Dealer Pricing Distortions and the Leverage Ratio Rule

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Based on research with Leif Andersen and Yang Song

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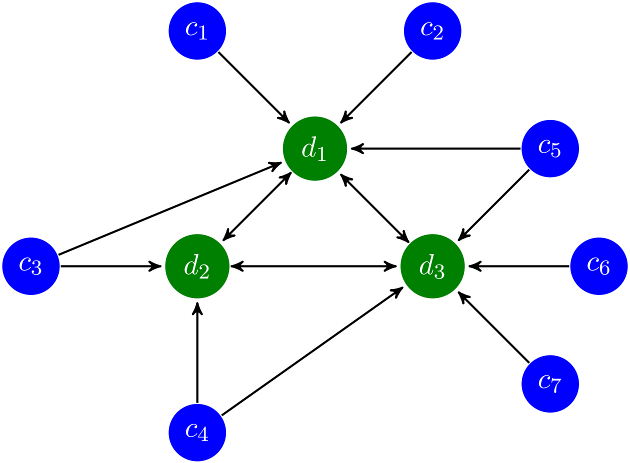
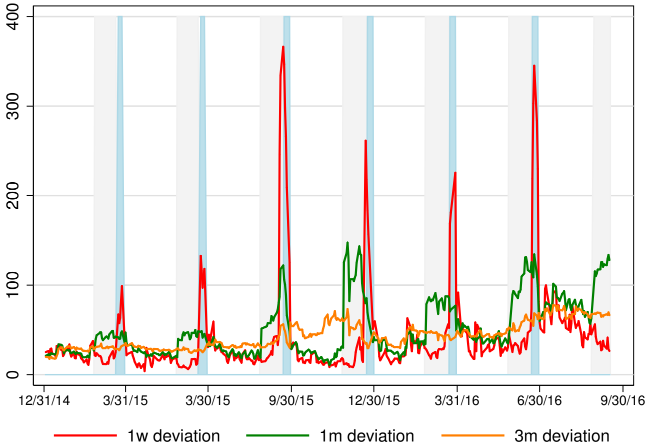
Dealer banks intermediate CIP arbitrage

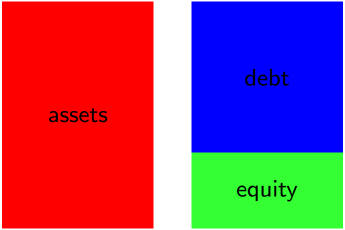


Example: The USD-JPY CIP basis

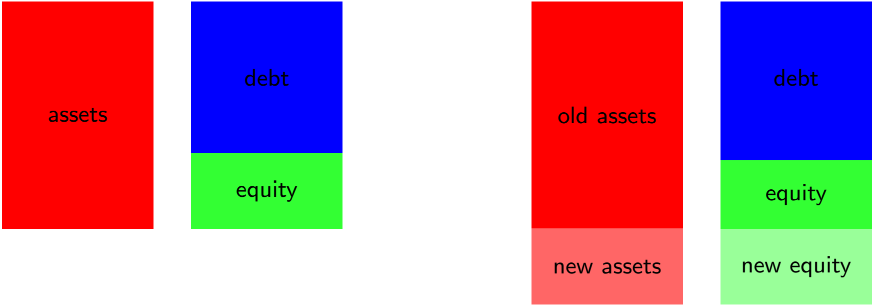


Source: Du, Tepper, and Verdelhan (2016).

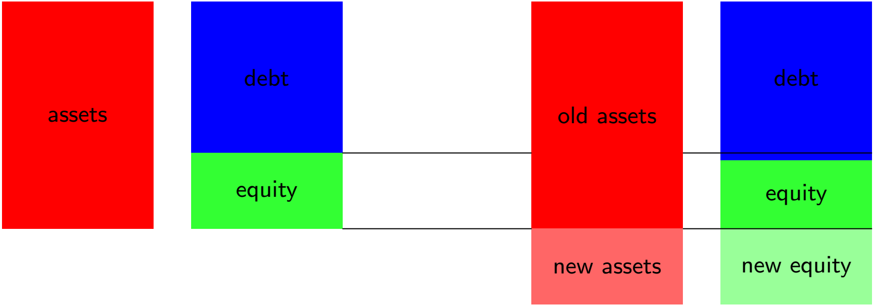
Dealer-bank balance sheet



When equity funds more assets

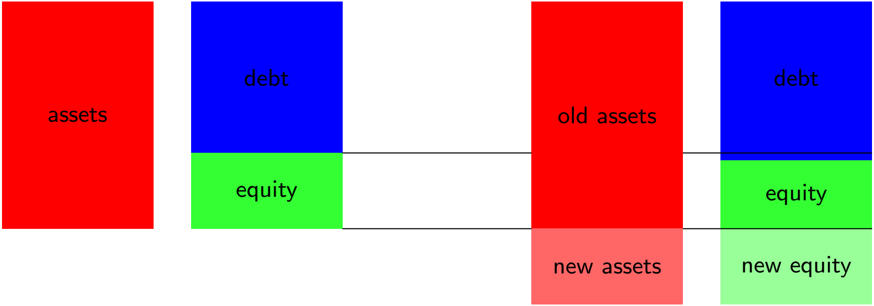


Legacy shareholders have subsidized creditors



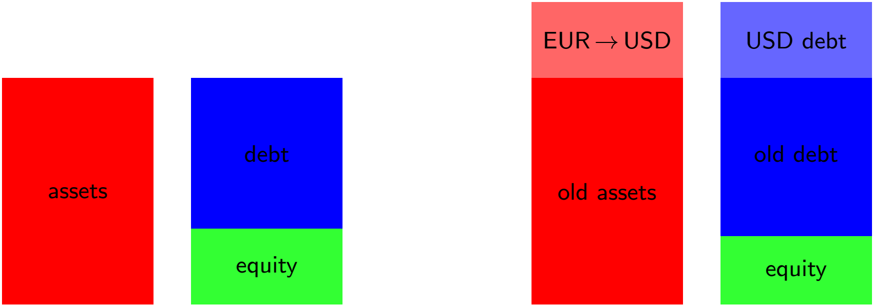
Higher capitalization implies a value transfer from legacy shareholders to creditors.

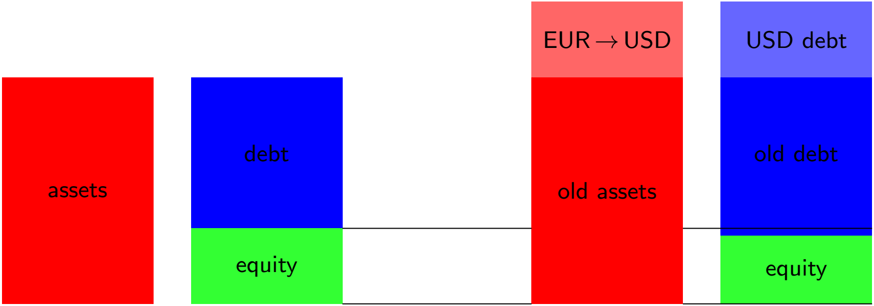
Debt overhang impedes arbitrage



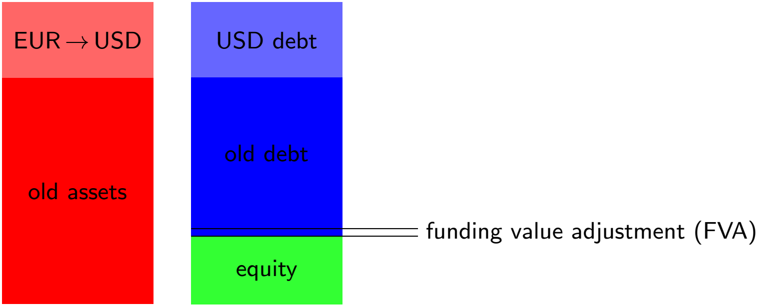
For shareholders to break even, the new assets must be purchased at a profit that exceeds the value transfer to creditors.

Bank funds synthetic dollars with dollar debt




EUR → USD
USD debt
assets
debt
old debt
old assets
equity
equity

Funding cost to legacy shareholders



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- Base case: The bank funds the trade with new unsecured debt.

Technical assumptions

1. There is a finite number of states.

   OR

2. Under the risk-neutral measure P^*
   - A, L, and Y have finite expectations.
   - A and L have a continuous joint probability density.

Impact of trade on balance sheet

If the bank finances a position of size q by issuing new debt, then its total asset payoff is

$$\mathcal{A}(q) = A + qY$$

and total liabilities due are

$$\mathcal{L}(q) = L + U(q)(R + s(q)),$$

where $s(q)$ is the dealer's credit spread to finance the position.

The limit spread $\lim_{q \downarrow 0} s(q)$ is

$$S = \frac{E^*(\phi)R}{1 - E^*(\phi)},$$

for fractional loss in the default event $D = \{A < L\}$ of

$$\phi = \frac{L - A}{L} \, \mathbf{1}_D.$$

Marginal impact on shareholder value

The marginal increase in the value of the bank's equity, per unit investment, is

$$G = \left. \frac{\partial E^*[\delta(A + qY - L - U(q)(R + s(q)))^+]}{\partial q} \right|_{q=0}.$$

The Funding Value Adjustment

Proposition

The marginal equity value G is well defined and given by

$$G = p^*\pi - \delta \operatorname{cov}^*(1_D, Y) - \Phi,$$

where

- p^* *is the risk-neutral survival probability of the bank.*
- $\pi = \delta E^*(Y) - u$ *is the marginal profit on the trade.*
- $\Phi = p^*\delta u S$ *is known as the funding value adjustment (FVA).*

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

Sources: Supplementary notes of quarterly or annual financial disclosures.

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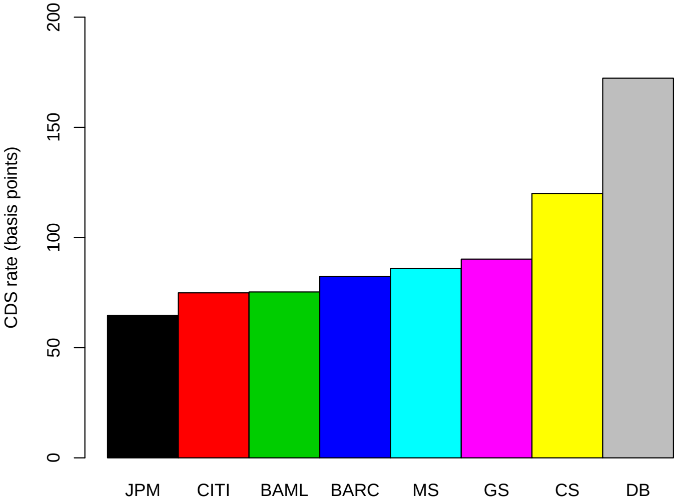
- The swapped payoff is \$100.60, for a CIP basis of -25bps.
- We have a new liability worth \$100 and a new asset worth approximately \$100.25, for a trade profit of approximately \$0.25.
- However, the marginal value of the trade to our shareholders is

$$0.993\Big(\$100.60\big(0.993+0.0035\big)-\$100.35\Big)\simeq -\$0.10.$$

5-year CDS Rates of Selected Major Dealers



With equity financing

If the dealer finances the position by issuing new equity, then assets are $A + qY$ and liabilities are L.

Because the new shareholders break even, the market value to the old shareholders is

$$\delta E^*[(A + qY - L)^+] - q\delta E^*(Y).$$

Proposition

The marginal value of the asset purchase to old shareholders is

$$G^0 = p^*\pi - P^*(D)u - \delta \operatorname{cov}^*(1_D, Y) > G.$$

Under the Leverage-Ratio Rule

Under the LR rule, a bank may be required to finance α of the investment with new equity, and only $1 - \alpha$ with debt.

Proposition

If a fraction α of the funding is equity and the rest is debt, the marginal cost of the trade to shareholders, above that for all-debt financing, is

$$\alpha u[1 - p^*(1 - \delta S)].$$

In our previous example, for a U.S. GSIB with $\alpha = 6\%$, the additional cost to the shareholders is 6.3 bps, for a total funding cost to shareholders of approximately $35 + 6 = 41$ bps.

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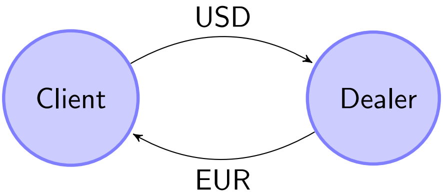
Additional Regulatory Capital for EUR-USD swap



Regulatory capital under the leverage rule must be held against the sum of

- Replacement cost.
- Potential future exposure (as tabulated by BCBS).
- Collateral supplied, in certain cases.