

Pricing Implication of Centrality in an OTC Derivative Market: An Empirical Analysis Using Transaction-Level CDS Data

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12th IFC Conference on
“Statistics and beyond: new data for decision making in central banks”
BIS Basel, 22 and 23 August 2024

Views expressed here are those of the authors and do not necessarily reflect those of the Bank of Japan.

Introduction & Motivation

□ Reforms in OTC derivative Markets

- The bilateral transaction of Over-The-Counter (OTC) derivatives markets

⇔ price heterogeneity

- Reforming of OTC derivatives markets following the Global Financial Crisis (GFC)

- Still sizable price heterogeneity (interest rate swap, *Cenedese et al. '20*; FX derivatives, *Hau et al. '21*)

□ Determinants of the price heterogeneity?

- The association between each parties' Centrality (Bargaining power and Search/ Matching frictions) and price heterogeneity

- Mixed & unconditional results

□ This paper: Pricing implication of centrality in CDS market

- Highly granular data & Conditional

- High centrality leads to higher price, depending on the condition.

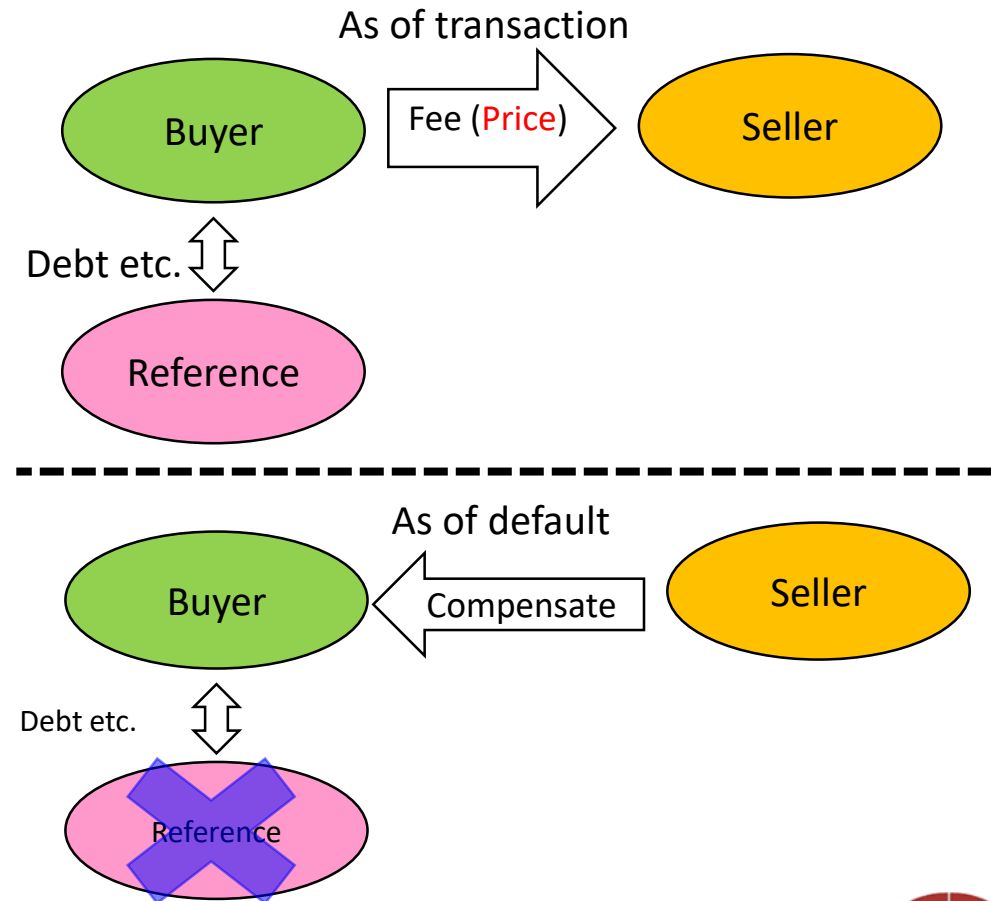
Prior Studies & CDS

■ Prior Studies includes:

- **Theoretical studies:** *Bargaining power and Search and Matching frictions*; *Duffie et al.* ('05, '07, '12) .
 - **Empirical studies 1- Mixed results :**
 - While many studies find a positive association between prices and centrality (i.e., **a centrality premium**).
 - Other studies arrive at the opposite empirical finding (i.e., **a centrality discount**)
 - **Empirical studies 2- Unconditional :**
(FX) *Hau et al. '21; Hasbrouck & Levich '21*
- First analysis on the Credit Default Swap (CDS) market

□ CDS (Credit Default Swap):

- Derivatives on the default event of the reference



Our Data & CDS Market in Japan

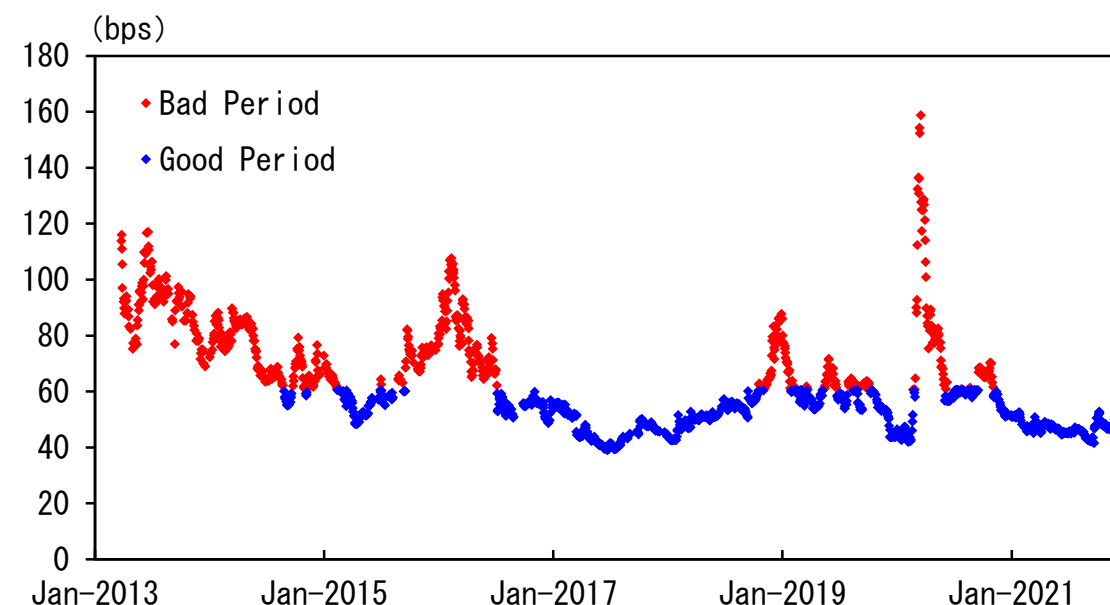
- Our data: Transaction-level **granular data** (FSA-Trade Repository (TR) data)
- Single-name CDS data for the period **April 2013 – December 2021**.
- All the new contracts including at least one Japan-based entities (including Japanese branch of foreign entities)
- We follow **the data cleaning process** proposed in *Loon and Zhong (2016)*

Summary statistics

	N	Mean	Std.dev
Transaction price (bps)		130.967	98.567
Maturity (month)	40,007	47.4	22.7
Notional (100mil)		6.996	9.054

- Market condition

Good & Bad periods
based on iTraxx median



Regression Model & Main Results (1)

■ Brute-force panel estimation

Measured over the past
3-months

$$CDS\ Price_{b,s,k,i,t} = \alpha + \beta \cdot \frac{Link_{s,t}}{Link_{b,t}} + \mu_{k,t} + \mu_{s,ym(t)} + \mu_{b,ym(t)} + \text{control variables} + \varepsilon_{i,t}$$

Where:

- Buyer-b, Seller-s, Reference-k, Time(date)-t
- Transaction-i (sufficient to identify)
- $\frac{Link_{s,t}}{Link_{b,t}}$ are **relative centrality**
 \propto Bargaining power & search ability
- Controlling for the **standard pricing factors** by μ
 - $\mu_{k,t}$ are time-variant **fixed-effects on entity's risk**
 - $\mu_{s,ym(t)}, \mu_{b,ym(t)}$ are **fixed-effects on counter-party risk**
- Also, *notional amount*, *maturity*, and *a dummy variable taking value of one if the trade is cleared at CCP*

□ Centrality premium (esp., in bad markets)

	All samples	Good periods	Bad periods
Link ratio	7.049** (2.974)	2.592 (3.873)	11.984** (5.893)
Maturity	0.421* (0.216)	0.381 (0.420)	0.399 (0.253)
Maturity (squared)	0.002 (0.002)	0.001 (0.003)	0.003 (0.002)
Notional principal	-0.103 (0.164)	0.339 (0.300)	-0.211 (0.201)
Notional principal (squared)	-0.001 (0.002)	-0.003 (0.003)	-0.001 (0.003)
CCP dummy	-2.091 (7.101)	-4.937 (5.891)	-2049.043 (20878.592)
Observations	32,614	16,303	16,311
R ²	0.889	0.943	0.839
Fixed effects			
Reference × date	Yes	Yes	Yes
Seller × month/year	Yes	Yes	Yes
Buyer × month/year	Yes	Yes	Yes

* p < 0.1, ** p < 0.05, *** p < 0.01

Regression Model (2)

■ “Short squeeze”

$$CDS\ Price_{b,s,k,i,t} = \alpha + \beta \cdot \frac{Link_{s,t}}{Link_{b,t}} + \gamma_1 \cdot Unwind_{i,t}^M \cdot \frac{Link_{s,t}}{Link_{b,t}} + \gamma_2 \cdot Unwind_{i,t}^C \cdot \frac{Link_{s,t}}{Link_{b,t}} + \delta_1 \cdot Unwind_{i,t}^M + \delta_2 \cdot Unwind_{i,t}^C + \mu_{k,t} + \mu_{s,ym(t)} + \mu_{b,ym(t)} + control\ variables + \varepsilon_{i,t}$$

□ Any chance for β to depend on something?

■ **Unwind**: How much the Buyer-*b* sells the protection of Reference-*k* over the past 3 months

■ **Unwind_{i,t}^M**: Amount

■ **Unwind_{i,t}^C**: Count

□ Unwind in bad markets is not a good idea...

	All samples	Good periods	Bad periods
Link ratio	10.176*** (2.464)	7.334*** (2.369)	13.335** (6.201)
Unwind (value)	0.016 (0.021)	-0.025 (0.023)	0.027 (0.026)
Link ratio × Unwind (value)	0.010* (0.006)	-0.003 (0.006)	0.012* (0.007)
Unwind (count)	0.156 (0.291)	0.613 (0.545)	0.055 (0.369)
Link ratio × Unwind (count)	-0.051 (0.079)	0.072 (0.109)	-0.079 (0.095)
Maturity	0.478** (0.222)	0.360 (0.428)	0.483* (0.261)
Maturity (squared)	0.002 (0.002)	0.002 (0.003)	0.002 (0.002)
Notional principal	-0.104 (0.166)	0.359 (0.309)	-0.224 (0.199)
Notional principal (squared)	-0.001 (0.002)	-0.003 (0.003)	-0.001 (0.003)
CCP dummy	1.175 (7.557)	-5.307 (5.942)	-3359.007 (20627.901)
Observations	30,084	15,041	15,043
R ²	0.883	0.937	0.832
Fixed effects			
Reference × date	Yes	Yes	Yes
Seller × month/year	Yes	Yes	Yes
Buyer × month/year	Yes	Yes	Yes

* p < 0.1, ** p < 0.05, *** p < 0.01

Regression Model (3)

■ “Relationship”

$$CDS\ Price_{b,s,k,i,t} = \alpha + \beta \cdot \frac{Link_{s,t}}{Link_{b,t}} + \gamma \cdot \frac{Link_{s,t}}{Link_{b,t}} \cdot rel_{i,t} + \delta \cdot rel_{i,t} + \mu_{k,t} + \mu_{s,ym(t)} + \mu_{b,ym(t)} + control\ variables + \varepsilon_{i,t}$$

- Any chance for β to depend on something?
 - rel : Buyer- b and seller- s had large (i.e., mean + one std. dev.) transactions over the past 3 months
 - Amount And/or Count

□ Insurance for a rainy day?

	All samples	Good periods	Bad periods
Link ratio	9.703*** (2.522)	6.247*** (1.829)	12.824** (6.116)
Relation dummy	20.429* (12.380)	8.598 (15.435)	-29.997* (16.345)
Link ratio × Relation dummy	6.424* (3.894)	7.113* (4.045)	-12.673** (5.573)
Maturity	0.420* (0.216)	0.378 (0.421)	0.399 (0.253)
Maturity (squared)	0.002 (0.002)	0.001 (0.003)	0.003 (0.002)
Notional principal	-0.103 (0.164)	0.340 (0.300)	-0.211 (0.201)
Notional principal (squared)	-0.001 (0.002)	-0.003 (0.003)	-0.001 (0.003)
CCP dummy	-2.093 (7.103)	-4.947 (5.894)	-2049.407 (20916.030)
Observations	32,614	16,303	16,311
R^2	0.889	0.943	0.839
Fixed effects			
Reference × date	Yes	Yes	Yes
Seller × month/year	Yes	Yes	Yes
Buyer × month/year	Yes	Yes	Yes

* p < 0.1, ** p < 0.05, *** p < 0.01

Conclusions

- Centrality and sizable price heterogeneity
 - Dependency on (i) market environment, (ii) pre-determined position (i.e., short squeeze), (iii) relation (in a dynamic sense)
 - In our data, centrality premium dominates
 - Partly reconcile the mixed phenomenon in the extant studies
- Policy implication?
 - Monitor price heterogeneity & network structure
 - Facilitate relations in normal periods

Thank you for your attention