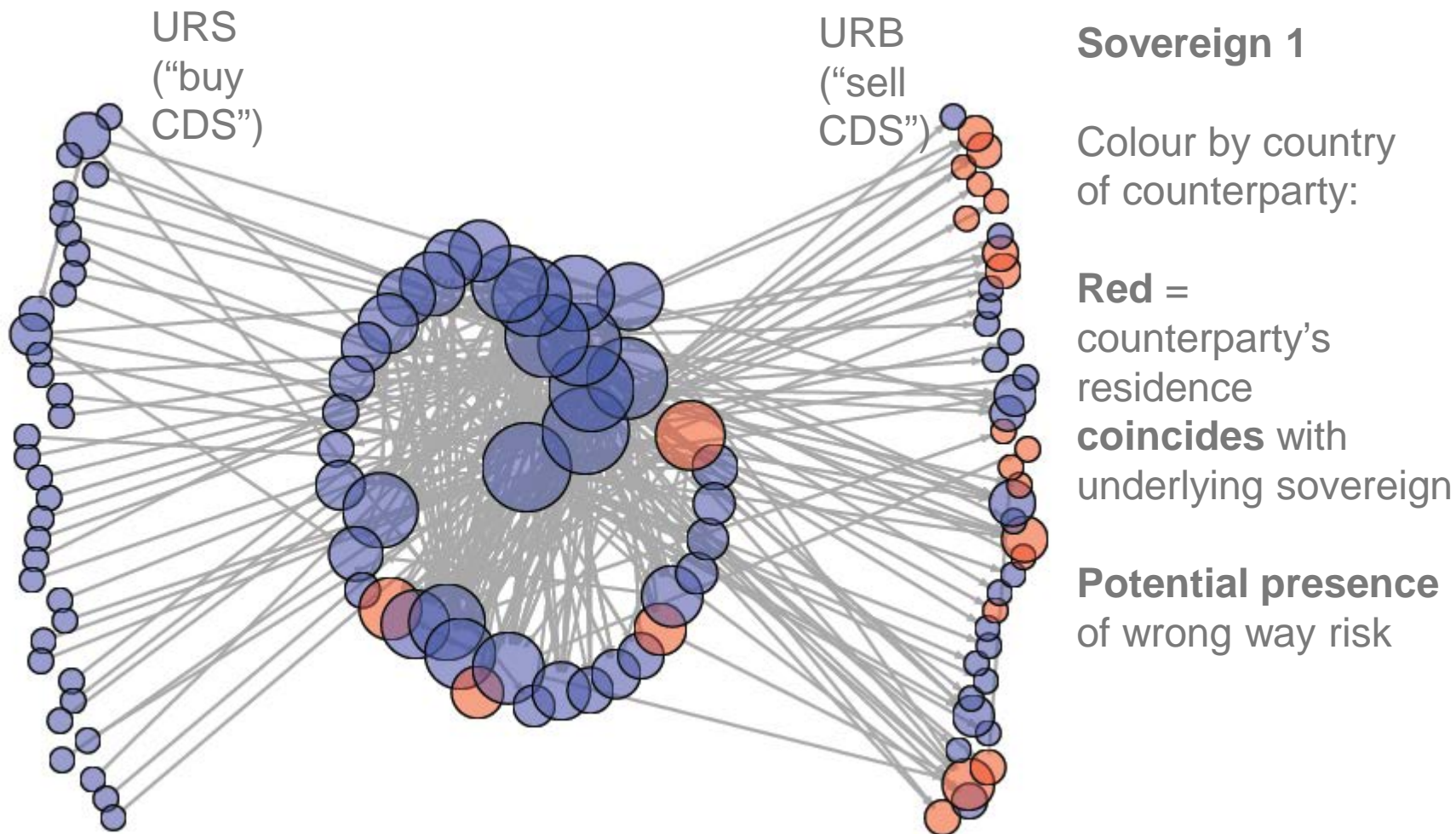


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# Analyse potential wrong-way risk on a EU sovereign reference entity using EMIR CDS data

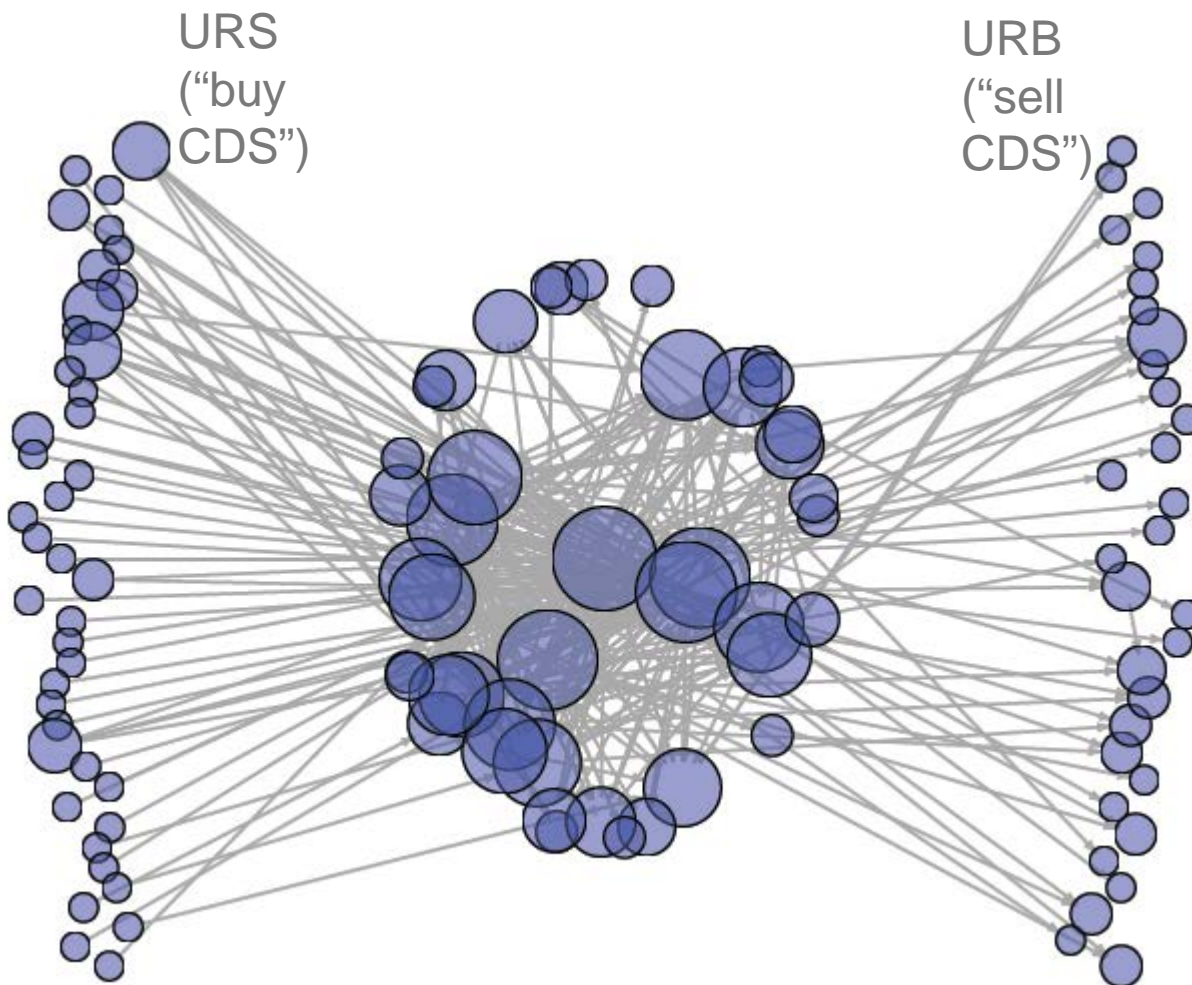


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# Analyse potential wrong-way risk on a EU sovereign reference entity using EMIR CDS data



## Sovereign 2

Colour by country of counterparty

All URB **blue** i.e. no domestic counterparty trading on underlying Sovereign

wrong way risk not evident



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# Some open questions and avenues for further research

1. **Map the portfolio and counterparty overlap** of market participants between different types of derivatives and underlying entities
2. **Analyse network dynamics** and develop monitoring tools
3. **Understand the role of CCPs** in shaping the network
4. Understanding of the **motives** for using OTC derivatives, e.g. **hedging** and **synthetic exposures by various types of financial institutions**
5. **Economic role** of large intra-financial positions
6. **Collateral flows**



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# Portfolio compression

As from **MiFIR** (Markets in Financial Instruments Regulation),  
**portfolio compression...**

1. ...is a **risk reduction** service in which two or more counterparties wholly or partially **terminate** some or all of the derivatives and replace them with other derivatives whose **combined notional value is less** than the combined notional value of the terminated derivatives.
2. ...**reduces non-market risk** in existing derivatives portfolios **without changing the market risk of the portfolio**

In a nutshell, portfolio compression is a post-trade operation that **reduces market gross notional without affecting** participants' net positions



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# Some facts about portfolio compression

## Some statistics

- Multiple types of derivatives are being compressed: IRS (cleared and non-cleared), CDS (single-name and index), FX, Commodity swaps, Inflation swaps,...
- According to TriOptima: **\$840** trillion of OTC derivatives' notional eliminated through their services (until August 2016); according to ISDA: **\$214** trillion of notional eliminated via compression (2007-2012)

## Why and how to compress?

- **Art 14** of Commission delegated regul. 149/2013: “*valid explanation* to the relevant competent authority for concluding that a portfolio compression exercise is not appropriate”
- **Individual level incentives**: reduction of counterparty risk, operational risk, management burden, settlements,... but also incentives to shrink balance sheet size for regulatory requirements
- Bilateral compression: mutual agreement between counterparties
- **Multilateral compression: external service provider**



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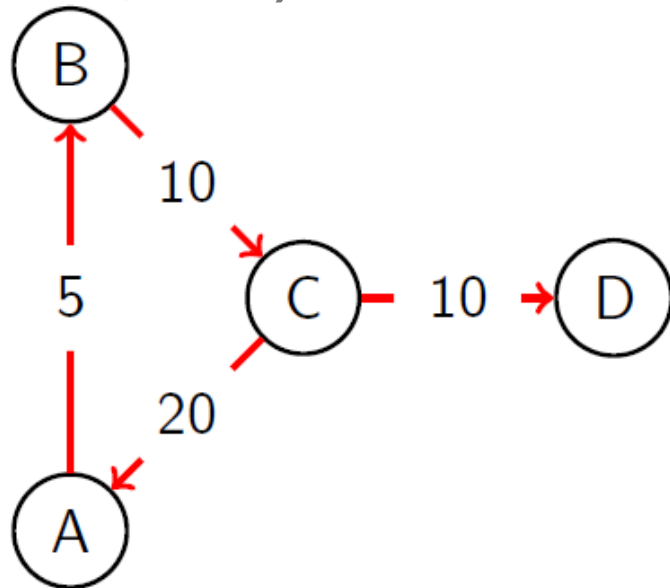
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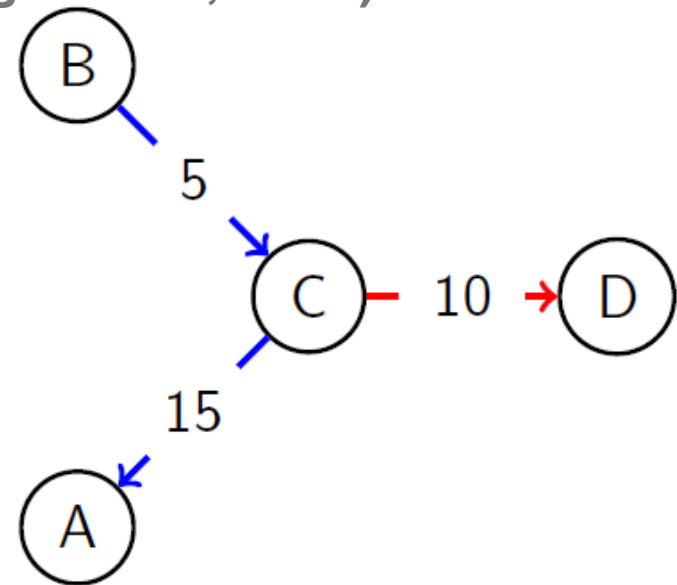
# Portfolio compression (before and after)

- Recall: in a nutshell, portfolio compression is a post-trade operation that **reduces market gross notional without affecting participants' net positions**
- Key to multilateral compression: closed intermediation chains

**Before compression**  
(gross 45, net 0)



**After compression**  
(gross 30, net 0)



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# Notional excess

In the flow-of-risk setting, **intermediation in the dealer's set** leads to '**notional excess**':

$$\Delta = \underbrace{\sum_{i,j} e_{ij}}_{\text{gross notional}} - \underbrace{\frac{(\sum_i |\sum_j e_{ij} - \sum_j e_{ji}|)}{2}}_{\text{minimum notional}}$$

- Intuitively, **excess is the part of gross notional that can be eliminated without changing net positions**
- Compression is a network operation that **reconfigures** the web of outstanding trades such that the resulting market has a **lower excess**
- Recent theoretical work (D'Errico and Roukny, 2016) identifies: i) different classes of compression, ii) necessary and sufficient conditions to apply compression, iii) algorithmic benchmarks, and iv) results on changes in network structure



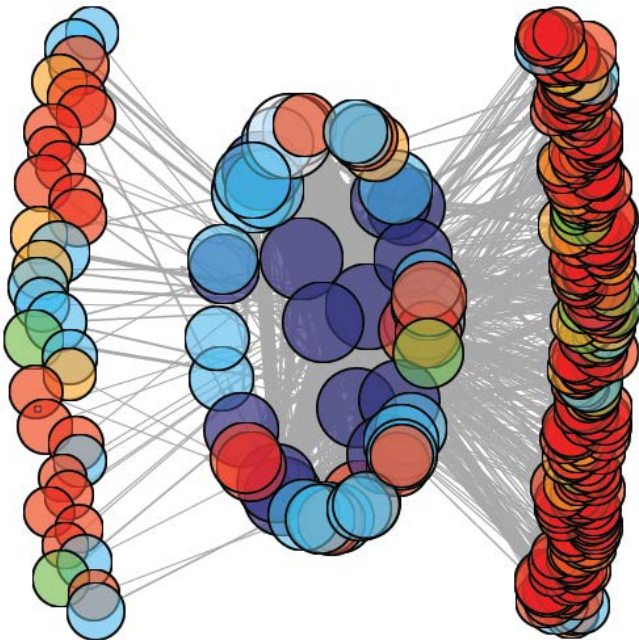
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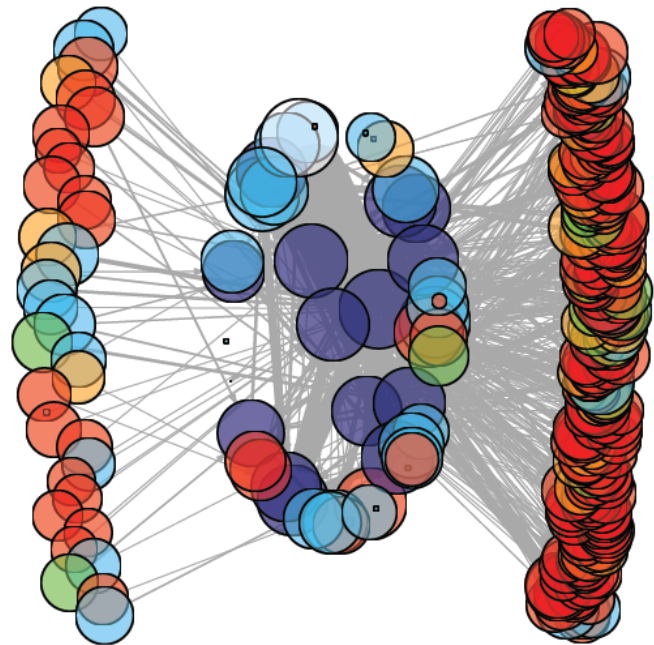
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# Application of portfolio compression to EMIR CDS data

- Depending on the level of aggregation and algorithm we find that roughly **20%-50%** of (single name) notional can be reduced. Naturally, compression is even more (relatively) efficient when several reference entities and maturities are aggregated.
- URS and URB are unaffected as compression focuses on the “**excess**” between dealers.



notional excess = 37.2 %



notional excess = 17.3 %  
notional reduction = 24 %



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# Implications

- **Portfolio compression is reshaping** (together with central clearing) the OTC derivatives markets
- Generally, there is **limited analytical research** on portfolio compression and its implications
- Moreover, the **history of portfolio compression** is non-trivial to identify in the current EMIR reporting framework

## Implications of portfolio compression

1. It reduces **overall gross notional amounts**, and may reduce **opacity** in times of distress (recall G20 objectives)
2. It reduces **payments** due (and the overall amount of **liquidity** necessary to settle claims) in case of a credit event of the underlying entity



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# Some open questions and avenues for further research

## Portfolio compression

1. What are the implications for **counterparty risk at times of stress** (due to changes in exposures)?
2. Does it enhance or reduce **network fragility by altering the network of gross exposures**? Moreover, when performing portfolio compression, service providers have local information of the derivative exposure network, while the regulator now has a broader view.
3. What are the (macroprudential) implications and impact on **capital and collateral**?

Importance of **transparency of portfolio compression methodologies to the regulators.**



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**Thank you for your attention!**



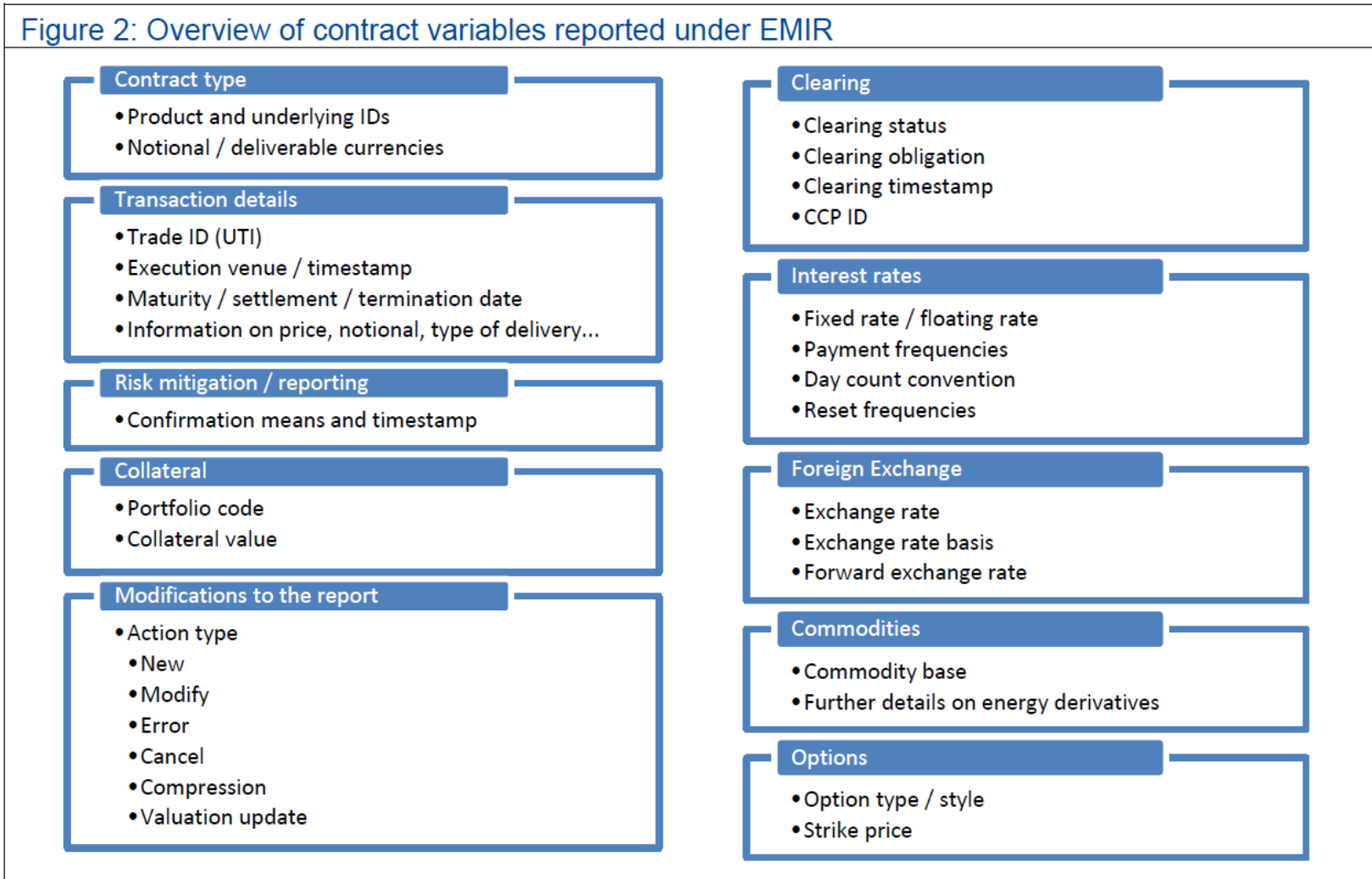
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# EMIR data are rich and usable for systemic risk analysis...

Figure 2: Overview of contract variables reported under EMIR



Source: ESRB OP “*Shedding light on dark markets*” by Abad et al. (2016).



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# ...but clearly data quality can still be improved

## Interest rate derivatives

	# Obs.
<b>Initial values</b>	<b>6,077,028</b>
<i>Observation dropping</i>	
Implausible values	35,120
No counterparty side	17,424
Missing mark-to-market value	1,253,677
Duplicates (trade IDs)	
Inconsistent:	
...notional	77,444
...counterparty ID	22,052
... maturity date	14,040
... intragroup flag	44,420
De-duplication	352,469
Non LEI counterparties	194,216

## Credit default swaps

	# Obs.
<b>Initial values</b>	<b>1,624,235</b>
<i>Observation dropping</i>	
Problematic report	1,122
Problematic ISIN	92,046
Implausible notional	14,602
Missing mark-to-market value	305,235
Duplicates (trade IDs)	
Inconsistent:	
...notional	1,764
...counterparty ID	2,064
...maturity date	316
...intragroup flag	62
...counterparty side	2,682
...reference entity	7,520
De-duplication	145,083
Non LEI counterparties	34,175

## FX derivatives

	# Obs.
<b>Initial values</b>	<b>6,609,385</b>
<i>Observation dropping</i>	
Implausible values	2,875
Negative/zero notional	145,040
No counterparty side	53,910
Implausible execution date	99,854
Missing tenor	38,619
Missing mark-to-market value	1,278,525
Irretrievable currency pair	184,924
Irretrievable contractual exchange rate	78,629
Duplicates (trade IDs)	
Inconsistent:	
...notional	161,672
...counterparty ID	15,518
...maturity date	9,214
...intragroup flag	5,408
De-duplication	611,749
Non LEI counterparties	512,714

Source: ESRB OP “*Shedding light on dark markets*” by Abad et al. (2016).



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