Market Structure and Transaction Costs of Index Credit Default Swaps

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Index CDSs

- Index CDS: corporate credit risk insurance contract
- Very large market (source DTCC):

Yet, transaction costs largely unknown!
A two-tiered market structure

- Interesting test case of the impact of recent regulation on the structure of swap markets
- Since inception, a two-tiered over-the-counter (OTC) market
  - Dealer-to-client (D2C) and interdealer (D2D) segments
- Trade execution requirement of Dodd-Frank Act
  - Mandates trading on swap execution facilities (SEFs)...
  - ...via order book or request for quote (RFQ)
- Post Dodd-Frank, still two-tiered: little All-to-All trading!
  - D2C SEFs (via name-disclosed RFQ) and interdealer SEFs (via anonymous trading protocols)
- Why?
  - Optimal market structure (Giancarlo 2015)
  - Dealers prevent all-to-all trading (Managed Fund Assoc. 2015)
Main Questions

- Characterize two-tiered post-Dodd-Frank index CDS market:
  - How large are transaction costs of D2C trades?
  - How do they compare to D2D t-costs?
  - How do they compare across different trading protocols (mid-market matching, workups, CLOB, RFQ)?
  - Could clients get better execution by trading on dealer platforms?
  - Do we observe dispersion in trading costs across clients in non-anonymous RFQ protocol?

- Broader economic questions:
  - What is the optimal structure of Swap markets?
    → All-to-All trading as envisioned by Dodd-Frank and CFTC?
  - What is the role of Dealers?
    → Excessive rents due to collusion (e.g., EU investigation and US class action with $1.87bn settlement in 2015)?
Agenda

Contracts, market structure, and data

Cost and price impact of D2C versus D2D trades

Cost and price impact across trading protocols

Market Quality
Agenda

**Contracts, market structure, and data**

Cost and price impact of D2C versus D2D trades

Cost and price impact across trading protocols

**Market Quality**
Main indices in North America:
- CDX.IG: Default protection on 125 investment-grade names (focus of presentation)
- CDX.HY: Default protection on 100 high-yield names

Maturities from 1Y to 10Y
- 5Y most liquid

Every 6 months, new index (new series) is launched
- Set of index constituents revised according to rating and liquidity criteria
- On-the-run index most liquid

Focus on 5Y on-the-run
Index CDSs, cont’d

- Time series of par spread on 5Y on-the-run CDX.IG
Current market structure

- D2C and D2D SEFs:
Transaction data


- **Transaction data** from Swap Data Repositories (SDRs):
  - Contain timestamp, price, size
  - Do not specify SEF
  - Do not distinguish outright vs. package trades (curve trade, roll trades, delta hedges,...)

- Develop algorithms that identify
  - SEFs from format used for trade reporting (in turn identify D2C and D2D trades)
  - Package trades from simultaneous trade execution in several contracts
Quote data

- **D2C segment:**
  - Mid-point of composite dealer quotes from Markit
  - From “dealer runs” sent to clients
  - 443 CDX.IG 5Y OTR quotes per day

- **D2D segment:**
  - Mid-point of bid/offer quotes on GFI order book
  - 1,136 CDX.IG 5Y OTR quotes per day

![Graphs showing transaction prices and quotes for the five-year index CDS contract on series 24 of CDX.IG on May 6, 2015. Panel A shows transaction prices of dealer-to-client (D2C) trades, the bid-offer spread of Markit intraday composite quotes, and the corresponding mid-quote. Panel B shows transaction prices of dealer-to-dealer (D2D) trades, the bid-offer spread on the limit order book of the GFI Swaps Exchange, and the corresponding mid-quote. Circles indicate trades that are identified as being outright and stars indicate trades that are identified as being delta hedges of index swaption trades. Both transaction prices and quotes are in terms of par spreads and expressed in basis points (bps). Series 24 of CDX.IG was on-the-run on May 6, 2015.](image)
Contracts, market structure, and data

Cost and price impact of D2C versus D2D trades

Cost and price impact across trading protocols

Market Quality
Transaction cost decomposition

 Decompose effective half-spread

\[ q_t(p_t - m_t) = q_t(p_t - m_{t+\Delta}) + q_t(m_{t+\Delta} - m_t) \]

=EffcSprd =RlzdSprd =PrcImp

with transaction price \( p_t \), mid-quote \( m_t \), 15-minute \( \Delta \), and \( q_t = \pm 1 \) inferred by Lee and Ready (1991) algorithm

 In D2C segment:

\[ m_t = m_t^{MARKIT} \]

 In D2D segment:

\[ m_t = m_t^{GFI} \]
Effective spreads an order of magnitude smaller than corporate bonds (Harris 2015) or single-name CDS (Biswas et al. 2014)

Higher transaction costs for D2C trades than D2D

Reflect higher price impact of D2C trades
## Transaction cost decomposition

<table>
<thead>
<tr>
<th>Trade Size</th>
<th>Dealer-To-Client</th>
<th>Dealer-To-Dealer</th>
<th>D2C-D2D</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 25</td>
<td>0.121</td>
<td>0.035</td>
<td>0.087</td>
</tr>
<tr>
<td>25–50</td>
<td>0.131</td>
<td>0.025</td>
<td>0.107</td>
</tr>
<tr>
<td>50–100</td>
<td>0.143</td>
<td>0.024</td>
<td>0.119</td>
</tr>
<tr>
<td>&gt; 100</td>
<td>0.169</td>
<td>0.054</td>
<td>0.115</td>
</tr>
<tr>
<td>Total</td>
<td>0.137</td>
<td>0.034</td>
<td>0.103</td>
</tr>
</tbody>
</table>

- Effective spreads an order of magnitude smaller than corporate bonds (Harris 2015) or single-name CDS (Biswas et al. 2014)
- Higher transaction costs for D2C trades than D2D
- Reflect higher price impact of D2C trades
Permanent or transitory price impact? VAR system

▶ What is the interrelation between D2C and D2D segments?

▶ Is price impact permanent (information-driven) or transitory (inventory driven)?

► Let \( x_t^{D2C} \) (\( x_t^{D2D} \)) denote number of signed D2C (D2D) trades that occur between D2C quote revisions

► VECM for \( \Delta X_t = (\Delta m_t^{D2C}, \Delta m_t^{D2D}, x_t^{D2C}, x_t^{D2D})' \)

\[
\Delta X_t = \alpha(Z_{t-1} - \mu_Z) + \sum_{j=1}^{p} \Gamma_j \Delta X_{t-j} + u_t,
\]

with cointegrating relation \( Z_t = m_t^{D2C} - m_t^{D2D} \) and adjustment coefficients \( \alpha \)
Impulse Response Price impacts

- Estimated cumulative quote revision in response to single D2C/D2D trade:

  Panel A: CDX.IG 5Y on-the-run
  Cumulative D2C quote revision (bps)
  Number of D2C quote revisions
  D2C trade
  D2D trade

  Panel B: CDX.IG 5Y on-the-run
  Cumulative D2D quote revision (bps)
  Number of D2C quote revisions
  D2C trade
  D2D trade

- Confirms that price impact larger for D2C trades
- Price impact is permanent
- More price discovery in DTC segment.

  Suggest clients have information advantage over dealers:
  - Genuine private information about index constituents
  - Advantage in processing public information
Agenda

Contracts, market structure, and data

Cost and price impact of D2C versus D2D trades

Cost and price impact across trading protocols

Market Quality
Size-discovery trading protocols

- Size-discovery: Fixed price, uncertain size (Duffie&Zhu 2016)

- Mid-market matching:
  - Price ("mid-market level") set by broker between bid and offer on limit order book

- Work-up:
  - Initiated by trade in limit order book
  - Trade additional quantity at price of initial trade

- Execution risk
Use of trading protocols on GFI

- Focus on GFI (the main interdealer SEF)
- Additional data on mid-market level for matching
- Identify trades in limit order book, mid-market matches, and workups

<table>
<thead>
<tr>
<th>Trading Protocol</th>
<th>% of Trds</th>
<th>% of Vlm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: CDX.IG</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limit order book</td>
<td>19.1</td>
<td>19.2</td>
</tr>
<tr>
<td>Workup protocol</td>
<td>18.4</td>
<td>19.9</td>
</tr>
<tr>
<td><strong>Mid-market matching</strong></td>
<td>54.8</td>
<td>52.2</td>
</tr>
<tr>
<td>Unidentified protocol</td>
<td>7.7</td>
<td>8.8</td>
</tr>
</tbody>
</table>
Table 6: Transaction Costs and Price Impacts by Trading Protocol.

Panels A and B show sample means of effective half-spreads (EffcSprd), realized half-spreads (RlzdSprd), and price impacts (PrcImp) of outright trades in five-year on-the-run index CDSs on CDX.IG and CDX.HY, respectively, that are executed on the GFI Swaps Exchange. Sample means are separately computed for trades in the limit order book, mid-market matches, workups, and trades with unidentified trading protocol.

EffcSprd is defined as $q_t \times (p_t - m_{D2D}^t)$, where $p_t$ is the transaction price and $m_{D2D}^t$ is the latest GFI mid-quote in the 15-minute period prior to trade execution. RlzdSprd is defined as $q_t \times (p_t - m_{D2D}^t + \Delta)$, where $m_{D2D}^t + \Delta$ is the GFI mid-quote that prevails 15 minutes after trade execution. PrcImp is defined as $q_t \times (m_{D2D}^{t+\Delta} - m_{D2D}^t)$.

Both transaction prices and quotes are in terms of par spreads and expressed in basis points. Trade direction, $q_t$, is inferred by the Lee and Ready (1991) algorithm. Rejection of a regression-based $t$-test for the null hypothesis that sample means are identical to those of trades in the limit order book at the 1% and 5% level is denoted by $^*$ and $^*$, respectively, with inference based on the Newey and West (1987) estimate of the covariance matrix of coefficient estimates. The sample period is October 2, 2013 to October 16, 2015 and comprises 1,333 (1,290) [3,782] {470} and 1,124 (1,172) [4,473] {456} outright trades in the limit order book (workups) [mid-market matches] {trades with unidentified trading protocol} in five-year on-the-run index CDSs on CDX.IG and CDX.HY, respectively.

- **CLOB trade**: Expensive, high price impact, execution certainty
- **Mid-market match**: Cheap, low price impact, execution risk
- **Partial segmentation of order flow**: consistent with model of strategic venue selection (Zhu 2014)
### Transaction cost decomposition

<table>
<thead>
<tr>
<th>Trading Protocol</th>
<th>Effc Sprd</th>
<th>Rlzd Sprd</th>
<th>Prc Imp</th>
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<tr>
<td>Panel A: CDX.IG</td>
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<td></td>
</tr>
<tr>
<td>Limit order book</td>
<td>0.132</td>
<td>-0.020</td>
<td>0.152</td>
</tr>
<tr>
<td>Workup protocol</td>
<td>0.131</td>
<td>-0.019</td>
<td>0.150</td>
</tr>
<tr>
<td>Mid-market matching</td>
<td><strong>0.055</strong></td>
<td><strong>0.019</strong></td>
<td><strong>0.036</strong></td>
</tr>
<tr>
<td>Unidentified protocol</td>
<td>0.151</td>
<td><strong>0.132</strong></td>
<td><strong>0.019</strong></td>
</tr>
</tbody>
</table>

- **CLOB trade**: Expensive, high price impact, execution certainty
- **Mid-market match**: Cheap, low price impact, execution risk
- **Partial segmentation of order flow**
  - consistent with model of strategic venue selection (Zhu 2014)
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Cost and price impact of D2C versus D2D trades

Cost and price impact across trading protocols

Market Quality
Client execution

- 96% of D2C trades are within bid-offer spread on GFI limit order book

→ Clients who value immediacy, could not improve execution by trading in DTD limit order book.
D2C spread dispersion reflects client heterogeneity

D2C Transaction Costs and Price Impacts by Effective Half-Spread Quartiles

<table>
<thead>
<tr>
<th>Trade Size</th>
<th>Effc Sprd Q1</th>
<th>Effc Sprd Q2</th>
<th>Effc Sprd Q3</th>
<th>Effc Sprd Q4</th>
<th>Rlzd Sprd Q1</th>
<th>Rlzd Sprd Q2</th>
<th>Rlzd Sprd Q3</th>
<th>Rlzd Sprd Q4</th>
<th>Prc Imp Q1</th>
<th>Prc Imp Q2</th>
<th>Prc Imp Q3</th>
<th>Prc Imp Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 25</td>
<td>0.022</td>
<td>0.066</td>
<td>0.121</td>
<td>0.278**</td>
<td>0.005</td>
<td>0.027</td>
<td>0.038</td>
<td>0.074**</td>
<td>0.017</td>
<td>0.040</td>
<td>0.083</td>
<td>0.204**</td>
</tr>
<tr>
<td>25–50</td>
<td>0.025</td>
<td>0.075</td>
<td>0.134</td>
<td>0.294**</td>
<td>0.013</td>
<td>0.020</td>
<td>0.024</td>
<td>0.046**</td>
<td>0.012</td>
<td>0.055</td>
<td>0.110</td>
<td>0.248**</td>
</tr>
<tr>
<td>50–100</td>
<td>0.029</td>
<td>0.084</td>
<td>0.146</td>
<td>0.313**</td>
<td>0.013</td>
<td>0.019</td>
<td>0.024</td>
<td>0.043**</td>
<td>0.017</td>
<td>0.065</td>
<td>0.122</td>
<td>0.270**</td>
</tr>
<tr>
<td>&gt; 100</td>
<td>0.033</td>
<td>0.096</td>
<td>0.167</td>
<td>0.388**</td>
<td>0.013</td>
<td>0.030</td>
<td>0.042</td>
<td>0.143**</td>
<td>0.020</td>
<td>0.066</td>
<td>0.124</td>
<td>0.245**</td>
</tr>
</tbody>
</table>

- Strong positive correlation between effective spread and price impact of DTC trades
- Suggests non-anonymity of RFQ benefits uninformed clients.
- Consistent with ‘separating equilibrium’ models of two-tiered markets (e.g., Seppi (1990))
Conclusion

- Characterize two-tiered post-Dodd-Frank index CDS market.

- **Transaction costs** of D2C trades larger than D2D, but due to differences in **price impact** rather than **dealer profits**

- Lower D2D transaction costs largely due to specific **trading protocols** (mid-market matching, workups) with lower degree of immediacy.

- D2C prices improve significantly upon contemporaneous executable D2D quotes.

- **Dispersion** of trading costs across clients in D2C markets largely driven by price-impact, suggests price-discrimination.

→ May explain endurance of two-tiered Swap-market structure despite Dodd-Frank ‘impetus’ towards All-to-All trading.