# CCP Fragmentation and Location Policy

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Workshop on Central Clearing Counterparties
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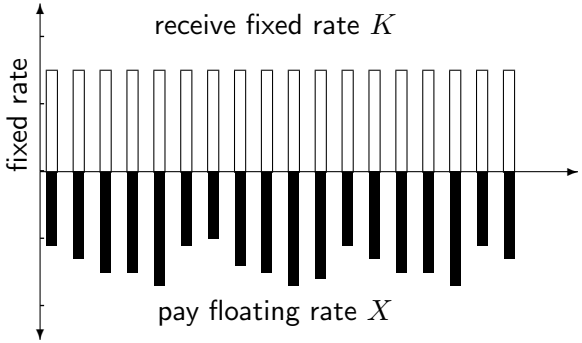
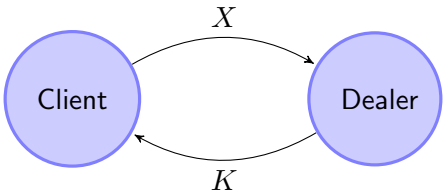
# A receiver interest rate swap



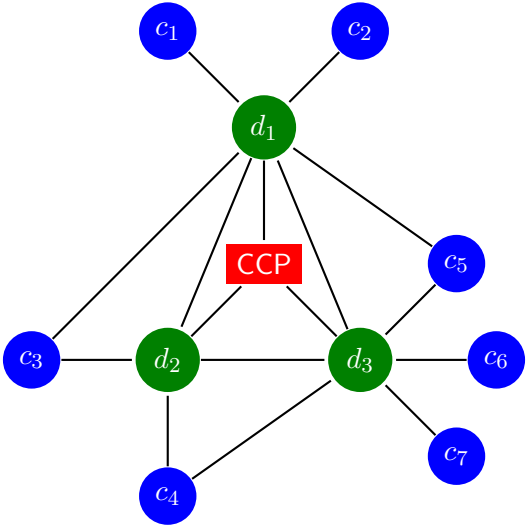
# Client-to-dealer bilateral swap position



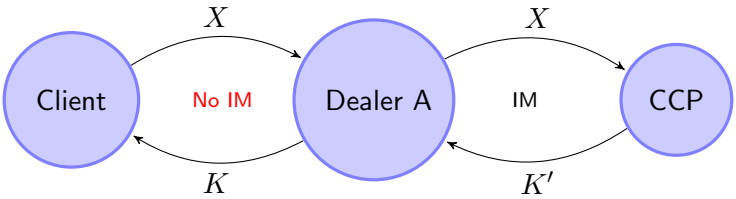
# Back-to-back swap trades


Dealers hedge the market risk of client swaps in the inter-dealer market.

# Inter-dealer swaps now require more collateral



# Example of why dealers require margin funding




Initial margin exchanged between dealer A and dealer B (or CCP).

Variation margin as swap value changes over time.

# The spread (in bps) between Yen Libor swaps at LCH and JSCC

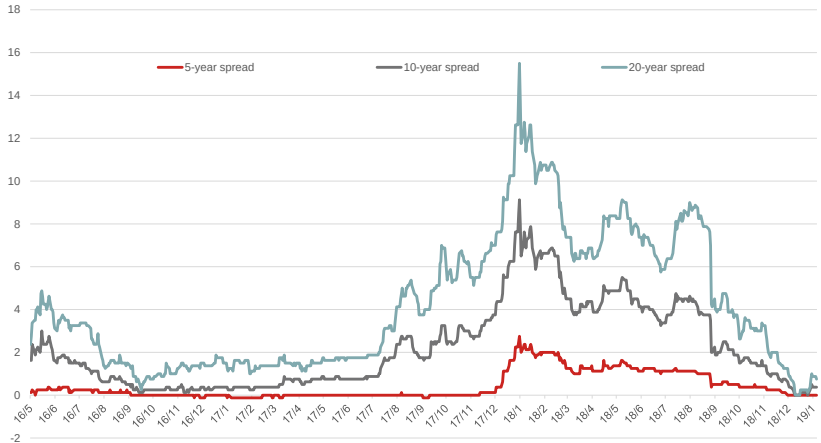
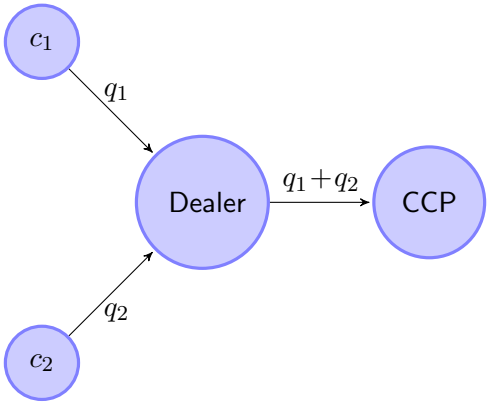


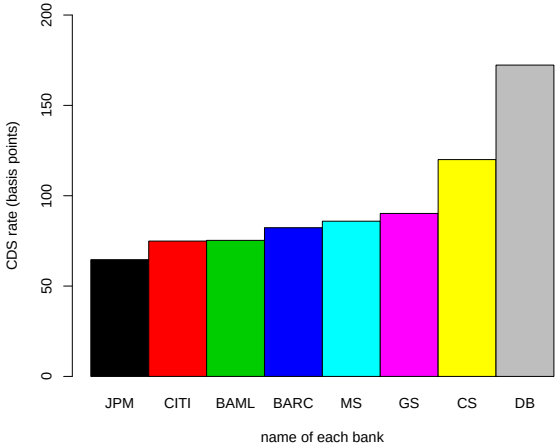

**Figure:** Takahiro Hattori, Ministry of Finance, Japan

# Collateralization costs are reduced by netting across customers

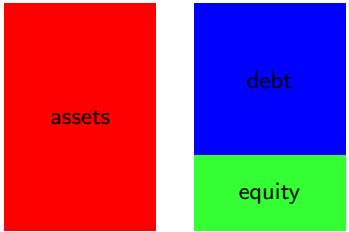



Dealer shareholder costs for margin and DVA (Andersen-Duffie-Song, 2019) and for regulatory capital (Duffie, 2018) are nearly proportional to $|\sum_i q_i|S$, where $S$ is the dealer's credit spread .

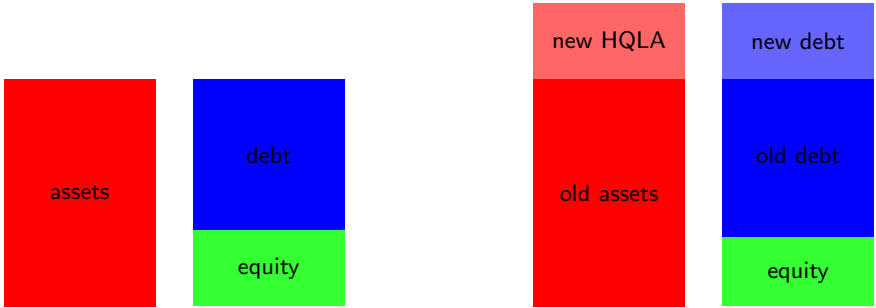
# 5-year CDS rates of selected major dealers in 2016



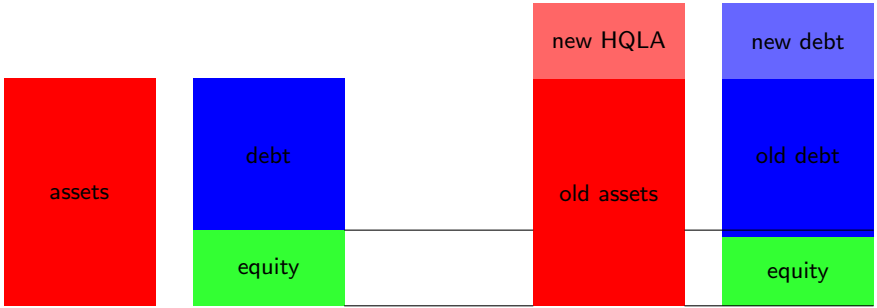
# Dealer balance sheet



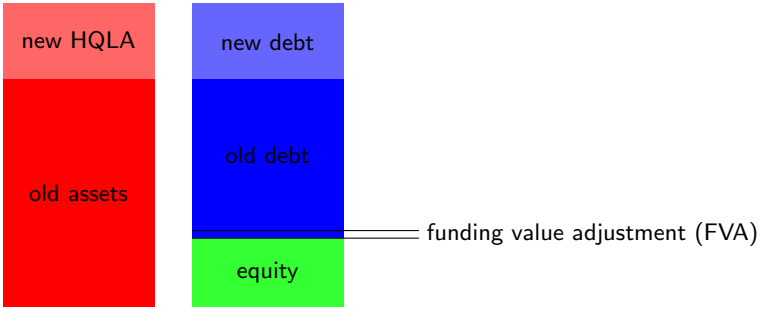
# Dealer funds swap margin with debt



# Funding margin causes debt overhang



# Funding value adjustment: a cost to dealer shareholders

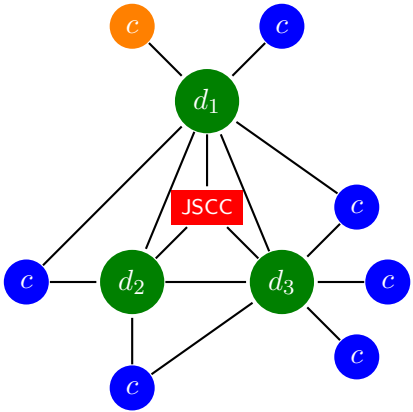


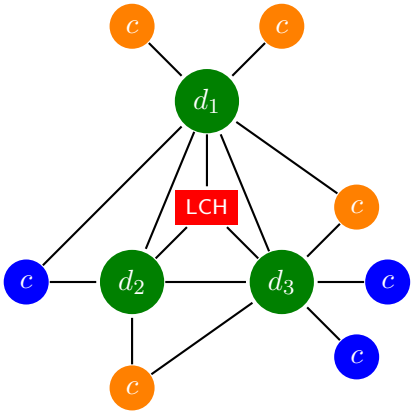
# Some funding value adjustments of swap dealers

| | Amount (millions) | Date Disclosed |
|---|---|---|
| Bank of America Merrill Lynch | $497 | Q4 2014 |
| Morgan Stanley | $468 | Q4 2014 |
| Citi | $474 | Q4 2014 |
| HSBC | $263 | Q4 2014 |
| Royal Bank of Canada | C$105 | Q4 2014 |
| UBS | Fr267 | Q3 2014 |
| Crédit Suisse | Fr279 | Q3 2014 |
| BNP Paribas | €166 | Q2 2014 |
| Crédit Agricole | €167 | Q2 2014 |
| J.P. Morgan Chase | $1,000 | Q4 2013 |
| Deutsche Bank | €364 | Q4 2012 |
| Royal Bank of Scotland | $475 | Q4 2012 |
| Barclays | £101 | Q4 2012 |
| Lloyds Banking Group | €143 | Q4 2012 |
| Goldman Sachs | Unknown | Q4 2011 |

Source: Andersen, Duffie, and Song (2019). Data: supplementary notes of quarterly or annual financial disclosures.

# CCP location policy reduces netting efficiency



# CCP fragmentation costs are raised by imbalanced demands

- The main determinant of the LCH-JSCC basis for JPY swaps:
  1. Non-dealers in Japan were heavily long (receivers) relative to non-dealers with access to LCH.
  2. Regulation: Japanese firms must clear at JSCC.
  3. Swaps of most non-Japanese non-dealers could not or did not clear at JSCC until 2018-2019.
  4. Major dealers conduct cross-market arbitrage, à la Gromb and Vayanos (2018).
  5. So, on average, dealers were short at JSCC and long at LCH, "doubling" balance-sheet costs.

- Dealer shareholders bear costs for DVA, margin funding (FVA, MVA), and regulatory capital (KVA). Dealers must therefore be compensated with price concessions.

- The mid-market swap rate at JSCC is thus lower than than that at LCH.

- Even if markets were locally all-to-all and competitive, there would be a CCP basis, although smaller, because of demand imbalance, fragmentation, and balance-sheet costs.

# What caused the drop in LCH-JSCC basis on September 4, 2018?

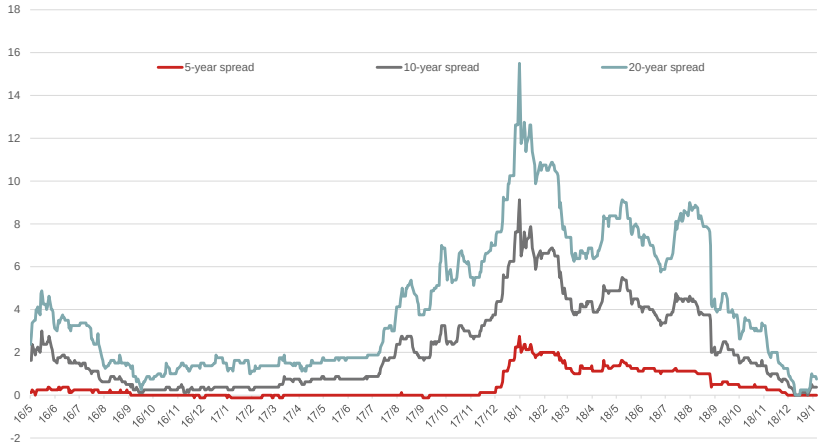



**Figure:** Takahiro Hattori, Ministry of Finance, Japan

# Relaxing US location policy suddenly reduced the basis

- On September 4, 2018, CFTC Chairman Giancarlo gave a speech in London suggesting that US non-dealers would be permitted by the CFTC to clear swaps on non-US CCPs.
- On the same day, the 20-year JSCC-LCH basis jumped down from 7.6 bps to 4.1 bps.

# The LCH-JSCC basis has become negative!

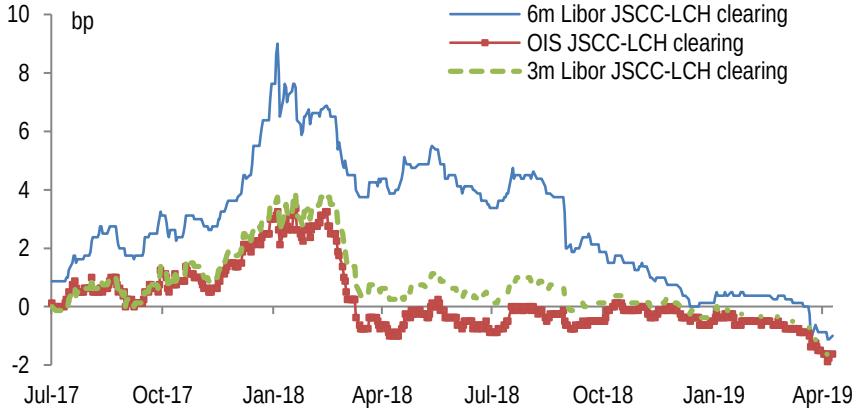
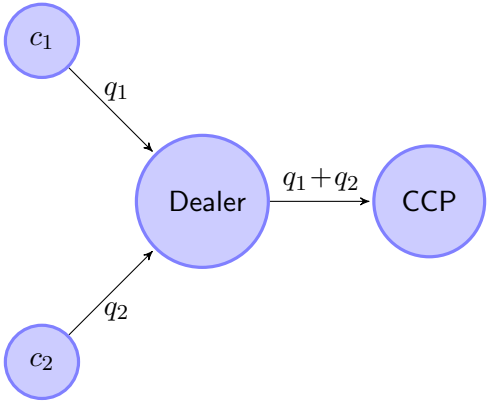


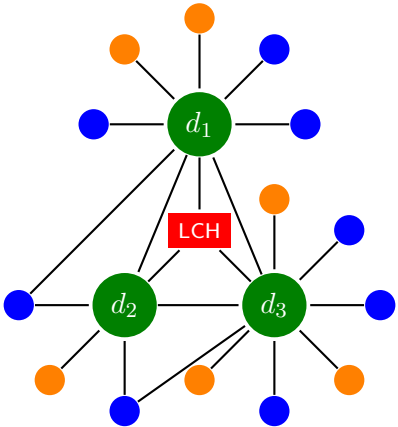

**Figure:** Reiko Tokukatsu, BNP Paribas, April 2019, for 10-year JPY swaps.

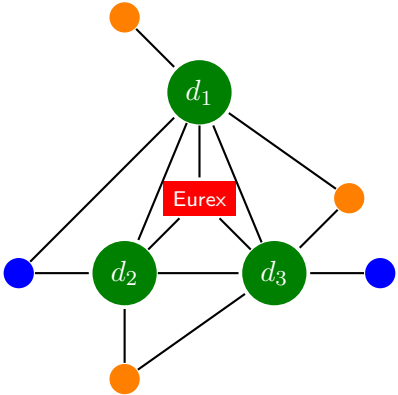
# CCP fragmentation is costly even when the CCP basis is zero




With OTC frictions, dealers expect to be locally imbalanced even if the local markets are balanced, to an extent increasing in fragmentation. (Duffie and Zhu, 2012).
$|\sum_{i\in A\cup B} q_i| \leq |\sum_{i\in A} q_i| + |\sum_{i\in B} q_i|$.

# EU or ECB location policy for CCPs threatens netting efficiency



# Appendix: More details

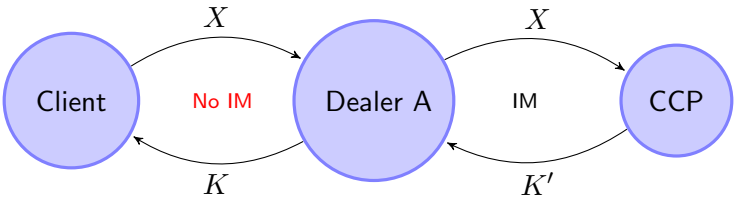
1. Slow moving capital reduces the CCP basis.
2. Various cases for dealer swap collateralization.
3. Balance sheet costs for dealer shareholders.
   - Margin funding and DVA costs.
   - Regulatory capital costs (leverage ratio rule).
4. Example of XVA costs for a 5-year interest rate swap.

# Slow moving capital reduces the CCP basis

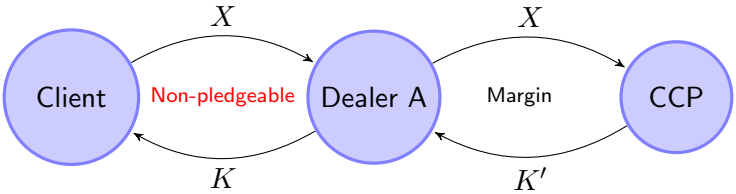
"Market participants say one explanation for the fall in the basis is that more non-Japanese firms have gained access to JSCC in order to take advantage of the better rates available for pay-fixed swaps. Some are also said to be arbitraging the basis by paying fixed at JSCC and receiving at LCH. One London-based swap trader says his rule of thumb is that if any CCP basis is above 4 bp, then an arbitrage is possible. Below that, the cost of funding initial margin at both clearing houses erases the benefit."

From "LCH-JSCC basis drops as hedge funds arrive: Capula and Rokos Capital among funds to have gained access to JSCC in recent months," by Chris Davis, Risk.net, April 15, 2018.

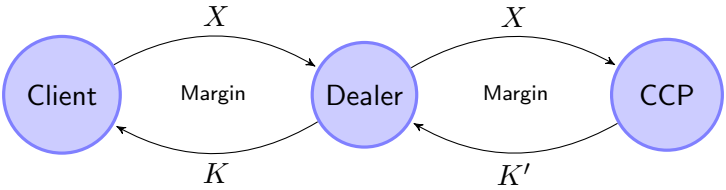
# Collateralization: Case 1



# Collateralization: Case 2



# Collateralization: Case 3




Margin of C-to-D position funds margin of D-to-CCP position.

# Dealer shareholder XVA regulatory capital costs

- Andersen, Duffie, and Song (2019) show that, with no regulatory capital constraint, the dealer shareholder costs for each incremental dollar of swap funding is approximately the dealer's unsecured wholesale credit spread $S$.
- Dealer shareholders also lose the incremental debit value adjustment (DVA), the market value of losses to counterparties of the dealer's default, which is also approximately proportional to $S$.
- Duffie (2018) computes the "KVA" cost to dealer shareholders for meeting additional regulatory capital.
- Under a leverage-ratio rule forcing an incremental capital ratio of $C$, each dollar of equity-financed incremental collateral costs shareholders approximately $CS$.

# Example Interest Rate Swap XVAs

Numerical example from Andersen, Duffie, and Song (2019).

- 10-year plain-vanilla interest rate swap with a notional size of $100 million.
- The underlying floating rate is six-month LIBOR.
- Assume LIBOR is associated with a hypothetical borrower whose credit spread is 30 basis points, relative to OIS.
- Assume default is independent of short rates. Dealer and client credit spreads of 100 and 200 basis points, respectively.
- Calibrate to the term structure and volatility of overnight index swap (OIS) rates as of January 2016.

# XVAs for 10-year interest-rate swap

| | $K = 1.0\%$ | $K = 1.783\%$ | $K = 2.5\%$ |
|---|---|---|---|
| **FVA** | $428 \mid -428$ | $116 \mid -116$ | $-171 \mid 171$ |
| | $(4.6 \mid -4.6)$ | $(1.2 \mid -1.2)$ | $(-1.8 \mid 1.8)$ |
| **MVA** | $116 \mid 116$ | $116 \mid 116$ | $116 \mid 116$ |
| | $(1.2 \mid 1.2)$ | $(1.2 \mid 1.2)$ | $(1.2 \mid 1.2)$ |
| **CVA** | $942 \mid 85$ | $479 \mid 247$ | $236 \mid 577$ |
| | $(10.0 \mid 0.9)$ | $(5.1 \mid 2.6)$ | $(2.5 \mid 6.1)$ |
| **DVA** | $42 \mid 471$ | $124 \mid 240$ | $289 \mid 118$ |
| | $(0.5 \mid 5.0)$ | $(1.3 \mid 2.5)$ | $(3.1 \mid 1.3)$ |

XVAs in thousands of USD per 100 million USD notional. Equivalent running-coupon adjustment in parentheses. Source: Andersen, Duffie, and Song (2019).