OTC Derivatives Market Concentration Use Case Note

October 2017

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1 Introduction

The OTC Derivatives Regulators' Forum (ODRF) was launched in September 2009 to provide authorities interested in over-the-counter (OTC) derivatives markets and their supporting infrastructures with a means to cooperate, exchange views, and share information on OTC derivatives central counterparties (CCPs) and trade repositories (TRs). The ODRF revised its mandate in 2014 to focus on use of TR data, TR data quality and access. The Technical Working Group (TWG) was established by the ODRF in May 2014 to facilitate sharing practical experience and information including the identification and resolution of deficiencies in the reliability and usefulness of data as it is delivered and presented to authorities, and derivatives data usage.

The ODRF and the TWG decided to focus on identifying and describing use cases of how some authorities are using OTC derivatives data. Work streams were formed to undertake this work, including on market concentration.

In September 2009, G20 Leaders agreed in Pittsburgh that OTC derivative contracts should be reported to trade repositories[1]. This note serves to provide transparency into examples of ways that some authorities are using this data and the data's importance. The data has proven to be an important window into the derivatives markets, which is greatly assisting these authorities in fulfilling their monitoring and/or oversight duties.

In the most recent financial crisis, one of the key lessons was that banks did not always consistently measure, aggregate and control exposures to single counterparties or to groups of connected counterparties across their books and operations.[2] As such, policy makers and researchers have turned their attention to assessing market concentration in view of the large volume of OTC derivatives trades that creates an intricate system of liability linkages among market participants. The Bank for International Settlement (BIS) noted that, in particular, authorities may find that putting in place a large exposures framework that measures and limits the size of large exposures may serve as a tool to protect banks from large losses resulting from the sudden default of a single counterparty.[3]

This note documents the discussions and experiences of some work stream members on OTC derivatives market concentration. As market concentration is multidimensional, there are multiple ways authorities assess it. Work stream members highlighted the following types of assessments: concentration by entity, product, fund, geographical location, clearing member, trade desk, and sector. The market concentration degree has been quantified and visualized through analyzing OTC derivatives TR data; some work stream member authorities' market concentration analysis cases are provided in this note.

This note does not reflect the views of all ODRF members, or the experiences of all work stream members,[4] nor does it represent recommendations of what authorities should do. This note identifies and describes how some authorities (in this case, some work stream members authorities) are using derivatives data.

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[1] OTC Derivatives Market Reforms Eleventh Progress Report on Implementation, 26 August 2016 http://www.fsb.org/wp-content/uploads/OTC-Derivatives-Market-Reforms-Eleventh-Progress-Report.pdf

[2] Supervisory framework for measuring and controlling large exposures, BIS, April 2014, http://www.bis.org/publ/bcbs283.pdf

[3] Id.

[4] A list of market concentration work stream members is in Appendix II.

2 Market Concentration Definition Used and Different Types of Assessments Addressed in this Note

2.1 Definition of market concentration

The Committee on Payment and Settlement Systems (CPSS)[5] and the International Organization of Securities Commissions (IOSCO) have defined the concept of concentration as follows: "Concentration refers to the relative role of individuals or groups of financial institutions within a market segment. The build-up of relatively large volumes of activity or relatively large positions (as measured by notional or mark-to-market amounts outstanding) in some defined population could increase systemic risk."[6]

2.2 Different types of market concentration assessments

While the CPMI-IOSCO report defines concentration as the relative role of market participants, market concentration is multidimensional. In addition to analyzing the concentrated exposures by entity, some work stream members expressed interest in examining concentration by product, fund, geographic location, clearing member, trading desk, branch, and sector. Some work stream members also noted that it may be meaningful to evaluate the data over time, regardless of the type of assessment chosen, rather than a time-static cross-sectional view.

2.2.1 Concentration by entity

The aim in constructing a detailed network of market participants is to have sufficient information on individual market participants' relationships hierarchy. Some work stream members consider this information essential for determining those market participants' risk aggregation. Without knowing the concentration of risk within a particular market participant, it may be difficult to determine overall aggregate market concentration. Some work stream members noted that for this reason they often seek to determine the amount of risk held by their local market participants domestically and internationally through their internal hierarchy relationships.

2.2.2 Concentration by product

Some work stream members stated that they might gain knowledge of systemic risk or regulatory arbitrage by using TR data to look at which products are traded. For example, a significant amount of activity in products such as swaps around specific dates could suggest possible tax or regulatory arbitrage.

2.2.3 Concentration by fund

Some work stream members have expressed their interest in market concentration by fund, as funds are increasingly important in OTC derivatives markets. Some funds use OTC derivatives to synthetically replicate their investment target (usually an index) while also using OTC derivatives to hedge their risks. The strong growth of mutual funds[7] and other funds such as Exchange Traded Funds (ETFs), in the last decade has raised some awareness on their importance.

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[5] Named Committee on Payments and Market Infrastructures (CPMI) since September 2014.

[6] Authorities' access to trade repository data, August 2013, http://www.bis.org/cpmi/publ/d110.pdf (CPMI-IOSCO report).

[7] In 2015 total assets invested through funds amounted to 37.2 trillion USD according to Investment Company Institute (ICI) statistics, https://www.ici.org/pdf/2016_factbook.pdf.

It was noted by some members that the availability of fund structure information (such as fund manager, fund type[8], and investment classification[9]) may help them analyse the fund's behaviour in OTC derivatives markets. There also are other types of collective investment vehicles regulated in other ways such as hedge funds and pension funds. Some work stream members believe it would facilitate more targeted analysis of different types of market participants' activities and risk exposures in OTC derivatives markets if these other kinds of collective investment vehicles could be distinguished.

2.2.4 Geographic concentration

Some work stream members are of the view that assessing the degree of market concentration by geographical jurisdiction can assist them in taking steps to help ensure the stability of their market.

While this type of analysis might be useful to authorities, some work stream members report that data limitations and legal barriers to accessing data pose certain hurdles. These hurdles have resulted in some authorities having a less-granular view of their geographical market than they would like. For example, some authorities have data of market participants in their jurisdiction but have only a partial view of transactions that reference underlying assets in their jurisdiction. Therefore it is not always practicable for such authorities to conduct a meaningful geographic concentration analysis of underlying assets at this stage.

2.2.5 Clearing member concentration

Some work stream members have noted that distinguishing between the agency and principal model for client clearing, and their impact on the clearing member margin requirement may help analyze the clearing member concentration. Under the principal model, the clearing member contracts as the principal with the CCP and the client does not have a direct relationship with the CCP.[10] In this model, measuring concentration is done by aggregating positions between CCP and clearing members. In the agency model, the clearing member acts as the agent for the client, though the client also has a contractual relationship with the CCP.[11] A key question some work stream members noted is how the ultimate exposure (initial margin, variation margin, guarantee fund, special assessments on clearing members, as well as client performance guarantee) is allocated between a client and a clearing member in the agency model.

In the event of a severe market downturn where multiple client clearing firms are unable to meet the variation margin call, the exposure of the clearing members to the CCP could rapidly increase. Some work stream members noted that measuring the degree of concentration using clearing members could shed light on this potential source of systemic risk.

2.2.6 Concentration by trading desk

Some work stream members noted that analyzing the market concentration by trading desk ID may help them detect market misconduct. The "London Whale" scandal shows that large trades could be hidden in a certain unit within a large financial institution, even as the large trader's exposures ballooned. Some

[8] Examples of fund type include open-end-fund, closed-end-fund, unit investment trusts, and ETFs.

[9] Examples of investment classifications include money market funds, bond funds, equity funds, balanced funds, indexed or passive funds, and actively managed funds.

[10] Ashwin Clark & Paul Ryan. "Non-dealer Clearing of Over-the-counter Derivatives," at n.6, Reserve Bank of Australia, 2014

[11] Id.

work stream members have noted that since one LEI could be used for all derivatives transactions in a single financial institution, it is difficult for authorities to view certain positions that are abnormally large within a certain trading desk.

2.2.7 Concentration by branch

Some work stream members have identified that concentration of OTC derivatives at the branch level is critically important to them. For example, for the resolution authority of a going-concern legal entity, OTC derivative exposures (along with assets and liabilities) held in the non-domestic branches of a systemically important financial institution (SIFI) may be subject to a jurisdiction's laws that are out of the resolution authority's reach. Differences between jurisdictional statutes in regulation of a going-concern legal entity may prohibit transfer of collateral and cross-jurisdictional netting and thereby invalidate other terms of the OTC contract. The unique identification of branches is an area that is being looked at by the LEI ROC.

2.2.8 Concentration by sector

Some work stream members noted that evaluating market concentration by sector may help them monitor systemic risk, especially when the risk is driven by sector-specific events. Sector concentration is measured by authorities from different perspectives; capturing the sectors to which the (buy-side) counterparties belong shows which sector is most dominant in OTC derivative trading; alternatively capturing the sectors to which the reference entities in OTC contracts belong may show which sector is the most hedged with OTC derivatives contracts.

As for sectors of counterparties, few jurisdictions require this information to be reported. However, some work stream member authorities have mapped the sector information for counterparties from the reference data sources. Some work stream members expressed that the desired granularity of sector information is not always met by the reference data sources. The LEI ROC has been studying the feasibility of including the sector indication to the LEI reference data.

As for sectors of reference entities, a development that drew some work stream members' attention is the centralized securities database (CSDB) by the European Central Bank (ECB).[12] CSDB is an on-going project but once finished, it can be used to link the LEIs to ISINs, which could be used to map out sector information. The ISIN database has sector information that the LEI database currently does not have. Such information could help authorities' aggregate derivatives positions by the sector of counterparties.

3 Market Concentration Use Cases

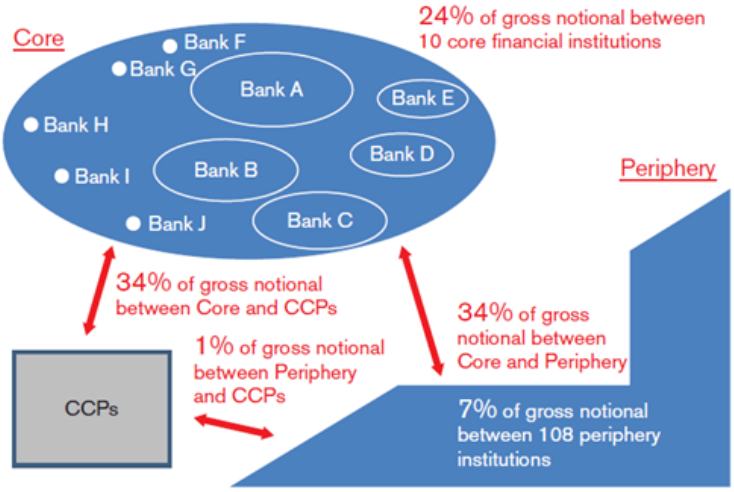
3.1 Core-periphery structure analysis – HKMA use case

The Hong Kong Monetary Authority (HKMA) published the article "A first analysis of derivatives data in the Hong Kong Trade Repository"[13] in the HKMA Quarterly Bulletin in 2015. TR data was used to assess market concentration using a variety of approaches. At the time of publication, the statistics did not reflect the entirety of the derivatives market in Hong Kong. The reporting requirements covered interest rate swaps (IRS) and non-deliverable forwards (NDF) between licensed banks and were being expanded in phases to different entities and products.

[12] https://www.ecb.europa.eu/pub/pdf/other/centralisedsecuritiesdatabase201002en.pdf
[13] http://www.hkma.gov.hk/media/eng/publication-and-research/quarterly-bulletin/qb201506/fa.pdf

The first approach used in the article is to identify the core institutions (as defined in the core-periphery model in the network literature[14]) and to compute the share of gross notional held by the core institutions versus the periphery in the derivatives network. The second approach in the article is to compute, for each of the two products (IRS and NDF), the Herfindahl-Hirschman Index (HHI). Staff also computed the share of gross notional held by the top 1/2/3 reporting entities for each product for internal use.

Figure 1: Core-periphery structure of the derivatives network



Sources: HKTR data and HKMA staff calculations.

Note: Uses November 2014 data from Hong Kong Trade Repository.

Figure 1 maps the network structure of the Hong Kong Trade Repository (HKTR) data using TR data from November 2014. Institutions are the nodes of the network and the derivatives trades they report between each other (measured by gross notional) are the links between the nodes.

The core is identified as the institutions that rank highly on each of three measures of concentration, interconnectedness and complexity.[15] For each institution, concentration is measured by the gross notional of derivatives positions; interconnectedness by the number of counterparties; and complexity by the number of derivatives positions on balance sheet (or trade count). The HKMA concluded that, it would seem that institutions that intermediate a large share of the market have the potential to stabilise or destabilise the system; that the number of connections to other counterparties can be important conduits for propagating contagion; and that a large number of open derivatives positions can introduce complexity and opacity on balance sheets.

[14] The key paper to generate the insight of the core-periphery structure is by Craig, B and G von Peter (2010), "Interbank tiering and money center banks", BIS Working Paper 322 (later published in *Journal of Financial Intermediation*, 2014).

[15] The ranking is within the same data set - it is unclear whether a high value would also be high in global data because of the absence of international benchmarks for these measures.

The HKMA's analysis indicates that the pattern of outstanding positions follows the core-periphery structure. Ten institutions form the core of the network and are counterparty to 92% of the total gross notional value of derivatives. The core trades with other core institutions (24% of total gross notional) and with periphery institutions (34% of total gross notional). In contrast, periphery institutions trade little with other periphery institutions (7% of total gross notional). The remaining one third of gross notional outstanding is cleared with CCPs, mostly with core institutions on both sides of the position before clearing.

Analysing the IRS and NDF networks separately, only four institutions are core players in both products. Holdings of derivatives are more concentrated in the core of the IRS network, as measured by a higher HHI. The value of the index is 0.54 in the core of the IRS network and 0.35 in the core of the NDF network.

3.2 Market concentration analysis in mandatory clearing determination – Canadian authorities use case

As result of the G-20 leaders' agreement in September 2009 to make substantial reforms to global OTC derivatives market[16],many authorities have introduced or are in the process of introducing clearing obligations and have developed a methodology for determining when OTC derivatives are required to be cleared. In fall 2015, the Québec Autorité des Marchés financiers (QAMF) and the Ontario Securities Commission (OSC) developed a methodology to assess mandatory clearing requirements. The methodology has since been improved to support the proposed clearing determinations put forward by the Canadian Securities Administrators ("CSA") Derivatives Committee. Market dispersion, standardization, liquidity, availability of pricing data, and international harmonization were the determinants of mandatory clearing.

To develop the methodology, the QAMF and OSC used OTC derivatives TR data and CCPs' quarterly regulatory filings. The HHI and the proportion of the Ontario clearing members' (including largest Canadian financial institutions) notional volumes of the clearing activity were calculated to measure the market concentration level. Market dispersion (or lack of concentration) is assumed to be acceptable when the positions of the six largest market participants or clearing members clearing a specific product can be absorbed by the other market participants or clearing members clearing that product in the event that large clearing member leaves the market. The analysis was mainly conducted on the interest rate derivatives (IRD) asset class (in various currencies). The OSC's data has shown that the largest Ontario clearing members do not represent a majority of the aggregate notional volumes of IRD that are cleared through the CCPs (even by looking at the IRD in different currencies), it could be assumed that the remaining proportion are foreign participants who could contribute to the bidding process for one or more defaulting clearing members' portfolio. Thus, the OSC concluded that the market may not be highly concentrated.

3.3 Clearing member concentration analysis – using CFTC public data use case

To measure clearing member concentration, the cumulated percentage of client swap margin held by larger clearing member(s) is calculated and tracked over time. The financial data for clearing members is collected by the CFTC and is made public[17]. The following table shows the trend in concentration of swap margins held among the list of clearing members. The top five clearing members hold at least 68% of the swap margin. This concentration has been consistent over the last three years.

[16] http://www.fsb.org/wp-content/uploads/r_101025.pdf

[17] Accessible at http://www.cftc.gov/MarketReports/financialfcmdata/index.htm

Table 1: Swap margins held among the list of clearing members

Number of clearing member	January 2015	January 2016	January 2017
Top 1	23%	17%	20%
Top 2	38%	33%	38%
Top 3	50%	46%	53%
Top 4	62%	59%	66%
Top 5	73%	68%	76%
Top 6	80%	76%	83%
Top 7	86%	84%	89%
Top 8	91%	90%	95%
Top 9	95%	93%	96%
Top 10	97%	96%	97%

3.4 CDS market concentration by reference entity – QAMF use case

QAMF has looked at market concentration through the reference entities or the underlying index of the CDS contracts. Below is an example of market concentration analysis that was carried out on DTCC Trade Information Warehouse data by the QAMF. Figure 2 shows the heat map of the 12 biggest reference entities in terms of gross CAD notional for all local counterparties and Figure 3 displays the same 12 reference entities in terms of number of contracts. The QAMF concluded that Reference entity 1 seems to be the most popular reference entity among the local counterparties in terms of both notional and number of contracts. However, QAMF also noted that the concentration in Reference entity 1 is less intense when comparing the reference entities in terms of number of contracts.

Figure 2: Twelve biggest reference entities by gross CAD notional for local counterparties

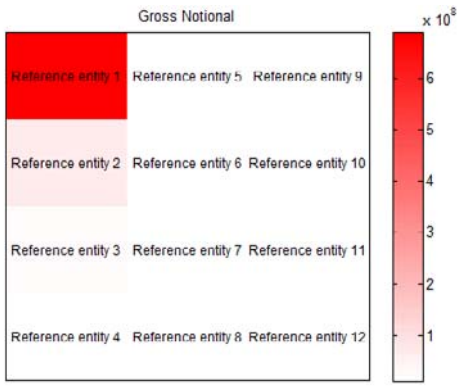
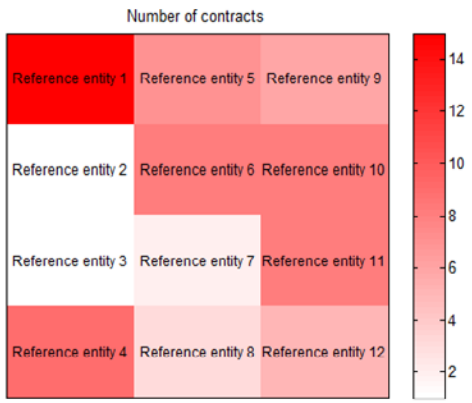


Figure 3: Twelve biggest reference entities by number of contracts for local counterparties



3.5 Network diagrams for market concentration analysis – MAS and DNB use cases

Market concentration analysis could be supplemented with market interconnectedness/network analysis. The visualisation of networks could help provide a more granular view of linkages, and hence, help authorities to better assess contagion risk. Network visualisation for market concentration analysis may involve describing and analysing the network of links across participants within a segment of the OTC derivatives market, and/or across different segments. Market interconnectedness/network analysis has enabled some work stream member authorities to study the nature, scale and scope of obligations that arise between and among entities.

The Monetary Authority of Singapore (MAS) has conducted a simplified form of market concentration analysis based on TR data, via the construction of network diagrams (Figure 4). This analysis is based on the following dimensions:

- Size of a node: denotes the relative outstanding notional amount
- Thickness of the edge: denotes the total notional transacted between two parties
- Color of a node: denotes the sector classification of the counterparty
- Eigenvector centrality: denotes how connected a node is to other well-connected nodes in the network

The Kamada-Kawai layout algorithm is used in the network diagram. Nodes with the highest eigenvector centrality tend to be in the centre.

Figure 4: Hypothetical network structure

De Nederlandsche Bank (DNB) has also conducted network analysis on the CDS market. Figure 6 shows the market concentration of the Dutch segment of the CDS market, in terms of the sum of the absolute notional amount (buy and sell) for each counterparty in the data set. Although this measure does not accurately reflect risk taking, it gives an indication of the importance of each player. The data from the DTCC trade state reports was used in this analysis.

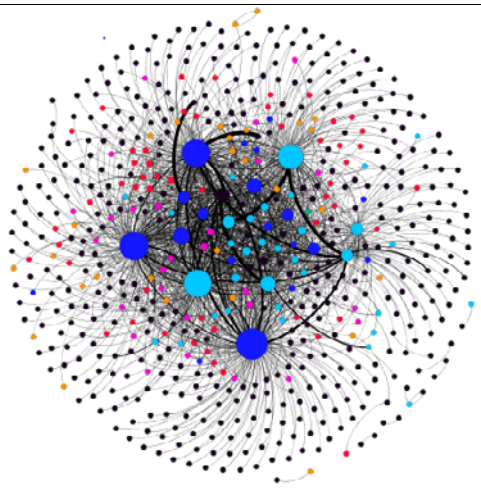
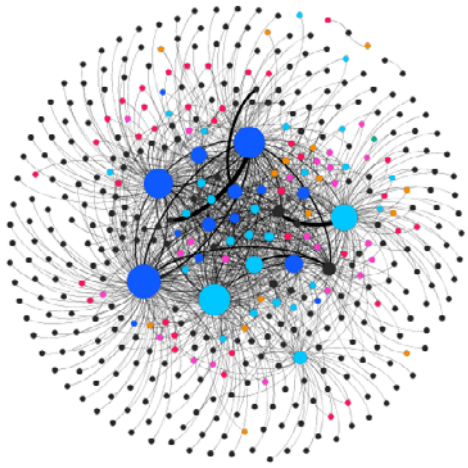
In Figure 5, the nodes were coloured by sector classification as given in the data. Because only the reporting counterparty has to provide sector information under EMIR, the sector data is missing for a large share of the sample for non-reporting counterparty. However, these non-reporting counterparties are

generally smaller players. In Figure 6, the nodes were colored according to the domicile of the counterparty (Dutch versus foreign). For this, EMIR data was used and augmented with information form the GLEIF database. Both Figure 5 and Figure 6 show the networks for CDS exposures on all underlying assets and for Dutch underlying assets only.

The DNB's analysis included the following points:

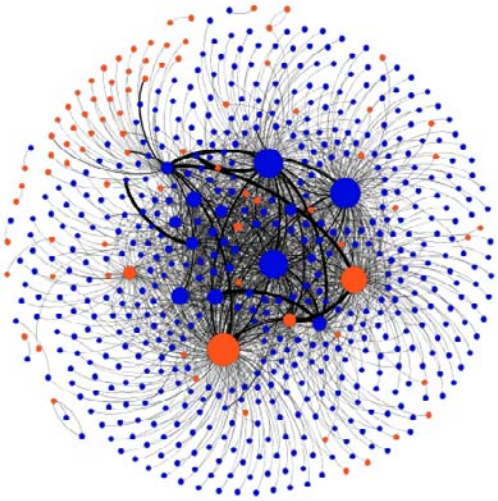
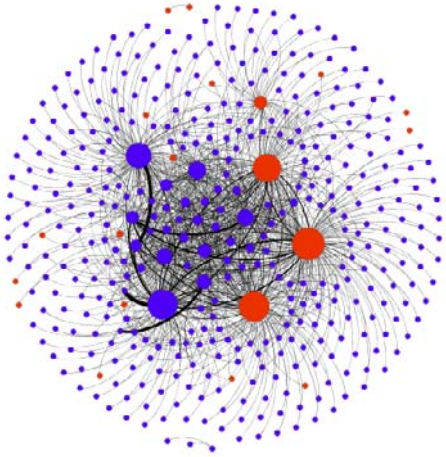
- The network shows a strong core periphery structure, with large (international and national) credit institutions and investment firms at the centre (dark and light blue dots, respectively). The core also trades with pension funds and various types of alternative investment funds. It is noteworthy that the core periphery structure is thus not only observed on the global scale, but also on lower levels of aggregation.
- The Dutch financial sector is quite open. As can be seen in Figure 6, foreign institutions (purple nodes) play an important role. Interestingly, these nodes are not just the large dealer banks but quite a number of relatively small players.
- There seems to be a larger market presence of Dutch market players in the case of Dutch underlying reference entities as can be seen in Figure 6. Based on our analysis, we cannot draw conclusions with respect to risk taking, e.g. we do not know whether the central Dutch players act as intermediary in the market (selling CDS protection) or whether they are large protection buyers. This information can be obtained by looking at net (buy versus sell) notional positions and market values.

Figure 5: Exposure in terms of sum of absolute notional amount (buy and sell), with counterparty sector classification

<table>
<tr><th colspan="2">Market concentration analysis – Dutch segment CDS market</th></tr>
<tr><td>A: All underlying reference entities</td><td>B: Dutch underlying reference entities</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Unassigned</td></tr>
<tr><td colspan="2">investment firm</td></tr>
<tr><td colspan="2">credit institution</td></tr>
</table>

	assurance undertaking
	institution for occupational retirement provision
	alternative investment fund (AIF)
	undertakings for collective investment in transferable securities (UCITS)
***Source*: Analysis by DNB (Levels and Van Lelyveld), based on DTCC confidential TR data.**	

Figure 6: Exposure in terms of sum of absolute notional amount (buy and sell), with counterparty domicile classification

Market concentration analysis – Dutch segment CDS market	
A: All underlying reference entities	**B:** Dutch underlying reference entities
	
Foreign	
Dutch	
***Source*: Analysis by DNB (Levels and Van Lelyveld), based on DTCC confidential TR data.**	

APPENDIX I List of Acronyms

BCBS	Basel Committee on Banking Supervision
BIS	Bank of International Settlements
CCP	Central counterparty
CCR	Counterparty credit risk
CDS	Credit default swap
CFTC	Commodity Futures Trading Commission
CPSS	Committee on Payment and Settlement Systems
CSA	Canadian Securities Administrators
CSDB	Centralized securities database
DNB	De Nederlandsche Bank
DTCC	Depository Trust & Clearing Corporation
ECB	European central bank
EMIR	European Market Infrastructure Regulation
ESA	European Supervisory Authority
ESMA	European Securities and Markets Authority
ESRB	European Systemic Risk Board
ETD	Exchange traded derivative
ETF	Exchange traded fund
FC	Financial counterparty
FSB	Financial Stability Board
FX	Foreign exchange
G-20	The Group of Twenty
HHI	Herfindahl-Hirschman Index
HKTR	Hong Kong Trade Repository
IOSCO	International Organization of Securities Commissions
IRD	Interest rate derivatives
IRS	Interest rate swap
ISIN	International securities identification number
LEI	Legal Entity Identifier
MAS	Monetary Authority of Singapore
NDF	Non-deliverable forward
NFC	Non-financial counterparty
ODRF	OTC Derivatives Regulatory Forum
OTC	Over-the-counter
OSC	Ontario Securities Commission
PFE	Potential future exposure
QAMF	Québec Autorité des Marchés financiers
SIFI	Systemically important financial institution
TR	Trade Repository
TWG	Technical Working Group

APPENDIX II Market Concentration Work Stream Members

Work Stream Lead

Marinus (Rien) Jeuken, De Nederlandsche Bank (Until June 2017)

Australia

Glenn Cogar, Reserve Bank of Australia

Canada

Jean-Sebastien Dupont, Québec Autorité des marchés financiers (Until May 2016)

Abdullah Rahman, Québec Autorité des marchés financiers (Until May 2017)

Shaun Olson, Ontario Securities Commission

Yani Wu, Ontario Securities Commission

France

Gilles Herve, Banque de France (Until November 2016)

Hong Kong

Pansy Pang, Hong Kong Monetary Authority

Silvia Pezzini, Hong Kong Monetary Authority

Netherlands

Iman Lelyveld, De Nederlandsche Bank

Nicole Mommersteeg, De Nederlandsche Bank

Anouk Levels, De Nederlandsche Bank

Singapore

Ang Shu Qin, Monetary Authority of Singapore

Evelyn Chen, Monetary Authority of Singapore

Justin Wong, Monetary Authority of Singapore (Until January 2017)

United States

Irina Leonova, US Federal Deposit Insurance Corporation

John Conboy, US Federal Deposit Insurance Corporation

Jimmy Kao, Office of the Comptroller of the Currency (Until March 2017)

Carter Evans, Office of the Comptroller of the Currency