The Impact of Central Clearing on the Interest Rate Swaps Market

Arnob L. Alam

# Introduction

The 2006-2008 financial crisis, the most severe downturn since the Great Depression, led to the passage of the Dodd-Frank Wall Street Reform and Consumer Protection Act (DFA). A key provision of the DFA required certain financial contracts to be cleared through a central counterparty. This study investigates the causal impact of this clearing mandate on the size, pricing, and price volatility in the interest rate (IR) swaps market, a major derivatives market used for hedging or speculating on interest rate risk. As the first comprehensive examination of the central clearing mandates on the interest rate derivatives market, this research contributes significantly to understanding the effects of post-crisis market reforms and informing future regulatory adjustments.

Despite extensive theoretical literature on central clearing, empirical studies are limited. Earlier research focused on the credit default (CD) swaps market using event studies, which cannot isolate causal impacts due to potential confounding factors. This study addresses this gap by examining the IR swaps market, which is larger and more widely used than the CD swaps market. Leveraging the fact that initial central clearing rules targeted IR swaps in the four largest currencies (USD, GBP, EUR, JPY) and did not apply to other currencies or regions, this research identifies the causal impact of the regulation on pricing, price volatility, and market size in the IR swaps market. Robustness checks include comparing contracts traded in the US, Europe, and Asia.

The paper is organized as follows: Section II provides background on the IR swaps market, the financial crisis, and the clearing mandate's role in post-crisis market reforms. Section III explains central clearing and discusses plausible impact of clearing on the IR swaps market. Section IV develops the theory of prices, price volatility and market size under a clearing mandate. Section V discusses the identification strategy (including developing a novel info-metrics difference-in-differences estimator). Section VI details our data. Section VII discusses the results and section VIII concludes.

# Background

## Interest Rate Swaps

Interest rate (IR) swaps are financial derivatives used to hedge or speculate on interest rate movements. The three most common types of IR swaps include vanilla fixed-for-floating swaps, basis swaps, and cross-currency basis swaps. Vanilla fixed-for-floating swaps are the most prevalent. In this type of swap, one party exchanges fixed-rate coupon payments for floating-rate payments on a notional principal. Firms use these instruments to convert floating-rate risk to fixed-rate risk, and vice versa. For example, imagine firm A can borrow at the LIBOR rate or a fixed rate of 2.0%, while firm B can borrow at (LIBOR + 0.25%) or a fixed rate of 1.75%. Suppose firm A prefers fixed-rate borrowing and firm B prefers floating-rate borrowing. Despite their preferences, firm A has a comparative advantage in floating-rate borrowing, and firm B in fixed-rate borrowing. To achieve their preferred arrangements, the firms can enter into an IR swap agreement with a $1M notional principal, where firm A receives a floating rate of LIBOR from firm B and pays a fixed rate of 1.75% to firm B. This transforms firm A's floating-rate liability into a fixed-rate one and vice versa for firm B. The IR swaps market allows firms to borrow in the market they have a comparative advantage in and trade for their preferred interest rate arrangement.

IR swaps are usually bespoke contracts, customizable to individual needs. As the largest over-the-counter swaps market, it accounted for $500 trillion of the $650 trillion global OTC swaps market in 2010 (BIS, 2011). Contracts are available in multiple currencies, with specific market conventions for each.

The IR swaps market is dealer-dominated, with dealer-customer and dealer-dealer trades accounting for 80% of notional value. Very few transactions occur bilaterally between customers. Bolandnazar (2020) found that 50% of trades (by notional value) are executed by the largest seven dealers, indicating market concentration among a few dealers. This concentration can impact pricing due to the market power of large dealers and affect market stability, as the failure of a large dealer or its counterparties can easily propagate through the system.

## Central Clearing

When a swap is cleared, the contract between the two initial parties is replaced by two contracts between each party and a central clearinghouse/derivative clearing organization (CCP or DCO). If one party fails to meet their contractual obligation, the clearinghouse can still make sure the other party gets paid. Clearinghouses are large financial institutions that are supposed to exercise prudent risk control measures, thereby lowering risks and mitigating consequences if one party defaults on their contractual obligations (counterparty risk). Clearing transforms trading by mutualizing counterparty risk, enabling netting to reduce collateral demand, and potentially reducing volatility caused by bank runs.

Originally created for futures exchanges members, clearinghouses became more significant with regulations like the Dodd-Frank Act and European Market Infrastructure Regulation (EMIR) mandating central clearing of derivatives. Mandated clearing may have macro and micro effects on the market. At the macro level, clearing could reduce volatility but also strain the market through collateral demands during volatile or illiquid periods. Large enough losses could threaten clearinghouse solvency, transmitting effects to all members.

At the micro level, central clearing may change the types of trades firms enter, potentially leading to riskier trades due to mutualized default risk (adverse selection) and riskier post-trade activities (moral hazard). Clearing is subject to economies of scale and scope, which could lead to natural monopolies. However, regulators are likely to prevent this through local clearinghouse requirements and antitrust scrutiny. While clearinghouses can reduce default risk and collateral demand, they also require resources for risk management activities, which may increase trading costs.

## Regulatory Background

### US context

Following the financial crisis, Congress passed the DFA in 2010 to enhance the US financial system's reliability. Since OTC derivatives markets played a crucial role in the crisis, the Act aimed to significantly reform this market. Key objectives included improving trade data availability for regulators and market participants, requiring real-time reporting of certain trade characteristics, and mandating confidential trade data reporting to swaps data repositories and regulators.

To reduce default risk for large swaps dealers, the Act requires registration with the CFTC, adherence to internal business conduct standards, maintaining adequate capital and margin requirements, and encouraging trading in central Swaps Execution Facilities (SEFs) or Designated Contract Markets (DCMs) to enhance liquidity and price discovery. Furthermore, the DFA mandates most contracts be centrally cleared and for uncleared contracts, requires parties to post margin to mitigate default effects. Table 1 summarizes the CFTC rule-making in these areas.

Table Major Dodd-Frank Act Rulemaking Areas

|  |  |
| --- | --- |
| Rulemaking Area | Major Rules |
| Derivatives Products Affected | * Agricultural Swaps * Commodity Swaps * Commodity Options * Foreign Currency |
| Data Requirements | * Establishment of Swap Data Repositories (SDR) * Data recordkeeping and reporting requirements * Real Time Reporting * Large Swaps Trader Reporting |
| Clearing Requirements | * Establishment of Derivatives Clearing Organizations (DCO/CCP) * Clearing requirement for most common swaps * Margining requirements for uncleared swaps |
| Trading Requirements | * Establishment of Swaps Execution Facilities (SEF) * Made Available for Trade (MAT) designation/requirement |
| Swaps Dealers and Major Swaps Participants | * Registration * Internal Business Conduct Standards * Capital and Margin for non-banks * Segregation and Bankruptcy |
| Position Limits | * Position Limits and Aggregation of Positions |
| Enforcement | * Anti-Manipulation * Disruptive Trading Practices * Whistleblowers |
| Other | * Investment Adviser Reporting * Volcker Rule * Reliance on Credit Ratings * Fair Credit Reporting Act * Cross-Border Applications |

### International Context

Considering the global nature of the financial system, US regulators collaborated with international counterparts to harmonize regulatory requirements. In Europe, both the UK and EU enacted comprehensive reforms for their respective financial systems. The EU passed the European Market Infrastructure Regulation (EMIR), which shares similar aims with the Dodd-Frank Act, while the Bank of England issued regulations mandating clearing for most trades involving UK-based entities.

In Asia, the Japanese Financial Services Authority (JFSA) required yen-denominated IR swaps and specific CD swaps contracts to be cleared by the end of 2012. Additionally, the Monetary Authority of Singapore and the Securities and Futures Commission of Hong Kong released consultation papers expressing their intentions to clear swaps denominated in certain Asian currencies. Table 2 summarizes the international context:

Table Summary of Central Clearing Requirements in Major FInancial Centers

|  |  |
| --- | --- |
| Jurisdiction | Relevant Regulations |
| North America | * Dodd-Frank Act and CFTC and SEC rulemaking requires mandatory clearing of IR swaps contracts by September 2013 |
| Europe | * European Market Infrastructure Regulation (EMIR) passed in 2012 |
| Asia | * Japan Financial Services Authority requires yen denominated IR swaps referencing LIBOR to be cleared by end of 2012. * Hong Kong Monetary Authority and the Securities and Futures Commission release consultation paper in 2011 on clearing of certain IR swaps denominated in Asian currencies. * Monetary Authority of Singapore (MAS) releases consultation paper in 2011 on plans for clearing of certain Singapore Dollar denominated IR swaps. |
| Australia | * Australian Council of Financial Regulators in 2012 announcing plans to pass legislation requiring mandatory clearing of Australian Dollar denominated IR swaps by end of 2012. |

# Theory

(Add theory section here)

# Identification Strategy

I investigate the impact of the central clearing mandate on the interest rate swap prices by comparing the premium (the difference between the fair rate and the actual quoted fixed rate) on USD denominated swaps versus CAD denominated swaps before and after the mandate. To achieve this, I employ a difference-in-differences (DiD) identification strategy, which allows me to isolate the causal effect of the mandate on the swap premiums by exploiting the variation in the timing of the policy implementation.

## Sample Selection and Data Sources

I begin by selecting a sample of interest rate swaps denominated in both USD and CAD with similar characteristics, such as contract maturity and credit quality, from the ten trading days before and after the central clearing mandate was implemented. My main data source is transaction-level data from swap data repositories (SDRs), and market data from financial information providers such as Bloomberg. Additionally, I collect data on macroeconomic indicators, central bank policies, and other relevant factors that could potentially affect swap premiums.

## Construction of Treatment and Control Groups

Next, I create two groups based on the currency of denomination: (1) the treatment group, consisting of USD denominated swaps that were affected by the central clearing mandate, and (2) the control group, consisting of CAD denominated swaps that were not subject to the mandate during the same period. By comparing the swap premiums between these two groups before and after the mandate, I can identify the causal effect of the policy on swap premiums, assuming that both groups would have followed parallel trends in the absence of the policy intervention.

Difference-in-Differences Estimation

To estimate the causal effect of the central clearing mandate on swap premiums, I employ a DiD regression model, which takes the following form:

Where is the swap premium for swap i at time t, Treatment\_i is an indicator variable equal to 1 if the swap is denominated in USD (treatment group) and 0 otherwise (control group), Post\_t is an indicator variable equal to 1 for the period after the mandate was implemented, and X\_it is a vector of control variables. The coefficient of interest is δ, which captures the causal effect of the central clearing mandate on swap premiums.

## Assumption Checks and Robustness Tests

To ensure the validity of our identification strategy, I first test the parallel trends assumption by visually inspecting the pre-treatment trends of swap premiums for both treatment and control groups and conducting placebo tests. Additionally, I perform several robustness checks, such as using alternative control groups, applying different sample selection criteria, and employing alternative econometric techniques, such as propensity score matching and synthetic control methods.

## Interpretation of Results

Finally, I interpret the estimated causal effect of the central clearing mandate on swap premiums (δ) and discuss the economic significance of our findings in the context of the interest rate swap market and the broader financial system. This will help us to understand the implications of the central clearing mandate on market efficiency, price transparency, and counterparty risk, which are crucial for policymakers and market participants. (Add identification strategy here)

# Data

The Commodity Futures Trading Commission's (CFTC) clearing mandate on interest rate (IR) swaps became effective on March 11, 2013. The regulation was implemented in three phases. Phase 1 mandated clearing for certain IR swaps involving swap dealers (SD), major swap participants (MSP), or active funds. Phase 2 extended the mandate to additional entities, while Phase 3 covered all remaining entities, unless exempted. The IR swaps covered by the mandate were the largest group by volume, denominated in USD, EUR, GBP, and JPY.

This paper compares prices, price volatility, and market size before and after Phase 1 became effective, examining relevant metrics for USD and CAD denominated swaps – the largest regulated and unregulated markets, respectively. To minimize the impact of interest rate policy and other macroeconomic variables, I analyze ten trading days before (Feb 25, 2013 – Mar 8, 2013) and after (Mar 11 – Mar 22, 2013) the regulation's effective date.

To calculate the fair price of IR swaps, I forecast future floating rate payments and discount the payments using the correct yield curve. I use a single curve method, the prevalent pricing method during the study period. For USD swaps, I obtain the USD semiannual fixed-floating rate curve for each trading day from Bloomberg. For CAD denominated swaps, I obtain the Canadian yield curve from the Bloomberg Terminal. I use the QuantLib-python library to construct a piecewise linear forward curve.

I acquire trading data from the Depository Trust & Clearing Corporation (DTCC) Data Repository (DDR), the only Swaps Data Repository (SDR) in operation during the study period. The data elements include swap currency, trade date and time, effective date, maturity date, fixed rate, payment frequencies, clearing status, notional value, and capped notional indicator. For USD swaps, USD LIBOR is the floating rate index for 98% of swaps, while for CAD swaps, CDOR is the index for 99% of swaps. I exclude swaps that make a single payment at maturity (i.e., payment frequency is 1T). Table 3 shows the notional value and number of trades captured in my data.

Table Number of trades and notional value of USD and CAD denominated IR swaps

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Pre-Regulation: Feb 25, 2013 - Mar 8, 2013 | | Post Regulation: Mar 11, 2013 - Mar 22, 2013 | |
|  | N | Notional Value (billions) | N | Notional Value (billions) |
| CAD | 468 | CAD 39,280.10 | 259 | CAD 20,605.31 |
| USD | 5,969 | USD 317,474.51 | 5,751 | USD 313,917.10 |

I note that the CAD swaps market is much smaller (both in dollar and ticket volume). Table 2 lists the notional values, floating leg index and average tenor of USD and CAD swaps in our dataset.

Table Some characteristics of USD and CAD swaps

|  |  |  |
| --- | --- | --- |
|  | USD | |
|  | Pre | Post |
| Average Notional Value | USD 53.2M | USD 54.6M |
| Floating Leg Reference Rate |  |  |
| USD Libor BBA | 98.00% | 98.00% |
| Fed Funds | 1.00% | 1.00% |
| Other | 1.00% | 1.00% |
|  | CAD | |
| Average Notional Value | CAD 53.2M | CAD 54.6M |
| Reference Rate |  |  |
| BA-CDOR | 99.00% | 99.00% |
| Other | 1.00% | 1.00% |

# Results

## Prices

The GME regression results for the price premium is described in Table 3. We are chiefly interested in the coefficient of the interaction variable , which takes on a value of 1 if the observation is in the regulated market (USD) after March 11, and zero otherwise. In model 1, only the variables Currency (1 for USD, 0 for CAD), Period (1 for on or after, March 11 and 0 for before March 11) and the interaction variable Currency \* Period are included. In the full model, other controls such as the natural log of the underlying notional amount, the tenor, payment frequency, trade day, trade time and late effective indicators are also included.

Regulation (the coefficient of the interaction variable) is associated with a 1.180 bps increase in the premium (1.176 bps in the full model). The increase is statistically significant. Among the control variables, payment frequency is the most important and associated with a 5 to 10 bps increase in the premium (compared to the baseline of a quarterly-semi-annual contract). Contracts with a larger notional value is associated with a smaller premium (a 1% increase in the notional value is associated with a 0.04 bps reduction in the premium. Trades completed after hours is associated with a 0.3 bps increase in the premium (compared to mid-day trading) and the trading day is associated with a 1 to 2 bps increase in the premium (baseline is Wednesday trading). Contracts that become effective after March 31 is associated with a 0.3 bps increase in the premium (ordinarily, a contract becomes effective 2 days after the trade is executed in the USD market and on the day of the trade in the CAD market).

Table Generalized Maximum Entropy Regression Results for Premium

|  |  |  |
| --- | --- | --- |
|  | Model 1 | Model 2 |
| Currency: USD | 1.07 (0.224) \*\*\* | 1.111 (0.284) \*\*\* |
| Period: Post | -0.239 (0.360) | -0.336 (0.303) |
| Currency\*Period | 1.180 (0.370) \*\*\* | 1.176 (0.307) \*\*\* |
| Ln(notional) |  | -0.046 (0.033) |
| Tenor (months) |  | 0.0157 (0.001) \*\*\* |
| Payment Frequency[[1]](#footnote-2)  1M-1M  1M-6M  3M-3M  3M-6M  3M-1Y  6M-1M  6M-3M  6M-6M  6M-1Y  12M-3M  1Y-3M  1Y-6M  1Y-1Y |  | 7.354 (1.866) \*\*\*  5.255 (2.069) \*\*  9.353 (1.881) \*\*\*  8.796 (1.824) \*\*\*  6.908 (1.834) \*\*\*  4.905 (1.936) \*\*  8.550 (1.824) \*\*\*  9.560 (1.840) \*\*\*  7.569 (2.575) \*\*\*  7.483 (1.949) \*\*\*  6.796 (1.880) \*\*\*  7.567 (2.351) \*\*\*  5.624 (3.171) \* |
| Trade Time[[2]](#footnote-3)  After Hours (After 5:00 PM)  Afternoon (2:00 PM – 4:59 PM)  Morning (8:00 AM – 10:59 AM) |  | 0.274 (0.117) \*\*  0.201 (0.135)  0.079 (0.115) |
| Trade Day[[3]](#footnote-4)  Fri  Mon  Wed  Tue  Wed |  | 1.741 (0.110) \*\*\*  0.855 (0.110) \*\*\*  1.467 (0.102) \*\*\*  0.862 (0.104) \*\*\*  x.xxx (y.yyy) |
| Late Effective[[4]](#footnote-5) |  | 0.277 (0.088) \*\*\* |
| Constant |  | -9.399 (1.960) \*\*\* |

# Conclusion

1. Base level is 3M – 6M, where the first number indicates payment frequency of the fixed leg, and the second number indicates the payment frequency of the floating leg [↑](#footnote-ref-2)
2. Base level is Mid-Day (11:00 AM – 1:59 PM). All times Eastern. [↑](#footnote-ref-3)
3. Base level is Thursday [↑](#footnote-ref-4)
4. If the effective date of the contract is more than 30 days after the trade date [↑](#footnote-ref-5)