Centralized Trading, Transparency and Interest Rate Swap Market Market Liquidity: Evidence from the Implementation of the Dodd-Frank Act

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The views expressed in this presentation are those of the authors and not necessarily those of the Bank of England or any of its policy committees.
What we do

- The **Dodd-Frank trading mandate** has increased pre-trade transparency in the interest rate and credit swap markets.

- We examine the impact of the mandate on Interest Rate Swap (IRS) market liquidity and activity.
What we find

- The mandate has brought about significant improvements in IRS market liquidity and has boosted participation and activity.
  - The drop in end-users’ daily execution costs for USD mandated contracts is around $2-$4 million (marginal effect) or $7-$13 million (total effect).

- The new rules appear to have caused global banks (dealers) to migrate their interdealer trading in the EUR segment of the IRS market from the American to their European desks.
  - This is consistent with regulatory arbitrage in an attempt to maintain market power

- Trading migration in the EUR segment has likely prevented further liquidity gains.
Regulatory background

Timeline:

- **G20 meeting in Pittsburgh** - Sept, 2009
- President Obama signs the Dodd-Frank Act - July, 2010
- CFTC authorises SEFs - 2 Oct, 2013
- CFTC’s Trade Execution Mandate - 15 & 26 Feb, 2014
- Commissioner Giancarlo’s white paper - Jan, 2015

All standardised OTC derivatives contracts should be:

- Traded on exchanges or electronic trading platforms,
- Cleared through central counterparties,
- Reported to trade repositories.
A new regulatory framework for swaps aiming to:

- Bring greater pre-trade and post-trade transparency, and
- Facilitate trading of swaps on multilateral platforms known as Swap Execution Facilities (SEFs).
Regulatory background

Timeline:

- **G20 meeting in Pittsburgh**
  - Sept, 2009

- President Obama signs the Dodd-Frank Act
  - July, 2010

- CFTC authorises SEFs
  - 2 Oct, 2013

- CFTC’s Trade Execution Mandate
  - 15 & 26 Feb, 2014

- Commissioner Giancarlo’s white paper
  - Jan, 2015

Implementation of the new framework:

- Mandate captures only “US persons”
- USD-, EUR-, and GBP-denominated swaps
- Specific maturities
Regulatory background

Timeline:

- G20 meeting in Pittsburgh: Sept, 2009
- President Obama signs the Dodd-Frank Act: July, 2010
- CFTC authorises SEFs: 2 Oct, 2013
- CFTC’s Trade Execution Mandate: 15 & 26 Feb, 2014
- Commissioner Giancarlo’s white paper: Jan, 2015
Regulatory background: SEFs in detail (1)

A. Traditional OTCD structure

B. Post Dodd-Frank OTCD structure

- Makes it easy to compare prices,
- Facilitates dealer competition,
- Allows end-users to bypass dealers,
Platforms where “...multiple participants have the ability to execute swaps by accepting bids and offers made by multiple participants in the platform” (CFTC)

SEFs must offer **minimum trading functionality**:

1. Limit order book (LOB)
2. Multi-dealer Request-for-Quote (RFQ) functionality

Diagram:

- EU1/EU2 → LOB
- D1/D2
- AM/HF
- EU1 → RFQ
- At least 2 dealers
- Any resting bid/ask quotes from LOB
Other SEF characteristics:

1. For MAT contracts, SEF regulation requires that broker-dealers, who have the ability to execute against a customer’s order flow be subject to a time delay between the entry of the two orders on the LOB.

2. The market participants responding to the RFQ cannot be affiliated with the RFQ requester and may not be affiliated with each other.

3. The identity of the RFQ requester doesn’t need to be disclosed.

4. SEF regulation allows work-up session open to all market participants upon execution of a transaction.

Overall, SEF regulation:

1. Makes it easy to compare prices,

2. Facilitates dealer competition and safeguards against dealer collusion,

3. Allows end-users to bypass dealers,

4. Abolishes single-dealer platform model.
Regulatory background: What/who/when is captured

1. SEF authorization:
   - What: SEF trading can commence on a voluntary basis
   - Who: Anybody
   - When: October 2, 2013

2. CFTC swap trading mandate:
   - What: Trading is now required to take place on SEFs for mandated contracts
   - Who: “US persons” (but it’s complicated)
   - When:

<table>
<thead>
<tr>
<th>Currency</th>
<th>Maturity</th>
<th>Effective date</th>
</tr>
</thead>
<tbody>
<tr>
<td>USD</td>
<td>2,3,5,7,10,12,15,20,30</td>
<td>15/02/2014</td>
</tr>
<tr>
<td>EUR</td>
<td>2,3,5,7,10,12,15,20,30</td>
<td>15/02/2014</td>
</tr>
<tr>
<td>USD</td>
<td>4,6</td>
<td>26/02/2014</td>
</tr>
<tr>
<td>EUR</td>
<td>4,6</td>
<td>26/02/2014</td>
</tr>
</tbody>
</table>
Literature: Theory

Duffie, Garleanu, and Pedersen (2005)
- “Bidask spreads are lower if investors can more easily find other investors or have easier access to multiple market-makers”

Vayanos and Wang (2012)
- Market imperfections have a negative impact on market liquidity.
- (a) Participation costs, (b) Imperfect competition, (c) Search frictions etc.

Hendershott and Madhavan (2015)
- Electronic one-sided auctions are a viable and important source of liquidity for inactively traded instruments (such as bonds, OTC derivatives, etc.) and are a natural compromise between pure bilateral search in OTC markets and continuous double auctions in CLOBs.
Literature: Evidence

Boehmer, Saar, Yu (2005)
- NYSE allowed traders not located on the exchange to see the contents of the limit order book.
- Resulted in a significant improvement in liquidity.

- Introducing post-trade transparency in the US corporate bond markets had, on balance, a positive effect on liquidity.
- But exceptions were found for very thinly-traded bonds and for the largest trades.

Loon and Zhong (2014, 2016)
- The introduction of central clearing in the CDS market reduced counterparty risk and boosted liquidity.
- CFTC real-time reporting improved CDS liquidity.

Fulop and Lescourret (2015)
- Liquidity in corporate single-name CDS contracts improves after the voluntary dissemination of post-trade data by DTCC in November 2008 and the European “Small Bang” in June 2009
Data

- **Transactions on USD and EUR-denominated vanilla spot IRS:**
  
  - Time range: Jan 1, 2013 - Sep 15, 2014.
  - Two data sources: LCH and DTCC real-time swap data.
  - Common fields: effective date, maturity date, execution price (swap rate), trade size (notional), currency.

- **London Clearing House (LCH):**
  
  - LCH is the leading clearing house in the global interest rate swap market.
  - Its services are used by more than 100 clearing members from over 30 countries, including all major dealers.
  
  - **LCH data unique features:** Counterparty identities, BICs: allows for dealer/non-dealer & US/non-US classification.

- **DTCC:**
  
  - As part of the Dodd-Frank Act (CFTC Regulation Part 43), the CFTC required the submission of swap trade reports to SDRs, which in turn they make these data available to the public in real-time.
  - DTCC was the first to operate a real-time swap reporting platform on Dec 31, 2012.
  
  - **DTCC data unique feature:** SEF flag.

- **223,111 reports after filtering.**
Summary statistics: Traded volume

Traded volume by currency (in $ billion), Jan 2013 - Sept 2014
Summary statistics: Trades by contract maturity

% of trades by maturity
Summary statistics: Counterparty location

- USD segment dominated by US persons and EUR segment by non-US (mostly European) ones
- More intra-EU activity for EUR contracts
Liquidity variables

- The selection of the liquidity variables is data and market driven:
  - Key limitations: the lack of any (i) good quality IRS firm bid-ask quotes data & (ii) intraday timestamps.
  - Hence, we rely on liquidity metrics that require only the use of execution prices.
  - Amihud (2002) price impact:

\[
Amihud_{i,t} = \frac{1}{T} \sum_{j=0}^{T} \frac{|R_{i,t-j}|}{Vlm_{i,t-j}}
\]

where \( T = 40 \).

- Jankowitsch et al (2010) dispersion:

\[
DispJNS_{i,t} = \sqrt{\frac{N_{i,t}}{\sum_{k=1}^{N_{i,t}} \frac{Vlm_{k,i,t}}{Vlm_{i,t}} \left( \frac{P_{k,i,t} - m_{i,t}}{m_{i,t}} \right)^2}}
\]

- Volume-weighted dispersion:

\[
DispVW_{i,t} = \sqrt{\frac{N_{i,t}}{\sum_{k=1}^{N_{i,t}} \frac{Vlm_{k,i,t}}{Vlm_{i,t}} \left( \frac{P_{k,i,t} - \bar{P}_{i,t}}{\bar{P}_{i,t}} \right)^2}}
\]
Empirical design

Difference-in-differences (DiD)
Empirical design

Difference-in-differences (DiD)

- **Treated:** USD mandated contracts.
- **Control A:** EUR mandated contracts.
  - **Pros:** EUR contracts have a lower participation of “US persons” (captured by the mandate). Otherwise, both groups have similar liquidity and activity profiles.
  - **Cons:** Different fundamentals: we control for this using a number of currency specific control variables.
- **Control B:** USD non-mandated contracts.
  - **Pros:** Same fundamentals: both groups are denominated in the same currency.
  - **Cons:** The two groups have different liquidity or activity profiles.
Empirical specifications (Test 1)

DiD Test 1:

- Treated: USD mandated (higher “US person” participation)
- Control: EUR mandated (lower “US person” participation)

Model:

\[ L_{it} = \alpha + \beta_1 Date_t^{(1)} + \beta_2 Curr_j Date_t^{(1)} + \beta_3 Date_t^{(2)} + \beta_4 Curr_j Date_t^{(2)} + \gamma' X_t + u_i + \epsilon_{it} \]

where \( Date_t^{(k)} \) is an event \( k \) date dummy, and \( Curr_j \) is a currency dummy and \( X \) is the vector of control variables.
Empirical specifications (Test 1)

Results:

<table>
<thead>
<tr>
<th></th>
<th>Liquidity variables</th>
<th>Activity Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.2121***</td>
<td>-0.2907***</td>
</tr>
<tr>
<td></td>
<td>(-10.98)</td>
<td>(-8.50)</td>
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<tr>
<td><strong>Curr x Date</strong></td>
<td>0.0162</td>
<td>0.0125</td>
</tr>
<tr>
<td></td>
<td>(0.50)</td>
<td>(0.39)</td>
</tr>
<tr>
<td><strong>Date</strong></td>
<td>0.1061***</td>
<td>0.0820***</td>
</tr>
<tr>
<td></td>
<td>(4.40)</td>
<td>(2.95)</td>
</tr>
<tr>
<td><strong>Curr x Date</strong></td>
<td>-0.1345***</td>
<td>-0.1341***</td>
</tr>
<tr>
<td></td>
<td>(-4.85)</td>
<td>(-4.78)</td>
</tr>
</tbody>
</table>

**Total effect:**
-0.22% -0.33% -0.27% -0.52% -1.91% -2.25%

Controls: Stock market returns, stock index implied volatilities, overnight interest spreads, yield curve slopes.
Fixed effects: Currency & maturity
Clustering by: Currency & maturity
Empirical specifications (Test 1)

Results:

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<th>Activity Variables</th>
<th></th>
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</thead>
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<td>0.0623</td>
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<tr>
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<td>(0.50)</td>
<td>(0.39)</td>
<td>(1.84)</td>
<td>(1.65)</td>
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<tr>
<td>Date²</td>
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<td>0.0820***</td>
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<td></td>
<td>(4.40)</td>
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<td>(5.06)</td>
<td>(2.46)</td>
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<tr>
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<td>-0.1341***</td>
<td>-0.2178***</td>
<td>-0.2127***</td>
</tr>
<tr>
<td></td>
<td>(-4.85)</td>
<td>(-4.78)</td>
<td>(-4.94)</td>
<td>(-4.83)</td>
</tr>
</tbody>
</table>

|                  | Total effect:     |                  | Marginal Effect:  |                  |
|                  | -0.22%            | -0.33%           | -0.27%            | -0.52%           | -1.91%        | -2.25%        |
|                  | Sum of event      |                  | Sum of interaction|                  |
|                  | dummies &         |                  | terms             |                  |
|                  | interaction terms |                  |                   |                  |
|                  | -0.13%            | -0.13%           | -0.15%            | -0.21%           | -2.07%        | -2.08%        |
|                  | Sum of interaction|                  |                   |                  |
|                  | terms             |                  |                   |                  |

Economic significance / Reduction in execution costs

Disp (JNS):
- Total Effect: (-0.27% x 1.7%) x $75bn x 7 years x 1/3 ≈ $7m
- Marg Effect: (-0.15% x 1.7%) x $75bn x 7 years x 1/3 ≈ $1.3m

Intuitively, we calculate the present value of the reduced future fixed payments of a swap whose notional equals the average daily total volume.

Controls: Stock market returns, stock index implied volatilities, overnight interest spreads, yield curve slopes.
Fixed effects: Currency & maturity
Clustering by: Currency & maturity
Empirical specifications (Test 1)

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<tr>
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<td>(1)</td>
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<tr>
<td>Date¹</td>
<td></td>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Curr x Date¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date²</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curr x Date²</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
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</tr>
<tr>
<td>Fixed Effects</td>
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<td>Yes</td>
</tr>
<tr>
<td>Clustered S.E.</td>
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<td>Yes</td>
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<tr>
<td>Within-R²</td>
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<td>0.052</td>
</tr>
<tr>
<td>N</td>
<td>8821</td>
<td>8740</td>
</tr>
</tbody>
</table>

**Key findings**

- **Increase in activity for USD contracts mainly after SEF trading becomes available**
- **Both SEF trading and the CFTC mandate boost market participation in USD contracts**
- **EUR activity declines, but interestingly without affecting liquidity.**

Controls: Stock market returns, stock index implied volatilities, overnight interest spreads, yield curve slopes.
Fixed effects: Currency & maturity
Clustering by: Currency & maturity
Empirical specifications (Test 2)

DiD Test 2:

▶ Treated: USD mandated
▶ Control: USD non-mandated

Model:

\[ L_{it} = \alpha + \beta_1 Date_t^{(1)} + \beta_2 MAT_i Date_t^{(1)} + \beta_3 Date_t^{(2)} + \beta_4 MAT_i Date_t^{(2)} + \gamma' X_t + u_i + \epsilon_{it} \]

where \( Date_t^{(k)} \) is an event \( k \) date dummy, and \( MAT_i \) a mandated contract dummy and \( X \) is the vector of control variables.
Empirical specifications (Test 2)

Results:

<table>
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<th>Date</th>
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<th>Activity Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
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<tr>
<td></td>
<td>Disp (vw)</td>
<td>Disp (vw)</td>
</tr>
<tr>
<td>Date¹</td>
<td>-0.2220***</td>
<td>-0.2718***</td>
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<tr>
<td></td>
<td>(-3.87)</td>
<td>(-5.06)</td>
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<td>MAT x Date¹</td>
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<tr>
<td></td>
<td>(0.41)</td>
<td>(0.41)</td>
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<tr>
<td>Date²</td>
<td>0.0304</td>
<td>0.0492**</td>
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<td></td>
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<td>(2.10)</td>
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<tr>
<td>MAT x Date²</td>
<td>-0.0589**</td>
<td>-0.0624**</td>
</tr>
<tr>
<td></td>
<td>(-2.63)</td>
<td>(-2.69)</td>
</tr>
</tbody>
</table>

Same picture:

- SEF trading brings about an improvement in liquidity across currencies and maturities.
- Liquidity of USD MAT contracts improves the most → Effect is statistically and economically significant.
- Increase in activity for USD MAT contracts mainly after SEF trading becomes available.
Market fragmentation

The issue:

- Due to the trading mandate capturing US persons only, there have been concerns of market fragmentation if EU counterparties refuse to trade on SEFs with US counterparties. See ISDA (2014).

- What does the data tell us?
Market fragmentation

- Clear evidence of fragmentation in the EUR segment of the IRS market.
- No visible effect in the USD segment.
Market fragmentation

Fragmentation is driven by inter-dealer activity, not end-users!
Market fragmentation

There is a shift in inter-dealer activity from the US desks to the non-US ones. Consistent with dealers trying to avoid being captured by the CFTC mandate so as to deny potential entrants access to the inter-dealer market.
The CFTC has been aware of “enablement mechanisms” which can be used to block access to the inter-dealer market.

The inter-dealer segment is crucial for liquidity provision as it is used by dealers to manage their inventories.
Concluding Remarks: The facts

- The CFTC trading mandate has improved liquidity in the (plain vanilla) IRS market (particularly its USD segment) and has reduced execution costs.

- Drop in execution costs is substantial: millions of $s on a daily basis

- The mandate appears to have geographically fragmented the EUR segment of the market. However this is artificial as it is driven by dealers shifting activity from their US desks to their European ones.
Concluding Remarks: Beyond the facts

- Reductions in execution costs for end-users translate into reduced revenues for dealers.

- It appears that dealers have been exercising market power and extracting rents in OTC derivatives markets.

- The EUR segment of the IRS market has only seemingly fragmented as D2D volume has migrated from the US to Europe
  - Appears to be a case of regulatory arbitrage, where dealers try to avoid being captured by the CFTC impartial access guidance and thereby prevent new entrants from gaining access to the inter-dealer segment (and the market for liquidity provision).

- Findings suggest that equivalent European regulation (MiFIR) should be implemented sooner than later.
Remco Lenterman (former chairman of the FIA European Principal Traders Association):

“Remember how Dodd-Frank was widely opposed by the oligopoly of swap traders. This $7m to $13m is money that goes from the pockets of traditional swap bank dealers straight into end-users pockets”
Welcome!

13th Annual Central Bank Workshop on the Microstructure of Financial Markets

BANK OF ENGLAND
Thank you!
Extensive data cleaning:

- Keep centrally cleared fixed-for-floating swaps.
- Keep spot starting swaps.
- Remove non price-forming transactions.
  - Cancelations, compressions, portfolio trades, among others.
- Remove bespoke swaps, eg. trades with additional price terms, non standard rates, non standard day conventions, legs with different notional or denominated in different currencies.
- Remove LCH duplicates (two reports per trade).
- Correct DTCC information using correction reports.
- Remove erroneous reports (±5% of BBG eod quotes), as in Loon and Zhong (2016).
- Remove LCH/DTCC duplicates.

223,111 reports after filtering.
Market fragmentation and liquidity

Model & Results:

\[ L_{it} = \alpha + \beta \text{fragm}_{it} + \gamma \text{Date}_{it}^{(1)} + \delta' X_{it} + u_i + \epsilon_{it}, \]

- where \( \text{fragm} = 1 - \frac{\text{US-EU Vlm}}{\text{Total Vlm}} \)
- Estimated for EUR-denominated mandated contracts

<table>
<thead>
<tr>
<th></th>
<th>Disp (vw)</th>
<th>Disp (JNS)</th>
<th>Amihud</th>
<th>Vlm</th>
<th>Ntrades</th>
<th>Nparties</th>
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<tbody>
<tr>
<td>fragm</td>
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<td>log R_{SP500}</td>
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<td>107.6561***</td>
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<td>O/N Spread EUR</td>
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<td>Slope EUR</td>
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</tr>
</tbody>
</table>

- Reduction in trading activity. However, no adverse effect of fragmentation on liquidity
- Perhaps not surprising since its the same institutions trading...