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OTC DERIVATIVES: A COMPARATIVE ANALYSIS OF REGULATION IN THE UNITED STATES, EUROPEAN UNION, AND SINGAPORE

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This study compares the regulation of OTC derivatives in the United States, European Union, and Singapore. All jurisdictions require central clearing and reporting of OTC derivatives. The onus of reporting falls primarily on financial counterparties to an OTC contract. The main difference in regulation is that only the United States and the European Union require mandatory trading of cleared derivatives. Additionally, implementation is proceeding in different stages across jurisdictions. These two differences have the potential to result in regulatory arbitrage across jurisdictions.

The over-the-counter (OTC) derivatives market is the largest financial market worldwide. It represents various financial and nonfinancial participants in the United States, Europe, Hong Kong, Singapore, and other financial centers. Nonfinancial participants usually use these markets to hedge business risks, while financial participants use them for both speculation and hedging.

According to the Bank of International Settlements' semiannual survey, the OTC derivatives market has grown from $603.9 trillion in December 2009 to $647.8 trillion in December 2011. As seen in Figure 1, interest rate contracts represent 85% of the total OTC derivatives, while credit default swaps represent 5% of the total OTC derivatives and commodity contracts, equity linked contracts, and foreign exchange contracts each represent 1% of the total OTC derivatives contracts (BIS 2012).

OTC contracts were blamed for the credit crisis of 2008 (Dømler 2012). This led to the Pittsburgh Declaration by G20 members to regulate the OTC derivatives market:

> All standardized OTC derivative contracts should be traded on exchanges or electronic trading platforms, where appropriate, and cleared through central counterparties by end-2012 at the latest. OTC derivative contracts should be reported to trade repositories. Non-centrally cleared contracts should be subject to higher capital requirements. We ask the FSB and its

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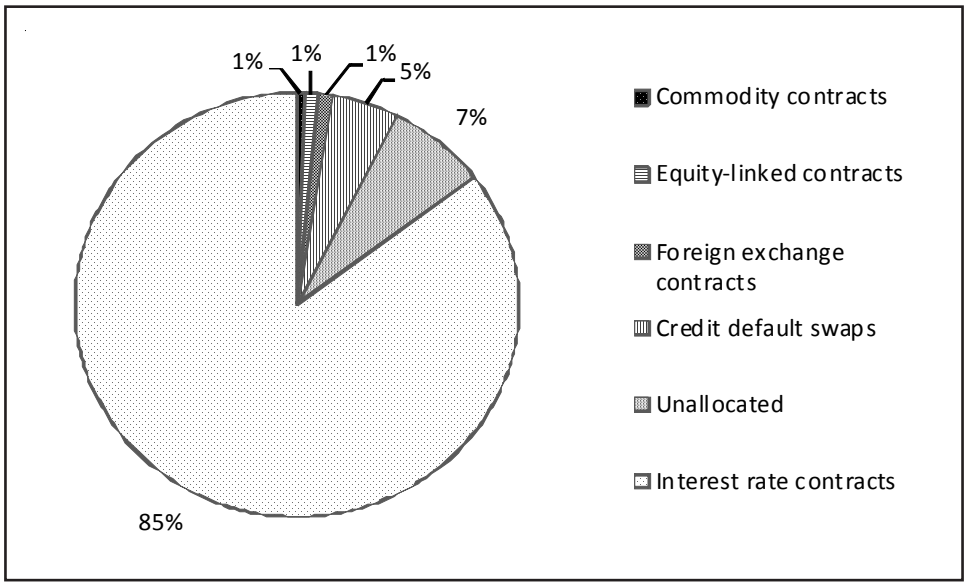
Figure 1. Outstanding OTC Derivatives by Categories.



relevant members to assess regularly implementation and whether it is sufficient to improve transparency in the derivatives markets, mitigate systemic risk, and protect against market abuse (*Financial Times* 2009).

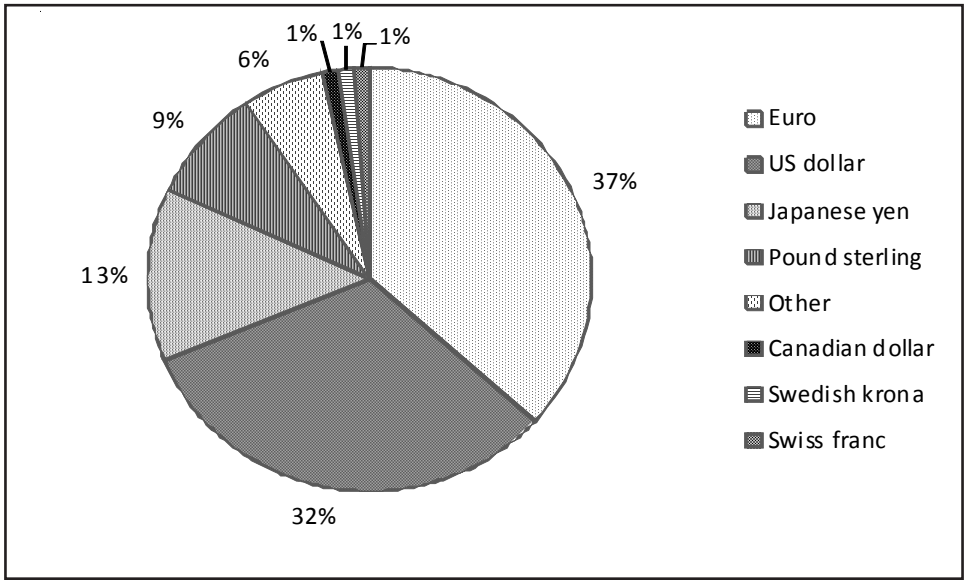
Ever since the declaration there has been sweeping regulation on both sides of the Atlantic with the Dodd-Frank Act in the United States and European Market Infrastructure Regulation (EMIR) in the European Union (EU). Other nations around the world have also formulated their own regulations to monitor and regulate the OTC markets.

This study compares and contrasts regulation of the OTC derivatives markets in three different jurisdictions, the United States, the European Union, and Singapore. As depicted in Figure 2, 32% and 37% of the single currency interest rate OTC derivatives contracts were in US dollars and euros, respectively. These two regulatory regimes were the first to propose regulation of OTC derivatives. The advent of these regulations has led some to fear a loss of OTC markets in countries where there is less or no regulation. Additionally, it is possible for counterparties in countries that have less stringent regulation to avoid business with the US counterparties (e.g., Armstrong 2012).

Singapore has been chosen in this study since regulation of its OTC market has only recently been proposed in February 2012. Also, Singapore does not form a part of the G20. Hence, it serves as an excellent case where there may be a perception that Singapore has less stringent regulations than the G20 countries.[1]

1. The author would like to thank the anonymous reviewer who pointed out that this perception may not be correct, especially in light of the stricter requirements that go beyond Basel III. (See Armstrong and Lim 2011, UPDATE 1-Singapore banks to face tougher capital rules than Basel III. Reuters, http://www.reuters.com/article/2011/06/28/singapore-basel-idUSL3E7HS1TM20110628.)

Figure 2. Percentage of Outstanding OTC Single-Currency Interest Rate Derivatives.



I. LITERATURE REVIEW

A. Central Clearing

An OTC derivative transaction between two parties has inherent risk of default by a counterparty. Before 2007, market participants preferred searching for the best value to close out an OTC position rather than looking for a reduction in counterparty credit risk. This meant that the close out of the OTC position may not have been with the original counterparty (Vause 2010). This resulted in offsetting contracts with a best value provider. Consequently, the number of outstanding OTC contracts increased.

After the credit crisis, management of counterparty credit risk became important. There are various techniques used to reduce counterparty risk, including trade compression and central clearing through a central counterparty (CCP). Standardization of contracts is essential for using trade compression and CCPs (Vause 2010). Trade compression reduces counterparty risk by reducing the number of outstanding contracts among market participants. However, market participants are still subject to bilateral credit risk for the remaining contracts (Weistroffer 2009). This risk could be eliminated using a central counterparty.

A central counterparty (CCP) provides risk mitigation by imposing itself between the buyer and the seller. Thus, it is a buyer to the seller and seller to the buyer. In case of a default by any one of its members, the CCP is the only party that will be affected. All other members of the CCP system remain unaffected. The CCP can reduce or eliminate the impact of default by a member through collateral management.

A CCP could give an open offer to act as a counterparty to members or become

a counterparty after an OTC contract has been signed between two parties. In the latter case, the original contract is void when the CCP becomes the counterparty. Using CCPs doubles the total number of contracts; however, there are also possibilities of netting across contracts (Vause 2010).

Another advantage of a CCP is multilateral netting where, instead of there being one buyer to a seller, CCPs can take off-setting positions with multiple members and, thus, diversify away the risk. The CCP could provide anonymity to transactions and thereby reduce the impact of the trader's position. Additionally, the CCP could provide post-trade management and provide financial management of members' collateral deposits.[2] Thus, a CCP is in a much better position to ensure fulfillment of obligations to its trading members than a bilateral OTC contract.

Cecchetti, Gyntelberg, and Hollanders (2009) indicate that using CCPs improves counterparty risk management and multilateral netting and increases transparency of prices and volume to regulators and the public. Using a CCP can also reduce operational risks and efficiently manage collateral. A CCP is in a better position to mark to market and to manage and evaluate exposure.

Acharya and Bisin (2010) indicate that OTC markets are opaque and participants possess private information that provides them incentive to leverage their position. This increases their likelihood of default. Centralized clearing by a CCP would reduce this opacity by either setting competitive prices or providing transparency of trade positions. Culp (2010) indicates that the CCP structure is time-tested and has sustained various market disruptions and individual institutional defaults. Benefits of using a CCP include a reduction in credit risk and evaluation of exposure, transparency of pricing, evaluation of correlation of exposures, default resolution, and default loss reduction.

Novation of a contract using a CCP concentrates risk with the CCP and, to that extent, will contribute to the systemic risk (BIS 2004; Koeppl and Monnet 2008). The CCP has offsetting long and short positions. Hence, they do not have any directional risk. However, they do face counterparty risk (Duffie, Li, and Lubke 2010). With a CCP, bilateral risk is replaced with that of the failure of a market participant in the CCP. This risk is separate from the operational failure of a CCP (Weistroffer 2009).

Biais, Heider, and Hoerova (2012), Milne (2012), and Pirrong (2010) indicate that central clearing mutualizes risk but does not eliminate risk. Such mutualization can be detrimental to the market as players possess private information, leading to underpricing of risk. Liu (2010) indicates that central clearing reduces counterparty risk but not default risk. Thus, governance and choice of financially robust market participants are more important than central clearing to the elimination of risk. Pirrong (2009) indicates information asymmetry could lead to a preference for bilateral arrangements over that of a CCP. In bilateral arrangements, parties to a contract can better monitor, and hence price, counterparty credit risk. Thus, the benefit of a CCP does not outweigh its cost. Lewandowska and Mack (2010) show

2. http://www.cmegroup.com/clearing/cme-clearing-overview/about-central-counterparties.html.

that multilateral arrangements provide comparable netting efficiency to that of CCP clearing.

Culp (2010) suggests that members could resist clearing through a CCP if they see that the credit risk mitigation is marginal, the margin requirements are not for risk management, or the pricing is not acceptable. Further, the study states that the imposition of the margin is costly due to opportunity cost. Additionally, marking-to-market will impose liquidity constraints on dealers. CCP-required standardization may preclude market participants from being able to effectively hedge their risks as the standardized products lead to basis risk and do not exactly offset their risk exposure. Finally, CCP risk managers who perceive themselves at an information disadvantage with respect to its members may impose higher requirements of collateral (Weistroffer 2009).

Studies have suggested various methods of organizing a CCP, the optimal number of CCPs, and ways CCPs may cope with losses. Koeppl and Monnet (2008) indicate that CCPs can be structured as mutual ownership or for-profit organizations. To secure itself from default by any of its members, a CCP will require margin and a default fund. A profit-maximizing CCP will require a larger default fund, whereas a mutualized CCP will enforce a higher margin requirement. In stressed market conditions, a profit-maximizing CCP will provide efficient trading, while a user CCP will shut down.

The Committee on the Global Financial System (2011) indicates that indirect access of clearing through dealers leads to a concentration of risk at these dealers. Also, it makes the system uncompetitive compared to one in which market participants have direct access to clearing. Indirect clearing can be efficient if end users have portability of their accounts across dealers. A domestic CCP may be helpful in maintaining regulatory oversight; however, multiple CCPs will lead to fragmentation and an increased need for collateral. The Committee further advocates coordination of regulation among global regulators to avoid regulatory arbitrage. Links between multiple CCPs will be advantageous due to multilateral netting possibilities through an expanded number of counterparties. However, these links could provide propagation of shocks and systemic risk.

Duffie and Zhu (2011) advocate having a lower number of CCPs as it will reduce counterparty credit risk. Having a separate CCP for each asset will reduce netting benefits across assets. It will also increase collateral needs and counterparty credit risk. Hence, having interoperability agreements will be beneficial. Multiple CCPs will have initial margin and equity requirements for each CCP. There is also a potential for regulatory arbitrage. Finally, trade and positions across multiple CCPs need to be consolidated.

A CCP could create a fund by contributions from its members. This fund could be utilized in case of default by a member to settle claims with the surviving counterparties (BIS 2004). The net obligations could be limited to the size of this fund. To mitigate this risk, CCPs could impose initial and variation margins, depending on the size and liquidity of positions. Additionally, they could impose capital requirements to create a fund for mutualizing losses (Duffie et al. 2010).

Cecchetti et al. (2009) indicate that a CCP may need access to liquidity from

the central bank in times of market stress or in the case of reduced liquidity due to a member's default.

B. Trade Repositories

In addition to central clearing, regulators across jurisdictions have proposed trade repositories. It has been contended by studies such as Wilkins and Woodman (2010) that there was not enough information about the OTC trades before the crisis. Regulators lacked information about the size of trades and the volume of trades linked to a counterparty. Hence, they were not in a position to identify concentration of risk in a contract or an institution. There was no central database where regulators could gather and analyze OTC information. Studies have suggested that a trade repository (TR) would help reduce this opacity.

Trade repositories can disseminate trade data to the public and help increase market transparency. They can help OTC market participants ascertain the deal on their trades. A trade repository is an institution that maintains a centralized database that records details about OTC derivatives contracts. The purpose of a trade repository is to increase pre-trade (quotes) and post-trade (information on executed trades) transparency. It is a single place where regulators can access data about the entire OTC market, a single trade, or any institution. The objective of a TR is to provide a centralized location where regulators can access data to monitor the OTC market. Regulators can identify concentrations of risk in a trade or with an institution before such concentration becomes destabilizing for the market. They can perform post-mortems on trades and identify guilty parties or aspects that are suspicious or illegal. Trade repositories can help manage trade life cycle events (Hollanders 2012).

Russo (2010) thinks that reporting of OTC trades should be mandatory. Additionally, TRs should give free access to regulators to the information stored in the registry (Wilkins and Woodman 2010). By disseminating trade information to market participants, TRs can improve market transparency and confidence in market participants. This dissemination of information will strengthen OTC markets.

Wilkins and Woodman (2010) advocate exchange trading of standardized and liquid OTC derivatives to improve transparency. Market participants can access firm quotes and see trade prices. This information will help level the playing field for both sophisticated and unsophisticated market participants. Electronic trading platforms, by providing indicative quotes, can offer limited pre-trade transparency.

Avellaneda and Cont (2010) distinguish between pre-trade and post-trade transparency of OTC derivatives data and between regulatory and public dissemination of data where participants in the interest rate swap market use these instruments to hedge the underlying interest rate risk. Standard interest rate derivatives market trades are usually large, OTC, and institutional. Pre-trade information can be disseminated among dealers using dealer networks such as ICAP, Tradition, BGC, and Tullet Prebon. Quotes from dealer networks could be used to provide aggregate indicators of market variables to the whole market.

Post-trade information includes detailed information about trades. Avellaneda and Cont (2010) suggest that electronic trading platforms and clearing facilitites can facilitate processing and transmission of post-trade data to regulators and trade repositories. However, there are impediments to post-trade reporting. Electronic networks have not yet gained traction in OTC markets. Clearing facilities keep trade information confidential and, hence, do not disseminate this information to the market.

Exchange trading of derivative contracts can help pre-trade and post-trade transparency. However, corporations using customized variations of tenors and maturity may not be able to use exchanges, unless the exchanges offer a wide range or variety of products. Additionally, Avellaneda and Cont (2010) and Wilkins and Woodman (2010) indicate that when the trade size is large and volume low, market makers may have to hold a position for a longer period of time. In fragmented markets, full transparency is feasible as a single position does not affect the price. However, when the size of the position is greater than average trading volume, full transparency will lead to front running and will dissuade market makers as they may not be able to offload risk (Avellaneda and Cont 2010). Hence, full post-trade disclosure may adversely affect market makers. They may be reluctant to enter a trade and provide a market (Wilkins and Woodman 2010). Additionally, dealers could stop or reduce OTC market participation in favor of standardized exchange contracts. Both these measures will reduce liquidity in the OTC market and may be, in general, detrimental.

Tuckman (2010) argues that the objective of ascertaining counterparty credit risk may not be met if the data are anonymized or if there is no reporting of intra-company trade. As such, market stability may be impacted.

Knowledge of price and volume data can help market participants decide on the appropriate capital to cushion potential losses and other risk management procedures. Price information can reduce collateral disputes. Public information can help identify counterparty credit risk and help calm markets as the market participants ascertain exposure level to derivatives (Duffie et al. 2010).

Avellaneda and Cont (2010) suggest that if post-trade transparency is mandated, then such dissemination should be delayed and capped at a certain threshold. Duffie et al. (2010) indicate that position data should be reported with a delay. This delay will help market participants trade on fundamental information rather than on market information. Additionally, this delay will reduce the price impact of the knowledge of real time position information and help market makers exit or change positions at close to the available market price.

This study finds that while mandatory clearing is required in all jurisdictions, there are differences in cleared assets, timing, and exemption of parties. Only Singapore exempts foreign exchange swaps and forwards from clearing. Both the EU and Singapore require immediate clearing for all asset classes. The United States phases in clearing based on asset and counterparties to a transaction. All financial institutions face stricter regulations in the EU, with the United States and Singapore exempting smaller financial institutions. Though in theory all jurisdictions are less stringent on nonfinancial institutions, there could be differences in the levels

used to decide the size of an institution. There are also differences in organizational requirements for a CCP in these jurisdictions. These differences in requirements for assets, timing, and counterparties could lead to regulatory arbitrage across jurisdictions. Singapore, alone, does not mandate trading of cleared derivatives. This exemption increases the choices available to market participants who trade OTC products.

Regulations in all three jurisdictions focus on the collection of data and reporting to the TR to increase post-trade transparency. All jurisdictions require reporting of both cleared and uncleared OTC derivatives in all asset classes. However, there is no consistency in priority given to asset classes in various jurisdictions.

In all jurisdictions, the onus of reporting is mostly on large financial institutions. While the United States focuses on complete reporting by both financial and nonfinancial institutions, the EU and Singapore are less stringent on nonfinancial institutions. Also, only the United States has a phased-in approach to reporting depending on the institution's category. This difference in reporting requirements based on asset classes and institutions creates differing costs for reporting entities. As such, there is the potential that these reporting entities will choose more favorable jurisdictions for OTC derivatives, leading to regulatory arbitrage.

The rest of the paper is organized as follows. First, I discuss the scope of the regulations governing central clearing, margin requirements on noncentrally cleared derivatives, backloading of existing transactions, trading, and trade repositories in each of the jurisdictions. This discussion is followed by a comparison of those same regulations and, finally, concluding remarks.

II. REGULATORY AUTHORITY

The US Commodity Futures Trading Commission (CFTC) is charged with the regulation of all OTC derivatives except the OTC derivatives based on exchange-traded securities. The US Securities and Exchange Commission (SEC) is charged with the regulation of OTC derivatives representing exchanged-traded securities

The European Securities Market Authority (ESMA) is the EU-wide regulator charged with drafting regulations on OTC derivatives. It is the sole authority that approves OTC products for mandatory central clearing.

The Monetary Authority of Singapore (MAS) is the sole authority responsible for regulating OTC derivatives market in Singapore.

The United States is the only jurisdiction in this study that has multiple authorities regulating OTC derivatives market. This may lead to delay in legislation on differences in the timing and compliance mandated by the two authorities.

III. REGULATORY REQUIREMENTS

In the United States, OTC derivative contracts called *swaps* are regulated and include all asset classes, interest rate, commodity, equity, foreign exchange, and credit default swaps. Two authorities in the United States regulate swaps. Swaps regulated by the SEC are focused on securities and include single security total

returns or narrowly based indexed total returns. All other swaps including optionality in a total return swap are regulated by the CFTC.

A bilateral mixed swap with a counterparty that is a registered dealer or a major participant with the CFTC and the SEC will be subject to key provisions of the Commodity Exchange Act (CEA) and related CFTC rules and requirements of the federal securities law. For all other mixed swaps, joint permission could be sought to comply with the parallel provisions of either the CEA or the Securities Exchange Act.

The European Market Infrastructure Regulation (EMIR) incorporates all derivatives contracts that are traded OTC and not on a regulated market. There are no exclusions for any particular type of derivatives.

The Monetary Authority of Singapore incorporates all derivatives contracts. The definition of a derivative contract is very broad and includes forwards, options, and swaps.

Of the authorities in these three jurisdictions, all have very comprehensive definitions of derivatives contracts. The US definition, though, is very prescriptive (detailed) and has specific exemptions for insurance, consumer and commercial transactions, and commodity forwards. The EU and Singapore are very broad in their definition and do not have any exceptions. Additionally, complications in the registration with either the SEC or the CFTC are confusing and could be costly.

A. Central Clearing

1. United States

All swaps, regardless of their asset class, need to be centrally cleared. There is a possibility that the Treasury Secretary may exempt foreign exchange swaps and forwards from central clearing. However, the latest clarification from the CFTC (2012) indicated that even if such an exemption from the swap regulation were to be granted by the Treasury Secretary, the swaps would still be subject to reporting requirements under the CEA.

Certain insurance products and commodity forward contracts are not required to be centrally cleared. Additionally, the Federal Energy Regulatory Commission regulates instruments or electricity transactions that the CFTC finds to be in the public interest are exempt from central clearing.

End users of derivatives are exempt from central clearing. Additionally, the definition of end user is expanded to include small financial institutions (with assets of $10 billion or less) (CFTC and SEC 2012) to be exempt from the regulation. Cooperatives such as farm credit unions and credit unions are also exempt from clearing requirements.

2. European Union

All standardized OTC derivatives that have met predetermined criteria need to be centrally cleared. All firms, financial and nonfinancial, that have substantial OTC derivatives contracts need to use central counterparty clearing houses.

Nonfinancial firms below a certain "clearing threshold" are exempt from clearing through a CCP. Any OTC contract that is considered to be a hedge is exempt from clearing and as such does not even count toward the total clearing threshold. The threshold has yet to be set by the ESMA and the European Systemic Risk Board.

The "European System of Central Banks, public bodies charged with or intervening in the public debt, and the Bank for International Settlements" (EUR-Lex 2010) are not subject to clearing. There is a temporary exemption from clearing through the CCP for pension funds. There is also an exemption for intragroup transactions subject to higher bilateral collateralization by the EMIR.

3. Singapore

All standardized OTC derivatives need to be centrally cleared. Singapore dollars interest rate swaps and US dollar interest rate swaps, and nondeliverable forwards (NDFs) denominated in certain Asian currencies have been prioritized for mandatory clearing followed by other asset classes in the future. The MAS exempts foreign exchange forwards and swaps from the clearing obligation. However, currency options, NDFs, and currency swaps are not exempt. They identify the Dodd-Frank Act in the United States for such exemptions or nonexemptions. Clearing is required when at least one leg of the OTC contract is booked in Singapore and if either one of the parties is a resident or has a presence in Singapore and has a clearing mandate.

B. Requirements of CCPs

The CFTC may exempt a foreign CCP from registration if it determines that the CCP is regulated and supervised by an appropriate authority in its home country with regulations comparable to those of the United States.

A CCP is required to maintain adequate capital to cover at a minimum a loss by a defaulting member and one year's operations. It is required to have sufficient liquidity arrangements to settle claims in a timely manner. Organizationally, the board needs to have market participants as its members. The CCP should have fitness standards for its board, members of a disciplinary committee should reduce (mitigate) any conflicts of interest, and it should maintain segregation of client funds. The CCP should be able to measure and manage risks.

The European Union recognizes a third country CCP if the ESMA is satisfied that the regulations in that third country are equivalent to that of the EU. Further, the CCP should be regulated in that third country and that third country regulator must have cooperation arrangements with the ESMA.

The ESMA is responsible for the identification of contracts that need to be centrally cleared (Europa.eu 2012). A competent authority in a member state can authorize a CCP; as such, it will then be recognized and can operate in the entire EU.

There are permanent capital requirements for CCPs of €5 million. A CCP is required to maintain sufficient funds to cover losses by a defaulting clearing member

in excess of the margin posted and default funds. These funds include insurance arrangements, additional funds by other nondefaulting clearing members, and loss sharing arrangements. Additionally, a CCP should have appropriate liquidity arrangements (EUR-Lex 2010).

There are specific organizational and governance requirements for CCPs. These include separation of risk management and operations, remuneration policies to encourage risk management, and frequent and independent audits. Additionally, CCPs must have independent board members and a risk committee chaired by an independent board member. Finally, there are specific guidelines to avoid a conflict of interest and maintain segregation of client funds (EUR-Lex 2010).

Singapore has no requirement of clearing through only domestic CCPs. Singapore-based corporations can act as clearing houses if they are approved. Foreign clearing houses can operate in Singapore if they are recognized.

There are no specific requirements of the central counterparties in relation to the amount of capital required. The only presumption is that the clearing house needs to have sufficient financial, human, and system resources (MAS 2012). The MAS requires segregation of client funds.

C. Margin Requirement for Noncleared OTC Derivatives

In the United States, the CFTC (2011) proposes rulemaking for initial margin and variation margin for swap dealers (SD) and major swap participants (MSP) for which there is no "prudential regulator" on swaps that are not centrally cleared through a derivative clearing organization. The proposal allows for netting of legally enforceable positive and negative marking to market swaps and reduction in margin requirements with off-setting risk characteristics. Only swaps entered after the effective date of the regulation are covered. The forthcoming capital rules will encompass existing swaps. There are no margin requirements on nonfinancial end users. Initial and variation margin requirements would not be required if payments are below the "minimum transfer amount" of $100,000.

SD, MSP, or financial entities can post initial margins in the form of cash; US government or agency securities; senior debt obligations of the Federal National Mortgage Association, the Federal Home Loan Mortgage Corporation, a Federal Home Loan Bank, or the Federal Agricultural Mortgage Corporation; or any "insured obligation of a farm" credit system bank. A variation margin has to be posted in cash or US Treasury securities. For nonfinancial entities, there is flexibility about assets that could be used as long as their value can be easily assessed on a periodic basis.

Those SD and MSP that have a "prudential regulator" are required to meet the margin requirements of that regulator. A prudential regulator is the Federal Reserve Board, the Office of the Comptroller of the Currency, the Federal Deposit Insurance Corporation, the Farm Credit Administration, or the Federal Housing Finance Agency. These commissions will propose capital requirements and financial condition reporting for SD and MSP at a later date.

In the EU, financial and nonfinancial firms that enter into OTC contracts that

are not centrally cleared through a CCP have to adopt procedures to measure, monitor, and mitigate both operational and credit risk including timely electronic confirmation of contract terms and early dispute resolution. Additionally, the contracts have to be marked to market on a daily basis. Finally, there should be appropriate exchange of segregated collateral or appropriate and proportionate holding of capital. These rules are applicable only to market participants subject to central clearing obligations (Herbert Smith LLP 2012).

Singapore recommends financial buffers of capital and margins to mitigate the risk of OTC derivatives that are not centrally cleared. The amount of capital and margin should reflect and be proportionate to the risk of noncentrally cleared OTC contracts.

The MAS will be implementing the Basel III requirements of capital for banks and will seek to align capital requirements of other regulated financial institutions with Basel III. The MAS will seek to align margin requirements on noncentrally cleared derivatives in accordance with the recommendations of the working group made up of representatives from the Basel Committee on Banking Supervision (BCBS), the Committee on the Global Financial System, the Committee on Payment and Settlement Systems, and the International Organization of Securities Commissions.

D. Trading

All centrally cleared swaps in the United States are required to trade on a swap execution facility unless the swap execution facility or exchange does not accept the swaps. In the EU, all cleared OTC derivatives have trading requirements mandated by the Markets in Financial Instruments Directive. The MAS does not require trading of centrally cleared OTC derivatives in Singapore.

E. Backloading of Existing OTC Contracts

In the United States, the Dodd-Frank Act applies to swaps entered only after the mandatory clearing requirement. However, this exemption is not applicable for reporting. The EU has proposed to require backloading of outstanding contracts with remaining maturities over a certain threshold (MAS 2012). In Singapore, a contract for a product subject to mandatory central clearing and having more than a year left before maturity is backloaded. Table 1 summarizes the regulatory requirements for these three jurisdictions.

F. Reporting Requirements

1. United States

In the United States, swaps trade repositories are regulated by the CFTC or the SEC. TRs authorized by the CFTC (SEC) deal in swaps regulated by the CFTC (SEC). All traded or bilaterally negotiated swaps have to be reported. These swaps

Table 1. Summary of Regulatory Requirements by Jurisdiction.

	United States	**European Union**	**Singapore**
Mandatory clearing	Yes	Yes	Yes
Who will clear	All financials,all end users, all above $10 billion	All financials and non-financials above a threshold. Temporary exemption for pension funds	All financial counterparties above a threshold, at least one leg in Singapore or one of the parties in Singapore
Assets	All assets	All assets	All except foreign exchange swaps and forwards
Domestic CCP only	Yes (exception if foreign CCP is in comparable jurisdiction)	Yes (exception if foreign CCP is in comparable jurisdiction and contract with foreign regulator)	No
Backloading	Yes	Yes, above a threshold	Yes, above a year
Interoperability	None	Yes	None
Mandatory trading	Yes	Yes	No
Margin requirement for non-centrally cleared derivatives	Yes	Yes	Yes
Base capital for CCP	Yes	Yes	Yes
Organizational requirements	Yes	Yes	Yes
Loss Mitigation	Capital for loss and one year operation liquidity arrangements	Capital liquidity arrangements, default funds, and insurance guarantees	N/A

have to be between two unrelated parties and any changes to the swap agreement have to be reported.

If a swap is executed by a swap execution facility (SEF) or designated contract market (DCM), the SEF or the CCP is required to report swap data to the TR as soon as technologically possible. For an off-facility swap, the hierarchy lies with the SD followed by MSP, followed by a non-SD or non-MSP. When the counterparties are within the same category, they have to choose which one of them will report. Both parties can choose to report and there is no condition of nonduplication. The party required to report is ultimately liable for the reported data even if that party contracts reporting to a third party (Young et al. 2012).

Any swap (mandatory cleared or nonmandatory) that is cleared before the reporting deadlines for primary data can be reported by the clearing facility. Confirmation data on a cleared swap need to be reported by the clearing facility. For a noncleared swap, confirmation data need to be reported by the counterparty as soon as technologically possible. Any changes to the swap over its lifetime need to be reported by the respective parties listed above. Additionally, the state of the swap needs to be reported daily to the TR (Young et al. 2012).

There is a real time public reporting obligation by a TR. Such reporting will not identify the counterparty and should be done when technologically possible. These records must be retained for the life of the swap and for five years after the termination of the swap.

A TR needs to be appropriately organized and be able to perform its duties in a fair, equitable, and consistent manner. The TR should have emergency procedures and system safeguards and provide data to regulators.

2. European Union

The ESMA has the regulatory power to register a trade repository in Europe. Regulators in individual countries cannot do so. Foreign authorities can deal with the ESMA for exchange of information and bilateral negotiations.

Foreign TRs are recognized if regulations in the foreign country are comparable to those of the EU and there is appropriate surveillance in that third country. Additionally, there should be agreement between that country and the EU for exchange of information.

Financial counterparties are required to report to a TR and to report to regulatory authorities if a TR is unable to record a contract. A counterparty required to report may delegate such reporting to another counterparty. Reporting should include the parties to the contract, the underlying type of contract, maturity, and the notional value. A nonfinancial counterparty, above the information threshold, is required to report on OTC contracts. Such reporting must be done in one business day from the execution, modification, or clearing of the contract. There should be no duplication.

The regulation has proposed robust governance arrangements including organizational structure to ensure continuity, orderly functioning of the TR, quality

of management, and adequate policies and procedures. Operational requirements include a secure TR with policies for business continuity and disaster recovery. Data reported to a TR should be confidential even from affiliates or the parent of the TR.

A TR will share information with (a) the ESMA; (b) the competent authorities supervising undertaking subject to the reporting obligation under Article 6; (c) the competent authority supervising CCPs accessing the trade repository; and (d) the relevant central banks of the European System of Central Banks. A TR will maintain confidentiality of information and maintain records for at least 10 years after the termination of a contract. A TR will aggregate data based on both class of derivatives and reporting entity.

3. Singapore

The MAS does not require reporting to a domestic TR. The MAS has proposed two types of trade repositories — approved and recognized overseas trade repositories (ATR and ROTR). Approved TRs are domestic, whereas ROTRs are foreign incorporated TRs. The MAS has not required foreign regulators to indemnify ATRs or ROTRs before obtaining data from them.

The MAS has proposed reporting for all asset classes of derivatives. However, it recommends a phased implementation of the reporting requirement with a priority given to asset derivatives from a significant share of the Singapore OTC market interest rate, foreign exchange, and oil derivatives. Oil forms a significant part of the physical market during the Asian time zone, but it does not form a significant part of the Singapore derivatives market.

All contracts that are booked or traded in Singapore or denominated in Singapore dollars are required to be reported. All contracts where the underlying entity or market participant is resident or has a presence in Singapore also need to be reported. Any foreign finance entities are not required to report in Singapore. However, if MAS has an interest in an entity, it will seek information from a foreign authority.

All financial entities and any nonfinancial entity above a threshold (that takes into account the asset size of the entity) have to report. Additionally, group-wide reporting is required for Singapore incorporated banks.

Singapore allows single-sided reporting and third-party reporting. While single-sided reporting is mandatory for financial entities, only one of the nonfinancial entities (among a group) needs to report. Foreign entities are not required to report, and public bodies are excluded from reporting.

Transaction-level data, including transaction economics, counterparty, underlying entity information, and operational and event data, need to be reported. The content of the data needs to be reported in both functional and data field approaches. Any changes to the terms of the contract over its life need to be reported. The MAS has proposed a legal entity identifier and standard product classification system, but has not required it. The data need to be reported within one business day of the transaction. The MAS requires backloading of pre-existing contracts.

Both TRs are required to have safe and efficient operations with appropriate risk management and security. They are required to avoid conflict of interest and maintain confidentiality of user information. They are required to maintain transparent reporting with authorities. The MAS is considering minimum base capital requirements on TRs. A ROTR may comply with comparable regulations in home jurisdictions. Table 2 summarizes the reporting requirements for the three jurisdictions.

IV. COMPARISON OF REGULATORY REQUIREMENTS

A. Clearing Requirements

Clearing exemptions for a certain asset class may not necessarily mean that these assets will not move to central clearing. As mentioned before, noncentrally cleared assets are required to maintain higher collateral. This increased requirement in collateral may lead to prohibitive costs.

The EU regulation is stricter for all financial entities as it gives no exemption on the size of the financial entity. Financial entities in Singapore below a certain threshold (below $10 billion in the United States) have an exemption from central clearing. As such, they and those exempted entities in the United States may have reduced costs and a competitive advantage over larger domestic rivals and all EU rivals.

The regulations for nonfinancial entities below a certain threshold are comparable in their exemption. While the United States has specified a $10 billion threshold, such has not yet been specified by the EU and Singapore. Any differences among these jurisdictions in the clearing threshold will be beneficial to the entities in respective jurisdictions.

The EU is the only jurisdiction that exempts pensions from clearing requirements. The idea is that pensions are mostly fully invested. To subject them to the clearing requirement will be detrimental to the pension funds.

However, pensions do deal in derivatives to hedge their interest rate and inflation risk. Leahy and Hurrell (2012) indicate that in many cases pension funds hedge those risks with financial counterparties. A requirement on financial counterparties to hold higher collateral on noncentrally cleared derivatives will require them to hold higher collateral for derivative hedges they enter with pension funds. This increases the cost to financial institutions which, in turn, pass them on to pension funds.

An exemption given to any nonfinancial entity below a certain threshold may still be costly for these institutions because, in most cases, the counterparty to these transactions may be a larger financial institution. To the extent that these larger financial institutions have to hold higher collateral, nonfinancial entities will bear a higher cost. This defeats the very purpose of the exemption. The alternative will be that even the exempt nonfinancial institutions will have to centrally clear their products.

Only Singapore gives an exemption from central clearing to domestic and foreign

central banks and supranational institutions. The EU regulation exempts member state banks from central clearing but is not clear on exemptions for foreign central banks.

B. Requirements for CCPs

The United States and EU require clearing through a domestic CCP. Clearing through a foreign CCP is acceptable in these jurisdictions if a foreign CCP is under a jurisdiction that has regulations comparable to that of either the United States or the EU. There are concerns that such requirement of equivalence in regulation will result in comparing identical points of regulations rather than the intent of regulations in foreign jurisdictions. The requirement for equivalency in foreign jurisdictions results in central clearing through a domestic CCP rather than foreign CCP. Having multiple CCPs will result in fragmentation of clearing.

Singapore is the only jurisdiction that allows central clearing using a foreign CCP without requiring investigation of regulations and agreements with foreign regulators. As such, Singapore has much more flexible regulations with respect to the choice of the CCP.

The EU has the most prescriptive regulation on the organization of a CCP and a choice of model for the CCP. The regulation indicates a mutualized CCP where the losses of a clearing member's default are mutualized through a default fund and loss sharing. As mentioned by Koeppl and Monnet (2008), this mutualization may ensure that the impact of default is minimized and may not pose systemic risk. However, liquidity may be affected in the case of default as the CCP focuses on default resolution rather than efficient trading, which is taken care of by the regulation through liquidity arrangements and insurance guarantees.

Only Europe allows interoperability of a CCP and, to that extent, reduces risk. Thus, it allows netting across asset classes. As such, there is a reduced need for collateral. Further, multilateral netting across asset classes also reduces risk.

C. Backloading of Existing Contracts

Backloading of contracts written prior to the regulation requires market participants to clear through CCPs. When these contracts were written, there was no regulation requiring OTC contracts to novate through a CCP. The choice of the counterparty was based on the best value provided rather than the counterparty credit risk and any mandated collateral requirements. Additionally, requiring these contracts to clear through a CCP subjects them to the model of a CCP. Backloading is of particular importance in the case of jurisdiction, such as the EU, that prescribes a CCP model. Each CCP model has specific costs. These costs may not have been considered while writing the original contracts. As such, the original contracts may be uneconomical for market participants subject to new regulations.

The US regulation is strict as it requires backloading with no exemption for the size or the duration of the contract. Therefore, market participants will face additional costs in the United States.

Table 2. Summary of Reporting Requirements.

	United States	European Union	Singapore
Reporting by TR			
Real time public reporting	Yes	No	No
Time delay to report to SDR	Minutes, "as soon as technologically possible"	++1 day	++1 day
Disclosure of identity of counterparty to public	No	No	No
Notional amount reporting to public	Capped	N/A	N/A
Recordkeeping	5 years until swap terminated, 2 years after termination	10 years	N/A
Regulation of TR			
Domestic only	No	No	No
Cooperation among regulators required	Yes	Yes	Yes
Indemnity required	Yes	No	No
Governance of TRs	Yes	Yes	Yes
Capital requirement	No	No	No
Foreign TR reporting	Yes	Yes	Yes
3rd party reporting	Yes	Yes	Yes
Single-party reporting	Yes	Yes	Yes
Double reporting	Yes	No	No

Table 2, continued. Summary of Reporting Requirements.

	United States	**European Union**	**Singapore**
Regulated by	CFTC or SEC	ESMA	MAS
Reporting for Products			
Required for cleared derivatives	Yes	Yes	Yes
Required for un-cleared derivatives	Yes	Yes	Yes
Phased-in reporting by product	Interest rate first followed by foreign exchange & commodity	None	Interest rate, foreign exchange, & oil first, followed by others
Phased reporting by entity	SD and MSP first, followed by non-SD & non-MSP	None	None
Threshold	None	Yes	Yes
Backloading	None	Yes	Yes, over 1 year
Intragroup trades	Not reported	Not reported	Not reported
What swaps need to be reported	All	All	All
When reported	Upon execution and changes	Upon execution and changes	Upon execution and changes
Confirmed	Yes	N/A	N/A
Subsequent changes to the swap	Reported	Reported	Reported
Daily value of the swap	Yes*	N/A	N/A

The EU regulation is most beneficial for transactions below the threshold and does not benefit any specific asset class. The Singapore regulation has the potential to benefit foreign exchange contracts (Global Financial Markets Association 2012) as they are typically short term in nature. As indicated, 99% of these contracts are for less than one year and hence do not need to be renegotiated.

D. Margin Requirements for Noncleared OTC Derivatives

All jurisdictions require an initial and variation margin. The US regulation has details about netting among legally enforceable offsetting contracts and "minimum transfer" amount. The United States exempts all nonfinancial end users, while the EU exempts any user not subject to central clearing. Singapore is not clear on this requirement. As all jurisdictions subject financial companies to these regulations, their costs may increase to hold collateral and margins. To the extent that these financial companies are on the other side of the contract with exempt companies, financial companies are still subject to these regulations. It is likely that these additional costs will be passed on to the nonfinancial companies exempt from the regulation.

E. Reporting Requirements

Reporting requirements are consistent across all three regulatory environments in that they require reporting on all asset classes. However, there is a difference in the timeline for reporting. In Europe, there is no phasing in. Singapore requires interest rate, foreign exchanges, and oil derivatives to be reported, followed by others. Finally, the United States has the most tiered reporting requirement. Interest rate derivatives are to be reported first, followed by the foreign exchange and commodity derivatives. Both cleared and uncleared trades need to be reported in all three jurisdictions.

The Singaporean requirement of reporting affects any party or transactions related to Singapore. Singapore is a relatively smaller market; hence, its immediate reporting requirement of foreign exchange and oil derivatives, which are additional to that of the United States of interest rate derivatives, may not affect a significant number of market participants or transactions.

The European requirement of immediate reporting of all assets will be a dominating requirement. Phasing-in allowed by the United States will give little flexibility if most of the transactions are cross-border.

All countries require financial institutions to report. However, there are significant differences. While Singapore requires only financial institutions above a threshold to report, both the EU and the United States require all financial institutions to report.

Nonfinancial entities only above a certain threshold are required to report in both the EU and Singapore. In the United States, while nonfinancial institutions are the last to report, there is no exemption for smaller institutions. The Singapore

regulation is more accommodating for smaller (financial and nonfinancial) institutions and will help such institutions keep costs down.

Only the US regulation has phased-in reporting, with financial institutions reporting first, followed by nonfinancial institutions. This gives nonfinancial institutions additional time to comply.

All three jurisdictions allow third-party reporting and single-sided reporting. However, only the United States allows for double reporting. Double reporting might be beneficial to the trade repository to confirm the accuracy of the data being reported. It would be costly for the trade repository to verify the accuracy of the data if double reporting is not allowed. However, double reporting involves costs associated with consolidation of data and the reporting costs incurred by each counterparty.

Time to report information to the trade repository is almost immediate in the United States. Both the EU and Singapore allow one day to report information to the trade repository. All three countries require not only initial reporting but also any subsequent changes to the contract. The Depository Trust and Clearing Corporation (DTCC 2012) believes that for day+1 care should be taken to avoid intraday cutoff.

Only the United States requires real time public reporting by the TR. While all countries require that the identity of the counterparties be kept confidential, only the United States requires the notional amount of the swap to be capped while public reporting. Capping of notional amounts will provide an added measure of security in keeping the identity of the counterparty confidential.

All three countries have similar governance of TRs. TRs are required to keep data confidential. The MAS proposal indicates that data collected by a TR serve a regulatory purpose. However, it does not specifically prohibit use of that data by affiliates of the TR or the TR itself for commercial use. Such absence of a specific prohibition may allow these private entities to benefit from privileged information (Argus 2012).

Only the EU prohibits the TR from sharing data with its parent or a subsidiary. Only Singapore is considering base capital requirement from the TR.

Singapore has no requirement for the time to keep records. The United States requires the data to be kept for 5 years and the EU for 10 years after the expiration of the contract.

The objective of the OTC regulation is to improve collection and monitoring of the OTC market. As such, the regulators in the three jurisdictions have focused on post-trade transparency. A major portion of this post-trade transparency deals with reporting information to the TR in a timely manner. Market participants in the United States face the most stringent deadline regarding reporting of information to the TR upon execution. All three jurisdictions have comparable information that needs to be reported.

In all jurisdictions, the onus of reporting falls primarily on financial institutions. Singapore is more favorable to smaller financial institutions. In the United States, nonfinancial institutions have to report only when there is no financial counterparty.

Both Singapore and the EU require only nonfinancial institutions above a certain threshold to report. Thus, regulations in Singapore and the EU are more favorable to smaller, nonfinancial institutions. Additionally, a potential for regulatory arbitrage is possible depending on the threshold level used.

The bulk of the above regulations focus on reducing reporting and regulatory costs for nonfinancial participants and smaller institutions. The idea is that as these participants do not regularly deal with derivatives, it will be costly for them to report. Even if these participants deal with derivatives, the financial counterparties have the requisite manpower and systems to meet the reporting obligations. Thus, it will be more cost effective to use their existing system for reporting.

Single-sided reporting is based on the same concept as stated above. However, only mandating a single counterparty to report while reducing reporting and reconciliation costs may increase inaccuracies in reported data. Improper data will definitely not help the regulators to properly maintain the markets. Though single-sided reporting may reduce costs, there may be situations in which double-sided reporting is preferred. This might be in the case of firms that want to be consistent with reporting and report all their trades. Also, if a party is ultimately responsible for the accuracy of a trade, it may want to report it. Finally, double reporting may be essential for trade repositories as it will be easier to compare and note and/or correct differences (DTCC 2012).

To avoid fractioning of data across jurisdictions and TRs, regulators in all three countries approve of reporting to TRs in foreign jurisdictions. They condition this approval on agreements between regulators in foreign countries with domestic regulators and compatibility of regulation. Bilateral negotiations between jurisdictions could take a considerable amount of time. The two regulators in the United States, the CFTC and SEC, had to go through various negotiations and time to propose rules on OTC derivatives. Hence, it is possible that market participants may have to report in various TRs leading to duplication and increased costs. There is also a chance that this will lead to fragmentation of data. Any fragmentation of data will not give regulators a complete picture of a market participant's exposure or about an asset class. Hence, regulators will not be in a position to maintain global concentration of positions by asset on a counterparty.

Regulators in all three jurisdictions have erred on maintaining confidentiality. The US regulation is more stringent, not just requiring counterparty confidentiality but also requiring capping of the notional amount in public reporting. This requirement will not help post-trade transparency. However, where markets are more concentrated by few participants, it is wise to maintain trade confidentiality. This will help market makers provide liquidity in the market.

V. CONCLUSION

This study compares clearing and reporting regulation of OTC derivatives in Singapore, the United States, and the EU on assets, institutions, and the timing of regulation. The United States and the EU require central clearing and trading of all asset classes. Singapore requires only central clearing but not trading of all assets

except foreign exchange swaps and forwards. Further, only the United States has phased implementation for reporting; Singapore prioritizes foreign exchange derivatives, interest rate contracts, and oil contracts. As the United States is in the most advanced stages of implementation of OTC regulation, the phasing in will be only a marginal reprieve. Singapore's clearing regulation is less stringent on foreign exchange derivatives but not on reporting.

Small nonfinancial companies in Singapore and the EU face no regulation of mandatory clearing and reporting. While smaller financial companies have no clearing requirements in Singapore and the United States, they do face reporting requirements (last to report). Hence, the bulk of the regulation is to minimize costs for nonfinancial companies, in particular, the smaller nonfinancial institutions. Regulatory arbitrage is thus possible only based on the threshold used for clearing and reporting in each of the jurisdictions.

The United States is in the most advanced stages of the derivatives regulation. It has both adopted and implemented regulations on clearing and reporting. The EU has agreement among members on the OTC regulation but has not yet implemented the regulation. Finally, Singapore has not yet adopted nor implemented OTC regulation (Financial Stability Board 2012). Thus, it is the time to implement regulation that may lead to a regulatory arbitrage towards the EU and Singapore.

The main difference in the three regulatory jurisdictions is the nonrequirement of trading of cleared derivatives in Singapore. This difference has the potential to provide substantial choices in trading venues for market participants.

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