

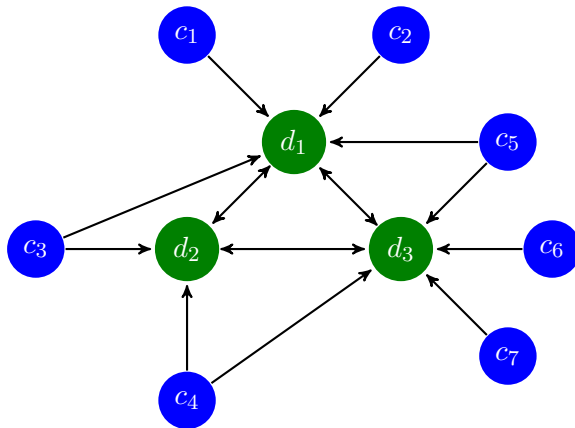
# Post-crisis bank regulations and financial market liquidity

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Based in part on research with Leif Andersen, Antje Berndt, Yang Song, and Yichao Zhu

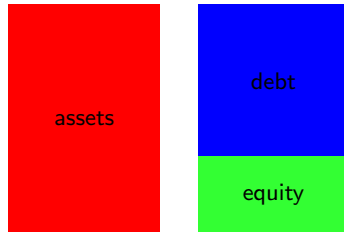
## A bank-intermediated over-the-counter market



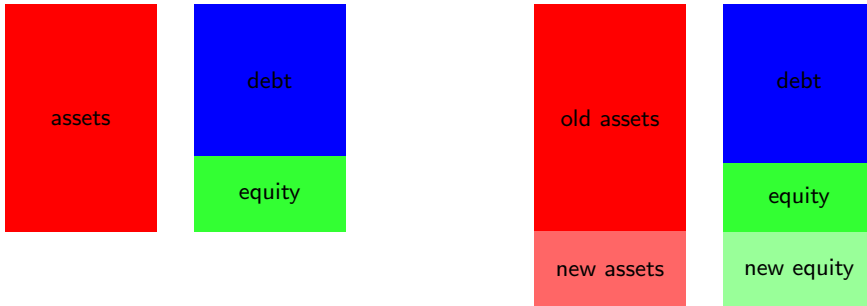
# Implications of post-crisis regulations for market efficiency

- 1 More financial stability from higher bank capitalization and bail-in failure resolution.
- 2 Increased cost of access to bank balance sheets.
  - The leverage-ratio rule has reduced incentives to intermediate safe assets.
  - Bail-in failure resolution has significantly increased bank funding costs.
- 3 Market infrastructure and new competition rules lower the need for balance-sheet space.

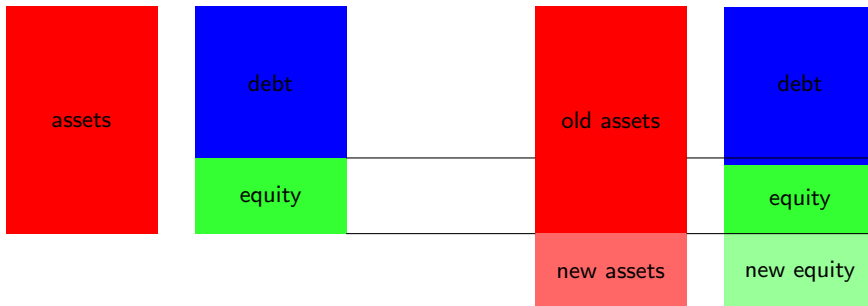
# Dealer balance sheet



## More equity to fund more assets

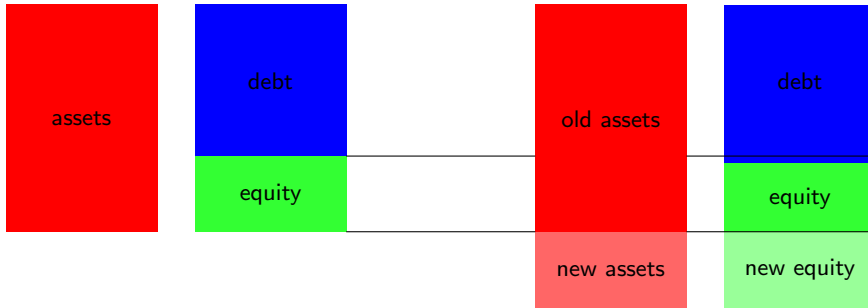


## Legacy shareholders have subsidized creditors



Higher capitalization implies a value transfer from legacy shareholders to creditors.

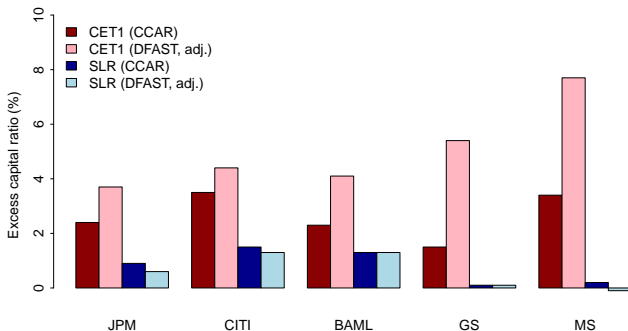
## Debt overhang



For shareholders to break even, the new assets must be purchased at a profit that exceeds the value transfer to creditors. (Myers, 1977)

# Leverage ratio rule is more binding than risk-based capital rules

Results of the Fed's 2017 stress tests for the largest US dealer banks



**CCAR:** stressed CET1 after assumed payouts, less 4.5%; stressed SLR less 3.0%.

**DFAST, adjusted:** stressed CET1 (no payouts) less (4.5% + G-SIB surcharge); stressed SLR less the G-SIB minimum of 5%.



## European banks reduce their balance sheets at quarter ends

### Daily collateral outstanding in the tri-party repo market and the Federal Reserve's overnight reverse repo (ON RRP) facility

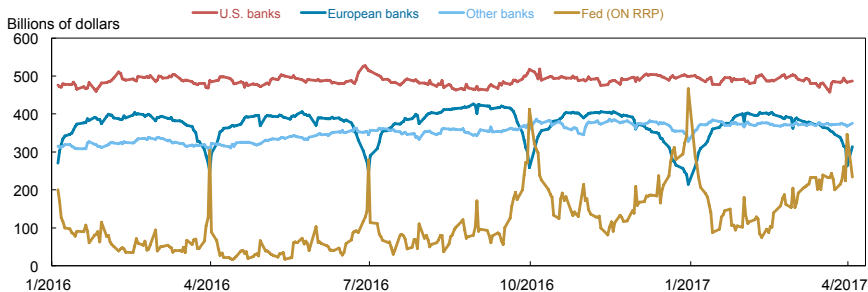
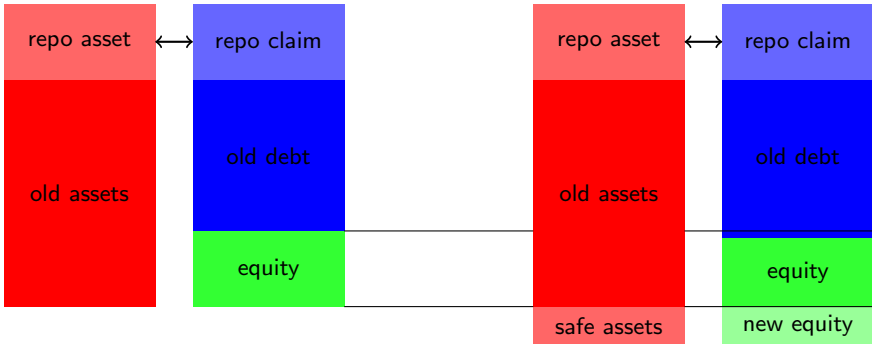


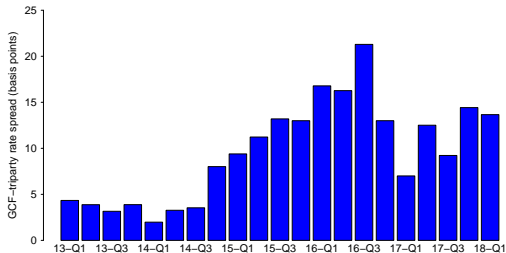
Figure Source: Egelhov, Martin, Zinsmeister, Federal Reserve Bank of New York, August, 2017.

Notes: Banks headquartered in the euro area and Switzerland report leverage ratios as a snapshot of their value on the last day of each quarter, while their U.S. counterparts report quarterly averages. Totals only include trades backed by Fedwire-eligible securities—that is, U.S. Treasury and agency securities.

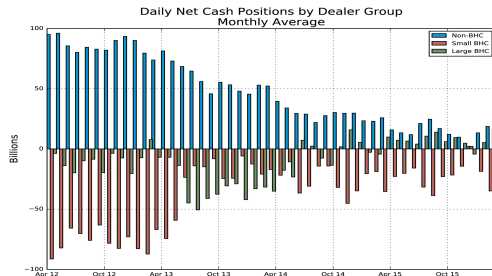
# Impact of the leverage-ratio regulation on repo intermediation costs to legacy shareholders



# Impact of SLR on UST repo market efficiency



(a) bid-ask spreads up

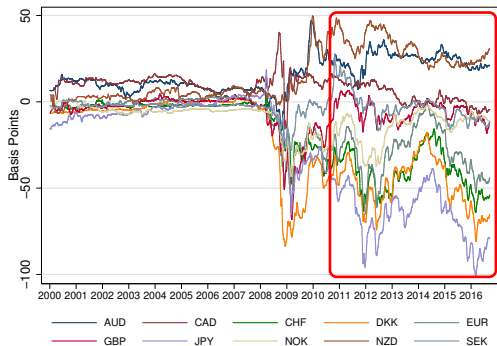


(b) inter-dealer positions down

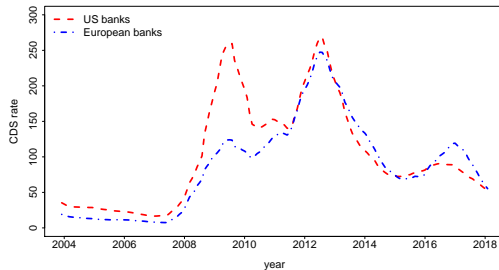
**Figure:** (a) Average within-quarter difference between overnight GCF and Tri-party repo rates. Data sources: Bloomberg and BNY-Mellon. (b) Figure source: Antoine Martin, FRBNY (2016).

# Cross-currency basis and bank funding costs

Funding value adjustments now leave wider arbitrage bounds on the basis



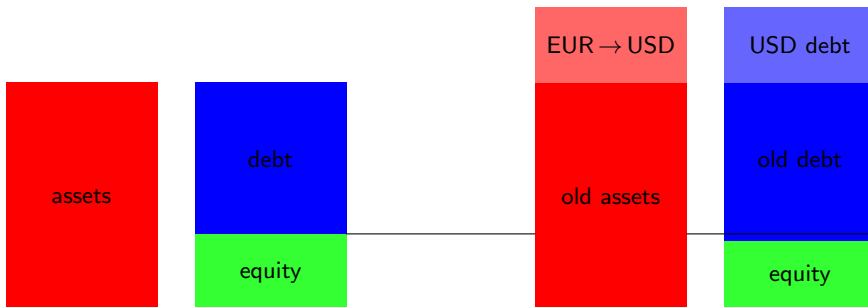
(a) 5-year USD cross-currency basis. Source: Du, Tepper, and Verdelhan (2017).



(b) 5-year dealer credit spreads

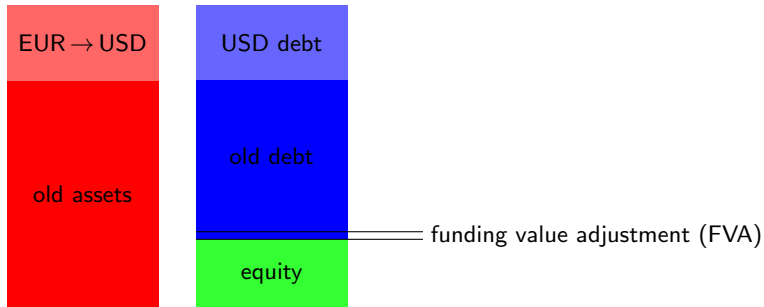
# CIP arbitrage can be costly to dealer shareholders

Debt overhang cost for funding synthetic dollar deposits



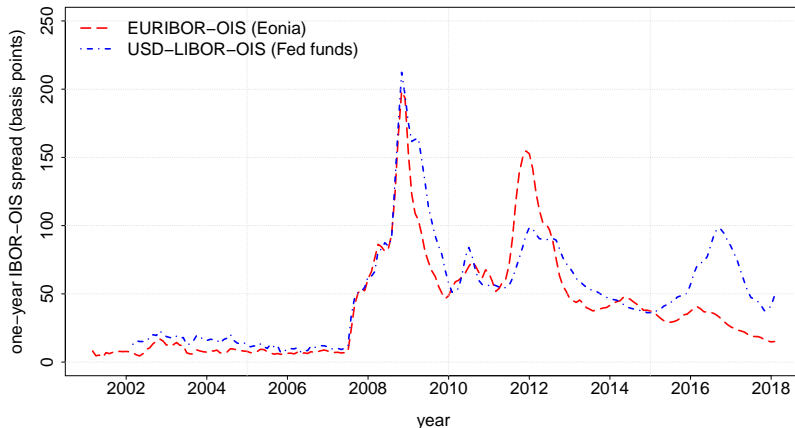
To benefit shareholders, the trade profit must exceed the funding value adjustment (FVA), a debt-overhang cost.

## Funding cost to shareholders



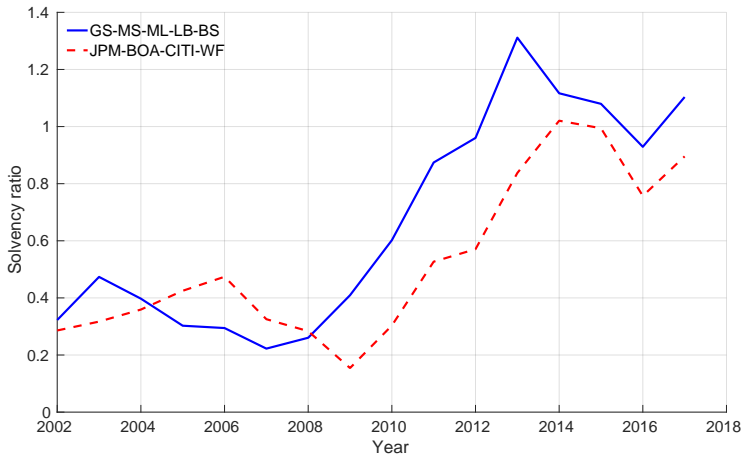
A debt-funded safe arbitrage is not valuable to bank shareholders unless its excess yield is above the bank's credit spread. Source: Andersen, Duffie, Song (2018)

## Increased dealer credit spreads imply larger funding-cost wedges



Spreads between one-year IBOR and OIS rates. Data source: Bloomberg.

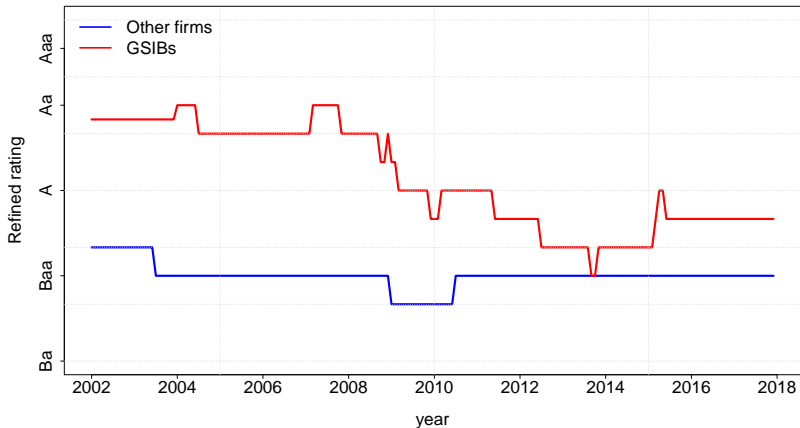
## But big dealer-banks now have much bigger capital buffers



Solvency ratio: tangible equity divided by an estimate of the standard deviation of the annual change in asset value. Source: Berndt, Duffie, and Zhu (2018).

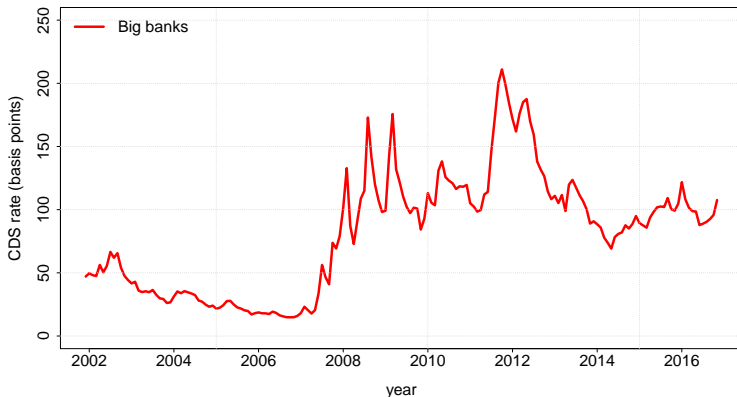


## G-SIB credit ratings no longer include sovereign uplifts



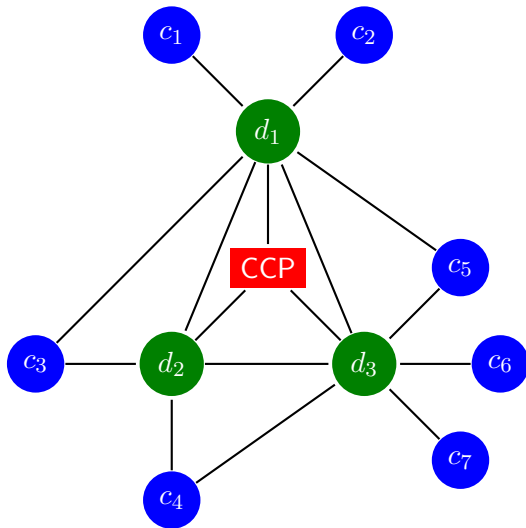
Median refined credit ratings. Data source: Moody's Investors Service.

## G-SIB 5-year credit spreads at annual default probability of 0.5%

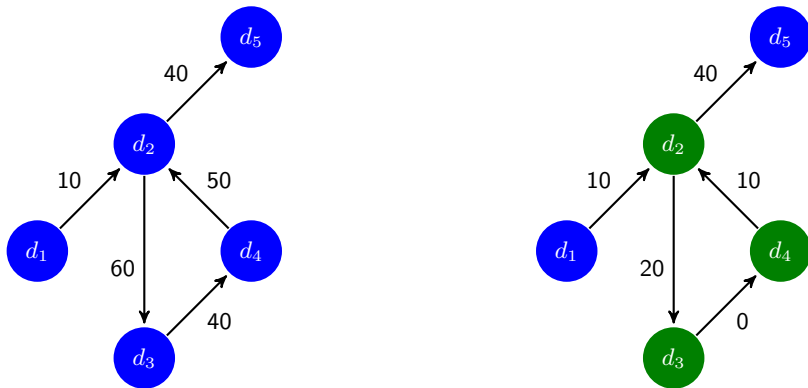


From a preliminary panel regression of log 5-year CDS rates on distance to default, for 1.6 million observations, 855 firms, 2002-2017, with interacted time and G-SIB fixed effects. Source: Berndt-Duffie-Zhu (2018).

## Central counterparties reduce need for balance-sheet space

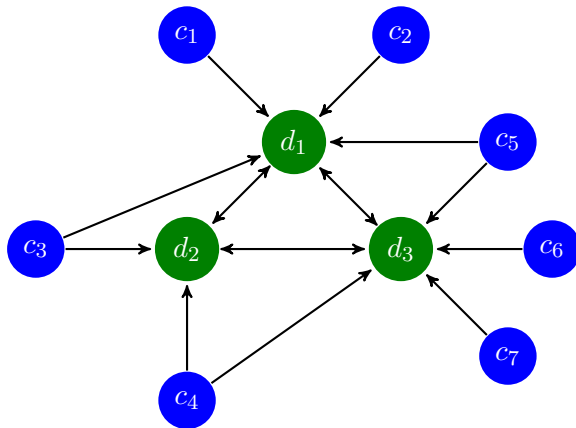


## Compression eliminates space used for redundant swaps



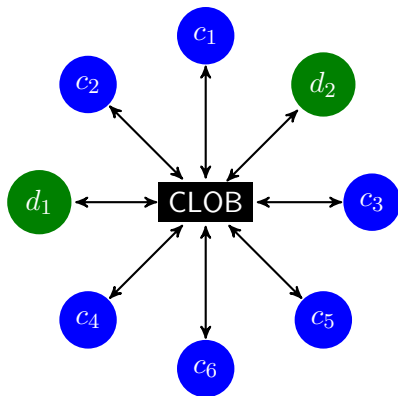
**Figure:** Counterparty exposures and initial margin are reduced without changing market exposures. Providers include TriOptima, which has eliminated over \$1 quadrillion notional of swaps.

## A bank-intermediated bilateral OTC market



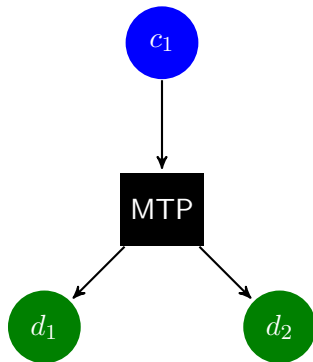
# Improving trade competition

Objective: Migration of actively traded products to all-to-all trade platforms

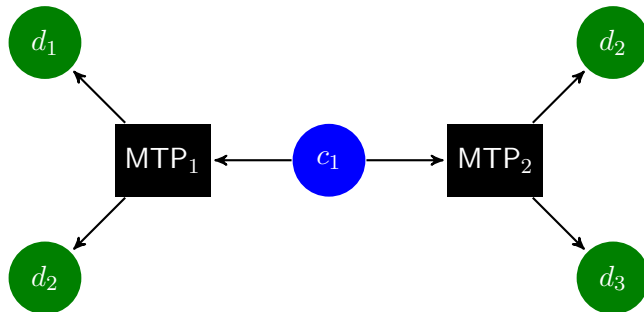


# OTC competition after Dodd-Frank and MiFID

Buy-side firms request quotes at multilateral trading platforms

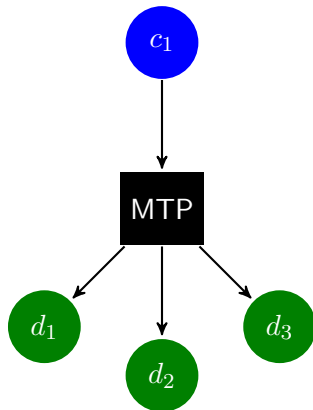


## Excessive fragmentation across platforms



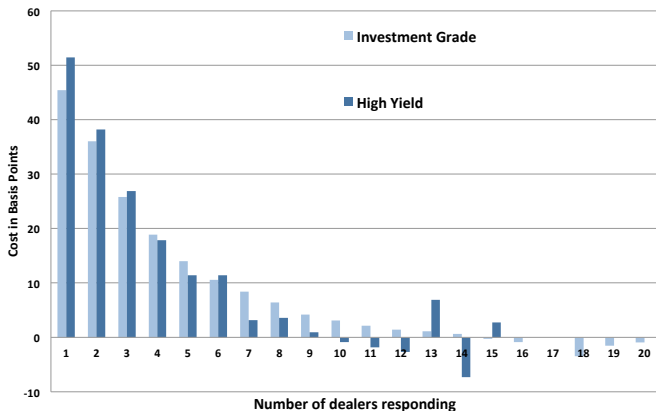


## Reducing fragmentation improves competition



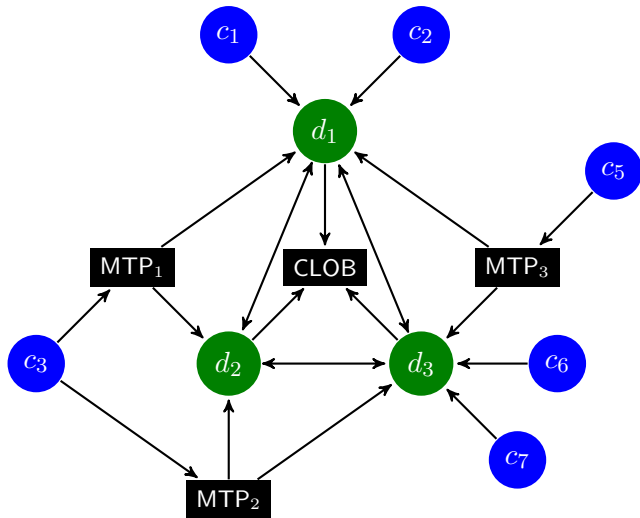
# At corporate bond platforms

## Dealer competition lowers buy-side trade costs



Source: Hendershott and Madhavan (2016)

## Now typical fragmented two-tiered OTC markets



## Appendix: How CIP arbitrage costs dealer shareholders

- ▶ Suppose the one-year USD risk-free rate is zero.
- ▶ Our bank has a one-year credit spread of 35 basis points.
- ▶ We borrow \$100 with one-year USD commercial paper, promising \$100.35.
- ▶ We invest \$100 in one-year EUR CP, swapped to USD, with the same all-in credit quality as that of our bank's CP, and uncorrelated.
- ▶ Suppose the EUR CP, swapped to dollars, promises \$100.60, for a basis of  $-25\text{bps}$ .
- ▶ We have a new liability worth \$100 and a new asset worth  $\$100.65/1.0035 \simeq \$100.25$ , for a trade profit of approximately \$0.25.
- ▶ However, the marginal value of the trade to our shareholders is negative, because, *conditional on dealer survival*, the expected incremental payoff to equity is  $\$100.25 - \$100.35 = -\$0.10$ . Conditional on default, equity gets nothing.

## Appendix: Funding Costs to Dealer Shareholders

From work with Andersen and Song (Journal of Finance, 2018): The marginal increase in the value of the dealer's equity per dollar of a debt-funded asset purchase is

$$p^* \pi - \delta \text{COV}^* - \text{FVA},$$

where

- ▶  $p^*$  is the dealer's risk-neutral probability of survival to term.
- ▶  $\pi$  is the trade profit (P&L).
- ▶  $\delta$  is the risk-free discount.
- ▶  $\text{COV}^*$  is the risk-neutral covariance of the asset payoff and dealer default event.
- ▶ FVA is the funding value adjustment  $p^* \delta ST$ , where  $S$  is the dealer's credit spread and  $T$  is the term.

The extra marginal cost to dealer shareholders when a fraction  $\alpha$  of the funding must be equity is  $\alpha(1 - p^* - \text{FVA})$ , which annualizes to roughly  $\alpha S$  (assuming a loss given default of 0.5).

For safe assets, the shareholder breakeven “arbitrage” yield is thus the total annualized funding cost to shareholders of roughly  $(1 + \alpha)S$ .