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

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Example: The USD-JPY CIP basis

Source: Du, Tepper, and Verdelhan (2016).
Dealer-bank balance sheet

[Diagram showing a balance sheet with assets on the left, debt in the middle, and equity on the bottom.]
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

- **assets**
- **debt**
- **equity**

**EUR → USD**

**old assets**
**old debt**
**equity**

**USD debt**
Funding cost to legacy shareholders

- EUR → USD
- old assets
- USD debt
- old debt
- equity
- funding value adjustment (FVA)
Model

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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

$$A(q) = A + qY$$

and total liabilities due are

$$L(q) = L + U(q)(R + s(q)),$$

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

$$\phi = \frac{L - A}{L} 1_D.$$
Marginal impact on shareholder value

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

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

<table>
<thead>
<tr>
<th>Bank</th>
<th>Amount (millions)</th>
<th>Date Disclosed</th>
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<tbody>
<tr>
<td>Bank of America Merrill Lynch</td>
<td>$497</td>
<td>Q4 2014</td>
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<tr>
<td>Morgan Stanley</td>
<td>$468</td>
<td>Q4 2014</td>
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<td>Citi</td>
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<td>HSBC</td>
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<td>Crédit Suisse</td>
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<td>BNP Paribas</td>
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<td>Royal Bank of Scotland</td>
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<td>Barclays</td>
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<td>Lloyds Banking Group</td>
<td>€143</td>
<td>Q4 2012</td>
</tr>
<tr>
<td>Goldman Sachs</td>
<td>Unknown</td>
<td>Q4 2011</td>
</tr>
</tbody>
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Sources: Supplementary notes of quarterly or annual financial disclosures.
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- Our bank’s one-year credit spread is thus 35 basis points.
- We borrow $100 with one-year USD CP, promising $100.35.

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 ($100$ - $0.60 - $0.993 + $0.0035 - $100.35) ≃ $-0.107$. 

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\[
0.993 \left( 100.60 \left( 0.993 + 0.0035 \right) - 100.35 \right) \approx -0.10.
\]

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5-year CDS Rates of Selected Major Dealers

![Graph showing 5-year CDS rates for various major dealers. Each bank is represented by a different color, and the vertical axis represents CDS rates in basis points. The banks include JPM, CITI, BAML, BARC, MS, GS, CS, and DB.]
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

$$G^0 = p^*\pi - P^*(D)u - \delta \text{cov}^*(1_D, Y) > G.$$
Under the Leverage-Ratio Rule

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

Proposition

If a fraction $\alpha$ 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.

At a CIP basis of $-25$ bps, the net value of EUR-USD CIP arbitrage to the bank’s shareholders is thus about $-16$ bps, barring netting benefits.
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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.