FSB FINANCIAL STABILITY BOARD

Review of OTC derivatives market reforms

Effectiveness and broader effects of the reforms

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1. Executive summary

In 2009, recognising the role of OTC derivatives markets in the global financial crisis, G20 Leaders committed to reform these markets, with the objectives of mitigating systemic risk, improving transparency, and protecting against market abuse. This review shows that:

- **Implementation** of these reforms is now well progressed, although this has taken longer than originally intended due to the scale and complexity of the reforms and other challenges. Implementation is still ongoing and is generally most advanced in the largest OTC derivatives markets. Further effort will be required to finish the job.
- **Meaningful progress has been made toward mitigating systemic risk**. Specifically, central clearing (which has increased markedly in interest rate derivatives and, to a lesser extent, credit default swaps) is simplifying much of the previously complex and opaque web of derivatives exposures, and the central counterparties supporting that clearing are more resilient. In addition, more collateral is in place to reduce counterparty credit risks within the system.
- Authorities also report **progress in improving transparency** – with a number of authorities using data from trade repositories (TRs), including to better monitor risk. To the extent implemented, platform trading has also improved transparency to market participants. However, **significant challenges remain** and it is important to complete work quickly to improve the quality of, and ability to aggregate, TR data including by removing legal barriers to the full reporting and sharing of such data.
- Further study should be made of the effects of the reforms in **protecting against market abuse**. There is little evidence on this at present, although some authorities report using TR data for market surveillance purposes.
- A range of views have been expressed on the impact of market reforms on **spreads and liquidity** in OTC derivatives markets. There is some evidence that the reforms have improved liquidity in some OTC derivatives markets, although some authorities have concerns that the interaction of the broader set of post-crisis reforms may have contributed to a reduction in the depth of liquidity.
- In addition, cross-border cooperation, including over the timing of implementation, are important to help reduce fragmentation.

This review should not be regarded as a final assessment, given that reforms are still being implemented and the effects are therefore not yet fully realised.

The FSB, working with standard-setters, is developing a framework for evaluating the effects of G20 financial reforms, including to help identify material unintended consequences that should be addressed, without compromising on the objectives of the reforms. Informed by this framework, the FSB and the relevant standard-setting bodies will undertake a study of the

effects of the interaction of reforms on incentives to centrally clear and publish the results in late 2018.

1.1 Motivation and commitments to reform OTC derivatives markets

Over-the-counter (OTC) derivatives benefit financial markets and the wider economy by helping market participants manage their risks, improving the pricing of risk, and adding to liquidity. However, the financial crisis of 2007-08 exposed weaknesses in the structure of OTC derivatives markets that had contributed to the increase in systemic risk and the damage caused by the crisis. These weaknesses included the build-up of large counterparty exposures between market participants which were not appropriately risk-managed; contagion risk arising from the interconnectedness of market participants; and the limited transparency of overall counterparty credit risk exposures that precipitated a loss of confidence and market liquidity in time of stress.

In response, the G20 Leaders at the Pittsburgh Summit in 2009[1] initiated a fundamental overhaul of OTC derivatives markets with the objectives to **mitigate systemic risk**, **improve transparency** in the derivatives markets, and **protect against market abuse**. Altogether, the G20 Leaders made five commitments to reform OTC derivatives markets:

- standardised OTC derivatives should be centrally cleared;
- non-centrally cleared derivatives should be subject to higher capital requirements;
- non-centrally cleared derivatives should be subject to minimum standards for margin requirements;
- OTC derivatives should be reported to trade repositories; and
- standardised OTC derivatives should be traded on exchanges or electronic trading platforms, where appropriate.

This report summarises information available to date on FSB members' implementation of these reforms (including through the FSB's regular implementation progress reports on OTC derivatives market reforms), describes how those reforms are helping to achieve G20 Leaders' objectives, and identifies those areas where implementation is still in progress and where challenges remain. It draws on information from a variety of sources, including from FSB member authorities and standard-setting bodies, market data, a literature review and outreach to the market, both bilaterally and multilaterally, including through a roundtable with industry participants held in April 2017 in Washington DC.

1.2 Implementation progress

Since 2009, there has been substantial progress in implementing and operationalising regulatory frameworks among the FSB membership, particularly in the following areas:

- central clearing frameworks have been, or are being, implemented, leading to a significant increase in the central clearing of some OTC derivatives asset classes;

[1] See the Pittsburgh Summit Leaders' statement, paragraph 13 of body, http://www.fsb.org/wp-content/uploads/g20_leaders_declaration_pittsburgh_2009.pdf.

- higher capital charges for non-centrally cleared derivatives, where an interim regime is in force[2] in almost all FSB member jurisdictions;[3, 4] and
- trade reporting requirements covering the vast majority of OTC derivatives are in force in most jurisdictions.[5]

Given its scale, complexity and other challenges, implementation of OTC derivatives reforms has taken longer than originally intended.[6] Implementation has tended to be most advanced in the largest OTC derivatives markets. The reform areas that are least advanced in implementation are:

- platform trading, where frameworks are in place in only half the FSB member jurisdictions; and
- margin requirements for non-centrally cleared derivatives, where despite recent progress in several jurisdictions, a number of jurisdictions missed the internationally agreed deadlines, and transitional and other implementation issues persist.

Authorities and market participants continue to note a range of implementation challenges, and workstreams aiming to address many of these are underway. It is important to complete the full, timely and consistent implementation of the OTC derivatives reforms, where authorities have not already done so, and also to address challenges to realise the G20 Leaders' objectives.

1.3 Reform effectiveness, challenges and work underway to address them

Overall, although reforms are still being implemented, authorities are increasingly able to observe the effects of the reforms and ongoing progress toward meeting the G20 Leaders' objectives.[7] Taking each objective in turn:

- **Mitigating systemic risk:** Authorities report meaningful progress towards mitigating systemic risk, including risk arising from interconnectedness of financial institutions in OTC derivatives markets. In particular, increasing central clearing is an important component of the reforms to mitigate systemic risk and thereby help end too-big-to-fail for banks, in part by improving their resolvability.

  Greater use of central counterparties (CCPs) is beginning to reduce counterparty credit risks in the financial system by replacing much of the complex and opaque web of ties between market participants that contributed to key markets seizing up during the

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2 Throughout this report, the term "in force" means a final statute/regulation/rule/policy statement/standard/etc. is operative and has effect as at the indicated date; in contrast, where a final statute/regulation/etc. has been enacted or published but it is not yet operative and does not have effect, for the purposes of this report this is treated as not yet in force.

3 The interim regime for bank exposures to CCPs was put in place progressively from 2013 and is now in force in 23 of 24 FSB member jurisdictions. Further changes which were due to be implemented in January 2017 are yet to be put in place in most jurisdictions. See FSB (2017a), *OTCD derivatives market reforms: Twelfth implementation progress report*, http://www.fsb.org/wp-content/uploads/P290617-2.pdf and BCBS (2017), *Twelfth progress report on adoption of the Basel regulatory framework*, April, www.bis.org/bcbs/publ/d404.pdf.

4 In this report, except where otherwise indicated, 'jurisdictions' refers to FSB national member jurisdictions, and EU member states are counted as individual jurisdictions.

5 FSB (2017a). Apart from the first citation of a paper, the details of papers may be found in Appendix 2 (Bibliography).

6 In the case of central clearing and platform trading reforms, the G20 Leaders set a date of end-2012.

7 In view of the challenges in measuring the effectiveness of the reforms in meeting the objectives, this report uses certain effects of reforms (for example, changes in rates of central clearing) as indicators that assist in understanding effectiveness. See discussion in Section 2.4.

crisis with simpler and more transparent links between CCPs and their clearing members, supported by robust CCP standards including improved resilience and risk management.

In particular, authorities observe:

- significantly higher levels of central clearing, especially in the OTC interest rate and credit derivatives asset classes, but also to a lesser extent in some other asset classes such as foreign exchange (FX) non-deliverable forwards (NDFs). The stock of outstanding OTC interest rate derivatives that are centrally cleared is estimated to have increased from at least 24% at end-2008 to at least 61% globally at end-2016, with the rate of clearing for new OTC interest rate derivatives transactions estimated to be 87% in the US and 62% in the EU;
- improvements in CCPs' resilience including their governance, risk management framework and the financial resources they are required to hold to manage a member default, primarily due to the implementation of the Principles for Financial Market Infrastructures (PFMI),[8] while further steps on CCP recovery and resolution are designed to help prevent CCPs from becoming a new, concentrated source of too-big-to-fail risk; and
- markedly higher levels of collateral for OTC derivatives exposures than before the financial crisis, with minimum standards both for centrally cleared and non-centrally cleared derivatives. The amount of collateral for OTC derivatives exposures in the system rose from an estimated US$0.67 trillion at end-2006 to US$1.74 trillion at end-2014. Requirements to hold bank capital against non-centrally cleared OTCD exposures have also increased.

Authorities should continue to monitor the effects of the reforms on systemic risk, including market liquidity as well as solvency risks.

- **Improving transparency:** Trade reporting requirements have improved the post-trade transparency of the OTC derivatives markets to those authorities that have access to TR data, and many authorities increasingly use such data to monitor systemic risk and for a range of other purposes. Nevertheless, significant challenges remain to be overcome before all FSB member authorities are in a position to fully and effectively access, aggregate and analyse TR data, including the need to remove legal barriers to authorities' domestic and cross-border access to TR data as well as to harmonise TR data elements. It is important that FSB members address these challenges promptly and effectively.

  In addition, market transparency has increased in those jurisdictions where TRs, trading platforms, CCPs or authorities make information about OTC derivatives transactions or markets available to the public.

- **Protecting against market abuse:** Reforms to promote trading of derivatives on exchanges or electronic trading platforms and to require the provision of TR data to market authorities can help to protect against market abuse. A number of authorities

[8] CPSS-IOSCO (2012), *Principles for financial market infrastructures* (April), www.bis.org/cpmi/publ/d101a.pdf and www.iosco.org/library/pubdocs/pdf/IOSCOPD377-PFMI.pdf.

report that they are already using TR data for some market surveillance purposes, although generally this is still in its early stages. Further work would be needed in order to measure whether there has been a reduction in market abuse.

Against this backdrop of progress, important challenges and costs – some transitional, others which may be longer-lasting – have also been identified, and work is and will be underway internationally or at a jurisdictional level to examine, and where appropriate, address these issues. This includes work to improve the resilience, recovery planning and resolvability of CCPs; to harmonise TR data elements and improve data quality and to remove legal barriers to reporting and accessing such data; and to consider issues around incentives to centrally clear.

1.4 Broader effects of reforms

The reforms are also having broader effects. Regarding **financial market infrastructures**, the reforms have resulted in an increase in the number of authorised TRs, and in the number of CCPs offering clearing of OTC derivatives, including those that operate on a cross-border basis. These reforms have also been accompanied by enhancements in post-trade services that support risk mitigation, including expanded portfolio reconciliation, compression and valuation services, and improved documentation practices.

The main market structure changes relate to **increased rates of and participation in central clearing**, and also early evidence of increased liquidity and reduced spreads in some product markets. However, there are concerns about possible reductions in liquidity in some others. Also, market intelligence suggests that some, particularly smaller, firms are facing **challenges in accessing clearing** arrangements, and that some CCP clearing members are withdrawing services to some clients or are not offering services to new clients. This is an issue that authorities are watching closely.

Authorities also recognise that **compliance costs** have increased as a result of the reforms, including one-time as well as ongoing costs to implement the necessary changes. Some increase in compliance and other regulatory costs is not unexpected as OTC derivatives markets were largely unregulated before the crisis and negative externalities, such as those arising from poor risk management practices, were not fully reflected in compliance costs or priced into OTC derivatives. Overall costs need to be weighed against the short- and long-term benefits that these reforms will provide by enhancing financial stability and contributing to other G20 Leaders' objectives.

Given that policies are still being implemented, it is not possible to fully judge the **ultimate costs and benefits** of these reforms in this report. A 2013 official sector study estimated the expected overall balance to be positive.[9] That said, even after full implementation of the reforms, the task of measuring the benefits of lower systemic risk, improved transparency, and less market abuse and the observable costs will remain challenging.

Concerns have been raised relating to increased **geographic market fragmentation** in certain markets, for example due to differences in implementation timetables. Authorities are sensitive to possible impacts of any fragmentation (e.g. on liquidity or trading costs for market participants) and remain committed to identifying and addressing cross-border challenges in

[9] Macroeconomic Assessment Group on Derivatives (2013), *Macroeconomic impact of OTC derivatives reforms*, www.bis.org/press/p130826.htm.

implementing the reforms, and to continuing to take forward international regulatory and supervisory cooperation.

1.5 Looking ahead

The **long-term economic effects** of the reforms remain difficult to assess because evaluating them is analytically difficult, and can only be fully ascertained over a longer period of time. This is especially the case when implementation is still ongoing. This review thus cannot be considered a final assessment of the effects and effectiveness of reforms.

As data become more available over time and the quality of such data improves, authorities will be able to undertake more definitive studies of the effects of reforms. They will continue to consider the calibration of policies to ensure the reforms achieve their objectives effectively and efficiently, taking account of the benefits and costs of the reforms.

Further work will be needed in the coming years to evaluate progress towards the reform objectives and to better estimate to what extent the goals of mitigating systemic risk, increasing market transparency and protecting against market abuse are being met, providing a basis for consideration of whether refinements to the calibration may be needed.

Margining and capital requirements for non-centrally cleared derivatives, together with central clearing mandates, are intended to promote central clearing of standardised OTC derivatives, and to provide adequate systemic protections relating to non-standardised, and thus non-centrally cleared, OTC derivatives. Authorities are aware of the need to review whether the appropriate incentives have been set to encourage central clearing of those transactions that should be centrally cleared, but not of those non-standardised products that could increase risks to CCPs and so should remain not centrally cleared.

For this reason, over 2017-18, a Derivatives Assessment Team (DAT), convened by the OTC Derivatives Coordination Group (comprising the chairs of the FSB, other relevant standard-setting bodies and the OTC Derivatives Regulators Group) will undertake a review of the incentives for central clearing arising from the interaction of margin requirements for derivatives and a number of other requirements including the leverage ratio and liquidity coverage ratio, to update and expand the analysis in the study on these subjects conducted in 2014.[10]

[10] See BIS (2014), *Regulatory reform of over-the-counter derivatives: an assessment of incentives to clear centrally; A report by the OTC Derivatives Assessment Team, established by the OTC Derivatives Coordination Group*, www.bis.org/publ/othp21.pdf.

2. Background

2.1 Motivation and intent to reform OTC derivatives markets

OTC derivatives benefit financial markets and the wider economy by helping market participants manage their risks, enabling efficient price discovery and adding to liquidity.

The financial crisis of 2007-08 exposed weaknesses in the structure of OTC derivatives markets that had contributed to the build-up of systemic risk and the damage caused by the crisis. These weaknesses included the build-up of large counterparty exposures between market participants which were not appropriately risk-managed; contagion risk arising from the interconnectedness of market participants; and the limited transparency of overall counterparty credit risk exposures that precipitated a loss of confidence and market liquidity in time of stress. The financial crisis saw some major derivatives participants fail or incur significant losses.

2.2 Overview of the OTC derivatives reforms

In response, the G20 Leaders made five commitments to reform OTC derivatives markets:

- standardised OTC derivatives should be centrally cleared;
- non-centrally cleared derivatives should be subject to higher capital requirements;
- non-centrally cleared derivatives should be subject to minimum standards for margin requirements;
- OTC derivatives should be reported to trade repositories; and
- standardised OTC derivatives should be traded on exchanges or electronic trading platforms, where appropriate.[11]

In its October 2010 report on implementing OTC derivatives market reforms,[12] the FSB made 21 recommendations addressing practical issues that authorities may encounter in implementing the G20 Leaders' commitments.[13]

At the November 2010 Seoul Summit, G20 Leaders endorsed the FSB recommendations and asked the FSB to monitor OTC derivatives market reform progress regularly. The FSB's OTC Derivatives Working Group has been regularly monitoring the implementation of OTC derivatives reforms. The FSB's twelfth progress report on implementation of OTC derivatives market reforms was published in June 2017.[14]

[11] G20 (2009), Pittsburgh Summit Leaders' statement, paragraph 13, http://www.fsb.org/wp-content/uploads/g20_leaders_declaration_pittsburgh_2009.pdf, and G20 (2011), Cannes Summit Final Declaration, http://www.fsb.org/wp-content/uploads/g20_leaders_declaration_cannes_2011.pdf.

[12] FSB (2010), *Implementing OTC Derivatives Market Reforms*, www.fsb.org/2010/10/fsb-report-on-implementing-otc-derivatives-market-reforms/.

[13] Other than the commitment to minimum standards for margin requirements, which was agreed by Leaders in 2011.

[14] FSB (2017a).

2.3 The objectives of the reforms

The G20 Leaders' objectives of the reform commitments are to mitigate systemic risk, improve transparency in the derivatives markets and protect against market abuse.[15] The Basel Committee on Banking Supervision (BCBS) and the International Organization of Securities Commissions (IOSCO) stated that the main objectives of the margin requirements are to reduce systemic risk and to promote central clearing, which could also contribute to the reduction of systemic risk.[16]

The reforms seek to address the weaknesses in OTC derivatives markets exposed by the global financial crisis, mentioned in section 2.1 above. The FSB has estimated that the global financial crisis resulted in lost global output of approximately 25% of global GDP compared to the pre-crisis levels.[17] Thus the benefits of reducing the likelihood and severity of future financial crises, to which OTC derivatives reforms are expected to contribute, are potentially substantial.

Given the global nature of OTC markets, it is important to have effective international cooperation and, where appropriate, coordination to fulfil enforcement and supervision responsibilities, minimise the potential for regulatory arbitrage, and fully and consistently implement the G20s Leaders' commitments.

2.4 Nature of this review and methodology

The aim of this review is to present a clear narrative of the effects and effectiveness of OTC derivatives reforms to date, by describing: what has been achieved so far by authorities in implementing the agreed reforms and what implementation is still in progress (drawing on the FSB's regular progress reports); the effectiveness of the reforms in terms of meeting the reform objectives; and the broader effects of the reforms on OTC derivatives markets and their users. The review also seeks to identify, to the extent possible, gaps in implementation of reforms or areas for further attention.

There are challenges in directly measuring the effectiveness of the reforms in meeting the objectives, including theoretical challenges in devising reliable and comprehensive measures of systemic risk. In view of these challenges, this report uses certain effects of reforms (for example, changes in rates of central clearing) as indicators that assist in understanding effectiveness.

The review summarises the progress that has been made since the crisis and that has been incrementally reported in other documents, such as the FSB's regular implementation progress reports on the OTC derivatives reforms.[18] It is intended to provide a current assessment both of the extent of implementation of reforms and their effects on the OTC derivatives markets,

[15] See paragraph 13 of the Annex to the Pittsburgh Summit declaration, *www.fsb.org/wp-content/uploads/g20_leaders_declaration_pittsburgh_2009.pdf* and paragraph 24 of the Cannes Summit final declaration, www.g20civil.com/documents/Cannes_Declaration_4_November_2011.pdf.

[16] BCBS-IOSCO (2013), *Margin requirements for non-centrally cleared derivatives*, www.bis.org/publ/bcbs261.pdf and www.iosco.org/library/pubdocs/pdf/IOSCOPD423.pdf, p. 2.

[17] FSB (2016b), *Implementation and effects of the G20 Financial Regulatory Reforms, 2nd annual report*, www.fsb.org/2016/08/implementation-and-effects-of-the-g20-financial-regulatory-reforms-2/

[18] See FSB (2017a) for the most recent of these progress reports.

globally and at the jurisdictional level (including, where information is available, on transitional effects).

Member authorities and standard-setting bodies were a key source of data and other information presented in this review, including through the use of a questionnaire to FSB member authorities returned in January 2017 and through the collection and sharing of relevant observations and statistics. A literature survey including official sector studies (including staff working papers), peer reviewed research and private-sector studies on the effects and effectiveness of derivatives reforms also informed the work.

As data become more available over time and the quality of such data improves, authorities will be able to undertake more definitive studies of the effects of reforms. They will continue to consider the calibration of policies to ensure the reforms achieve their objectives effectively and efficiently, taking account of the benefits and costs of the reforms.[19]

[19] For example, the European Commission presented on 4 May 2017 targeted reforms to simplify the European Market Infrastructure Regulation (EMIR) and reduce costs for market participants, without compromising on financial stability. The proposal will now be discussed by the European Parliament and the Council, in their capacity as co-legislators (available at ec.europa.eu/info/sites/info/files/170504-emir-proposal_en.pdf). The US Treasury is conducting a broad review of the current regulatory structure under the terms of a Presidential Executive Order dated 3 February 2017, see www.whitehouse.gov/the-press-office/2017/02/03/presidential-executive-order-core-principles-regulating-united-states.

3. Effectiveness of reforms

3.1 Progress in implementation

Overall, progress continues to be made across the OTC derivatives reform agenda, though implementation gaps remain. Given the scale, complexities and other challenges in regulating this previously largely unregulated market, implementation has taken longer than originally intended.[20] The challenges have included establishing new financial market infrastructures, including trade repositories and in some CCPs for OTC derivatives, upgrading existing ones to meet new standards, or providing cross-border services in additional jurisdictions.

In terms of fully implementing and operationalising regulatory frameworks among the FSB membership:

- central clearing frameworks have been, or are being, implemented;
- interim higher capital charges for non-centrally cleared derivatives are mostly in force;
- margin requirements for non-centrally cleared derivatives have begun to be implemented (though agreed recent international deadlines[21] have been missed by a number of jurisdictions and others have transitional arrangements to allow more time for market participants to adjust to the new requirements);
- comprehensive trade reporting requirements for OTC derivatives are mostly in force; and
- platform trading frameworks are relatively undeveloped in most jurisdictions.

Reform implementation has tended to be most advanced in the largest OTC derivatives markets (see figure 1). Authorities continue to note a range of implementation challenges, as described below, and international workstreams that aim to address many of these challenges are underway.[22]

Given the global nature of OTC derivatives markets, authorities are also addressing, where appropriate, the cross-border impact of reforms. For example, potential geographic market fragmentation may occur in some cases when reforms are implemented in different ways and/or to different timeframes by different jurisdictions. Examples of work to address such issues include work on harmonisation and aggregation of TR data, and cross-border resolution arrangements for CCPs that are systemically important in more than one jurisdiction.

[20] The agreed target date for implementation of the changes other than minimum standards for margin requirements was end-2012.

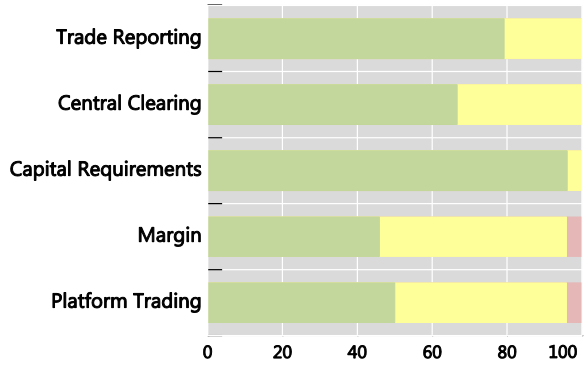
[21] For example, the 1 September 2016 commencement date for phase 1 of the initial margin requirements, and the 1 March 2017 implementation date for the second and final phase of the variation margin requirements, for non-centrally cleared derivatives.

[22] These implementation challenges and workstreams are discussed in FSB (2017a).

Figure 1

Implementation progress as at end-June 2017

As percent of number of FSB member jurisdictions[1]



As percent of market size for OTC interest rate derivatives[2]

Regulatory framework and standards in force for over 90% of relevant transactions[3]

Regulatory framework being implemented

No regulatory framework in place

[1] The six EU members of the FSB are presented as separate jurisdictions. [2] Market size is proxied by single currency OTC interest rate derivatives' gross turnover in April 2016. [3] For central clearing and platform trading, this means legislative framework or other authority is in force and, with respect to over 90% of transactions, standards/criteria for determining when products should be centrally cleared/platform traded are in force. Source: FSB (2017a), op. cit.; BIS (2016) Triennial Central Bank Survey: OTC interest rate derivatives turnover in April 2016; FSB calculations

3.2 Metrics and results

3.2.1 Central clearing rates

Rates of central clearing of standardised OTC derivatives have increased globally since the crisis, particularly in interest rate derivatives and CDS.

The determination of whether an OTC derivative is "standardised" depends on many factors.[23] Therefore, it is difficult to provide a precise figure for standardised OTC derivatives, and accordingly precise figures showing the total proportion of standardised OTC derivatives that are centrally cleared are not available.[24] However, estimates of the proportion of *all* OTC derivatives that are being centrally cleared can be observed and give a clear indication of the trend.

Central clearing rates in OTC interest rate derivatives and, to a lesser extent, CDS have increased markedly since 2009, while central clearing rates for OTC FX, equity and commodity derivatives products remain modest. For some standardised OTC derivatives products, increases in central clearing rates have likely been mainly driven by central clearing

[23] Authorities report that they assess a range of factors to determine whether a contract is standardised and thus should be required to be centrally cleared. The most commonly reported are liquidity of asset classes or products, the perceived level of standardisation of asset classes, and the number of CCPs and/or clearing members providing access to clearing for that specific product. Other factors reported as taken into consideration include the ability for CCPs to manage certain risks (e.g. wrong way risk) on a large scale; desire to be coordinated with peer jurisdictions; and ability of different kinds of clients to engage in cleared trades.

[24] See FSB (2017a), Appendix I for some relevant estimates to the nearest 20 percentage points.

requirements. Higher capital charges and, more recently, margin requirements for non-centrally cleared derivatives also appear to have contributed to increases in central clearing rates for some products, notably NDFs[25] and inflation swaps, that have not been made subject to mandatory central clearing requirements as yet.

The highest rate of central clearing is observed in the largest OTC derivatives asset class by total notional outstanding, **interest rate derivatives**.[26]

- At end-December 2016, the proportion of the global **stock** of outstanding OTC interest rate derivatives that was centrally cleared is estimated to be at least 61% compared with 24% at end-December 2008 (figure 2, left hand panel, dotted line).[27]
- Moreover, authorities from nine of the 19 FSB member jurisdictions (counting the EU as a single jurisdiction for this purpose) are able to estimate clearing rates for the **flow** of new interest rate derivative transactions as being 40% or more, up from five jurisdictions in Q4 2014 (figure 13 in Appendix A). The clearing rate for new interest rate swaps has reached 87% in the US, while the comparable figure for the EU as a whole is 62%.[28]
- Clearing rates are markedly higher for interest rate derivatives denominated in some of the most-traded advanced economy currencies (e.g. CAD, CHF, GBP, EUR, JPY and USD) than for emerging market currencies (figure 3, right hand panel).

Globally, the central clearing rate for the stock of outstanding **CDS** is estimated to have reached at least 28% at end-December 2016 versus 5% at end-June 2009 (figure 2, right hand panel, dotted line). Clearing rates for the flow of new transactions in index CDS are estimated at 80% in the US and in OTC credit derivatives as a whole at 37% in the EU.[29]

For **FX, commodity and equity** OTC derivatives, in contrast to interest rates and CDS, central clearing has yet to make significant inroads at the global level (figure 3, left hand panel; commodity derivatives not shown).[30] This is in part due to central clearing requirements not having been widely imposed in these asset classes, which account for more than half of the outstanding OTC derivatives as measured by number of contracts (figure 4) but less than 20% by value of notional outstanding (table 12 in Appendix A).

Looking forward, authorities generally expect the rate of central clearing to continue to increase, especially in interest rate and FX derivatives such as NDFs (figure 14 in Appendix A). However, exemptions for certain derivatives from bilateral margin requirements and, in some jurisdictions, mandated clearing may limit future increases in clearing rates for FX products.

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[25] NDFs are FX forwards that are settled in another currency (usually USD) than the reference currency, which is typically not convertible. The settlement amount reflects how the value of the reference currency has changed prior to settlement.

[26] Interest rate derivatives which globally account for around 80% of the overall OTC derivatives market by notional value and roughly 40% by number of contracts: see table 12 in Appendix A and figure 2.

[27] Source: BIS, OTC derivatives statistics, semiannual survey, available at www.bis.org/statistics/derstats.htm .

[28] Sources: CFTC (2017), Weekly Swaps Report for 21 April 2017, www.cftc.gov/MarketReports/ SwapsReports/index.htm; European Systemic Risk Board (ESRB) Secretariat calculations based on TR data for 31 March 2017.

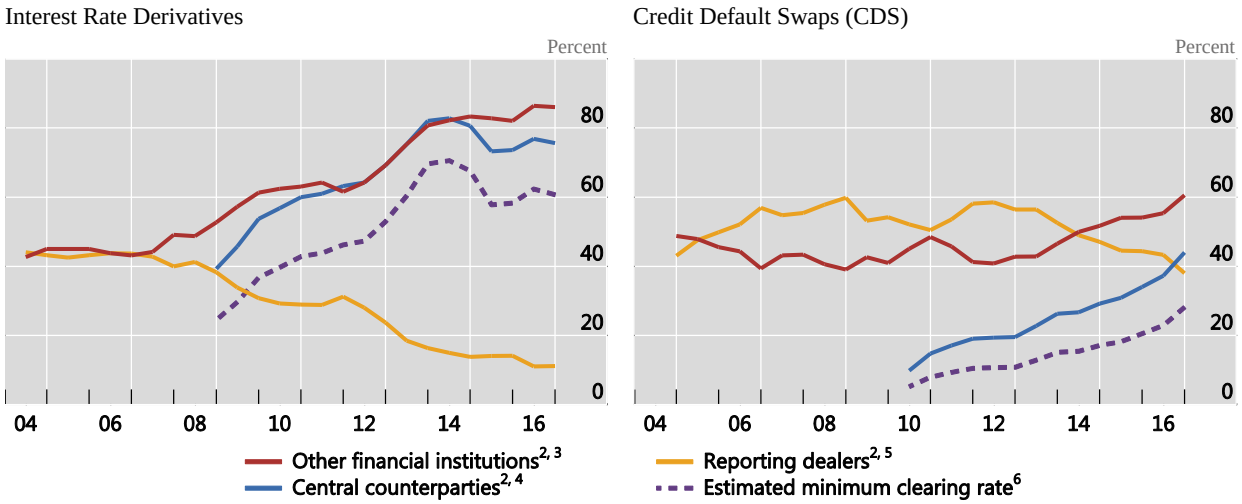
[29] Sources: CFTC (2017), Weekly Swaps Report for 21 April 2017, www.cftc.gov/MarketReports/ SwapsReports/index.htm; ESRB Secretariat calculations based on TR data for 31 March 2017.

[30] For commodity derivatives, see the estimates of central clearing rates in FSB (2017a), Appendix I.

Figure 2

Growth of central clearing, 2004–16

Notional amounts outstanding by counterparty type, in percent[1]



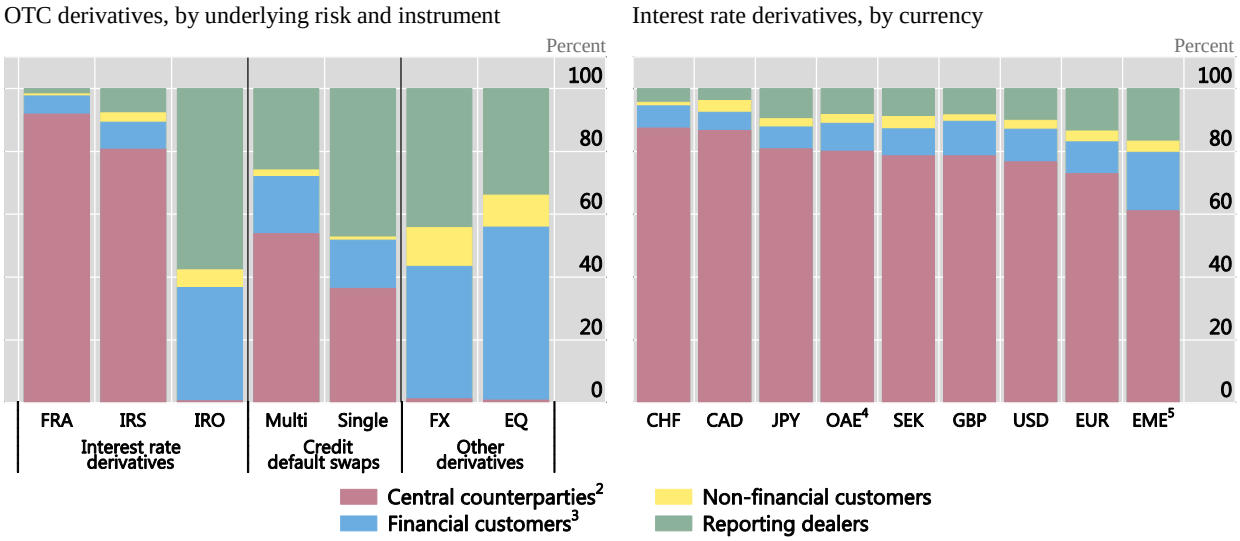
Further information on the BIS derivatives statistics is available at www.bis.org/statistics/derstats.htm. [1] As reported in the semi-annual survey of OTC derivatives markets, excluding the positions of dealers that report only in the Triennial Survey. [2] As a percentage of notional amounts outstanding against all counterparties. [3] Including central counterparties but excluding reporting dealers. [4] For interest rate derivatives, data for CCPs prior to end-June 2016 are estimated by indexing the amounts reported at end-June 2016 to the growth since 2008 of notional amounts outstanding cleared through LCH's SwapClear service. [5] Adjusted for the double counting of positions between dealers (that are not cleared through CCPs). [6] Proportion of trades that are cleared, estimated as (CCP/2)/(1-(CCP/2)), where CCP represents the share of notional amounts outstanding that dealers report against CCPs. CCP's share is halved to adjust for the potential double counting of interdealer trades cleared through CCPs. Source: BIS OTC derivatives statistics; LCH.Clearnet Group Ltd.; Wooldridge, P. (2016), "Central clearing predominates in OTC interest rate derivatives markets" in BIS (2016), *BIS Quarterly Review* December.

The reforms seek the central clearing only of *standardised* OTC derivatives. Non-standardised OTC derivatives are not appropriate for central clearing, due in part to possible risks to CCPs. Authorities consequently expect a proportion of OTC derivatives to remain non-centrally cleared even after the reforms are fully implemented. Authorities will continue to assess whether further standardised OTC derivatives products should be subject to mandatory central clearing, or other incentives for their central clearing could be enhanced.

Figure 3

Central clearing

Notional amounts outstanding by type of counterparty, at end-June 2016[1], in per cent



Further information on the BIS Triennial Central Bank Survey is available at www.bis.org/publ/rpfx16.htm. EQ = equity-linked derivatives; FRA = forward rate agreements; FX = foreign exchange derivatives; IRO = interest rate options; IRS = interest rate swaps; Multi = multi-name CDS; Single = single-name CDS. [1] Contracts between reporting dealers that are subsequently cleared through CCPs are recorded twice. [2] Excluding central counterparties and reporting dealers. [3] Financial customers include banks, insurance companies and other institutional investors. [4] Other advanced economy (OAE) currencies: AUD, DKK, NOK and NZD. Data are reported by a small sample of dealers and thus are incomplete. [5] Emerging market economy (EME) currencies: ARS, BGN, BHD, BRL, CLP, CNY, COP, CZK, HKD, HUF, IDR, ILS, INR, KRW, MXN, MYR, PEN, PHP, PLN, RON, RUB, SAR, SGD, THB, TRY, TWD and ZAR. Data are reported by a small sample of dealers and thus are incomplete. Source: Wooldridge, P. (2016); BIS Triennial Central Bank Survey.

Possible concerns had been raised that market participants may try to avoid clearing mandates by adjusting the terms of contracts to make them non-standardised; or that the reforms to promote central clearing may in fact lead to less-standardised or illiquid products being centrally cleared, increasing risks within CCPs. Authorities are generally not aware of evidence to date of OTC derivatives market participants adjusting the terms of contracts so that they do not fall within clearing mandates that apply to standardised contracts or conversely, CCPs inappropriately treating as standardised and offering for central clearing overly complex or illiquid contracts that CCPs are not in practice able to risk-manage. Nevertheless, authorities should continue to monitor developments.[31]

The introduction of higher capital charges and, more recently, of margin requirements for non-centrally cleared derivatives are also expected to support the goal of helping to mitigate systemic risk. Initial evidence from some asset classes indicates that these measures are likely to have incentivised market participants towards central clearing derivatives, including for products that are not subject to mandatory clearing requirements, and to have mitigated counterparty credit risk. For example, standardised NDFs have seen significant increases in amounts cleared in the inter-dealer market since margin requirements were introduced in some

[31] One jurisdiction, Korea, noted that before Korea Exchange was designated as a QCCP by foreign authorities, some foreign bank branches adjusted some of the terms of IRS contracts in order to avoid KRW-IRS clearing. However, the CCP in question was licensed as a QCCP in 2016 and this adjustment has since declined.

jurisdictions in September 2016 in line with the BCBS-IOSCO phase-in schedule (figure 15 in Appendix A). Inflation swaps is another asset class that has seen significant recent increases in clearing rates, albeit from a low base.[32]

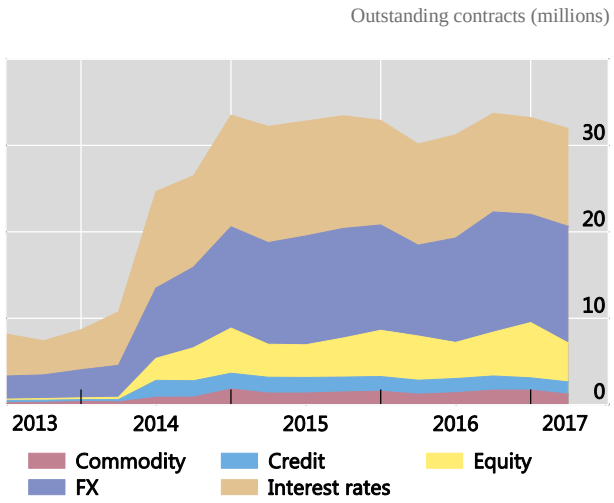
3.2.2 Availability, use and dissemination of TR data

Access to and use of TR data

Overall, the OTC derivatives market is now more transparent to those authorities that have access to TR data, but significant challenges remain to be overcome before all relevant authorities in FSB member jurisdictions are in a position to fully and efficiently access, aggregate and analyse TR data. In addition, market transparency has increased in those jurisdictions where TRs, trading platforms, CCPs or authorities make information about OTC derivative transactions available to the public.

Figure 4

Numbers of OTC derivatives position reports at trade repositories[1]



[1] Position numbers represent aggregates of the number of OTC derivative positions reported to selected TRs and outstanding as at the reporting date. Positions may be reported individually by both parties to the transaction (e.g. under double-sided reporting regimes), which may lead to some double counting. Source: DTCC group (DDR, DDRL, DDRS), JFSA (DDRJ), RegisTR, Cetip, B&M Bovespa and HKMA-TR.

Through TRs, authorities collectively had access to data on up to around 30 million outstanding OTC derivatives contracts in Q1 2017 compared to less than 10 million in Q3 2013 (see figure 4), and 19 of 24 FSB member jurisdictions have trade reporting requirements in force covering over 90% of OTC derivatives in their jurisdiction. The scope of TR data reporting along with the granularity of reporting requirements means that authorities with access to TR data have the raw data to develop a much more detailed understanding of OTC derivatives markets than before and during the financial crisis, better equipping them to identify and analyse developments and risks. However, there remain certain challenges regarding TR data, and work is underway by international organisations and at jurisdictional level to address them.

[32] Source: Clarus Technology (2016), *Two month update: uncleared margin rules & swap data*, https://www.clarusft.com/two-month-update-uncleared-margin-rules-swap-data/.

TR data is increasingly being used by authorities to support their mandates in a wide variety of ways, including assessing of systemic risks; regulating or supervising markets, trading venues, financial market infrastructures and market participants; analysing product and market structure analysis, conducting event studies, and making new policy or recalibrating policy (see figure 5 for an overview of authorities' "use cases" for TR data as of January 2017).

Figure 5

Uses of TR data made by FSB member jurisdictions/authorities

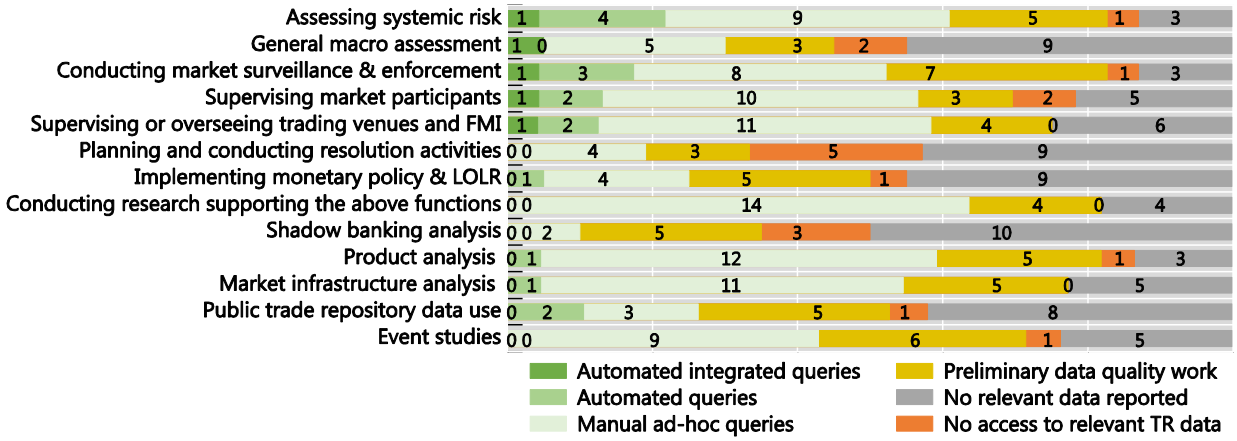


Chart shows number of jurisdictions/authorities reporting, for each type of TR data use, the respective type of use being made of TR data, or other status. Some EU-wide authorities' answers are included alongside consolidated answers from national EU jurisdictions. "No relevant data reported" means that no relevant data is currently reported to TRs. Source: FSB member jurisdictions/authorities.

TR data is also referenced in a number of published studies by officials and other authors relating to systemic risk and market functioning.[33]

Aggregation and data sharing

At end-2016 there were 10 TRs that were accessed by authorities of more than one jurisdiction (figure 16 in Appendix A); on the other hand, 20 TRs and TR-like entities were accessed by authorities of only one jurisdiction.

Authorities from eight jurisdictions reported that data from multiple TRs is being aggregated in their jurisdiction.

Two recent Bank of England studies emphasise the value of accessing aggregated TR data for authorities in evaluating systemic risk in their efforts to mitigate systemic risk.[34]

In 13 jurisdictions (about half of the FSB membership), OTC derivatives data is not aggregated, cross-checked or matched with any other type of data. It is on the other hand aggregated, cross-checked or matched: with exchange-traded derivatives data in seven jurisdictions; with public financial reports in five; with prudential reports in five; with equity market data in four; with

[33] See Appendix B for a list of relevant papers including (in bold) those which cite TR data. Throughout this report, references to these and other studies should not be taken to mean that the FSB agrees with all of the findings or conclusions of those studies.

[34] Ali, R., Vause, N. and Zikes, F. (2016), "Systemic Risk in Derivatives Markets: A Pilot Study Using CDS Data," *Bank of England Financial Stability Paper No. 38*; Cielinska, O., A. Joseph, U. Shreyas, J. Tanner and M. Vasios (2017), "Gauging market dynamics using trade repository data: the case of the Swiss franc de-pegging", *Bank of England Financial Stability Paper No. 41*.

bond market or bond holdings data in three; and with credit data and securities financing data in two each.

In many jurisdictions, memoranda of understanding (MoUs) between domestic authorities are not a necessary step as the legal framework already allows for TR data to be accessed by relevant authorities, or for the authority with direct access to data to share the data with other domestic agencies. In other jurisdictions, MoUs are either in place to permit data sharing between domestic agencies or are under negotiation. Authorities in Australia, Canada, the EU, Hong Kong, Japan, Mexico, Singapore and the US report having entered MoUs or put other arrangements in place with foreign authorities to enable sharing of TR data.

Publication and dissemination of TR data

TR data in many cases is accessible to data vendors and market participants who use it for a variety of purposes, either directly from the TR or via aggregated data published by authorities. In a number of jurisdictions, existing or future requirements to publish trade-by-trade data about derivatives transactions enhance (or will, when implemented, enhance) market transparency, potentially lowering execution costs and reducing spreads for standard sized trades. Many jurisdictions also require aggregate data on newly reported transactions to be published.

Information required to be published about OTC derivatives transactions (either by TRs, trading platforms, CCPs or authorities) differs widely between jurisdictions. Aggregate information is required to be published on a weekly basis (or less than daily) in nine jurisdictions; on a monthly basis (or less than weekly) in six; on a daily basis in four; and on an intra-day basis in two. Trade-by-trade information is required to be published on a (close to) real time basis in three jurisdictions; and on a daily basis in one, while no information at all is required to be published in some jurisdictions.[35]

As for price information, in 12 jurisdictions no price or spread information is currently required to be published; in four jurisdictions price or spread information on individual trades is required to be published, while in three jurisdictions average prices or spreads of new transactions are required to be published on a per-asset class basis.[36]

As to the use made of published data about OTC derivative transactions, one authority reported that market participants, data vendors, and end users regularly query the swaps information displayed by TRs on public websites, and that third parties including trade associations (such as the Futures Industry Association and the International Swaps and Derivatives Association (ISDA)) and service providers often analyse the data publicly disseminated by TRs and publish

[35] Other responses were also provided by nine jurisdictions and included that markets are not yet required to publish specific information of OTC derivatives transactions but in practice publish on their webpages aggregated data on a daily, weekly and/or monthly basis; transaction-level data is required to be reported on daily basis with a 48 hour reporting delay, with exclusions made for specific types of transactions and if the counterparty is an exempt clearing agency; third parties are allowed direct access to derivatives transaction data in aggregated form by applying for membership access to a TR-like entity; aggregate information is published on a non-periodic basis or is subject to the possibility of ad-hoc direction to publish information regarding OTC derivatives transactions.

[36] Other responses included that designated contract markets and swap execution facilities must publish certain market data on swaps, including trading volume and open contracts, prices and certain critical dates (CFTC); and that in aggregate position data published by TRs there is information on aggregate market value (ESMA).

their analyses. This authority also publishes a weekly report consolidating TR data from several TRs.[37]

Expected changes over next two years

Authorities typically reported that they expected the benefit they could derive from OTC derivatives data reported to TRs to increase by the end of 2018, following implementation of harmonisation of data elements, improvements in data quality and removal of barriers to OTC data access such as in relation to privacy or blocking statutes. A number of authorities reported they expected the scope of OTC derivatives that are publicly disseminated on a transaction basis to be broadened.

Harmonisation of data elements reported to TRs is important to ensure effective aggregation and analysis. CPMI and IOSCO initiatives are developing unique global identifiers (Unique Transaction Identifier (UTI) and Unique Product Identifier (UPI)) as well as harmonisation of other critical data elements of OTC derivative transactions are important in supporting this effort. The effective implementation of these elements and identifiers within the FSB member jurisdictions will improve data quality and ultimately transparency in global OTC derivatives markets.

EU members reported that an important milestone will be the commencement of the Markets in Financial Instruments Directive and Regulation (MiFID 2/MiFIR) in the EU, which will see the publication of transaction-level data about OTC derivatives that are traded on trading venues. In the US, both the Federal Deposit Insurance Corporation and the Federal Reserve Board reported expecting to gain access to TR data.

3.2.3 Platform trading rates

While trading of OTC derivatives on organised trading platforms, including electronic trading platforms, has increased since the crisis by varying degrees in different asset classes and jurisdictions, this reform area remains less advanced than trade reporting or central clearing reforms. Platform trading, where appropriate, has the potential to increase transparency to participants in these markets and support the ancillary goals of reduced operational risk and improved end-to-end processing.

Frameworks for mandatory **platform trading** are in force in 12 FSB member jurisdictions. However, so far only six jurisdictions have mandatory requirements for specific products to be traded on platforms. Mandatory trading requirements are due to be implemented more widely, for example through MiFID 2/MiFIR in the EU (starting in 2018), and some authorities expect platform trading rates to continue to increase (figure 14 in Appendix A).

While the G20 Leaders' commitment called for standardised OTC derivatives to be traded "on exchanges or electronic platforms, where appropriate", statutory language in some jurisdictions is technology-neutral.[38] Electronic platform trading has increased since 2012 for some products in the largest OTC derivatives markets, including standardised interest rate swaps (figure 6).

[37] CFTC Weekly Swaps Report is available at www.cftc.gov/MarketReports/SwapsReports/index.htm.

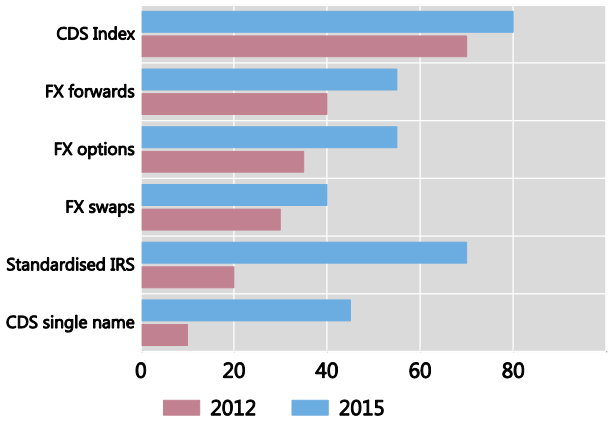
[38] The US Wall Street Reform Act (Dodd-Frank Act) requires trade execution of swaps to take place on regulated platforms, but does not require electronic execution. This is also the case under the European Union's MiFIR.

The increase in on-platform trading of interest rate derivatives was particularly pronounced around the start in October 2013 of the CFTC's rules mandating trading of certain derivatives on swap execution facilities (SEFs) (figure 17 in Appendix A).

Figure 6

Extent of electronic trading[1] in various product types

Percent



IRS = interest rate swaps. [1] See BIS (2016a), *Markets Committee; Electronic trading in fixed income markets*: "The term 'electronic trading' covers a variety of activities that are part of the life cycle of a trade. In this report, electronic trading refers to the transfer of ownership of a financial instrument whereby the matching of the two counterparties in the negotiation or execution phase of the trade occurs through an electronic system." Source: Greenwich Associates (2014); McKinsey & Company and Greenwich Associates (2013); as cited in BIS (2016a).

However, authorities in some other jurisdictions have reported low levels of platform trading (figure 18 in Appendix A), including on electronic platforms, and the share of interest rate derivatives trading through exchanges globally has declined by some 15 percentage points since 2001 (figure 19 in Appendix A).

At the jurisdictional level, estimates of rates of trading on exchanges or electronic trading platforms are limited (figure 18 in Appendix A). In many cases authorities report that the data are not available from data reported to TRs to enable such calculations to be readily performed, or that there are difficulties with comparing trading volumes on exchanges and trading platforms.

Authorities continue to monitor the potential effects of platform trading on market quality, liquidity, structure, and transaction costs. They are also focused on the potential for geographic market fragmentation as different jurisdictions implement platform trading in different manners and pursuant to different time frames. In at least one large jurisdiction where platform trading has been implemented, relevant authorities are concerned about the potential trade-off between increasing pre-trade transparency and ensuring robust market liquidity.

As for the future, a number of authorities (including in the EU, Korea and Singapore) propose to review in 2017-18 whether trading mandates should be introduced for specific products. Expectations on the part of authorities of increases in rates of platform trading are concentrated in the interest rate and, to a lesser extent, FX asset classes (see figure 14 in Appendix A).

3.2.4 Collateralisation of non-centrally cleared derivatives

Over the last year, margin requirements have begun to be introduced in around half the FSB member jurisdictions. Initial margin requirements, which have been implemented by some jurisdictions for non-centrally cleared derivatives trades between the largest institutions, are expected to continue to be phased-in progressively through to 2020. Variation margin requirements came fully into effect in March 2017 in 13 jurisdictions, in line with the BCBS-IOSCO phase-in schedule, with transitional arrangements in place in some jurisdictions beyond then. Some market participants faced challenges to complete the necessary documentation and processes to be in full compliance with these variation margin requirements. While reaffirming their commitment to implementation of the margin requirements, authorities have, where appropriate and consistent with their legal and supervisory frameworks, taken measures to ensure fair and orderly markets during the introduction and application of such variation margin requirements.

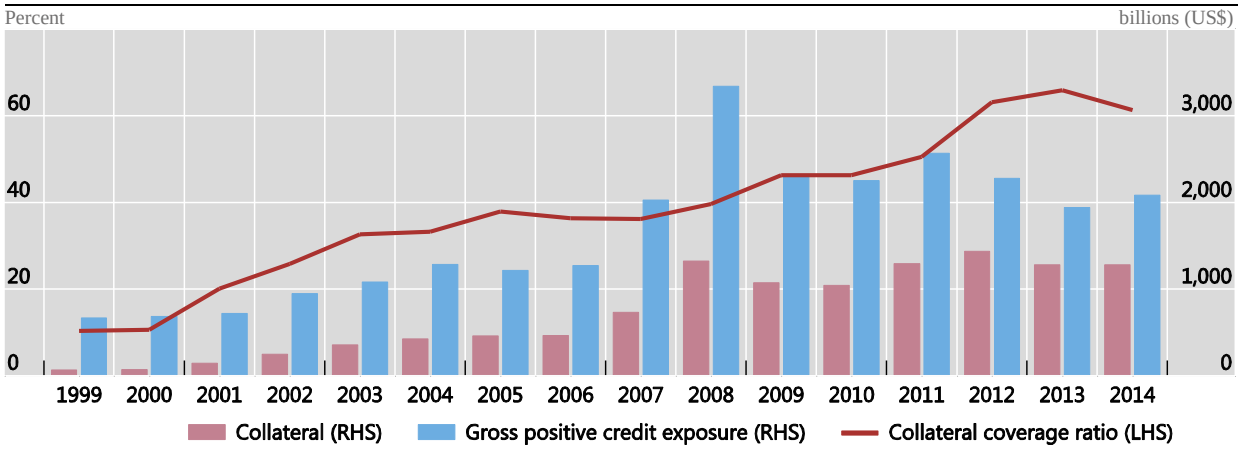
Since the crisis, the amount of collateral relating to OTC derivatives, and the collateral coverage ratio, i.e. the ratio between collateral and exposures for OTC derivatives have increased markedly. Collateral held by ISDA members increased from a reported US$0.46 trillion at end-2006 to US$1.28 trillion at end-2014. The amount of collateral in the global system (including non-financial firms) has increased from an estimated US$0.67 trillion to US$1.74 trillion. The collateral coverage ratio for global banks increased from around 36% in 2007 to around 61% to end-2014 (figure 7). (The collateral coverage ratio across all institutions over the same period increased from 33% to 52%.) This occurred ahead of the introduction of higher capital requirements and minimum margin requirements for non-centrally cleared derivatives, and may have been driven in part by changes in the broader regulatory and risk-management landscape. More recently, US figures show a strong increase in the proportion of fair value collateral to net current credit exposures from 80.6% at end-2014 to 98.5% at end-2016 (see Table 20 in Appendix A), at a time when many jurisdictions had begun to implement higher capital standards for non-centrally cleared derivatives.[39]

Looking ahead, initial margin requirements are being phased in across FSB jurisdictions over the next five years, variation margin transitional relief is due to run out in jurisdictions that have implemented margin requirements in 2017, and Basel III capital requirements including for non-centrally cleared trades are also being implemented. Thus authorities expect to see increases in the collateral coverage ratio in future.

[39] The OCC reported that "the increase in the ratio of collateral held against counterparty exposure was due primarily to stronger collateral coverage of exposures to banks and securities firms, which increased from 107.2 percent to 119.0 percent. Collateral held against hedge fund exposures increased in the fourth quarter, and coverage remains very high at 491.5 percent. Bank exposures to hedge funds have always been secured, because banks take "initial margin" on transactions with hedge funds, in addition to fully securing any current credit exposure. Collateral coverage of corporate, monoline, and sovereign exposures is much less than coverage of financial institutions and hedge funds, although coverage of corporate exposures has been increasing over the past several years because of increases in the volume of trades cleared at central counterparties." OCC (2016), *Quarterly Report on Bank Trading and Derivatives Activities Fourth Quarter 2016*.

Figure 7

Collateralisation of global dealer-banks' OTC derivatives exposures, 1999-2014



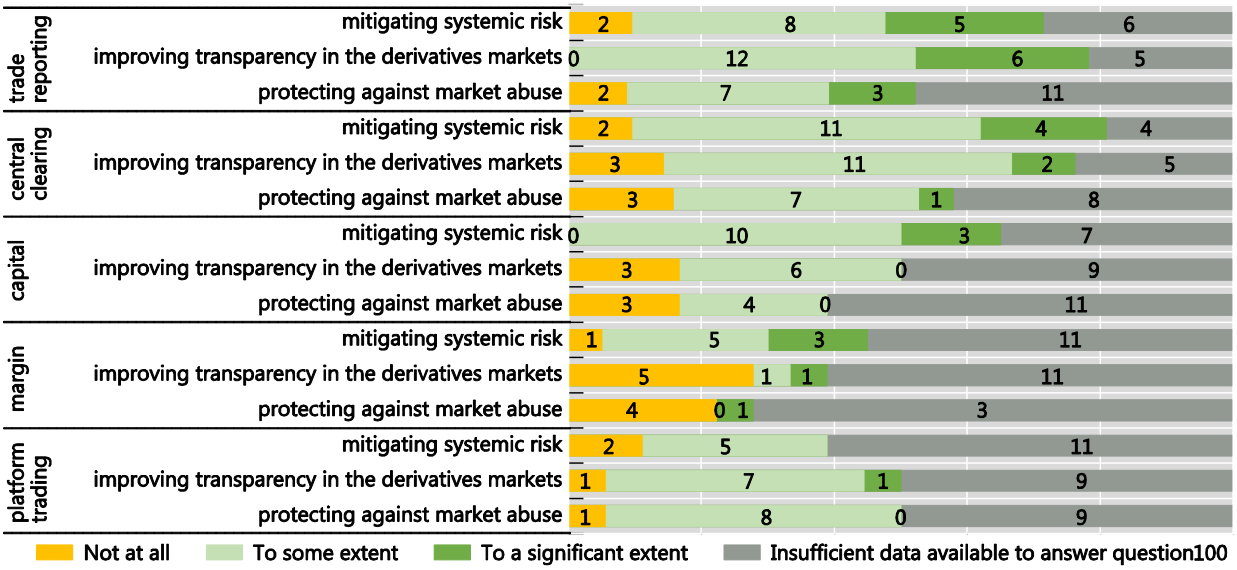
This figure shows the collateral coverage ratio for derivative transactions where dealer-banks have claims on their customers. Gross positive credit exposures as reported by the BIS represents the current values of counterparty credit exposures of BIS-reporting dealers to their counterparties (including banks and nonbanks) with whom the BIS-reporting dealers are "in-the-money", and thus represents the claims that BIS-reporting dealers have on their customers. This does not include derivative portfolios for which dealers are "out-of-the-money". "Collateral" is derived by adjusting the volume of collateral reported as received and posted by ISDA members (a similar population of institutions as in the BIS data set) against both non-centrally cleared and centrally cleared OTC derivatives in ISDA Margin Surveys for double counting. Source: BIS; ISDA Margin Survey; Bank of England calculations.

3.3 Effectiveness of the reforms to date

Overall, although reforms are still being implemented, authorities are increasingly able to observe ongoing progress toward meeting the G20 Leaders' objectives. Trade reporting, central clearing and higher capital requirements, the reforms that are overall furthest advanced, are perceived by jurisdictions to have been more effective so far in achieving the objectives of the G20 Leaders' commitments than the other reforms (figure 8). Across all the reform areas, in response to the FSB questionnaire jurisdictions typically either indicated they lacked sufficient information to evaluate effectiveness of reforms against individual G20 objectives, or judged effectiveness to be partial. Accordingly, it generally remains too early to reach more than preliminary conclusions. Evaluations of the reforms' effectiveness, using the new FSB evaluation framework, should give a progressively clearer view as implementation continues.

Figure 8

Jurisdictions' effectiveness perceptions by reform type and objective



Number of jurisdictions responding on their perception of the effectiveness in their jurisdiction of each of the five reforms (in their jurisdiction or elsewhere) with regard to each of the reform objectives. Source: FSB member jurisdictions, January 2017.

3.3.1 Mitigating systemic risk

Central clearing helps to mitigate systemic risk in several respects. As compared to the bilaterally-cleared market, central clearing provides transparency by replacing the complex and opaque web of ties between market participants (in particular banks) with simpler and more transparent links between CCPs and their clearing members. A CCP also reduces counterparty credit risk by facilitating multilateral netting and through its margin requirements and risk management of its clearing members. For example, a CCP may substantially reduce the number and notional amount of outstanding bilateral positions through multilateral netting.[40] Moreover, a CCP provides counterparties with daily mark-to-market valuations and exchange of variation margin pursuant to a risk management framework as set out ex ante in the CCP's rules and procedures. Further, the CCP helps ensure the performance of market participants' transactions. CCPs require participants to provide collateral (margin) to cover current and potential future exposures. CCPs also mutualise certain risks through devices such as default funds, and enable centralised and orderly management of participant defaults.

A CCP's role at the centre of the network of transactions means it is critical that CCPs are resilient. In recent years there have been material improvements, primarily due to the implementation of the PFMI in CCPs' resilience including their governance, risk management framework and the financial resources they are required to hold to manage a default. Further and ongoing steps are designed to help prevent CCPs from becoming a new, concentrated source of too-big-to-fail risk (see section 3.4.1).

[40] This effect can be reduced when activity is concentrated in a few counterparties, central clearing is more fragmented among CCPs, or participants' positions are more directional; see Duffie and Zhu (2011); Heath, Kelly, and Manning (2013); Cont and Kokholm (2014); and Garratt and Zimmerman (2015).

For non-centrally cleared derivatives, higher capital charges and margin requirements, together with improved risk management processes, can be expected to mitigate systemic risk by reducing associated uncollateralised exposures, and increasing capital held against those exposures. Should a counterparty come under stress, contagion and spillover effects would be reduced by ensuring that collateral and capital is available to offset losses caused by a defaulting counterparty.

The reforms to set higher capital charges and, more recently, margin requirements, for non-centrally cleared derivatives transactions are still being implemented, so the effects cannot yet be fully seen. Nevertheless, some authorities report that a greater proportion of OTC derivatives exposures are collateralised, for both centrally and non-centrally cleared transactions, when compared with the undercollateralised exposures in the pre-crisis period. This build-up in collateral has taken some time and remains ongoing but has already contributed to greater loss absorbency for OTC derivatives in the finanical system.

As set out in section 3.2.1, there is some evidence that higher capital charges and particularly margin requirements contribute to encouraging increased central clearing of some OTC derivatives that are not subject to mandatory central clearing requirements, such as NDFs and inflation swaps. The effects of these new requirements, including mitigation of systemic risk, will continue to be studied.

TR data is another important component in mitigating systemic risk, in helping authorities to better understand the structure of, and relationships, exposures and risks in, OTC derivatives markets. Whilst significant challenges remain (including to improve data quality), TR data is beginning to enhance many authorities' ability to identify and monitor systemic risk, e.g. related to risk exposures (see section 3.2.2 above).

Regarding platform trading requirements, the benefits of more automated processes and greater price transparency may help with risk management, thus contributing to systemic risk mitigation overall, but the implementation of these reforms is less advanced and the existing studies on platform trading do not examine its influence on systemic risk.

3.3.2 Improving transparency in derivatives markets

Trade reporting is increasing the transparency of OTC derivatives markets to authorities which have access to TR data. Trade reporting requirements covering at least 90% of OTC derivatives trading are now in force in 19 FSB member jurisdictions.[41]

Authorities generally consider trade reporting requirements to be the most effective of the five reform areas in increasing transparency of OTC derivatives markets (figure 8).[42] Authorities typically referred to increased availability of TR data as increasing transparency for authorities, and disclosure of trade-by-trade or aggregate information as increasing transparency for market participants.

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[41] Jurisdictions that have yet to have such requirements in force are: Argentina, Hong Kong, South Africa, Switzerland and Turkey. In all of these jurisdictions except Argentina, requirements are due to be in force by end-2017.

[42] By contrast, around half the 24 member jurisdictions (13) described central clearing requirements as effective in increasing transparency to some extent (11) or to a significant extent (2). Eight member jurisdictions described a belief that platform trading requirements were effective with regard to achieving increased transparency of OTC derivatives transactions to some extent (7) or to a significant extent (1). The more limited responses may be due to some extent to the fact that only six jurisdictions will have platform trading requirements in force by end-June 2017: see FSB (2017a).

Greater transparency could be achieved by overcoming the remaining challenges concerning trade reporting. Many authorities continue to report significant challenges in being able to compile and use fully (or in some cases use at all) TR data for their regulatory or supervisory mandates. These challenges include legal barriers to full reporting of and access to TR data, lack of harmonisation of data formats and data quality issues.

Important efforts are underway to increase the ability to fully use TR data by removing legal barriers to reporting and accessing data and by improving the data quality through harmonising reporting requirements at jurisdictional and at global levels (including through the introduction of UTIs and UPIs) (see section 3.4.4). G20 Leaders' continued support will be important to ensure that the needed changes in national regulatory frameworks are made to remove legal barriers to full reporting of and access to access to TR data to achieve the goal of transparent OTC derivatives markets.

3.3.3 Protecting against market abuse

The third objective of the OTC derivatives reforms is to protect against market abuse. This would be achieved primarily through reforms relating to trading on exchanges or electronic trading platforms, which provide higher levels of pre-trade transparency through the publication of quotes and orders for transactions, and post-trade transparency through TR data for completed transactions.

Jurisdictions report they have limited evidence on the effectiveness of overall reforms in protecting against market abuse.[43] Challenges in fully using TR data and slow progress in implementing platform trading reforms may contribute to the relative lack of evidence to date. However, authorities have reported that they do use, or intend to use, TR data in market surveillance and there are examples of TR data being used to complement other findings and impose fines where instances of market abuse have been identified. Specifically, authorities from 11 national jurisdictions and the European Securities Markets Authority (ESMA) reported that they had access to relevant TR data for conducting market surveillance and enforcement (e.g. market pricing manipulation, insider trading) and that manual or automated inquiries were underway.[44]

3.4 Challenges and work underway to address those challenges

This report has noted that there have been a number of challenges encountered in implementing the reforms agreed by G20 Leaders. This section describes work underway to address some of these challenges.

[43] Ten jurisdictions perceived that trade reporting was effective to a substantial extent (3) or to some extent (7) in achieving the objective of protecting against market abuse. Similar numbers were reported for central clearing (7 and 1) and platform trading (8 and 0) in regard to this objective (see figure 8).

[44] In particular, authorities from seven national jurisdictions and ESMA reported that manual, ad-hoc inquiries relevant to the mandate/type of analysis are underway, three jurisdictions reported that automated inquiries or alerts relevant to the mandate/type of analysis are applied, while one jurisdiction reported that automated inquiries or alerts relevant to the mandate/type of analysis are applied in an integrated way across OTC derivatives data and other data sets.

3.4.1 CCP resilience, recovery and resolution

The reforms of derivatives markets seek to enhance financial stability by increased use of central clearing for standardised derivatives. However, fully realising the benefits of central clearing requires CCPs to be subject to strong regulatory, oversight and supervisory requirements. CCPs must be sufficiently resilient and have comprehensive recovery plans. In addition, resolution authorities should develop credible resolution plans which could be implemented in the event a CCP failure in order to ensure that the critical functions of a CCP will be continued. International standard setters, led by the FSB, are delivering on a CCP workplan[45] launched in 2015 to address these areas.

CCP resilience

In April 2012, the then Committee on Payment and Settlement Systems (CPSS, now CPMI) and the Technical Committee of IOSCO published the PFMI[46] which replaced three previous sets of international standards.[47] The PFMI raise minimum standards, provide more detailed guidance and broaden the scope of the standards to cover new risk management areas and new types of FMI, i.e. trade repositories. The PFMI also incorporate additional detailed guidance for CCPs and TRs.

The CPMI and IOSCO's most recent 'Level 1' implementation monitoring report, shows that most jurisdictions have stated that they have completed the process of adopting legislation, regulations, and/or policies that will enable them to implement the PFMI with regard to all FMI types, including CCPs.[48]

The CPMI and IOSCO also reviewed the financial risk management and recovery practices of 10 derivatives CCPs in a report published in August 2016.[49] This report found that the CCPs have overall made important and meaningful progress in implementing arrangements consistent with the financial risk management and recovery standards of the PFMI. Some gaps and shortcomings were nevertheless identified relative to these standards. These areas are currently subject to further implementation monitoring by CPMI and IOSCO.

To address this and other areas identified in the CCP workplan, CPMI and IOSCO will publish further guidance on financial risk management for CCPs in July 2017. In particular, the guidance will cover: governance; internal stress testing for both credit and liquidity exposures; coverage of credit and liquidity resource standards; CCP margin systems (including aspects specific to managing procyclicality); and a CCP's contribution of its own financial resources to losses.

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45 FSB, BCBS, CPMI and IOSCO (2015), *CCP Workplan* http://www.fsb.org/wp-content/uploads/Joint-CCP-Workplan-for-2015-For-Publication.pdf

46 CPMI and IOSCO (2012).

47 The Core principles for systemically important payment systems (CPSS, (2001)); the Recommendations for securities settlement systems (CPSS-IOSCO, (2001)); and the Recommendations for central counterparties (CPSS-IOSCO, (2004))

48 CPMI and IOSCO (2016a), *Implementation monitoring of PFMI: Third update to Level 1 assessment report,* www.bis.org/cpmi/publ/d145.htm and www.iosco.org/library/pubdocs/pdf/IOSCOPD534.pdf.

49 CPMI and IOSCO (2016b), *Implementation monitoring of PFMI: Level 3 assessment – Report on the financial risk management and recovery practices of 10 derivatives CCPs* (August), www.bis.org/cpmi/publ/d148.htm and www.iosco.org/library/pubdocs/pdf/IOSCOPD538.pdf.

CCP Supervisory Stress Testing

As part of the CCP workplan and as a complement to the further guidance on internal stress testing for CCPs, CPMI and IOSCO are developing a framework for supervisory stress testing of CCPs. The framework is designed to serve as a guide to support supervisory stress tests conducted by one or more authorities that examine the potential broad, macro-level impact of a common stress event affecting multiple CCPs, from a credit perspective, a liquidity perspective, or both. In particular, conducting this type of supervisory stress test could help authorities better understand the scope and magnitude of the interdependencies between markets, CCPs and other entities, such as liquidity providers and custodian banks. CPMI and IOSCO published a consultative version of the framework in June 2017, for which industry and the wider public will be able to provide feedback.[50]

CCP recovery

In October 2014, CPMI and IOSCO published its report on *Recovery of Financial Market Infrastructures*,[51] based on the PFMI which provides guidance to FMIs, including CCPs, on how to develop plans to enable them to recover from threats to their viability and financial strength that might prevent them from continuing to provide critical services to their participants and the markets they serve. It also provides guidance to relevant authorities in carrying out their responsibilities associated with the development and implementation of recovery plans. CPMI and IOSCO will publish additional recovery guidance by the time of the G20 Summit in July 2017, providing additional clarifications in four areas of recovery planning: (i) operationalisation of the recovery plan; (ii) replenishment; (iii) non-default-related losses; and (iv) transparency with respect to recovery tools and how they work.

CCP resolution

Following the financial crisis and G20 Leaders' commitments to end too-big-to-fail, the FSB published its *Key Attributes of effective resolution regimes for financial institutions* (Key Attributes)[52] in October 2011. Additional guidance on the application of the Key Attributes to FMIs was published in October 2014, in the form of an Annex.

Resolution frameworks for CCPs are currently in place in Hong Kong, Italy, Singapore, the United Kingdom and United States. Draft legislation has been introduced in the European Union, and Australia and Canada are in the process of developing draft legislation.

The FSB has led work to develop further guidance on CCP resolution, due to be finalised by the time of the G20 Summit in July 2017. This guidance is intended to assist authorities in their resolution planning and promote international consistency. The guidance will address a number of areas including: the overall objectives of CCP resolution and resolution planning; the powers that resolution authorities should have to maintain the continuity of critical CCP functions, including returning the CCP to a matched book and addressing default and non-default losses; the potential indicators of circumstances that could lead to a determination to trigger resolution;

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50 CPMI and IOSCO (2017b), *Consultative Report: Framework for supervisory stress testing of central counterparties* at www.bis.org/cpmi/publ/d161.htm and www.iosco.org/library/pubdocs/pdf/IOSCOPD566.pdf

51 CPMI and IOSCO (2014), *Recovery of financial market infrastructures - final report*, at www.bis.org/cpmi/publ/d121.htm and www.iosco.org/library/pubdocs/pdf/IOSCOPD455.pdf

52 FSB (2014), *Key Attributes of effective resolution regimes for financial institutions* at www.fsb.org/2014/10/key-attributes-of-effective-resolution-regimes-for-financial-institutions-2/

allocating losses to equity holders in resolution; the application of the "no creditor worse off" safeguard and determination of the insolvency counterfactual; resolution planning and resolvability assessments; and cross-border cooperation and the cross-border enforcement of resolution actions.

In addition, crisis management groups are being established for CCPs that are systemically important in more than one jurisdiction.

3.4.2 Alignment of incentives in central clearing

In 2012, the chairs of the BCBS, Committee on the Global Financial System (CGFS), CPMI, FSB and IOSCO established the OTC Derivatives Assessment Team (DAT) to assess the incentives to centrally clear OTC derivatives resulting from the various international standards for capital and margin requirements. The DAT's report was published in October 2014, and it observed that clearing members (i.e. those institutions that clear directly through CCPs) have incentives to clear centrally. Central clearing incentives for market participants that clear indirectly (i.e. that are not direct clearing members of a CCP but clear through an intermediary that is a clearing member) were assessed as less obvious and could not be comprehensively analysed on the basis of the data received in the quantitative analysis.[53]

Some academic articles have also considered incentives to centrally clear in a competitive CCP landscape. Krahnen and Pelizzon (2016)[54] argue that competing CCPs might have an incentive to lower margins and haircut requirements to attract more clearing volumes. According to these authors, such competitive pressures may contribute to a system-wide build-up of leverage and increase the potential for sudden and sharp spikes in initial margins, collateral haircuts and/or margin add-ons during the downswing of the asset price cycle. Analysis of US futures market data by Park and Abruzzo (2016)[55] finds evidence that competition among CCPs can have an impact on margin requirements. Similarly, Ghamami and Glasserman (2016)[56] conclude that central clearing is not necessarily incentivised even for direct clearing member banks and can be sensitive to the default fund contributions required by CCPs.

In light of further policy development and ongoing implementation since 2014, a new DAT, convened by the Oversight Derivatives Coordination Group, will undertake an updated review of the incentives for central clearing, building on the previous report, by end-2018.

3.4.3 Issues relating to procyclicality

Initial margin requirements are typically designed to adjust relative to the expected contract price volatility, which is not directly observable. Hence, margins are derived from measures of the potential future exposure (PFE) of the derivative transactions or portfolios in question.

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53 BCBS, CGFS, CPMI, FSB and IOSCO (October 2014), *Regulatory reform of over-the-counter derivatives: an assessment of incentives to clear centrally*, at www.bis.org/publ/othp21.pdf

54 Krahnen, J., and Pelizzon, L. (2016). "'Predatory' Margins and the Regulation and Supervision of Central Counterparty Clearing Houses (CCPs)." *Sustainable Architecture for Finance in Europe: White Paper Series*

55 Park, Y.-H., and Abruzzo, N. (2016), "An Empirical Analysis of Futures Margin Changes: Determinants and Policy Implications." *Journal of Financial Services Research* 49.1: 65-100

56 Ghamami, S., and Glasserman, P. (2016), 'Does OTC Derivatives Reform incentivise central clearing?' *Office of Financial Research Working Paper* at www.financialresearch.gov/working-papers/files/OFRwp-2016-07_Does-OTC-Derivatives%20-Reform-Incentivize-Central-Clearing.pdf

Because PFE can be sensitive to near-term return volatility, some initial margin frameworks could give rise to procyclical effects by requiring market participants to post relatively more collateral when volatility is elevated and relatively less collateral when volatility is subdued, which generates a procyclical behaviour in margin changes. This procyclical property of initial margin frameworks – for both centrally cleared and non-centrally cleared transactions – could, therefore, contribute to market stress.[57] A number of recent policy documents describe potential adjustments to margin policies addressing this property.

In the PFMI[58] and forthcoming guidance to be published in July 2017 CPMI and IOSCO recommend that CCPs appropriately address procyclicality in their margin arrangements (including initial margin) and, to the extent practicable and prudent, adopt forward-looking, relatively stable and conservative margin requirements that are specifically designed to limit the need for destabilising, procyclical changes.

In addition, BCBS and IOSCO have published a recommendation for non-centrally cleared derivatives where initial margin levels are calibrated to a period that includes financial stress to ensure that sufficient margin will be available when it is most needed and to limit the extent to which the margin can be procyclical. Also, the BCBS-IOSCO framework states that, to mitigate procyclicality impacts, large discrete calls for (additional) initial margin due to "cliff-edge" triggers should be discouraged and margin levels should be sufficiently conservative.[59]

Aspects of these policy frameworks have been implemented by many jurisdictions, and some authorities in the EU have studied the initial effects of these policies.[60]

There are, of course, important trade-offs associated with dampening the cyclicality of margin requirements. If margin requirements are not allowed to rise commensurate with increases in market volatility, market participants or CCPs could be exposed to additional counterparty risk. Conversely, if margin requirements are not allowed to fall during periods of market calm, increased trading costs could result.[61] Different approaches have been taken by different authorities, and policymakers continue to explore these issues.

3.4.4 Harmonisation of TR data; improvements in data quality; overcoming legal barriers

Further work is needed to help authorities realise the full extent of benefits from TR data. Authorities are working to overcome differences between TR reporting specifications to enhance comparability and aggregation of data. Authorities also cite a range of challenges, including the need for improvements in data quality and for more powerful IT systems to analyse data as important challenges in making fuller use of TR data.[62]

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57 For example, see Brunnermeier, M. and Pedersen, L.H. (2008), 'Market Liquidity and Funding Liquidity', *Review of Financial Studies*, 22.6 (2009): 2201-2238

58 CPSS-IOSCO (2012)

59 BCBS and IOSCO (2015) (sections 3.10 and 3.11).

60 ESMA (2015b); ESRB (2017); Murphy et al (2016).

61 See also Glasserman, P. and Wu, Q. (2016), "Persistence and Procyclicality in Margin Requirements" Working Paper.

62 When jurisdictions were asked to identify the three most important challenges that remain before authorities in the jurisdiction expect to be able to make full use of TR data, the key challenges reported were: improving data quality (14 jurisdictions); data harmonisation of key data elements, e.g. UTI, UPI, critical data elements (11); more powerful information systems to analyse TR data (8); gaining access to foreign TR data (7); gaining the ability to access TR data at

Recently, a number of academic papers have focused on TR data. For example, in a detailed exploration of data from six European trade repositories, Osiewicz et al. (2015) find that the decentralised character of trade reporting, lack of common reporting standards, and data quality issues pose significant challenges for data analysis and aggregation.[63] Cielinska et al. (2017) examine the quality of the European FX TR data and document a number of data limitations, such as: double-counting of trade reports, inconsistent use of buy/sell indicators, lack of information about complex derivatives products, and mismatches between state and activity reports. Despite these drawbacks, they conclude that the TR data provide an invaluable source of information for analysing market activity and the build-up of exposures in derivatives markets.[64]

In response to such challenges, efforts to improve data quality and harmonise data elements in trade reporting requirements (which are important to effective data aggregation and analysis), continue at both domestic and international levels. CPMI and IOSCO are working on recommendations for harmonisation of key OTC derivatives data elements that are reported to TRs and are important for the aggregation of data by authorities. Guidance to authorities on a global UTI was published in February 2017.[65] Work continues on a global UPI and other critical data elements, and the FSB is developing recommendations for governance of the UTI and UPI. Once the guidance and governance recommendations are finalised, some jurisdictions may need to update their OTC derivatives trade reporting rules and work closely with market participants on implementation, taking account of the benefits and costs of such changes.

The 2015 FSB thematic peer review of trade reporting highlighted that FSB member jurisdictions should remove legal barriers to the reporting of OTC derivatives transactions to TRs (including with respect to foreign requirements) and have legal frameworks in place to permit both domestic and foreign authorities' access to data held in a domestic TR.[66] The report highlighted that cross-border access to TR-held data is important for making full use of TR data.[67] Authorities reported last year to the FSB on their planned actions to address the identified legal barriers; the FSB is publishing a progress report ahead of the G20 Summit in July 2017.[68]

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a global level (6); gaining the ability to aggregate data sets from different TRs (4); gaining the ability to aggregate or match TR data with other data under own control (5); improving the design of the data set that is reported (5); gaining the ability to aggregate positions across members of corporate groups (4); increased human resources to analyse or develop analytics for TR data (4); other challenges (3); gaining access to domestic TR data (2); improving the coverage of data reporting (2); and none – authorities are already making full use of TR data (1); improving the frequency or timeliness of data reporting (1).

63 Osiewicz, M., Fache Rousova, L., and Kulmala, K.-M. (2016), "Reporting of derivatives transactions in Europe – Exploring the potential of EMIR micro data against the challenges of aggregation across six trade repositories." *IFC Bulletins chapter 41*

64 Cielinska, O., Joseph, A., Shreyas, U., Tanner, J. and Vasios, M. (2017)

65 CPMI and IOSCO (2017a), *Technical Guidance; Harmonisation of the Unique Transaction Identifier*, at www.bis.org/cpmi/publ/d158.pdf and www.iosco.org/library/pubdocs/pdf/IOSCOPD557.pdf.

66 FSB (2015), *Thematic review of OTC derivatives trade reporting*, at www.fsb.org/2015/11/thematic-review-of-otc-derivatives-trade-reporting/

67 FSB (2015), p. 23.

68 FSB (2017b), *FSB members' plans to address legal barriers to reporting and accessing OTC derivatives trade data: Progress report*, available at http://www.fsb.org/2017/06/fsb-members-plans-to-address-legal-barriers-to-reporting-and-accessing-otc-derivatives-trade-data-progress-report/ together with members' plans (updated where relevant).

Aside from participating in or undertaking these actions, authorities reported seeking to address challenges to the use of TR data through a variety of means, including: building or upgrading IT systems and data governance or analytic capability to analyse TR data; working with firms to identify fields of particular concern and to provide guidance and feedback; mapping financial institutions' cross-border flows to prioritise jurisdictions to enter bilateral information sharing agreements; and developing heat maps with TRs to address data quality amongst the largest participants.

EU authorities have been focusing on improving data quality in the TR dataset for some time. In 2014 ESMA launched an initiative called the Data Quality Action Plan which is aimed at improving the quality and usability of derivatives data. The main elements include amending rules to mandate validations at the TR level of data fields, and to further specify correct content for data fields; targeted assessments by national authorities of the entities with worst data quality indicators (rejections and reconciliation rates); and on-going assessment by ESMA of the quality of data provided to national authorities.

Similarly, in 2014, the CFTC requested public comment on its swaps data reporting rules in an effort to improve its data collection and quality standards.[69]

Studies have demonstrated the positive impact of ongoing work in this area. Abad et al. (2016) examine the fraction of observations with missing values for European TR data reported to ESMA over time. These analyses suggest that TR data quality was relatively poor in the first months after trade reporting was required in the EU but has improved slowly over time. More rigorous data validation standards adopted by ESMA in December 2014 appear to have resulted in a significant improvement in data quality. The introduction of Level 1 validations by TRs in December 2014 in particular led to a significant reduction in the number of missing observations in EU TR data. [70]

[69] CFTC (2014), "CFTC Requests Public Comment on Swap Data Reporting Rules", Mar. 19, www.cftc.gov/PressRoom/PressReleases/pr6882-14.

[70] Abad, J., Aldasoro, I., Aymanns, C., D'Errico, M., Fache Rousova, L., Hoffmann, Pl, Langfield, S., Neychev, M., and Roukny, T. (2016), "Shedding light on dark markets: First insights from the new EU-wide OTC derivatives dataset." *ESRB Occasional Paper Series.*

4. Broader effects of the reforms on OTC derivatives markets and the wider economy

4.1 Changes in market structure, including in emerging markets

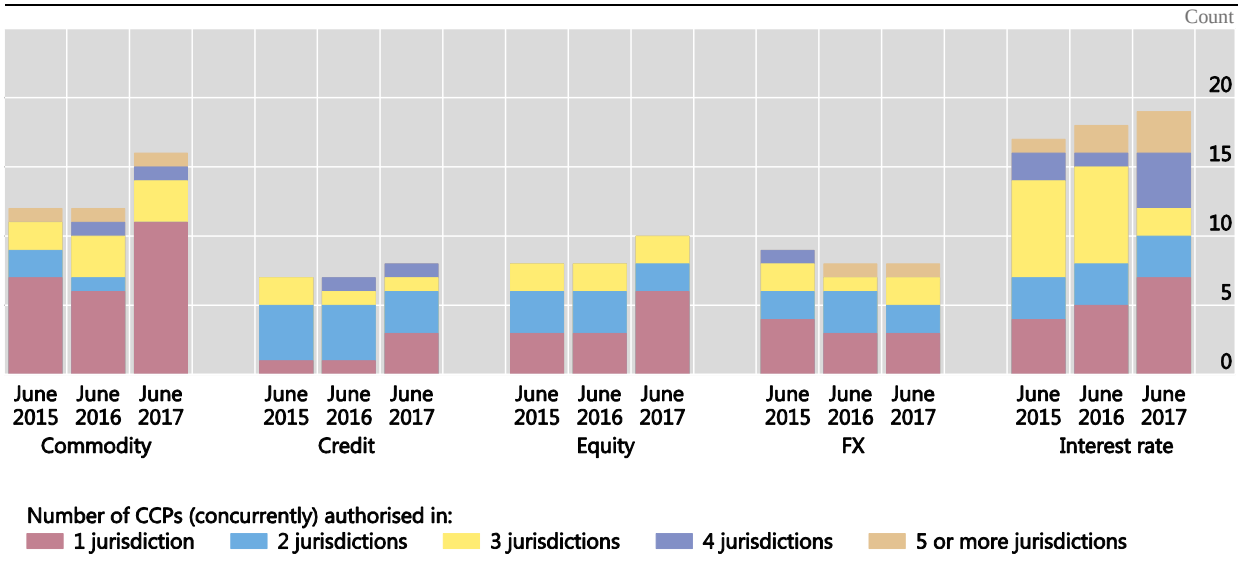
The main market structure changes relate to increased rates of and participation in central clearing. Some jurisdictions reported a range of effects with respect to market structure of the reforms, including the implementation of mandatory clearing requirements having increased use of CCPs and client clearing; and an increased presence of the buy-side entities in the clearing process, including the emergence of buy-side clearing members. A few jurisdictions have noted that they have not yet observed changes in market structure at this stage of implementation.

Regarding financial market infrastructures, the reforms have resulted in an increase in the number of authorised TRs to 22 and 12 TR-like entities.[71] Jurisdictions' regulatory requirements appear to have resulted in increased access to TRs by market participants, though the cost of reporting to TRs is perceived by some market participants as relatively high for smaller reporting entities, or for some TRs compared to other TRs.

There has also been an expansion in the products cleared by CCPs clearing OTC derivatives, as well as an expansion in the number of CCPs authorised to clear OTC derivatives in individual jurisdictions (figure 9).

Figure 9

Number of CCPs concurrently authorised in one or more jurisdictions



Each bar indicates the number of CCPs authorised (i.e. licensed, registered, recognised, or operating pursuant to an exemption) and operating to centrally clear at least some OTC derivatives sub-products in one or more FSB member jurisdictions in the indicated asset class. The colours indicate the numbers of CCPs authorised in the respective numbers of FSB member jurisdictions. No CCP is currently available in more than 8 FSB member jurisdictions in a given asset class. Source: FSB member jurisdictions.

[71] FSB (2017a), Appendix G.

The OTC derivatives market reforms, including the encouragement and support for cross-border cooperation, equivalence and substituted compliance, are likely to have improved access to CCPs. As shown in figure 9, a number of FSB member jurisdictions have authorised multiple CCPs to provide clearing services in OTC derivatives. Existing CCPs have expanded their product range and/or attained licences or authorisations in other jurisdictions resulting in increased clearing offerings. Few new CCPs have been established since the financial crisis.

Jurisdictions also report changes to market structure having arisen as a result of platform trading requirements that include:

- increased numbers of trading platforms offering access to local participants or into the local markets;
- the market structure of some asset classes shifting from one in which participants primarily transacted on a bilateral basis to one in which participants transact through a multilateral trading environment where market participants may observe and transact upon competing price quotes; and
- initiatives by the industry to promote the trading of certain FX products which are sufficiently liquid to be traded on exchanges as FX futures.[72]

As for possible negative effects, a number of authorities report market intelligence suggesting a decline in the number of dealers which may be driven by wider changes in bank business models and intermediary services markets, while some authorities report limited change or even increases in the number of dealers. Any such declines could result in increased costs of trading or on costlier default management processes in the jurisdictions affected.

4.2 Availability of market infrastructure and client clearing

Client clearing offerings by CCPs have increased recently in some jurisdictions as clearing requirements come on-stream. The PFMI have encouraged CCPs to facilitate a wider variety of client clearing offerings (e.g. through individually segregated accounts). BCBS requirements that provide capital benefits for holding margin at CCPs or with clearing members through bankruptcy remote arrangements have also encouraged new client clearing options to emerge in recent years.

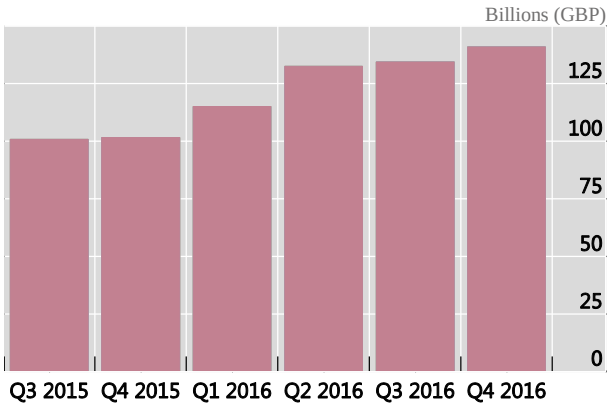
In OTC derivatives markets, client clearing services are currently predominantly offered in the interest rate and CDS asset classes. For example, client initial margin held at five OTC clearing CCPs increased by roughly 30% in the 12 months to end-2016 (figure 10, left hand panel). Measures of client funds held at CFTC-registered Futures Commission Merchants (FCMs) in connection with interest rates and CDS asset classes have also increased markedly, reaching over US$ 90 billion by end-2016, but declining since somewhat (figure 10, right hand panel). Client clearing could potentially grow further as clients of clearing members become subject to margin requirements for non-centrally cleared derivatives and in some cases become subject to clearing requirements.

[72] For example, in Singapore a suite of Asian FX futures was launched in Nov 2013, covering various currency pairs such as AUD/USD, USD/SGD, INR/USD and KRW/USD.

Figure 10

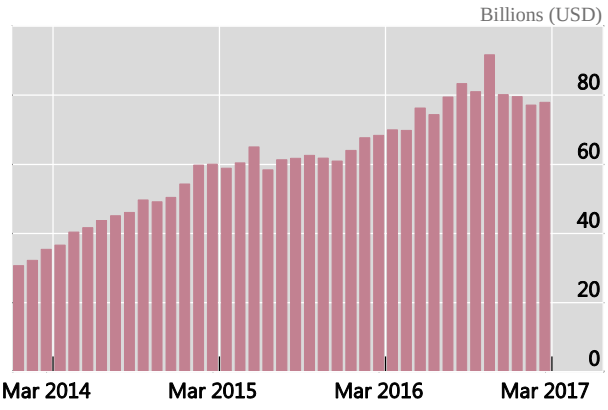
Growth in holdings of client funds connected to client clearing

Client clearing initial margin at CCPs



Source: Clarus Technology Ltd based on publicly reported data from five CCPs clearing IRS (CME, LCH SwapClear, Eurex Clearing, CME and JSCC)

Client funds held at CFTC-registered FCMs



Source: CFTC

On the other hand, market intelligence also suggests some, particularly smaller firms are facing issues in accessing clearing arrangements, with some clearing members withdrawing services to clients or ceasing to offer services to new clients. For example, in the US the number of FCMs providing client access to swap CCPs declined from 22 in the first half of 2014 to 19 in the first half of 2016, concentrating risks exposures faced by CCPs. Concentration of risk also can be observed in the fact that the 10 largest FCMs held 96% of required client segregated funds in June 2016 compared to a level of 94% in 2014. This concentration of risk may increase the challenges of transferring client positions in the case of a clearing member default. Authorities are watching this issue closely, not only from a clearing access perspective but also in terms of possible concentration risk amongst a few entities and the potentially diminished ability to port client positions in the event of clearing member default.

ESMA noted in a consultation paper that 'Category 3' counterparties in the EU, i.e. those financial counterparties with the smallest level of activity in OTC derivatives, are facing difficulties in preparing the arrangements with clearing members that are necessary for clearing the contracts. According to ESMA, recent evidence suggests that clearing members find little incentive to develop extensively their client clearing offering because of cost issues, especially for clients with limited activity in OTC derivatives and counterparties are currently unable to access CCPs by becoming an indirect client of a clearing member through a client, because of the scarcity of the offer. In response, the EC recently endorsed technical standards proposing to postpone the clearing obligation for small financial counterparties by up to two years.[73] The EC also proposed in May 2017 to introduce a clearing threshold for small financial counterparties, such as small banks or funds, as part of targeted amendments to EMIR.[74]

[73] See ESMA (2016), *Final Report: On the clearing obligation for financial counterparties with a limited volume of activity*; EC (2017), Commission Delegated Regulation (EU) 2017/751 of 16 March 2017 as regards the deadline for compliance with clearing obligations for certain counterparties dealing with OTC derivatives.

[74] The Commission's proposal is available ec.europa.eu/info/sites/info/files/170504-emir-proposal_en.pdf.

According to a recent industry study, the costs of direct membership of CCPs may encourage some firms to access clearing as clients.[75] Clearing costs, such as monthly mandatory minimum clearing fees or minimum revenue thresholds applied to clients, appear standard among larger clearing members in the EU, and are increasingly common in the US. A survey of end users contained in the same industry study found that they anticipated further cost increases over coming years, especially after their introductory rates expire.

Anecdotal evidence reported by some authorities also suggests that the treatment of client initial margin under the Basel III regime (including the net stable funding ratio and leverage ratio) could discourage banks from offering balance sheet capacity to some clients, if clearing banks hold capital against client exposures without being able to make allowances for the exposure-reducing effect of initial margin received from these clients. The FSB and standard-setters will review issues relating to the incentives to central clearing, including client clearing, by end-2018 in a second DAT study of incentives to clear centrally. This study will deepen understanding of how various reforms affect the costs of and access to clearing. In the EU, the European Commission has proposed an amendment of the Capital Requirements Regulation, which includes the recognition of client margin, in order to address this issue.[76]

4.3 Effects on liquidity

A range of views have been expressed on the impact of market reforms on spreads and liquidity in OTC derivatives markets. Some FSB member jurisdictions have noted the difficulty in attributing structural changes in liquidity to certain regulatory factors, given the complex market dynamics and the continued regulatory reform efforts.

Some research has reported improvements in liquidity measures: a tightening of bid-ask spreads, increases in market depth on electronic trading platforms; and increased transparency due to public and regulatory trade repository reporting. For instance, a Bank of England staff working paper by Benos et al. (2016) that examines the impact of the US platform trading mandate on USD and EUR denominated interest rate swaps concluded that centralised trading reduced execution costs and improved liquidity measured by price impact and effective bid-ask spreads, particularly in the USD market. The study also showed that market participation increased as a result of the reforms.[77]

A number of studies consider the effects of OTC derivatives reforms on clearing and post-trade transparency and its resulting impact on liquidity. A Federal Reserve Board working paper by Du et al. (2016)[78] investigates whether central clearing in CDS has had an impact on liquidity provision costs. The authors find that transaction spreads on centrally cleared trades are significantly lower relative to spreads on contemporaneous non-centrally cleared transactions, and find no evidence that transaction spreads increased around the commencement of central clearing. An earlier study by Loon and Zhong (2014) examined the impact of post-trade

[75] ISDA (2016), *Key Trends in Clearing for Small Derivatives Users: ISDA Research Note.*

[76] Available at eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2016:0850:FIN.

[77] See Benos, E., Payne, R., & Vasios, M. (2016). "Centralized trading, transparency and interest rate swap market liquidity: evidence from the implementation of the Dodd-Frank Act," *Bank of England Staff Working Paper No.580.*

[78] Du, W., Gadgil, S., Gordy, M. and Vega, C. (2016), "Counterparty Risk and Counterparty Choice in the Credit Default Swap Market." Board of Governors of the Federal Reserve System: *Finance and Economics Discussion Series* 2016-087.

transparency on the liquidity of single-name CDS contracts that became eligible for voluntary central clearing. It found that the increased post-trade transparency following central clearing is associated with an improvement in liquidity and trading activity.[79]

Loon and Zhong (2016) examine the effects of post-trade transparency by analysing data from the public OTC derivatives trade information required by Dodd-Frank. The authors find that, as with mandatory clearing, mandatory trade reporting reduced effective spreads, with similar decreases in price impact and price dispersion measures.[80] In contrast, Fleming et al. (2012) analyse the interest rate swaps market using three months of OTC derivatives transactions data from 14 major derivatives dealers and highlight potential concerns about the negative effects of transparency on hedging large trades. They note that end users can benefit from delaying public information about their large-volume trades, though they also note it is hard to identify the right balance between positive public transparency and negative information leakage.[81]

Research on the impact of post-financial crisis reforms in corporate bond markets has identified changes in those markets that may also be relevant to evaluations of the liquidity effects of reforms to OTC derivatives markets. This research, though not directly analysing liquidity in OTC derivatives markets, may provide indirect evidence when thinking about OTC derivatives markets. For example, in developing its post-trade transparency and platform trading rules, the CFTC considered analyses of liquidity and market structure in the US corporate bond markets.[82] This research analyses the impact of post-financial crisis reforms on US corporate bond markets and indicates a shift in liquidity provisioning by traditional bank-dealers from a principal to an agency style of business. Some researchers also point to a reduction in dealer inventories as potentially indicating a reduced willingness by dealers to provide liquidity.[83] It could also indicate that dealers are better able to manage their inventory, and are less willing to carry large inventories after suffering significant losses during the crisis. Evidence on changes in transaction costs on principal trades is mixed.

A recent paper by Choi and Huh (2017)[84] attempts to separate principal from agency trades and finds that though overall trading costs remain around historic averages, trades done on a principal basis have experienced some cost increases. On the other hand, Bessembinder et al. (2016), a working paper which focuses on dealer-to-customer principal trades, finds that despite a temporary spike during the financial crisis, trade execution costs have not increased

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79 See Loon, Y. C., Zhong, K. Z. (2014), "The impact of central clearing on counterparty risk, liquidity and trading: Evidence from the credit default swap market." *Journal of Financial Economics*. 91-115.

80 See Loon, Y. C., and Zhong, K. Z. (2016), "Does Dodd-Frank Affect OTC Transaction Costs and Liquidity? Evidence from Real-Time CDS Trade Reports," *Journal of Financial Economics*, 119.3: 645-672.

81 Fleming, M.J., Jackson, J., Li, A., Sarkar, A. and Zobel, P. (2012), "An Analysis of OTC Interest Rate Derivatives Transactions: Implications for Public Reporting", *Federal Reserve Bank of New York Staff Report 557.*

82 See the rule text for Real-Time Reporting and Swap Execution Facilities in the U.S. available at www.cftc.gov/idc/groups/public/@lrfederalregister/documents/file/2011-33173a.pdf., and the final rules in the US pertaining to Swap Execution Facilities available at www.cftc.gov/idc/groups/public/@newsroom/documents/file/federalregister051613b.pdf.

83 Adrian T., Boyarchenko N., Shachar O. (2016), "Dealer Balance Sheets and Bond Liquidity Provision," *FRB of NY Staff Report No. 803* finds that institutions facing higher regulatory costs reduce activity relative to some measures of intermediation such as trading volume.

84 See Choi, J., and Huh Y. (2017). "Customer Liquidity Provision: Implications for Corporate Bond Transaction Costs," *Federal Reserve Working Paper*.

notably over time.[85] These studies highlight that the impact of underlying structural changes on trading costs is complex. Further analysis is required to understand the effects of the reforms on spreads, post-trade transparency and liquidity, as the market adjusts to the reforms and implementation continues across member jurisdictions.

4.4 Effects on ability or readiness of end users to hedge their financial risks

Jurisdictions reported being aware of only limited evidence of the impact of the OTC derivatives market reforms on the ability or readiness of end users to hedge their financial risks (for example, the availability of risk management tools to end users, cost of hedging financial risks, and the extent to which end users hedge financial risks). Any observations in this area thus remain tentative.

The impact of OTC derivatives reforms on end users is likely to be somewhat differentiated, as legal regimes treat them differently, and FSB member jurisdictions have described a range of localised effects on this topic. For example, in the US non-financial entities using OTC derivatives to hedge or mitigate commercial risks are exempt from clearing and margin requirements. A similar approach is taken in the EU for some end users using OTC derivatives for hedging commercial risks under phase 4 of the EMIR clearing mandate.[86]

One advanced economy jurisdiction reported that the authorities understand end users continue to be able to use OTC derivatives to hedge, though the relative transaction costs and availability of centrally cleared vs non-centrally cleared products are said to have changed as a result of capital and margin requirements. In some cases, buy-side entities have reported changes in their choice of dealers, depending on whether they are willing (or able) to transact with entities subject to the requirements of some overseas regimes.

Some European authorities reported that counterparties in a money market survey indicated lower volumes in overnight index swaps (OIS), with the result that more risks are becoming un-hedged. They also reported that in the FX swap market, volumes were consistently higher.

There has also been a suggestion from one emerging market economy that reforms may have made non-standardised derivatives harder to source.

Another authority raised the issue of potential unintended consequences for pension funds with regard to collateral availability. In that authority's view, pension funds face particular challenges sourcing cash to post margin to CCPs due to the reduced availability of functioning repo markets able to take bonds in exchange for cash. Increased cash demands due to margin calls in combination with decreased liquidity in the repo market would be particularly problematic for pension funds in times of stress.

Some academic studies also suggest the possibility of different impacts of reforms on different market participants. For example, Collin-Dufresne et al. (2016)[87] use publicly-reported swaps

[85] Bessembinder, H., Jacobsen, S., Maxwell, W., and Venkataraman, K. (2016) "Capital Commitment and Illiquidity in Corporate Bonds." Working Paper, available at https://ssrn.com/abstract=2752610

[86] Only non-financial counterparties with a large volume of non-hedging activity (i.e. that have a volume of non-hedging activity above a defined clearing threshold) will be covered by mandatory clearing obligations.

[87] Collin-Dufresne, P., Junge, B. and Trolle, A.B. (2016), "Market Structure and Transaction Costs of Index CDSs." Ecole Polytechnique Federale de Lausanne at www.eurofidai.org/sites/default/files/pdf/parismeeting/2016/Collin_Dufresne_2016.pdf.

data to analyse the differences across dealer-to-client and dealer-to-dealer SEFs in the index CDS market. The study finds that transaction costs are larger on dealer-to-client platforms compared to dealer-to-dealer SEFs and the costs increase with trade size and volatility. That dealer-to-client trades may have higher transaction costs, however, they suggest this is possibly due to the higher information content of dealer-to-client trades. When comparing execution methodologies, the authors also note that customers are shown better prices on dealer-to-client SEFs when compared to the executable prices on the order book of a dealer-to-dealer SEF, but the order book often represents a small portion of dealer-to-dealer executions.

4.5 Cross-border issues, regulatory arbitrage and fragmentation

FSB member authorities agreed to implement reforms in a manner consistent with international standards. Given the complexity and extent of reforms and varying legal and regulatory contexts across jurisdictions, some differences do occur but authorities typically aim to achieve consistent outcomes.

Some authorities note the possibility of regulatory arbitrage or market fragmentation as a result of uneven implementation, different timing of the reforms, or a lack of coordination (e.g. with respect to clearing or trading mandates). Consistent with this, authorities in 10 jurisdictions reported that a desire to be coordinated with peer jurisdictions was a key factor that had influenced these authorities in determining the scope and timing of the development of clearing frameworks, or of the imposition of mandatory central clearing requirements.

Authorities from eight jurisdictions likewise reported that a desire to be coordinated with peer jurisdictions was a key factor that had influenced authorities in determining the scope and timing of the development of platform trading frameworks, or of the imposition of platform trading requirements.

There is also some evidence that differences in the timing of mandatory trading requirements in the US and EU have led to market fragmentation, notably in the non USD-denominated segments of the interest rate swap market. However, the fragmentation does not appear to have negatively affected market liquidity, according to one study.[88]

Three authorities report that differences in timing of the introduction of margin requirements have affected the behaviour of the market participants. One jurisdiction reported some indications of market participants shifting activity away from US, Japanese or Canadian counterparties after margin requirements came into effect in these jurisdictions on 1 September 2016 as internationally agreed, potentially raising costs.

Some authorities also report changes to business models as a result of the implementation of the reforms. One jurisdiction reported having been approached by a number of banks to move the booking of such banks' OTC derivatives activities to that jurisdiction to optimise their operational efficiency. Another jurisdiction also reported there is evidence of optimisation of the regional derivatives hub model to achieve fast and accurate processing of swap trades and sound risk management of derivatives portfolios. A third jurisdiction stated that entities that potentially need to be compliant with foreign jurisdictions have structured their derivatives activities in such a way that their regulatory costs are minimised. A fourth reported a general

[88] Benos et al. (2016)

impression that local counterparties use US-based counterparties less than previously. A fifth reported that foreign firms may be unwilling to invest the time and money to understand local rules, and prefer to deal with foreign counterparties instead. A sixth reported some instances of firms booking certain OTC derivatives abroad to optimise capital requirements.

Some authorities expect possible incentives for market participants to arbitrage between jurisdictions to reduce, through the recognition of substituted compliance or as the BCBS-IOSCO margining framework is implemented more broadly. At the same time and for these reasons, it is important that these reforms are completed and implemented consistently globally to remove the potential for arbitrage opportunities to persist long-term.

Also, a number of jurisdictions acknowledged some positive and negative externalities due to reforms taking place in other jurisdictions as well as locally. For example, one jurisdiction stated that the impact of overseas clearing mandates as well as domestic capital requirements helped to move transactions to central clearing even ahead of a domestic clearing mandate. Another reported that increased execution costs are likely a result of OTC reforms introduced in other jurisdictions; the increased availability of CCPs and the number of OTC derivatives products that can be centrally cleared are a result of both clearing mandate requirements introduced in other jurisdictions, as well as in anticipation of a clearing mandate which is targeted for commencement locally in 2017; and the effects of market fragmentation are likely attributable to the implementation of a trading mandate, or to other reforms implemented elsewhere.

Similarly, a number of emerging and developing market economy jurisdictions commented that changes in other jurisdictions have affected their market. For instance, one jurisdiction reported that changes in a neighbouring jurisdiction's platform trading requirements had affected the choice of location of local trading. Another mentioned that several banks have raised concern that the implementation of margin requirements in other jurisdictions, particularly home jurisdictions of foreign bank branches, may have a noticeable impact on domestic markets.

In line with G20 Leaders' statements calling for deference when justified,[89] a number of FSB member jurisdictions have in place the legal capacity to defer to another jurisdiction's regulatory framework and/or authorities regarding OTC derivatives.[90] Deference can involve diverse legal means such as equivalence determinations, substituted compliance determinations, or other methods of full or partial deference. Given the global nature of OTC derivatives markets, it is very important to have effective international cooperation, and deference mechanisms, when justified, may help to minimise the potential for regulatory arbitrage and fully and consistently implement the G20 Leaders' commitments.

There has been progress in amending terms of master agreements to help to reduce the risk that the resolution of an institution with cross-border operations triggers default rights in financial

[89] See G20 Leaders' St Petersburg Declaration of September 2013 (paragraph 71): "We agree that jurisdictions and regulators should be able to defer to each other when it is justified by the quality of their respective regulatory and enforcement regimes, based on similar outcomes, in a non-discriminatory way, paying due respect to home country regulatory regimes.", as well as the G20 Leaders' Brisbane declaration of November 2014 (paragraph 12): "We call on regulatory authorities to make further concrete progress in swiftly implementing the agreed G20 derivatives reforms. We encourage jurisdictions to defer to each other when it is justified, in line with the St Petersburg Declaration".

[90] For more detail about existing deference arrangements for OTC derivatives, see FSB (2017a), Appendix K.

contracts (including OTC derivatives contracts).[91] Triggering early termination could undermine the measures that authorities are taking to maintain financial stability. Initiatives such as ISDA Resolution Stay Protocols support the cross-border recognition of resolution actions through contractual approaches. These increase the likely success of resolving a cross-border institution, improving systemic stability and moving closer to ending 'too-big-to-fail'.

4.6 Compliance costs

Compliance costs have increased as a result of the OTC derivatives reforms, including costs to implement the necessary changes. Authorities are not aware of precise industry-wide estimates of compliance costs that disaggregate OTC derivatives reforms from other financial regulatory reforms.

Some increase in compliance and other regulatory costs is not unexpected as OTC derivatives markets were largely unregulated before the crisis leading to negative externalities, such as those arising from poor risk management practices. Also, margin and capital requirements are designed to use economic cost as a driver to incentivise central clearing of standardised derivatives.

Overall costs also need to be weighed against the short- and long-term benefits in these previously largely unregulated markets that these reforms are expected to provide by enhancing financial stability, contributing to the other identified objectives, and driving increased levels of automation and standardisation.

Generally, transitional implementation costs have been significant; e.g., dealers have incurred increased costs associated with meeting trade reporting obligations, including infrastructure costs. Whilst many buy-side firms have also incurred similar costs, in some jurisdictions smaller buy-side firms have been able to limit the increase in IT costs by utilising (conditional) single-sided reporting or delegated reporting options where available. For trade reporting, some set-up costs are expected to be transitional ones, though there will be fixed costs associated with maintaining trade reporting structures and access to TRs and ongoing costs such as fees.

Similarly, for counterparties that were not previously clearing with CCPs, there are upfront costs in setting up systems to clear and post margin.

With regard to margining non-centrally cleared derivatives, the changes in documentation necessary to facilitate margin requirements are proving to be, as expected, time-consuming and expensive. There are also potential system changes with substantial IT outlays.

Differences in requirements across jurisdictions may also have contributed to additional implementation costs for market participants. Market participants note that greater international consistency in requirements (e.g. through the work on harmonisation of reporting of data elements) and the use of deference when justified could assist in containing costs.

[91] For example, see FSB (2015b), "FSB welcomes extension of industry initiative to promote orderly cross-border resolution of G-SIBs", at www.fsb.org/2015/11/fsb-welcomes-extension-of-industry-initiative-to-promote-orderly-cross-border-resolution-of-g-sibs/

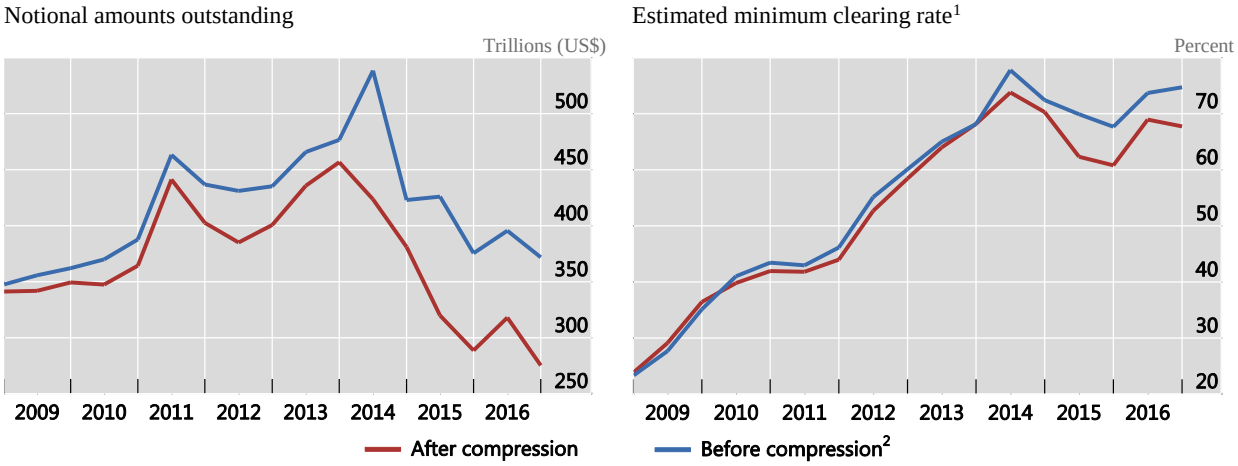
4.7 Enhancements to risk management practices

The reforms have been accompanied by other enhancements that support risk mitigation, including the expanded use of portfolio compression, reconciliation, and valuation services, and improved documentation practices, including through the development of documentation to reflect and support reforms.

The use of portfolio compression services has increased markedly in recent years, according to figures from one prominent service provider (figure 21 in Appendix A). Initially dealers, and more recently other financial institutions, have been using portfolio compression and risk mitigation services in a way that has reduced overall notional exposures without altering their economic exposure to the underlying (figure 11). Through reduction in overall notional exposures, the overall collateral levels required to support the same economic exposures also declined. Portfolio compression and other risk mitigation services should help to reduce overall operational risk, including by simplifying the web of interconnectedness in the market. In addition, by having to calculate variation margin and initial margin on a regular basis as part of the reforms, market participants obtain a regular valuation and risk measure (respectively) for their positions.

Figure 11

Interest rate swaps adjusted for the impact of compression



[1] Proportion of trades that are cleared, estimated as (CCP/2)/(1-(CCP/2)), where CCP represents the share of notional amounts outstanding that dealers report against CCPs. Under the extreme assumption that all outstanding positions with CCPs were initially inter-dealer contracts, CCPs' share is halved to adjust for the potential double-counting of trades. For periods prior to end-June 2016, positions of CCPs are estimated by indexing the amounts reported at end-June 2016 to the growth since 2008 of notional amounts outstanding cleared through LCH's SwapClear service. [2] Estimated by adding triReduce portfolio compression volumes to outstanding positions reported in the BIS semi-annual survey of OTC derivatives. Source: LCH.Clearnet Group Ltd; TriOptima AB; BIS OTC derivatives statistics; BIS calculations.

Besides central clearing and portfolio compression, a range of other risk-management techniques are increasingly being used by market participants, either as a result of requirements being introduced[92] or in response to other incentives or factors. Such risk-management techniques include trading relationship documentation, portfolio reconciliation, valuation services, and dispute resolution processes. One jurisdiction also reported, as a result of platform trading requirements, an increased utilisation of straight-through processing in the derivatives

[92] See FSB (2017a), Table I on p. 18.

markets and emergence of designated services for front-, middle- and back-office processing, derivatives trade affirmation, swap compression and reconciliation, collateral optimisation, and document standardisation.

Even before the financial crisis, close-out netting was used as a means of mitigating counterparty credit risk associated with OTC derivatives. For example, according to the most recent figures available, around 86% of OTC derivatives risk positions held by US reporting banks and dealers are subject to bilateral netting.[93]

4.8 Expected steady state and transitional effects of reforms

As noted above, many of the reforms have not been fully implemented and it will take time for the markets to adjust accordingly. Thus it is difficult to provide a comprehensive overview of the steady state effects. That said, the expectation of some authorities is that the emerging benefits described in this report are broadly likely to remain in the long run as they are generally structural in nature.

For example, authorities anticipate that as the significant existing challenges regarding TR data are increasingly overcome (see section 3.4.4), such data will further improve transparency of the derivatives market for authorities, and would expect TR data to play an increasing role in understanding the nature of the market as well as allowing regulators to investigate better systemic risk and market abuse.

Non-standardised OTC derivatives are not appropriate for clearing by CCPs, and authorities recognise that a proportion of OTC derivatives will and should remain non-centrally cleared even when reforms are fully implemented.

An official sector study of the potential long-term economic effects of the reforms published in 2013 estimated the anticipated net benefits in terms of an increase in annual GDP for a representative economy ranging from 0.09% to 0.13% once fully implemented, and having their full economic effects.[94] This estimate was based on an ex ante assessment of the reform package and may therefore have to be reviewed on the basis of an ex post analysis, once sufficient data to assess the associated benefits and costs becomes available.

[93] OCC (2016), Graph 6, p. 25.

[94] Macroeconomic Assessment Group on Derivatives (2013)

Appendix A Additional tables and figures

Table 12

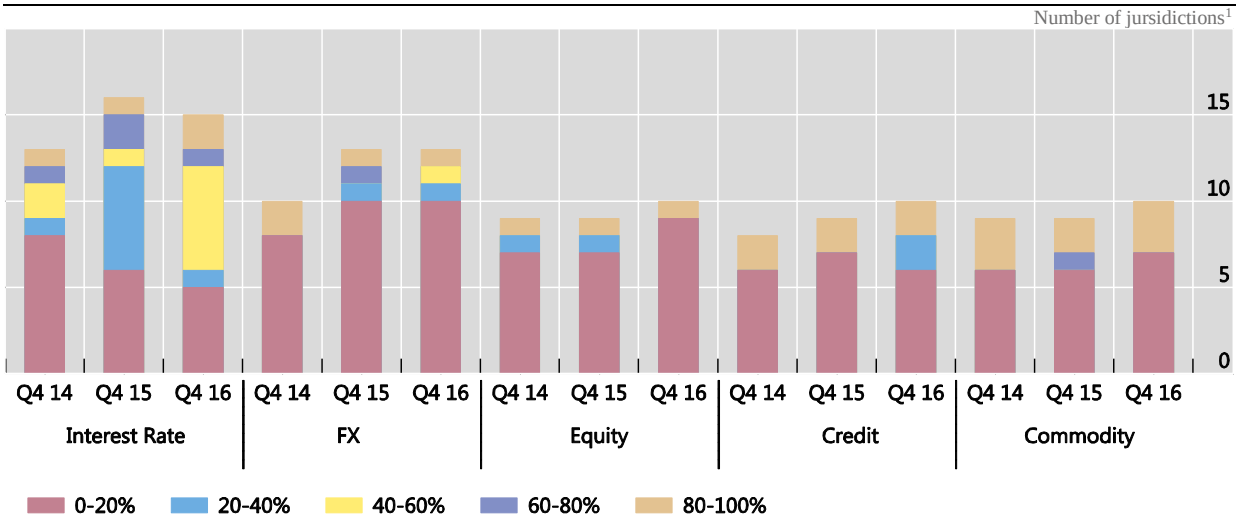
Notional amounts outstanding of various asset classes in overall OTC derivatives market, end-December 2016

Asset class	Notional amounts outstanding	Percentage of total
Interest rate derivatives	US$368 trillion	81.1%
FX derivatives	US$69 trillion	15.2%
Credit derivatives	US$10 trillion	2.2%
Equity derivatives	US$6 trillion	1.3%
Commodity derivatives	US$1 trillion	0.2%
Total	**US$454 trillion**	**100%**

Source: BIS OTC derivatives statistics

Figure 13

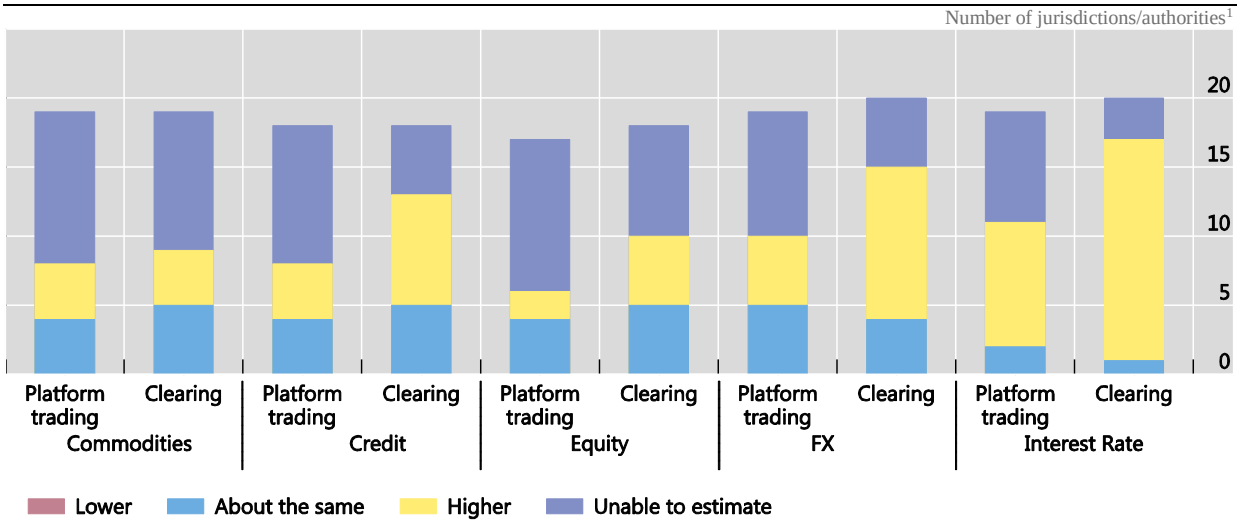
Estimates of central clearing rates of OTC derivatives



[1] Number of jurisdictions estimating clearing rates for a chosen reference period within each of the indicated ranges and periods. For these purposes, the six EU FSB member jurisdictions are counted as one. Source: FSB member jurisdictions

Figure 14

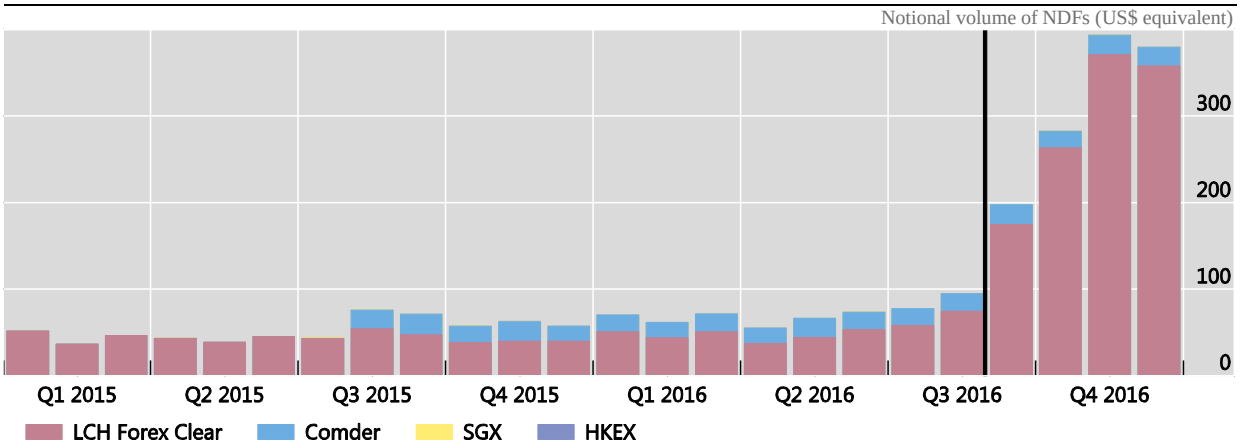
Expected changes in central clearing rates of clearable OTC derivatives and in rates of trading of OTC derivatives on exchanges or electronic platforms until end-2018



[1] Number of jurisdictions/authorities that responded as indicated whether, over the next 2 years (i.e. to end-2018) the rate of (i) clearing of OTC derivatives transactions that are clearable given existing clearing offerings from CCPs; (ii) trading on exchanges or electronic trading platforms of OTC derivatives in each asset class in the jurisdiction was expected to be lower than, higher than or about the same as it is at present. Source: FSB member jurisdictions/authorities.

Figure 15

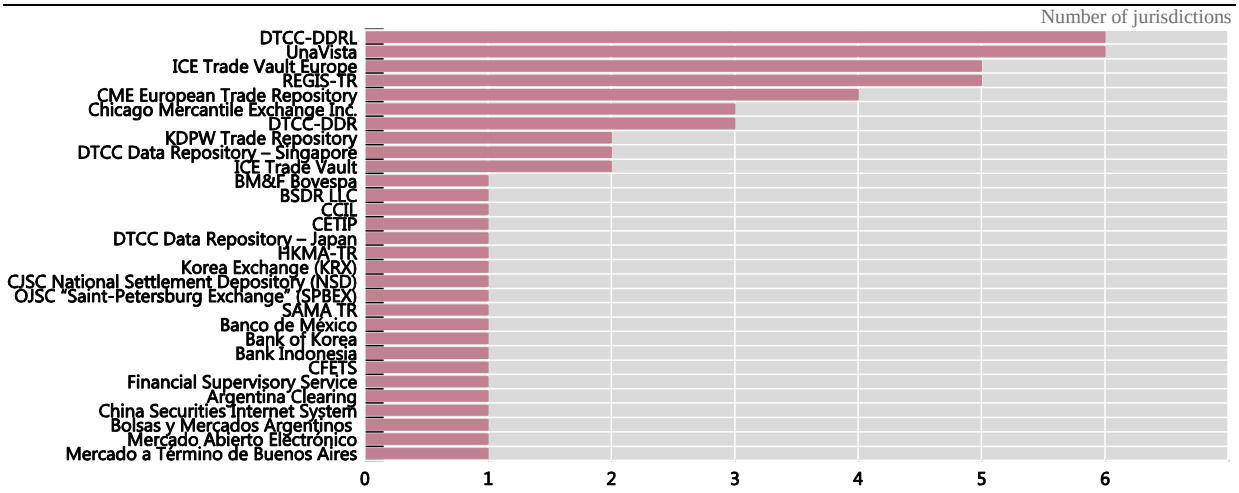
Extent of central clearing in dealer-to-dealer non-deliverable forwards (NDF) market



Solid black line represents the date of the start of mandatory exchange of initial margin and variation margin for trades among certain large dealers in US, Canada and Japan. Source: Clarus Technology Ltd, based on public data for selected CCPs.

Figure 16

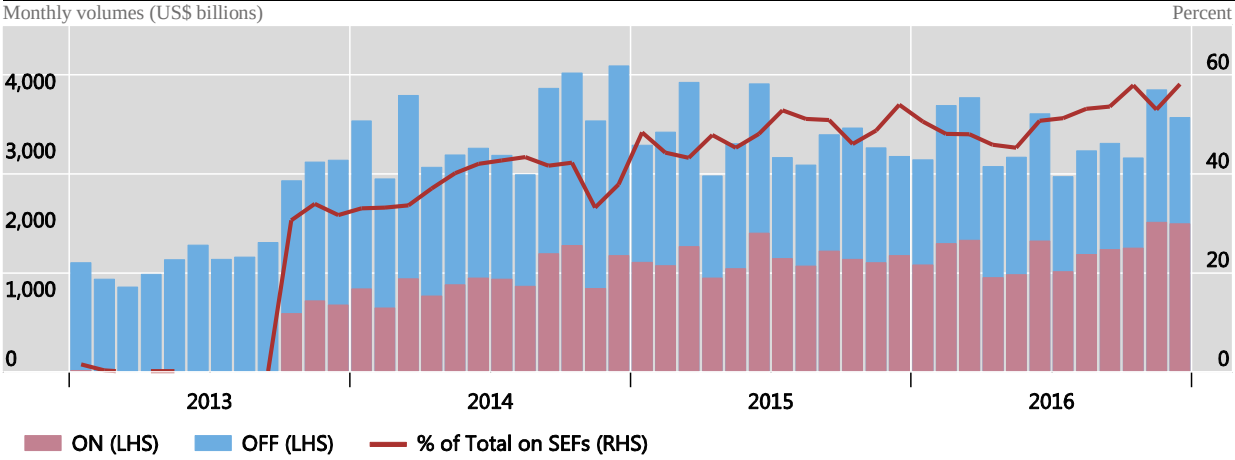
Number of jurisdictions accessing data in individual TRs



Data as at end-2016. Source: FSB member jurisdictions.

Figure 17

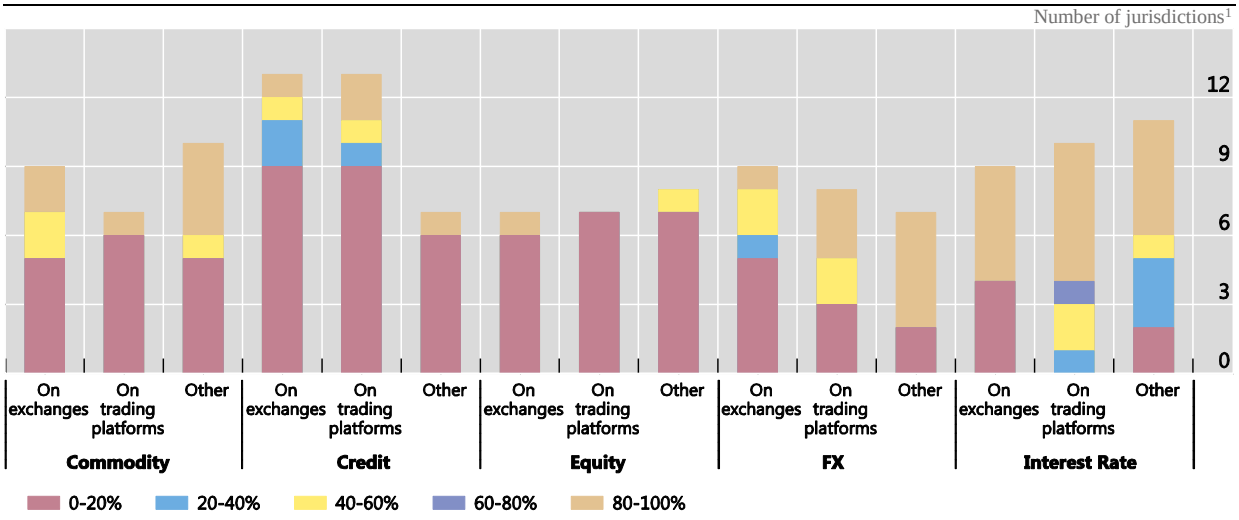
Notional Trading Volume of OTC Interest Rate Derivatives by Execution Mechanism[1]



[1] "On" and "Off" (SEF) refer to on and off Swap Execution Facilities, respectively. Source: Clarus Technology.

Figure 18

Estimates of platform trading rates

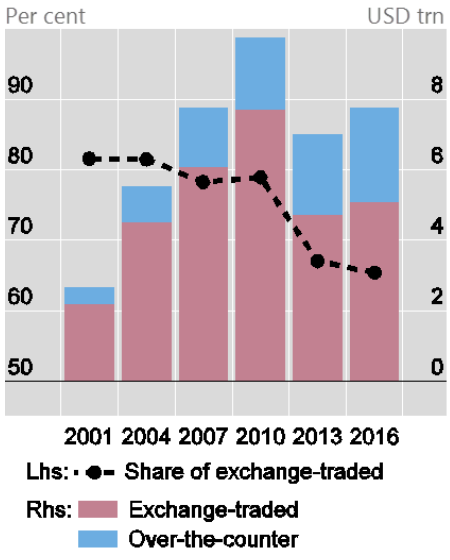


Source: FSB member jurisdictions.

Figure 19

Share of exchange trading of interest rate derivatives markets since 2001,

Notional amounts, daily averages in April



Source: BIS (2016), *December Quarterly Review*, at www.bis.org/publ/qtrpdf/r_qt1612.pdf

Table 20

Collateralisation as a Percentage of Total Net Current Credit Exposure, by Counterparty Type (US figures)

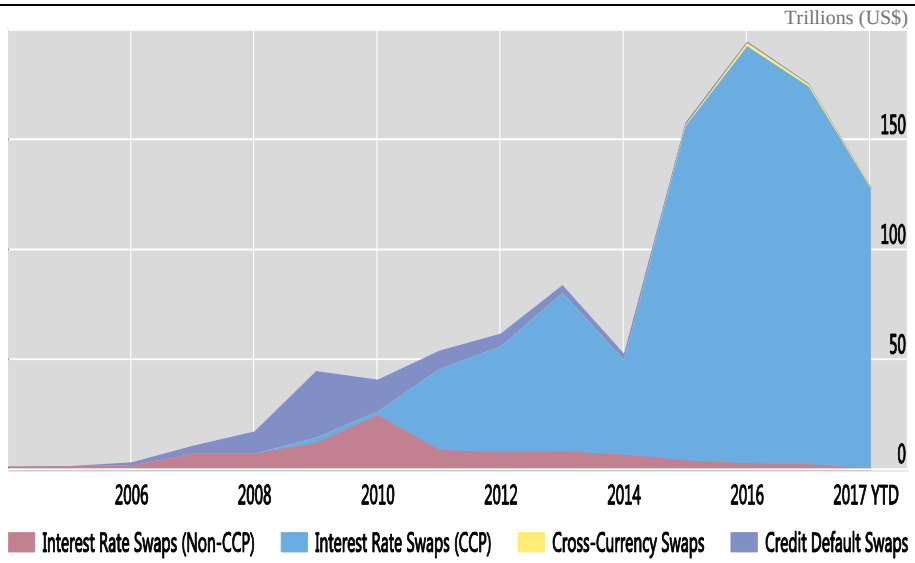
	Banks, securities firms	Monoline financial firms	Hedge funds	Sovereigns	Corporat-ions, all other	Overall
2016 Q4	119.0%	0.0%	491.5%	34.2%	67.1%	98.5%
2016 Q3	107.2%	0.7%	461.7%	26.4%	73.9%	95.1%
2016 Q2	103.1%	4.6%	368.4%	26.7%	62.4%	86.2%
2016 Q1	94.6%	0.0%	378.8%	20.1%	65.5%	83.7%
2015 Q4	101.6%	5.2%	435.5%	15.6%	66.2%	89.6%

Source: OCC (2016), *Quarterly Report on Bank Trading and Derivatives Activities, Fourth Quarter 2016*, p. 10. Refers to entities subject to OCC reporting regime.

Figure 21

Use of portfolio compression services at triReduce[1]

triReduce Compression Metrics



[1] Volume of trades compressed annually, measured by overall reduction in gross notional outstanding effected by compression cycles. Figures quoted are single-counted, apart from CCP, which are double-counted in line with market convention. Figures for the YTD to end-March 2017 are annualised. Source: TriOptima

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Appendix C Acronyms and defined terms

BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
CCP	central counterparty
CDS	credit default swap
CFTC	US Commodity Futures Trading Commission
CGFS	Committee on the Global Financial System
CPMI	Committee on Payments and Market Infrastructures
DAT	Derivatives Assessment Team, convened by the FSB OTC Derivatives Coordination Group
Dodd-Frank	US Dodd-Frank Wall Street Reform and Consumer Protection Act
EC	European Commission
ECB	European Central Bank
ESMA	European Securities Markets Authority
ESRB	European Systemic Risk Board
FCM	Futures Commission Merchants
FMI	financial market infrastructure
FSB	Financial Stability Board
FX	foreign exchange
IOSCO	International Organization of Securities Commissions
ISDA	International Swaps and Derivatives Association, Inc.
LEI	legal entity identifier
MiFID 2/MiFIR	EU Markets in Financial Instruments Directive/Regulation
MoU	Memorandum of Understanding
NDF	non-deliverable forward
OCC	US Office of the Comptroller of the Currency
OIS	overnight index swap
OTC	over-the-counter
PFMI	CPMI-IOSCO *Principles for Financial Market Infrastructures*
SEF	swap execution facility
TR	trade repository
UPI	Unique Product Identifier
UTI	Unique Transaction Identifier

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