



EUROPEAN CENTRAL BANK

EUROSYSTEM

# OTC DERIVATIVES AND POST-TRADING INFRASTRUCTURES

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## ABBREVIATIONS

ATS	automated trading system(s)
BIS	Bank for International Settlements
CCP	central counterparty
CDO	collateralised debt obligation
CDS	credit default swap(s)
CSD	central securities depository
CPSS	Committee on Payment and Settlement Systems
FpML	Financial products Markup Language
FSF	Financial Stability Forum
GC	general collateral
ICMA	International Capital Market Association
ICSD	international central securities depository
IOSCO	International Organisation of Securities Commissions
ISDA	International Swaps and Derivatives Association
IRS	interest rate swap(s)
OTC	over the counter
PPS	Protected Payments System
repo	repurchase agreement
SC	special collateral
SWIFT	Society for Worldwide Interbank Financial Telecommunications
TARGET2	Trans-European Automated Real-time Gross settlement Express Transfer system
TIW	Trade Information Warehouse

## EXECUTIVE SUMMARY

Concerns regarding the limited development of post-trading infrastructures for OTC derivatives intensified in the context of the recent financial market turmoil. The financial market turbulence illustrated that the absence of adequate post-trading infrastructures contributes to weaknesses in operational and counterparty risk management, as well as to a lack of transparency and oversight in OTC derivatives markets, with negative implications for overall financial market functioning and financial stability. Against this background, in 2008 the Eurosystem launched an analysis of the markets and market infrastructures for OTC derivatives, including interest rate swaps, equity derivatives, credit default swaps and foreign exchange derivatives, focusing on the euro-denominated segment and corresponding systemic risk implications for the euro area.<sup>1</sup> In addition, the Eurosystem also assessed the markets and infrastructures for repos, given their systemic relevance for the euro area, and the fact that some repos are intertwined with derivatives transactions.<sup>2</sup>

This report presents the main findings of this work, relating to (i) general market characteristics, (ii) the size and location of the market, (iii) post-trading infrastructures and market arrangements, and (iv) possible policy implications.

The report discusses the different product characteristics, the main market participants and the corresponding systemic risk implications. It highlights the fact that OTC derivatives are of systemic relevance particularly because of the large risk exposures of a small number of major financial institutions. In addition, the inherent opacity of OTC derivatives markets and the limited development of post-trading infrastructures hamper effective risk management and market discipline. As a result, major initiatives are currently under way to improve the safety, efficiency and resilience of OTC derivatives markets.

The size of the OTC derivatives market has significantly increased during the past decade. While the implied payment flows vary depending on the particular product specification, and in general represent a small fraction of the market, they are still substantial. Moreover, although market volumes have recently declined, namely as a result of portfolio compression efforts, this has not been the case for the payment flows at risk, which have actually increased. The euro-denominated share of OTC derivatives markets is very substantial, with the euro being either the most important or the second most important currency in all five markets under consideration. Furthermore, while only limited information on geographical counterparty breakdowns is available, the existing evidence suggests that euro area counterparties play an important role in the business.

Although the majority of transactions in the OTC derivatives market are still traded, cleared and settled bilaterally, a number of clearing and settlement infrastructures do exist for most of the markets under consideration. However, the availability of euro area infrastructures for OTC derivatives is still limited. A major euro area clearing infrastructure is the German-based Eurex Clearing AG, which serves OTC equity derivatives as well as certain types of repo transaction. For OTC foreign exchange derivatives settlement, CLS is the main infrastructure (with a 53% market share); however, about 35% of OTC foreign exchange transactions are still cleared and settled through correspondent banking arrangements. In addition, Eurex Clearing has recently established a CCP for CDS and another euro area CCP for

1 The analysis was conducted by a task force (see also the Annex) composed of Alexander Al-Haschimi and Corinna Freund (European Central Bank), Steven Van Cauwenberge (Nationale Bank van België/Banque Nationale de Belgique), Roland Neuschwander (Deutsche Bundesbank), J. Ignacio Becerril Sánchez (Banco de España), Anne-Laure Roche (Banque de France), Barbara Lupi (Banca d'Italia) and Lars Groenhuijse (De Nederlandsche Bank).

2 For example, a repo can be used to obtain a security temporarily for the purpose of completing a derivatives transaction.

CDS is currently under development by the French clearing house LCH.Clearnet SA.

The report points to two main policy implications. First, given the importance of adequate post-trading infrastructures for the safe, efficient and transparent functioning of OTC derivatives markets and the particular systemic relevance of these markets for the euro area, there is a strong Eurosystem interest in further developing these infrastructures, especially in the euro area. At the present juncture, a key priority in this regard is the effective implementation of CCP for CDS within the euro area. Second, the development of post-trading infrastructures for OTC derivatives markets should be accompanied by enhanced cross-border cooperation among authorities. Such cooperation should aim to achieve a consistent regulatory framework for different infrastructures, a comprehensive analysis of the risks in this systemically relevant industry, and adequate oversight arrangements in line with the systemic implications of OTC post-trading infrastructures and related service providers for different jurisdictions and currencies.

## I INTRODUCTION

There are growing concerns that the development of post-trading infrastructures for OTC derivatives has not kept pace with the rapid growth of OTC derivatives markets during the past decade. Clearing and settlement arrangements in these markets are still organised on a predominantly bilateral, non-standardised basis and continue to require a considerable degree of manual intervention. Post-trading infrastructures for OTC derivatives have therefore struggled to cope with the growing volume and complexity of OTC derivatives trades in recent years. The heightened market activity and volatility during the financial market turbulence presented additional challenges. Furthermore, the financial market turmoil illustrated that the limited development of OTC derivatives market infrastructures not only implies operational inefficiencies and risks, but also hampers effective counterparty risk management and market transparency. Owing to a lack of information about where risks related to OTC derivatives arise and are distributed throughout the financial system, the large size of OTC derivatives markets and their close linkages with cash markets, OTC derivatives markets seem to have acted as a contagion channel during the financial market turbulence. Against this background, measures to strengthen post-trading infrastructures for OTC derivatives and the respective oversight arrangements have gained momentum during the past year, in line with the mandate of the Financial Stability Forum.<sup>3</sup>

From a Eurosystem perspective, the availability of adequate post-trading infrastructures for the euro-denominated segment of OTC derivatives markets is a particular priority. Given the large size of OTC derivatives markets and the systemic importance of clearing and settlement systems for securities and derivatives, any malfunctioning of the post-trading infrastructures for euro-denominated OTC derivatives trades could have negative repercussions for financial stability and market infrastructures in the euro area, with direct implications for the Eurosystem's

responsibilities for monetary policy, financial stability and market infrastructure oversight.

Against this background, in 2008 the Eurosystem launched an analysis of the markets and market infrastructures for OTC derivatives, including interest rate swaps, equity derivatives, credit default swaps and foreign exchange derivatives, focusing on the euro-denominated segment. In addition, the Eurosystem also assessed the repo markets and infrastructures, given the close linkages between repo and derivatives markets. This report presents the main findings of the analysis. Section 2 describes the general characteristics of the markets for the five products under consideration. Section 3 provides an overview of the size and location of these markets, while Section 4 examines the associated post-trading infrastructures. Section 5 discusses possible policy implications.

## 2 GENERAL MARKET CHARACTERISTICS

### 2.1 GENERAL PRODUCT TYPES AND FEATURES

Derivatives are financial contracts which are fulfilled at a future point in time and whose value is based on the development of an underlying asset price, rate, index or event. The term "derivative" refers to the fact that the price of the contract is *derived* from the price of the underlying product. Derivatives contracts are typically customised to meet the specific needs of the counterparties involved. As a consequence, derivatives are largely traded over the counter (OTC), with OTC markets taking a variety of forms. Traditionally, the market involves dealers as market-makers, who maintain bid and offer quotes and negotiate execution prices, usually over the phone or via an electronic bulletin board. These dealer markets represent bilateral trading because only the counterparties involved in the trade observe the prices at the time of trade execution. The electronic brokering market constitutes an alternative OTC derivatives

<sup>3</sup> See "Report of the Financial Stability Forum on Enhancing Market and Institutional Resilience", 7 April 2008, available at: [http://www.fsforum.org/publications/r\\_0804.pdf](http://www.fsforum.org/publications/r_0804.pdf)



market. While the electronic brokering market operates similarly to the electronic trading platforms used by exchanges, it has a non-public nature and is characterised by a lower level of contract standardisation, as the contract terms are set not by trading platforms but by the counterparties. Moreover, unlike regulated markets, the brokering market does not provide for the clearing of the derivatives transactions. The following sub-sections consider the five products under consideration in more detail.

### INTEREST RATE SWAPS (IRS)

An interest rate swap is an agreement between two counterparties to exchange two streams of interest payments denominated in the same currency. The payment flows are calculated based on the relevant interest rate multiplied by the principal, or notional, amount agreed in the contract. The most common interest rate swaps are fixed-for-floating swaps under which cash flows of a fixed rate loan are exchanged for those of a floating rate loan. These are called “vanilla” interest rate swaps. Among these, the most common use a three-month or six-month EURIBOR rate (if the currency is the euro) as their floating rate. As they are OTC instruments, a wide variety of interest rate swaps exist, which can be structured to meet the specific needs of the counterparties. For example, there is also a liquid market for floating-floating interest rate swaps, which are known as basis swaps. IRS maturities range from overnight to 30 years. In the euro market, IRS with a maturity of up to three months are referenced against the EONIA as the reference floating rate.

### OTC EQUITY DERIVATIVES

An OTC equity derivative is an instrument with underlying assets based on equity securities or equity indices. The most common are equity options, which account for approximately 75% of the global OTC equity derivatives market. An equity option offers the right but not the obligation to buy or sell a specific equity, or basket of equities, at an agreed price and an agreed time in the future.

Contracts with maturities of one year or less account for 45% of all option contracts, whereas medium-term maturities (one to five years) have a 44% share and longer-term maturities (more than five years) have an 11% share.<sup>4</sup>

The other major types of equity derivative comprise equity forwards, which represent a contract to buy or sell an equity, or group of equities, at an agreed price at a future date, and equity swaps, which involve the exchange of one equity or equity index return for another. Equity forwards and equity swaps make up approximately 25% of the global OTC equity derivatives market.

### CREDIT DEFAULT SWAPS (CDS)

A credit default swap is a credit derivatives contract in which one party (the protection buyer) pays a periodic fee to another party (the protection seller) in return for compensation for default (or a similar credit event) by a reference entity, which itself is not party to the credit default swap.<sup>5</sup> According to the 2003 credit derivatives definitions of the International Swaps and Derivatives Association (ISDA), the main types of possible credit event include bankruptcy;<sup>6</sup> obligation default;<sup>7</sup> failure to pay;<sup>8</sup> repudiation/moratorium<sup>9</sup> and restructuring.<sup>10</sup>

4 “OTC derivatives market activity in the second half of 2008”, BIS, May 2009.

5 See the ISDA product definitions at [www.isda.org](http://www.isda.org).

6 The reference entity becomes insolvent or is unable to pay its debts. It should be noted that “bankruptcy” is defined in a wide sense so as to be triggered by a variety of events associated with bankruptcy or insolvency proceedings under English law and New York law, as well as analogous events under other insolvency laws.

7 A situation, other than a failure to pay, where the relevant obligation becomes capable of being declared due and payable as a result of a default by the reference entity before the time when such obligation would otherwise have been capable of being so declared. A sub-set of obligation default is obligation acceleration.

8 The failure of the reference entity to meet, when and where due, any payments under one or more obligations.

9 A situation where the reference entity or a government authority disaffirms, disclaims or otherwise challenges the validity of the relevant obligations.

10 Events as a result of which the terms, as agreed by the reference entity or government authority and the holders of the relevant obligation, governing the relevant obligation have become less favourable to the holders than they would otherwise have been. Such events include, for example, a reduction in the principal amount or interest payable under the obligation, a postponement of payment, a change in ranking in priority of payment or any other composition of payment.

It is not necessary for the protection buyer to suffer an actual loss to be eligible for compensation if a credit event occurs.

There are two main types of CDS, *single-name* and *multi-name instruments*. Whereas the former are set up with respect to a single reference entity, such as a company or a government, the latter – including trades based on CDS indices and index tranches – relate to a pool of reference names. The main CDS indices are the CDX and iTraxx series, which are compiled, managed and owned by Markit, a financial services information company with a specific focus on credit derivatives pricing. The most widely used reference points for global CDS markets are the iTraxx Europe index (comprising the 125 most liquid European investment-grade corporate names) and the DJ CDX IG index (composed of the 125 most liquid North American investment-grade corporate names). CDS index tranches are linked to synthetic collateralised debt obligations (CDOs) based on a CDS index, with each tranche referencing a different segment of the loss distribution of the underlying index.<sup>11</sup>

A key difference between single-name and multi-name CDS products is the degree of standardisation: whereas the standardisation of CDS index products in particular is already highly advanced, single-name CDS still contain more bespoke elements and are less frequently traded electronically.

CDS were initially developed as a form of insurance against the default of corporate borrowers. The protection buyer gives up the risk of default by the reference entity, and takes on the (lower) risk of simultaneous default by both the protection seller and the reference entity. The protection seller takes on the (higher) risk of default by the reference entity, which is similar to the risk of a direct loan to the reference entity. However, CDS subsequently developed quickly into a much wider *tool for managing credit risk*. In particular, as markets for both single-name and index CDS markets have become generally more liquid than the underlying bond markets, participants have increasingly used CDS as

a tool to adjust their overall credit exposures more quickly and at lower cost. Moreover, CDS have also been used increasingly for purely *speculative purposes*, as they can be bought and sold without any ownership in the entity or obligations underlying the respective CDS contract. In this way, CDS can be used to create synthetic positions with regard to the reference entity for market-making or proprietary trading activities.

As CDS markets have matured in recent years, *progress in standardisation* has been achieved, as a result of, for example, ISDA templates, standards in FpML (Financial products Markup Language) and increased use of Markit's reference entity database. Standardisation has in turn fostered *increasing migration towards electronic trading* on interdealer platforms. Increased efficiency of both trading and post-trading processes is one of the benefits of electronic trading. Most platforms provide the ability to transfer trade data directly from the e-trading platform to firms' internal data capture systems through upload/download linkages. The acceptance of electronic trading varies by region; European traders have embraced electronic trading platforms more than their US counterparts. Electronic trading is also crucial for smooth and safe post-trading processes, as it provides the basis for the swift and correct capture and further processing of trade details with no (or very limited) manual intervention, ultimately achieving straight-through processing throughout the life cycle of the products.

## OTC FOREIGN EXCHANGE DERIVATIVES

The main instruments in the OTC foreign exchange derivatives market are outright forward contracts and foreign exchange swap contracts, which together comprise half of the OTC foreign exchange derivatives market. An *outright forward* transaction represents a single exchange of one currency for another, which is delivered at a pre-agreed future date.

<sup>11</sup> See <http://www.markit.com/information/products/category/indices.html>

The exchange rate used in an outright forward transaction is agreed at the outset. Payments are typically not exchanged until the transaction is executed, although dealers may require customers to provide collateral in advance. A *foreign exchange swap* transaction involves an exchange of one currency for another for a given time period, after which the currencies are returned or re-exchanged. The rate at which the currencies are re-exchanged at the future date is agreed in advance. Thus, a foreign exchange swap transaction allows a party to temporarily move from one currency into another without incurring the exchange rate risk of temporarily holding the second currency.

A third category of foreign exchange derivative includes *currency swaps*, which are conceptually similar to IRS transacted across two or more currencies. In a currency swap, counterparties exchange equal principal amounts of two currencies at the prevailing exchange rate, and subsequently exchange a stream of interest rate payments in their swapped currencies for a pre-agreed period of time. At the end of this period, the principal amount is re-exchanged at the initial spot exchange rate. Finally, foreign exchange derivatives also comprise foreign exchange options, which give the buyer the right, but not the obligation, to buy (or sell) a specified amount of one currency for another at a pre-agreed price and time.

## REPOS

A repo, or “repurchase agreement”, is a type of collateralised loan, where one party posts a security as collateral for a cash loan. A repo transaction thus entails an exchange of collateral for cash, while a reverse repo implies the provision of cash in exchange for securities. While the repo market is not typically considered an OTC derivatives market, there is a relationship between the repo and derivatives markets through arbitrage opportunities between repo rates and rates on derivatives contracts.<sup>12</sup> In addition, repos can be used to acquire securities to deliver at the maturity dates of securities futures contracts.

The type of collateral posted for a repo materially affects the associated risk. When non-specific government securities are used, the repo is called a general collateral (GC) repo. As the associated risk is considered low, the corresponding interest rate on a GC repo with an overnight maturity is close to the relevant overnight policy rate. More generally, repos that are used to obtain short-term funding have maturities from overnight up to one year.

Another type of repo is transacted to obtain a specific security temporarily, and these repos are called “special” or “special collateral” (SC) repos. Securities lending and borrowing transactions involve the swap of a specific security against other securities or cash. The structure of the securities lending market is still less standardised. Generally, the term of a securities lending transaction is open-ended, although in most cases they are made on a 48-hour recall basis. The volume of repos driven by securities lending was 21.7% of the overall European repo market in June 2008, but this fell sharply to 12.5% by December 2008.<sup>13</sup>

Repos are used by a variety of actors as a secured means of borrowing or lending securities or funds for a predetermined period of time. Banks and dealers employ repos to cover short positions, to create leverage and to hedge against or speculate on interest rate movements. On the investor side, mutual funds, pension funds, insurance companies and corporate treasurers transact in repos in order to invest surplus cash, to earn returns on their portfolios or to raise cash for investment.

Generally, repo transactions can be carried out via trading platforms or over the counter. The principal automated trading systems (ATS) operating in Europe process approximately 28% of the overall market in repo transactions. Direct bilateral trades account for about 42%. Direct

<sup>12</sup> This is especially relevant for short-term interest rate derivatives such as interest rate futures.

<sup>13</sup> “European repo market survey”, ICMA, February 2009, reporting data from December 2008.

tri-party repos have a market share of about 9%. Around 20% of the whole market is made up of voice-brokered repos.<sup>14</sup>

There are three types of repo maturity: overnight, term and open. While open repos (which have no fixed maturity) only account for about 6% of the European repo market, overnight repos represent approximately 18% of the market. Term repos usually have a maturity of up to 12 months, with the majority having a maturity of less than one month.

Given the focus on systemic risk, this report does not include repos transacted with central banks for open market operations in its analysis.<sup>15</sup>

## 2.2 MARKET PARTICIPANTS

The main participants in OTC derivatives markets are the market-making dealers, which include mainly large commercial and investment banks and securities houses, as well as large customers such as mutual funds, pension funds, hedge funds and insurance companies.

In the IRS market, participants typically enter into an IRS contract with swap dealers, who in turn limit their exposure to interest rate risk by entering into offsetting swaps with other counterparties. Similarly, CDS trading is mainly conducted between major commercial and investment banks, as shown by the counterparty breakdown of CDS markets provided by the BIS. In December 2008, 86.9% of the reported CDS contracts were agreed either between the banks responding to the BIS surveys (59.8% of all contracts) or between those dealers and other commercial and investment banks (27.1% of all contracts). The next important counterparty group was formed by other financial institutions (e.g. large institutional investors, namely mutual funds and pension funds), which accounted for 11% of the trades with the reporting dealers, whereas trades with non-financial end-users (e.g. corporations) and with insurance companies accounted for only 1.2% and 1% respectively.<sup>16</sup> It should be noted that insurance companies,

despite their small share in the outstanding market volume, still have an important role in CDS markets, as they are typically large net protection sellers. This has crucial implications for the distribution of financial risk, as was illustrated in the case of the near-default of the American International Group (AIG).<sup>17</sup>

For OTC foreign exchange derivatives, commercial banks, investment banks and insurance firms conduct a large share of the OTC foreign exchange derivatives business in the interdealer market. According to a BIS survey, reporting dealers were counterparties in 39% of all contracts outstanding as at December 2008, while other financial institutions had a share of 43%.<sup>18</sup> Non-financial institutions were counterparties in 18% of all contracts.

The main participants in the repo market are banks, securities firms, institutional investors and insurance companies. More generally, repos are typically transacted between market participants that also operate in the uncollateralised money and interbank markets, given that the instruments in both markets provide for cash borrowing or lending functions.

14 “European repo market survey”, ICMA, February 2009, reporting data from December 2008.

15 Transactions with central banks are not considered as a source of systemic risk.

16 “OTC derivatives market activity in the second half of 2008”, BIS, May 2009.

17 Following heavy losses on its structured credit portfolio, and shortly after the failure of Lehman Brothers, on 17 September AIG was effectively nationalised when the US government took over an equity stake of 79% in the group and provided it with an emergency loan of USD 85 billion. One key factor behind the US government’s decision to save the group was the fact that AIG had been a counterparty to CDSs of over USD 400 billion, and held a large net selling position in this regard. Against this background, many other participants in CDS markets depended on AIG’s ability to meet its CDS commitments. If AIG had collapsed – and had therefore been unable to meet its commitments – institutional investors around the world would have instantly been forced to reappraise the value of the underlying corporate debt obligations, which in turn would have reduced their capital and the value of their debt. It was widely considered that the expected knock-on effects for the already destabilised financial system would have been far-reaching.

18 “OTC derivatives market activity in the second half of 2008”, BIS, May 2009.

### 2.3 SYSTEMIC RELEVANCE

OTC derivatives markets are of systemic relevance in particular because of the existence of *large exposures between a limited number of large financial institutions*. As described above, most of the activity in the OTC derivatives market takes place between market-making dealers. Given the close web of interdependencies related to OTC derivatives trades between these dealers, disruptions at one major dealer can easily be transmitted to other significant financial institutions, with potential knock-on effects for the financial system more widely.

While the most common reference point for measuring the size of OTC derivatives markets are the notional amounts outstanding, it is not adequate for gauging the actual exposures at risk in this market. For example, the notional amount outstanding of IRS stood at USD 328.1 trillion in December 2008. However, this figure only reflects the principal amount of the contracts, which is then used to calculate the size of the cash flows to be exchanged between the counterparties. For example, in a fixed-for-floating swap, the actual payment flow is based on the difference between the fixed interest payments and the floating interest payments on the underlying principal amount. The principal amount itself is not exchanged. Similarly, in the case of a CDS, credit protection sellers do not typically pay out the total amount outstanding since that presupposes both default by the reference entity (or all reference entities in the case of an index product) and zero recovery on the underlying debt obligation.

According to the BIS, the gross market value therefore provides a more accurate measure of the scale of financial risk transfer in OTC derivatives markets. The gross market value measures the cost of replacing all existing OTC contracts and was estimated at USD 33.9 trillion at end-2008. However, even gross market values generally overstate the payment flows

at risk as they do not take into account legally enforceable bilateral netting agreements or the collateralisation of OTC positions. While it is difficult to calculate an exact figure that reflects the actual payment flows at risk in the OTC market, the BIS estimates that the gross credit exposure (which takes into account legally enforceable netting agreements but not collateralisation) in the global OTC market stood at approximately USD 5 trillion at end-2008. While this figure is significantly smaller than the USD 592 trillion in notional amounts outstanding, the exposures created in the global OTC market are still of a systemically relevant size. Moreover, as explained in the next section, it is also important to note that while notional amounts outstanding have recently decreased, gross market values continue to rise at a rapid pace.

In addition to risks resulting from their sheer magnitude, *OTC derivatives markets are also comparatively vulnerable to weaknesses in risk management*. For instance, given the private nature and consequent opacity of OTC derivatives markets, it is difficult to assess how different institutions are interlinked and where the risk exposures are ultimately held. This may give rise to shortcomings in both operational and credit risk management and can add to financial uncertainty, especially in the context of distressed market conditions, as was demonstrated during the recent market turbulence.

*An important additional source of risk in OTC derivatives markets is the fact that the development of post-trading processes has not kept pace with the strong growth of OTC derivatives markets in recent years*, as highlighted in the April 2008 report of the Financial Stability Forum (FSF). As the infrastructure for clearing and settling OTC trades is still predominantly bilateral and non-standardised, and continues to require a considerable degree of manual intervention, OTC derivatives markets have struggled to cope with the rising volumes and increasing complexity of derivatives trades. This was

underscored during recent market events, when processing backlogs resurfaced, hampering the effective management of operational risk and exacerbating concerns about counterparty risk.

Similar problems had already caused concern on a number of occasions since the late 1990s and triggered several initiatives to strengthen the OTC infrastructure in recent years, particularly for credit derivatives. While these measures fostered progress towards more automated procedures and an enhanced standardisation and documentation of derivatives contracts, the recent difficulties clearly demonstrate that more needs to be done in these areas. Other priorities highlighted are the need to enhance counterparty risk management for OTC derivatives, in particular through netting and collateralisation arrangements, as well as to achieve greater market transparency and enhanced public oversight. Several major initiatives in these fields are currently under way.<sup>19</sup>

While the envisaged measures relate in principle to all major OTC derivatives asset classes – interest rate derivatives, foreign exchange derivatives, credit derivatives, equity derivatives and commodity derivatives – an initial area of focus has been measures to enhance the resilience of the CDS markets. These markets have received particular attention since 2008, when the near-collapse of Bear Stearns, the failure of Lehman Brothers and the near-default of AIG, all major CDS counterparties at the time, raised immediate concerns regarding the safety and transparency of these markets. More generally, effective counterparty risk management is a particular priority for CDS in view of their non-linear payout structure, the significance of the related exposures relative to both the total counterparty risk and the capital cushions of the financial institutions involved, and the close link between CDS markets and cash securities markets. The enhanced use of central counterparty clearing for CDS has been identified as a key measure to achieve progress in this field (see also Section 4.2 below).

### 3 SIZE AND LOCATION OF THE MARKET

#### 3.1 OVERALL SIZE AND DEVELOPMENT

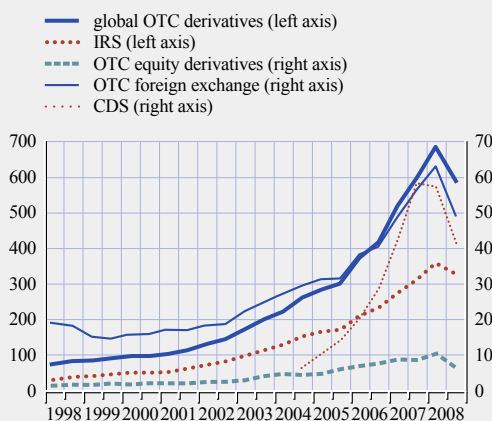
Over the ten years up to June 2008, the OTC derivatives markets experienced exponential growth. As Chart 1 indicates, the global OTC derivatives market grew from USD 72 trillion in 1998 to USD 684 trillion in June 2008, as measured in notional amounts outstanding.<sup>20</sup> Moreover, this overall growth trajectory was observed across most of the OTC market segments. Notional amounts outstanding of IRS rose sharply from USD 29 trillion in June 1998 to USD 357 trillion in June 2008, and OTC foreign exchange derivatives followed a similar pattern, peaking at USD 63 trillion in mid-2008. Over the same period, OTC equity derivatives grew nearly eightfold to just over USD 10 trillion. Finally, the CDS market experienced particularly strong growth, rising by 900% in the three years up to end-2007 to USD 58 trillion in notional amounts outstanding, before contracting during 2008.

19 See, for example, the European Commission's communication on possible initiatives to enhance the resilience of OTC derivatives markets, published on 3 July 2009, and the US plans for a regulatory reform of OTC derivatives", which were outlined by the US Treasury on 13 May 2009.

20 "Semiannual OTC derivatives statistics", BIS.

Chart 1 Global OTC derivatives market

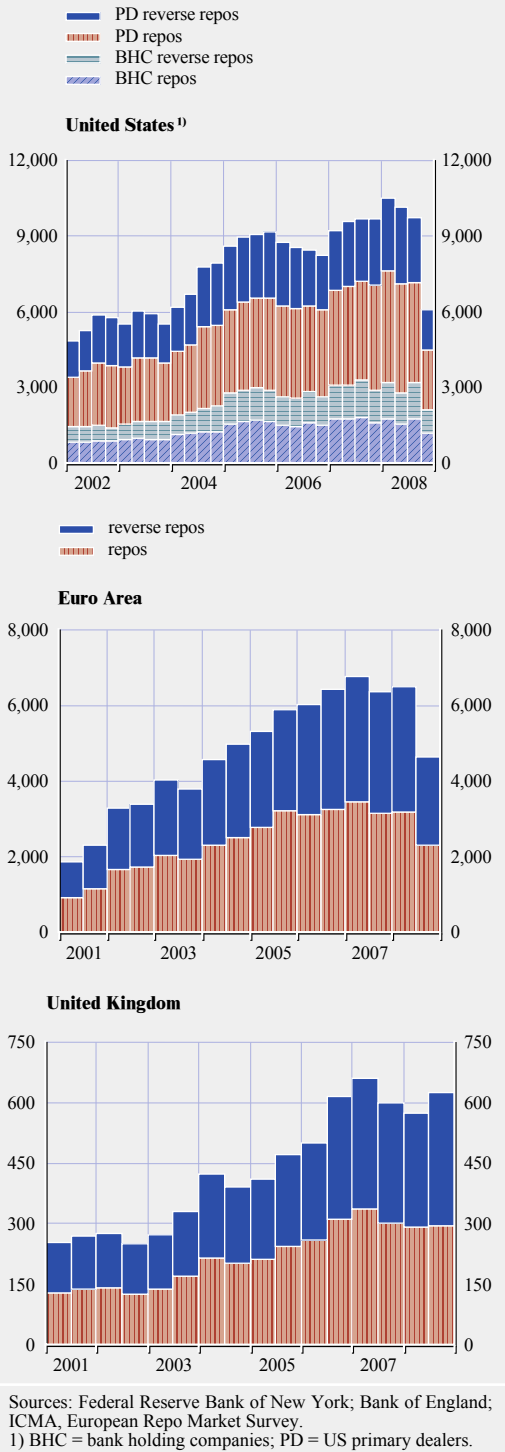
(notional amounts outstanding; USD trillions)



Source:

**Chart 2 Repo markets, amounts outstanding**

(billions of national currency units)



In contrast to its evolution until mid-2008, the OTC derivatives market declined sharply during the second half of 2008, falling by 13.4% to USD 592 trillion in the sixth months to December 2008. This was the first decline since the BIS started collecting OTC derivatives data in 1998. OTC foreign exchange derivatives declined by 21% to USD 49 trillion in December 2008. Over the same period, OTC equity derivatives fell by 36% to USD 6.5 trillion in notional amounts outstanding. The CDS market, which had already shrunk by 1% in the first half of 2008, declined by an additional 27% in the second half of the year. By end-2008, the CDS markets stood at USD 41.9 trillion; some indicators suggest that this figure stabilised in the first half of 2009.<sup>21</sup> IRS experienced a less significant drop, falling by 8% over the second half of 2008 to stand at USD 328 trillion in December 2008.

The dynamics of the repo market followed a similar pattern to the OTC derivatives data surveyed by the BIS. Chart 2 shows the repo market as measured by gross amounts outstanding of USD, GBP and EUR repos. As the chart indicates, the repo market rose steadily to approximately USD 10 trillion in mid-2008 (adjusted for double-counting of repos and reverse repos).<sup>22</sup> In the second half of 2008, however, the repo market declined sharply to about USD 6.7 trillion. This drop is due to steep declines in the US and European repo markets. Over the second half of 2008, the US repo market contracted by 40% to USD 3 trillion, while the European repo market declined by almost 29% to USD 3.2 trillion, which was the steepest contraction observed since the repo

21 According to the latest estimates of the Depository Trust and Clearing Corporation (DTCC) of May 2009, gross notional amounts outstanding were comparable with the levels observed by DTCC in January 2009.

22 Specifically, this figure was calculated by converting the GBP and EUR estimates into USD equivalents and adjusting the sum of the three markets (USD, GBP and EUR repos) for double-counting of repos and reverse repos (dividing the sum by a factor of 2). This adjustment is in line with estimates of double-counting provided by the BIS (see, for example, "BIS Quarterly Review", December 2008).

survey was launched in 2001.<sup>23</sup> The repo market in the United Kingdom, by contrast, increased slightly over the same time period.

Despite the contraction in the OTC market, however, the payment flows at risk in most OTC markets significantly *increased* in the second half of 2008. This is reflected in the development of gross market values. While gross market values do not account for legally enforceable bilateral netting agreements or collateralisation of OTC positions, they can indicate the relative change over time in payment flows at risk. Chart 3 shows that gross market values for the global OTC market increased by 66.5% to USD 33.9 trillion in the second half of 2008, the fastest rate since such data were first collected in 1998. Within six months, the gross market values for IRS doubled in size, rising from USD 9.3 trillion in June 2008 to USD 18.4 trillion in December of the same year. The gross market value of CDS increased by 78% over the same horizon, while OTC foreign exchange derivatives increased by 73%. Only OTC equity derivatives contracts experienced a slight contraction in terms of gross market values, dropping by 2.8% in the second half of 2008.

The BIS also releases an estimate of *gross credit exposure*, which represents the aggregate gross market value of all OTC markets, taking into account legally enforceable bilateral netting arrangements. According to this measure, gross credit exposure increased by almost 30% over the second half of 2008, from USD 3.8 trillion in June 2008 to just over USD 5 trillion by the end of that year, further reinforcing the view that payment flows at risk increased during that period.

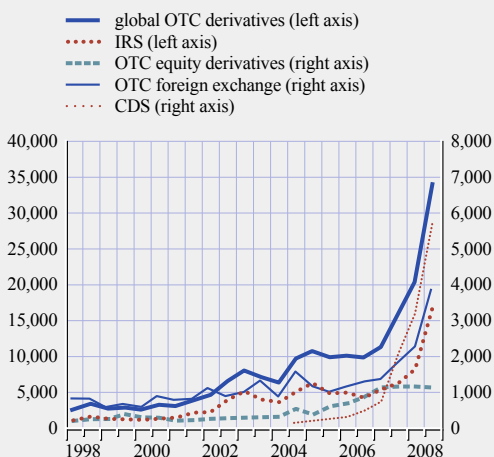
According to the BIS, the unprecedented rise in gross market values over the second half of 2008 can be explained by significant market price movements. More specifically, within the IRS category, the largest increase occurred in the US dollar-denominated IRS market, which rose by 201% in the six months to end-December 2008. Significant interest rate movements in the latter half of 2008 contributed to the rise in gross market values in this OTC market segment. For CDS, the increase in default probabilities and associated credit spreads drove up gross market values. It is noteworthy that the rise in gross market values accelerated despite the sharp contraction in market size which occurred over the same time period.

Returning to the reduction in the size of the market for CDS, a major factor behind falling notional volumes were the significant efforts by market participants to close out offsetting contracts. Such terminations, also referred to as portfolio compression, reflect the strengthened interest of market participants, especially in view of the financial market turbulence, to reduce the size and complexity of their CDS portfolios.

Portfolio compression was achieved more easily for the more standardised CDS index products. Accordingly, multi-name CDS, which include CDS indices and CDS index tranches, declined by 33% to USD 16.1 trillion in terms

Chart 3 Global OTC derivatives market

(gross market values; USD trillions)

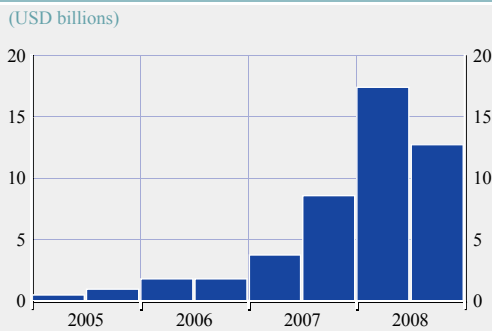


Source: BIS.

<sup>23</sup> In this survey, the market size estimate can fluctuate owing to the changing composition of the sample of reporting institutions. The survey also compared the aggregate returns of a sub-sample of those institutions that had participated in the last three surveys, and by this measure the repo market contracted by 26% during the second half of 2008.



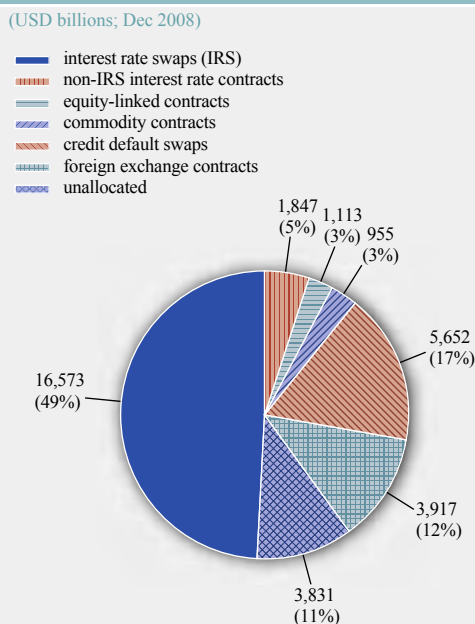
**Chart 4 CDS trade terminations by TriOptima**



Source: TriOptima.

of notional amounts outstanding, while the decrease in single-name CDS products was somewhat less pronounced, with such products falling by 23% to USD 25.7 trillion over the second half of 2008. As Chart 4 illustrates, the impact of the multilateral CDS terminations was very significant. The largest provider of such termination services, TriOptima, cancelled CDS trades amounting to USD 29 trillion during 2008 alone.

**Chart 5 OTC global derivatives market: gross market value**



Source: BIS.

Chart 5 provides an additional breakdown of the OTC derivatives market, showing the contribution of each market segment in terms of gross market value. As the chart indicates, IRS represent the largest category, accounting for 49% of the global gross market value. CDS and OTC foreign exchange contracts capture 17% and 12% of the market share respectively. OTC equity-linked contracts are of a smaller magnitude, with a 3% market share.

### 3.2 SHARE OF EURO-DENOMINATED TRANSACTIONS

*In the five markets under consideration, the euro is either the predominant currency or the second most important currency after the US dollar, depending on the market and measurement used, as shown in Table 1.*

#### INTEREST RATE SWAPS

In the market for IRS, which is by far the largest segment within the global OTC derivatives market, the euro is either the first or second most commonly used currency, depending on the measure used. The BIS reports that, at end-December 2008, of the USD 328.1 trillion IRS market (in terms of notional amounts outstanding), USD 118.6 trillion (36%) was denominated in euro, compared with USD 110.4 trillion (34%) in US dollars, the second largest currency in this market. In terms of gross market value, the euro had the second-largest share, with USD 4.5 trillion (27%), compared with USD 9.3 trillion (56%) for the US dollar. The gross market value shares fluctuated widely during the second half of 2008 owing to the doubling of the gross market value of US dollar-denominated IRS between June and December 2008.

#### OTC EQUITY DERIVATIVES

OTC equity derivatives are dominated by contracts on European equities, which account for 62% of all contracts in terms of notional amounts outstanding (USD 4.0 billion out of total contracts of USD 6.5 billion in US dollar

Table 1 | Share of euro-denominated OTC instruments

	Measure	Euro share (%)	USD share (%)	Source
IRS	Notional amounts outstanding	36	34	BIS
	Gross market value	27	56	
OTC equity derivatives <sup>1)</sup>	Notional amounts outstanding	45	23	BIS and ECB
	Gross market value	40	23	
CDS	Market turnover	39	59	CLS and ECB
OTC FX derivatives	Notional amounts outstanding	21	42	BIS
	Gross market value	20	40	
Repo market <sup>2)</sup>	Repo contracts outstanding	47	45	FRBNY, BoE, ICMA, ECB

1) The euro share of OTC equity derivatives is based on a very imperfect estimate using the euro area share of EU stock market capitalisation. In general, derivatives contracts on European equities can in principle be written in non-European currencies. In the absence of better data, these are the best available estimates. In a 2001 ECB study on the euro equity markets ("The euro equity markets", August 2001), the euro share of EU turnover of exchange-traded equity derivatives was 80%, which, while not directly comparable, is similar to our estimates for OTC equity-linked derivatives.

2) Only the repo markets for the US dollar, the pound sterling and the euro are included.

equivalent amounts in December 2008). Contracts on US equities account for 23%, while contracts on Japanese equities account for 6% of all contracts.<sup>24</sup> Given that the euro area stock market capitalisation is about 73% of EU equity values,<sup>25</sup> it could be assumed that the euro-denominated share of OTC equity derivatives is also approximately 73% of total European equity derivatives, or 45% of all OTC equity derivatives transactions<sup>26</sup> in terms of notional amounts outstanding.

The BIS provides data on the gross market values of OTC equity derivatives. By end-December 2008, the gross market values of OTC equity derivatives outstanding worldwide amounted to USD 1.1 trillion, of which USD 607 billion (55%) represented contracts on European equities, compared with USD 254 billion (23%) on US equities and USD 85 billion (8%) on Japanese equities.

### CREDIT DEFAULT SWAPS

Euro-denominated instruments play a significant role in global CDS markets. In terms of currency breakdown, estimates by the Continuous Linked Settlement (CLS) system of June 2007 and ECB calculations indicate that euro-denominated instruments accounted for approximately 39% of the turnover in credit derivatives markets (of which CDS made up 88%) settled by CLS,

second only to the US dollar-denominated turnover, which accounted for 59%.

### OTC FOREIGN EXCHANGE DERIVATIVES

For this market, the BIS reports that the US dollar is the predominant currency, with a 42% share in notional amounts outstanding, followed by the euro (21%), the yen (12%) and the pound sterling (6%) at end-December 2008. The currency shares remain similar when the alternative measure of gross market values is considered.

### REPOS

Chart 2 compares the US, UK and euro area repo markets and shows that, by the end of 2008, the US market stood at about USD 3 trillion, compared with USD 3.2 trillion for the euro area and USD 0.54 trillion for the UK repo market (adjusting for double-counting of repos and reverse repos; see also Chart 2 above).<sup>27</sup> With regard to the currency breakdown of *repos transacted by counterparties located in the EU*,

24 BIS data on amounts outstanding of OTC equity-linked derivatives by instrument and market, <http://www.bis.org/statistics/otcder/dt13.pdf>

25 World Federation of Exchanges, 2007 data.

26 See footnote 23.

27 The euro-denominated repo data exclude repos transacted with central banks as part of official monetary policy operations.

a survey by the International Capital Market Association (ICMA) finds that the euro accounts for 71% of this market, followed by the pound sterling (13%) and the US dollar (10%)<sup>28</sup>.

### 3.3 SHARE OF TRANSACTIONS INVOLVING AT LEAST ONE EU COUNTERPARTY

*Transactions by counterparties located in the EU represent a sizeable share of the four OTC derivatives markets under consideration (with data on the geographical location of the repo market being unavailable), as summarised in Table 2.*

The BIS has published market volume data on euro-denominated OTC *interest rate derivatives*, which comprise not only IRS, but also forward rate agreements and options<sup>29</sup>, for April 2007. During that period, the daily average turnover in these euro-denominated derivatives amounted to USD 858 billion (in USD equivalent amounts) across all countries, the majority of which was conducted by UK counterparties (USD 487 billion, or 57%), followed by counterparties located in France (USD 143 billion, or 17%) and Germany (USD 79 billion, or 9%). The total for counterparties located in a euro area country amounted to USD 308 billion, or 36%. US counterparties had a share of the euro-denominated interest rate derivatives market of only USD 24 billion, or 3%<sup>30</sup>. Given that IRS make up 77.2% of the euro-denominated interest rate derivatives

market in terms of notional amounts outstanding (and 86.3% in terms of gross market value), it is a reasonable approximation to assume that the share of counterparties located in Europe for the interest rate derivatives market (as reported by the BIS) is indicative of the counterparty share for the IRS component of the overall interest rate derivatives market (thus yielding the shares in Table 2 above).

For OTC *equity derivatives*, the market share of European counterparties amounted to 56.6% as at end-June 2007<sup>31</sup>. By comparison, the share of US counterparties represents only 21.2%, while Japanese counterparties have the third largest share, at 9.1%. Another indicator of the importance of European counterparties in this market is the location of leading dealer banks, which represent a significant proportion of the participants in the OTC equity-linked derivatives market. Based on a 2008 interdealer ranking provided by “Risk” magazine, of the five banks with the highest market share of European OTC single stock equity options, four are European.

With regard to the *CDS market*, an informal survey of CDS markets carried out by the Eurosystem’s Banking Supervision Committee in June 2007 indicated that contracts in which at least one of the counterparties was domiciled in the EU accounted for 35% of the global CDS market. Similarly, it can be noted that out of the ten major dealer groups which are involved in the calculation of the iTraxx and CDX indices, six are domiciled in Europe.

The OTC *foreign exchange derivatives* market is primarily located in the United Kingdom. 2007 BIS data show that 54% of the reported OTC foreign exchange derivatives market turnover is transacted with the involvement of at least one EU counterparty, of which 39% are

**Table 2 Share of EU counterparties**

	Market share of counterparties located in the EU
Euro-denominated IRSs	94% (36% euro area)
Global OTC equity derivatives	57%
Global CDS market	35%
Global OTC FX derivatives	54% (11% euro area; 39% United Kingdom)
Global repo market	Not available <sup>1)</sup>

1) While hard data on the share of counterparties located in Europe were not available, a number of studies allow the conclusion that the majority of participants in the euro-denominated repo market are located in the euro area. See the main text for further explanations.

28 “European repo market survey”, ICMA, February 2009, reporting data as at December 2008.

29 Measured over all currencies, more than 70% of these comprise IRSs.

30 “Triennial Central Bank Survey”, BIS, December 2007, Table E31.

31 “Triennial Central Bank Survey”, BIS, December 2007, Table E40.

located in the United Kingdom. The euro area share amounts to 11%, compared with 15% for the United States.

Direct data on the geographic breakdown of the global *repo market* are not available. However, participants in the euro-denominated repo market appear to be primarily located in Europe. In particular, a survey of the European repo market found that there is a high degree of concentration, with the top 20 reporting European institutions accounting for 82% of the European repo market.

#### 4 POST-TRADING INFRASTRUCTURES AND MARKET ARRANGEMENTS

Following the execution of a trade, a number of post-trading processes are set in motion, which can be divided into three phases: pre-clearing, clearing and settlement. A range of other services support the post-trading processes over the life cycle of a derivatives product, such as collateral management services and portfolio compression, whereby mutually offsetting trades are terminated between two counterparties.

##### 4.1 PRE-CLEARING AND LIFE-CYCLE MANAGEMENT

The pre-clearing phase mainly involves trade confirmation/matching services and services related to the life-cycle management of trades.

Timely confirmation is essential for the overall effectiveness of the post-trading process. The confirmation process entails drawing up a confirmation document that identifies the details of a trade and any governing legal documentation, as agreed by both parties. This document represents the final record of the transaction. The initial drafts of the confirmation document are typically exchanged via fax, e-mail or an electronic confirmation service. Either one party provides trade details and the other verifies the information (known as *trade affirmation*) or both parties submit records of the trade and verify each other's records (known

as *trade matching*)<sup>32</sup>. Timely confirmation services are still not sufficiently developed (see also Section 2.3 above). By one measure, some 50% of OTC derivatives trades were, at least until very recently, still confirmed on paper.<sup>33</sup> In the four years to 2005, outstanding confirmations of OTC derivatives transactions continued to grow, reaching 30.5 business days for non-vanilla equity derivatives in 2005 (with the exception being credit derivatives, where industry efforts reduced the number of outstanding, unconfirmed transactions). Delays in confirmation weaken the enforceability of a trade and hamper the ability of counterparties to net the unconfirmed transaction against other transactions. In addition, unconfirmed trades increase the risk that incorrect book-keeping will go undetected for some time, which leads to market or counterparty credit risk (the risk of a counterparty not fulfilling its payment obligations) being measured incorrectly.

In this context, the past few years have seen a number of important industry efforts to automate the confirmation/matching and life-cycle management processes in order to increase efficiency and mitigate credit and counterparty risk. The main providers of trade matching and confirmation services for OTC derivatives are the United States-based *DTCC* holding company (through its subsidiary *DTCC Deriv/Serv*) and *Markit*, a United Kingdom-based data, valuations and trade processing service provider, notably through its subsidiary *Markit Wire* (formerly *SwapsWire*). Consolidation in this field is ongoing, as *Markit* and *DTCC* announced in July 2008 the formation of a joint venture (to be called *MarkitSERV*) in September 2009, which will combine the two companies' electronic trade processing services for OTC derivatives. This joint venture between *DTCC* and *Markit* is to be based in London and will serve all major asset classes, including credit, interest rate, equity and commodity derivatives.

<sup>32</sup> New developments in clearing and settlement arrangements for OTC derivatives", BIS, March 2007.

<sup>33</sup> See *Markit* press release of 21 July 2008 entitled "DTCC and *Markit* to Form Strategic OTC Derivatives Partnership".

Portfolio compression has become an increasingly important issue in view of the fact that inflated OTC derivatives portfolios, containing a large number of mutually offsetting trades<sup>34</sup>, render effective risk management more complex. The elimination of offsetting contracts can contribute to reducing risk-weighted assets, related capital charges and counterparty credit risk. A major provider in this field is *TriOptima*, a Swedish financial technology company which offers portfolio compression services for CDS and IRS through *TriReduce*. *TriReduce* provides a tool for the mass multilateral termination of contracts, which is then legally binding for the counterparties using the service. *TriOptima* also operates *TriResolve*, a tool to achieve cross-product portfolio reconciliation among counterparties, with a view to preventing potential disagreements related to collateral management. *TriResolve* matches the collateral portfolios of the participating counterparties, highlighting any valuation differences. This service also supports commitments made by major dealers and buy-side institutions participating in the Operations Management Group (OMG) to strengthen the operational infrastructures for OTC derivatives.<sup>35</sup>

Finally, regarding collateralisation practices, the use of bilateral collateral agreements to cover outstanding positions is becoming increasingly common in the OTC derivatives markets. According to the ISDA Margin Survey 2009, the amount of collateral used for OTC derivatives was estimated at USD 4 trillion as at end-2008. The survey also reports that, by the end of 2008, 65% of OTC derivatives trades were collateralised, and 66% of credit exposures to counterparties arising from OTC derivatives were covered by collateral. While most of the collateral used takes the form of cash, initiatives are under way to facilitate the use of securities as collateral for OTC derivatives trades. For instance, since the end of 2007, Euroclear's *DerivManager* has provided trade matching and daily portfolio reconciliations between counterparties to allow them to use securities to collateralise the exposures resulting from

OTC derivatives transactions. The Euroclear exposure management service for OTC derivatives complements the services offered by DTCC.

## INTEREST RATE SWAPS

SwapsWire was launched in October 2002 to service the IRS market, providing an automated trade input facility linking dealers, buy-side users, electronic execution platforms and interdealer brokers. SwapsWire is involved in the trade immediately after execution and in certain post-trade events over the trade life cycle. Trades are recorded in SwapsWire right after the trade has been executed. The final trade record is subsequently confirmed by affirmation or matching by each counterparty via SwapsWire. As a consequence, close to 100% of interdealer trades are confirmed on the day of execution. Confirmation on the buy side tends to be somewhat slower, with more than 70% of trades confirmed on the trading day, and 90% by the day following the trade execution date.

SwapsWire maintains a database of all trades confirmed in the SwapsWire system. In addition, historical trades can be back-loaded into SwapsWire. As a result, participants can reconcile their database of trades to the SwapsWire records on a periodic basis, in the knowledge that their counterparty is reconciling to the same database of trades. This also facilitates confirmation and straight-through processing (i.e. full automation) of life-cycle events, such as trade amendments, terminations, allocations, exercises, corporate actions and novations.

Since its launch, SwapsWire has expanded its coverage to 25 currencies and a range of additional product types, including interest rate options, inflation swaps, CDSs and equity

<sup>34</sup> *TriOptima* estimates that only 25% of the portfolio actually reflects the risk of the book, while the other 75% represents offsetting positions.

<sup>35</sup> An update on the status of these commitments is provided in the OMG's letter of 2 June 2009 to the President of the Federal Reserve Bank of New York, published at: <http://www.newyorkfed.org/newsevents/news/markets/2009/ma090602.html>

products. In May 2008, SwapsWire was acquired by Markit, and was subsequently renamed Markit Wire.

### OTC EQUITY DERIVATIVES

OTC equity derivatives are currently served by both Markit Wire and DTCC's Deriv/SERV. However, as mentioned above, Markit and DTCC plan to form a joint venture (MarkitSERV) which will service OTC interest rate, equity and credit derivatives. The new company will comprise Markit Wire as well as other trade processing services, while DTCC will contribute its Deriv/SERV confirmation and matching service, among others. Services that will not become part of the new company include Markit's data and valuation services and DTCC's Trade Information Warehouse and centralised settlement and payment netting services. The joint venture will have its headquarters in London, with a second major centre of operations in New York, as well as representative offices in Europe and Asia.<sup>36</sup>

### CREDIT DEFAULT SWAPS

Since late 2003, DTCC's Deriv/SERV has provided an automated trade matching and confirmation service for CDS. The service compares the trade information received by counterparties and reports matches (or mismatches) to them in real time.<sup>37</sup>

In November 2006, DTCC complemented its matching and confirmation service with the establishment of the *Trade Information Warehouse* (TIW). The TIW provides first and foremost a comprehensive trade database containing the primary record of each CDS contract and is therefore a key source of industry statistics for public authorities and markets alike. According to its own assessment, DTCC's data warehouse stores all electronically confirmed CDS trades and about 96% of all global CDS trades<sup>38</sup>. In addition, the TIW provides a central technology infrastructure that automates and standardises trade processing

and life-cycle management, with open access also to other service providers along the CDS post-trading value chain. Key functions provided in this regard include (i) payment calculations for one-time fees and coupons; (ii) multi-currency payment netting and central settlement of payments (provided together with CLS); (iii) centralised processing of credit events and (iv) novation consent, which automates the approval process when one party to a transaction assigns its position to another.

### OTC FOREIGN EXCHANGE DERIVATIVES

For the foreign exchange derivatives market, SWIFTNet Accord operated by SWIFT (Society for Worldwide Interbank Financial Telecommunications) is a central matching system for confirmation. Upon agreement of a trade, SWIFT confirmation messages are exchanged. SWIFT enters these messages into the Accord matching service, which notifies the counterparties in real time of matches (or of any mismatches). Accord stores the confirmations for a week, and participants can choose to save the confirmation information for up to ten years in SWIFT's Long Term Archival facility.

<sup>36</sup> See Markit press release of 21 July 2008 entitled "DTCC and Markit to Form Strategic OTC Derivatives Partnership" and DTCC Important Notice #798 of 16 July 2009 entitled "Transfer of Deriv/SERV Confirmation and Matching Service, the Deriv/SERV Novation Consent Service, and the MCA Xpress Service to MarkitSERV".

<sup>37</sup> Both parties to a trade submit trade information to Deriv/SERV either through a direct computer-to-computer link or through a secure web-based application. Once information has been received from both parties, Deriv/SERV automatically compares the trade information and matches (or mismatches) are reported in real time to the counterparties. If the trade details fully match, the trade is considered "confirmed" and no further action is necessary. If there are fields that do not match, the system reports the fields that do not match and counterparties are required to submit revised data to resolve the differences. This process continues until all the trade details fully match and the status of the trade becomes confirmed.

<sup>38</sup> These figures were provided by DTCC at a meeting at the European Commission on 20 November 2008. According to a recent estimate by the US Securities and Exchange Commission (SEC), the coverage is only 80% (see "Testimony concerning credit default swaps" by Erik Sirri, Director Division of Trading and Markets, SEC, before the House Committee on Agriculture on 15 October 2008).

For participants such as buy-side clients and corporations which cannot send the SWIFT message type used for derivatives (MT3xx), SWIFTNet Affirmations was introduced in November 2006. This service enables dealers to send trade confirmations to these clients, who can then simply accept (or reject) the dealer's confirmation.

## REPOS

Automated post-trading services are offered by the automated trading systems (ATS), which are used for about 28% of repo transactions in Europe. Trading via ATS implies that efficient post-trading services such as confirmation and matching are conducted automatically as part of the electronic platform. Moreover, ATS usually offer clearing via a central counterparty (CCP), as discussed in the next section. As such, the increased use of ATS for trading repos would also increase the potential for a greater use of centralised clearing and settlement in the repo market.

A major provider of automated trading services is BrokerTec, which represents a leading electronic interdealer platform for trading repos in Europe. In June 2009, its average outstanding daily volume of European repo products was €214.1 billion. Once repo trades are conducted on this ATS, the trade information is used for post-trading services that connect to participants' back office systems, resulting in electronic straight-through processing of the trade. Another major ATS in the European repo market is Eurex Repo, with an average daily outstanding volume of €85.3 billion in the first quarter of 2009 for the euro-denominated repo market. Its euro repo market is operated by Eurex Repo GmbH, a subsidiary of Eurex Frankfurt AG. MTS Group also provides trading services for European repos and offers central counterparty clearing by Cassa di Compensazione e Garanzia, LCH. Clearnet SA and LCH.Clearnet Ltd. In January 2006, Tullett Prebon launched a new electronic trading platform for the US repo market. The Tullett Prebon Electronic Broking platform is extending its services to support EU

government bond repos for the United Kingdom, Germany and France.

## 4.2 CLEARING

While OTC derivatives products are still cleared predominantly through bilateral arrangements, the use of CCPs has increased in recent years.

### INTEREST RATE SWAPS

*SwapClear* is a service operated by the London-based clearing house LCH.Clearnet Ltd, and started operating in 1999. Today, SwapClear clears vanilla IRS denominated in USD, EUR, JPY and GBP with maturities of up to 30 years, as well as CHF, AUD, DKK, CAD, HKD, NOK, NZD, SEK, PLN and ZAR IRS with maturities of up to ten years. IRS trades are sent to SwapClear through either Markit Wire or SWIFT, subject to the consent of both counterparties. SwapClear currently has 25 clearing members.

As at December 2006, USD 35.5 trillion in swaps was cleared through SwapClear, representing approximately 40% of the global interdealer market in IRS.<sup>39</sup> Given that the interdealer market itself has approximately a 40% share of the global IRS market, this implies that SwapClear had a global market share in clearing IRS of about 16% at the time.

SwapClear has expanded its business in recent years. In June 2009, the overall size of the SwapClear portfolio was worth USD 178 trillion in terms notional amounts outstanding<sup>40</sup> (both sides of the cleared IRS transactions are counted), up from USD 103 trillion in October 2007<sup>41</sup>.

39 "New developments in clearing and settlement arrangements for OTC derivatives", BIS, March 2007.

40 Slide presentation by LCH.Clearnet at a "Meeting on establishing central counterparties for credit default swaps" held at the ECB on 9 July 2009.

41 Slide presentation by LCH.Clearnet at the joint Bank of England/ECB conference on payments and monetary and financial stability of 12-13 November 2007, panel session on OTC derivatives clearing arrangements.

## OTC EQUITY DERIVATIVES

Since 2005, LCH Clearnet Ltd has also acted as a CCP for OTC equity derivatives, processing trades booked on Euronext.Liffe's Bclear platform. Bclear offers specific OTC equity derivatives products which are traded OTC on a bilateral basis. The users of Bclear retain the flexibility to specify contract maturity, exercise price and settlement method, while also having the choice as to whether or not to publish trade details to the market. Once the trades have been submitted and accepted, they are replaced by exchange contracts and brought to LCH.Clearnet Ltd for trade confirmation, administration and clearing. The original transaction is replaced by an exchange contract through novation. A similar OTC trade entry facility, combined with CCP clearing (provided by Eurex Clearing), is offered by the German-based Eurex derivatives exchange.

## CREDIT DEFAULT SWAPS

Until very recently, CDSs were cleared solely on a bilateral basis. However, as discussed above, following the lessons from the financial market turmoil, strong efforts have been made by public authorities and market participants alike to foster an enhanced use of CCP clearing for these products. In this context, EU authorities have also underscored the importance of having at least one CCP for CDS that is located in Europe, given the significant implications of CCP services in this field for European institutions and financial markets, and the corresponding need for effective regulation and oversight by the competent European authorities. Similarly, the Governing Council of the ECB, at its meeting on 18 December 2008, stressed that there was a need for at least one European CCP for credit derivatives and that, given the potential systemic importance of securities clearing and settlement systems, this infrastructure should be located within the euro area. The Governing Council recently confirmed this position at its meeting on 16 July 2009, when it also underlined that particular priority would be given to the use of euro area infrastructures for clearing CDS

denominated in euro, which will be closely monitored by the Eurosystem in the coming months. Indeed, in view of the importance of euro-denominated CDS contracts, a CCP for CDS in the euro area would facilitate the effective access of the CCP to central bank liquidity, which EU public authorities, as well as a growing share of the European user community, consider a basic requirement for the safe functioning of a CCP for CDS.

Overall, there are five existing or proposed providers of a European CCP solution for CDS: Eurex Clearing, LCH.Clearnet Ltd., LCH.Clearnet SA, ICE Clear Europe and the Chicago Mercantile Exchange (CME). While LCH.Clearnet Ltd. launched its service in December 2008<sup>42</sup>, Eurex and ICE went live with their applications at the end of July 2009. This implies that with Eurex Clearing one euro area CCP for CDS is currently available. Another euro area provider, LCH.Clearnet SA, expects to be able to go live by the end of this year. The CME intends to implement its European solution for CDS CCP clearing during the second half of 2009. The precise starting date will largely depend on the finalisation of the UK regulatory approval process.

All proposals in principle aim at global product coverage, involving especially the main US and EU products. All providers would also aim at connectivity with DTCC's TIW; the DTCC has repeatedly underlined that it is in principle open to any robust provider.

## OTC FOREIGN EXCHANGE DERIVATIVES

A majority of foreign exchange transactions, including foreign exchange derivatives, are processed by CLS, as discussed in greater detail in Section 4.3. However, some 45% of all foreign exchange transactions are still cleared and settled bilaterally.

<sup>42</sup> LCH. Clearnet operates a CCP service for CDS in connection with the Bclear platform, in cooperation with NYSE Liffe. However, the service has not attracted any significant trading volumes so far; the provider recently announced its decision to review the project.



CCP clearing services for foreign exchange transactions were briefly offered by FXMarketSpace, a joint venture between the CME and Reuters, which went live in March 2007. The joint venture failed to reach a sufficient market share and ceased trading in October 2008.

## REPOS

ATS typically offer clearing via a CCP. The ATS BrokerTec and MTS offer the option of clearing via LCH.Clearnet Group Ltd through their RepoClear service. In 2007, about 92% of BrokerTec's European repo transactions and about half of all MTS repo transactions were cleared through LCH.Clearnet.<sup>43</sup> RepoClear has provided repo trade clearing since 1999 across a number of European markets, with current monthly volumes averaging €10 billion.<sup>44</sup> Recently, LCH.Clearnet also began providing clearing services for pound sterling and euro GC repos (for which a basket of securities can serve as collateral for a cash loan).

Trades via the electronic platform Eurex Repo are automatically routed to the CCP Eurex Clearing. Eurex Clearing also plans to launch the clearing of securities lending transactions, where it will act as a CCP for the bond lending service ASLplus of Clearstream Banking Luxembourg. Eurex Clearing also plans to serve the European equity lending platform of Quadriserv.

## 4.3 SETTLEMENT

Settlement arrangements depend in part on the organisation of the earlier components of the post-trade value chain. Both pre-clearing and clearing arrangements can be relevant in determining the settlement processes, as illustrated in particular by the discussion regarding the forthcoming settlement arrangements for CDS.

## INTEREST RATE SWAPS

IRS are cash-settled. The notional amount of an IRS is not exchanged between counterparties. In a typical arrangement, the two underlying

loans have an initial payment of principal, but they net to zero. Both loans have a final return of the same principal, which also net to zero. In order to mitigate settlement risk, the periodic interest payments are generally scheduled on the same dates, so that these periodic payment flows between the counterparties can be netted. As is the case with other OTC derivatives products, payment obligations related to the IRS can furthermore be netted across IRS and all other derivatives that are specified in the master agreement between the counterparties.<sup>45</sup> The actual payments of IRS cash flows occur in the relevant payment system (e.g. TARGET2 for euro-denominated IRS) or on the books of a commercial bank.

The ISDA Master Agreement contains booklets relating to a specific type of derivatives transaction and other provisions. As such, Articles 5 and 6 of the 2000 ISDA definitions set out how to calculate the amounts payable under an IRS. The ISDA Master Agreement and all the confirmations entered into under it form a single agreement. This is important as it allows the parties to an ISDA Master Agreement to aggregate the amounts owed by each counterparty on all types of transaction covered by ISDA Master Agreement, and replace them with a single net amount payable by one party to the other. Transactional netting, dealt with under section 2(c) of the ISDA Master Agreement, allows the parties to net out amounts payable on the same day and in the same currency. This transactional netting must be distinguished from the close-out netting arrangements also foreseen in the ISDA Master Agreement and in the relevant legislation.

For SwapClear (see Section 4.2 above), all payment obligations for the same value date and in the same currency are "novated" into

<sup>43</sup> These data refer to the repo activities of the London-based and Paris-based CCPs of LCH.Clearnet Group.

<sup>44</sup> This figure reflects repo and cash bond (outright) markets.

<sup>45</sup> A master agreement specifies the standard terms and conditions for a defined set of transactions between the counterparties. These master agreements are usually based on standards developed by the ISDA, which represents participants in the privately negotiated derivatives industry.

a single payment obligation between each clearing member and the CCP LCH.Clearnet Ltd. For the settlement of payment obligations to and from LCH.Clearnet Ltd, the following arrangement is employed. LCH.Clearnet Ltd uses an embedded payment arrangement, called the Protected Payments System (PPS), for the transfer of funds to and from its members. All transfers of funds between LCH.Clearnet Ltd and its members are made via PPS member banks, thereby transferring the counterparty risk from the clearing members to the PPS member banks. For each currency, there is also a “concentration bank”. All transfers of funds to and from LCH.Clearnet Ltd and the PPS member banks are made via LCH.Clearnet Ltd’s concentration bank accounts. For pound sterling and euro payments, the Bank of England is the concentration bank, which ensures that LCH.Clearnet Ltd has access to a settlement asset free of credit risk. For US dollar payments, Citibank acts as the concentration bank. For all other currencies, the concentration bank is HSBC.

Finally, the margin payments, when margins are paid in cash, generated by a derivatives trade can be substantial, as additional margins may be paid daily among the contracting counterparties. Margin amounts may also be netted before payment across several (IRS) contracts or types of contract is made, which implies that the ultimate payment flows at stake are difficult to estimate.

#### OTC EQUITY DERIVATIVES

Currently, cash payments related to OTC equity derivatives are made either through the relevant payment systems (e.g. TARGET2 for euro-denominated OTC equity derivatives, CHAPS for pound sterling-denominated OTC equity derivatives, and Fedwire for US dollar-denominated equity derivatives). Alternatively, cash payments are settled on the books of a commercial bank. The physical delivery of securities takes place in the existing central securities depositories (CSDs).

Bclear offers a facility whereby cash settlement is offered by Bclear to trading parties. Bclear calculates the settlement amount, which is exchanged via Bclear.<sup>46</sup>

#### CREDIT DEFAULT SWAPS

To date, *cash payments related to CDS are largely settled through CLS*. More specifically, CLS provides an automated settlement service for payments related to contracts that are confirmed electronically in DTCC’s TIW. The TIW automates and centralises the most up-to-date information about a derivatives contract and links this data with CLS’s electronic settlement process. At the same time, the TIW receives real-time information on the status of all payment instructions that have been submitted to CLS.

With the prospective establishment of one or more CCPs for CDS in the euro area, there could also be scope for cash settlement via existing euro area settlement infrastructures, namely TARGET2. A precondition for opening up the settlement process to other providers would be access by any emerging CCP for CDS to the trade data stored in DTCC’s data warehouse. However, as mentioned above, DTCC has repeatedly underlined its open access policy with regard to all forthcoming CCP solutions, provided that its participation criteria are met.

#### OTC FOREIGN EXCHANGE DERIVATIVES

Approximately 55% of foreign exchange transactions, including foreign exchange derivatives, are settled by the CLS system.<sup>47</sup> The CLS system is owned by the CLS Group, which has as shareholders 71 major financial institutions located in the United States, Europe and the Asia/Pacific region. The CLS Group is regulated by the Federal Reserve System and is the group holding company for CLS Bank International (CLS Bank), among others.

<sup>46</sup> It is not known which system(s) Bclear uses for the sending of cash payments.

<sup>47</sup> “Progress in reducing foreign exchange settlement risk”, CPSS, May 2008. The data refer to April 2006.

CLS Bank is a limited purpose institution providing settlement services for eligible currencies. CLS Bank is supervised and regulated by the Federal Reserve, which also acts as lead overseer in a cooperative oversight arrangement with the central banks whose currencies are settled by CLS Bank.

Settlement members submit their payment instructions directly to the CLS system for matching of payment orders. Once these instructions have been validated, they are settled on the settlement members' accounts with CLS Bank. Institutions that do not have a direct relationship with CLS Bank need to set up access via a member of the CLS system.

The CLS system services foreign exchange trades in spot instruments, forwards, option exercises and foreign exchange swaps in 17 currencies. In May 2009, CLS settled a daily average volume of 562,340 foreign exchange transactions, which represented a daily average value of USD 3.21 trillion.

A second major form of settlement is via traditional correspondent banking, which has a 32% share of the market. In this settlement mode, counterparties to a foreign exchange trade exchange the currencies they are transacting via correspondent banks. Since the transfers of the currencies occur independently, the counterparties are subject to principal and liquidity risk to the full value of the trade. The payments related to foreign exchange trades are made in part through the relevant payment systems (e.g. TARGET2 for euro-denominated legs, Fedwire for US dollar-denominated legs).

In addition to CLS and correspondent banking, a third major form of settlement is bilateral netting. This settlement method for foreign exchange transactions is used for approximately 8% of all foreign exchange obligations. It involves bilaterally netting foreign exchange obligations which are due on a certain date between two counterparties, and subsequently settling the net amount by another method (such as traditional correspondent banking). Netting

can be used to reduce the size and number of payments, limiting liquidity needs and operational risk during the settlement process. However, the netting agreements for the underlying settlement obligations are not legally robust, thereby leaving the foreign exchange counterparty with exposures on a gross basis.

## REPOS

In the case of bilateral repos, the counterparties themselves execute the opening and closing legs of a repo via the established settlement channels used by those counterparties, e.g. via direct access to the same CSD, direct access to two CSDs which are linked, indirect access via a CSD participant to the same CSD or linked CSD, or internal settlement in the accounts of a custodian.

During the lifetime of a repo, the counterparties monitor whether their position continues to be sufficiently collateralised. When additional securities need to be posted as collateral, the associated transfer is conducted bilaterally via the same avenues used for the initial repo.

In the case of direct triparty repos, the trade itself is executed directly between the counterparties, but the collateral management is conducted by third parties such as major global custodian banks or an international central securities depository (ICSD).

Voice-brokered trades can be settled similarly to the way bilateral or direct triparty repos are settled. Trades executed via an automated trading platform could be settled either bilaterally, via a third party (such as a global custodian or an ICSD), or via a CCP. In the case of trades cleared via RepoClear, operated by LCH.Clearnet Ltd, trades are subsequently settled in the relevant CSDs or in the ICSDs.

Finally, for trades executed in the GC pooling of Eurex Repo, the clearing takes place in Eurex Clearing AG. The settlement of collateral movements, which comprises the opening and closing of a repo, substitution of collateral, and

calls for additional collateral, is executed in Clearstream's collateral management systems (Xemac and the linked CMax) upon instructions from Eurex Clearing AG.

## 5 POLICY IMPLICATIONS

This report highlights the systemic relevance of the markets for OTC IRS, equity derivatives, CDS, foreign exchange derivatives and repos, owing in particular to their significant size and the central role of large financial institutions in the respective trading activities. Moreover, although in terms of notional amounts outstanding OTC derivatives markets have been declining since mid-2008, gross market values have grown during the same period, which implies that the payment flows at risk have actually increased. At the same time, the report shows that the euro-denominated segment of these markets is very substantial. Indeed, the euro is either the predominant or the second most important currency of denomination in all five markets. Moreover, a significant share of market participants is located in the euro area for most of these markets. At the same time, while some post-trading infrastructures for OTC derivatives are in place, their market coverage is by no means comprehensive. Much of OTC derivatives clearing and settlement is still done bilaterally and, despite the important role of the euro in OTC derivatives markets, euro area infrastructures are not available for several market segments.

These findings point to two main policy implications.

*First, further developing post-trading infrastructures to support the safe, efficient and transparent functioning of OTC derivatives markets is a key concern for the Eurosystem. Moreover, in line with the Eurosystem's location policy for payment, clearing and settlement systems for euro-denominated financial instruments, the Eurosystem is particularly interested in the availability and use of adequate post-trading infrastructures for the processing*

*of euro-denominated OTC derivatives within the euro area, as was confirmed by the decision of the Governing Council of 16 July 2009. The location of such key market infrastructures within the euro area enables the Eurosystem to directly fulfil its responsibilities with regard to financial stability, the smooth functioning of payment, clearing and settlement systems and the implementation of monetary policy. In particular, the Eurosystem is able to maintain full control over the euro, to carry out its oversight role effectively, and to facilitate access to its central banking operations. Access to central bank liquidity is essential for the functioning of a CCP in the event of one or multiple defaults of clearing members or wider market liquidity shortages. Reflections on the possible modalities and conditions for CCP access to central bank liquidity are currently under way at both the Eurosystem and international level.*

While some post-trading infrastructures for OTC derivatives are already available within the euro area, namely for equity derivatives and CDS, and have also been established for repo markets, there is clearly scope for further development. An immediate priority in this regard is the effective use of at least one euro area CCP for clearing CDS denominated in euro, which will be closely monitored by the Eurosystem in the coming months.

*Second, there is a need to accompany the development of post-trading infrastructures for OTC derivatives markets with close cross-border cooperation among the competent authorities.*

In the event of the emergence of multiple infrastructure solutions, close convergence of the applicable regulatory requirements must be ensured in order to safeguard a global level playing field and to pre-empt any scope for regulatory arbitrage. There is also a need for close coordination and information-sharing in the ongoing oversight of different infrastructures within the same market segment to ensure an effective overview of the industry as a whole, to avoid possible gaps or duplications in oversight,

and to promote convergence towards best practices. A specific priority in this regard at the present juncture is the need for a consistent regulatory framework for the different CCPs for CDS. The recommendations for securities settlement systems and central counterparties issued recently by the European System of Central Banks and the Committee of European Securities Regulators constitute a major milestone in this area. However, the harmonised EU approach needs to be complemented by effective global cooperation. Against this background, the recently launched work of the Committee on Payment and Settlement Systems (CPSS) and the International Organisation of Securities Commissions (IOSCO) to review the 2004 CPSS-IOSCO recommendations for central counterparties with specific regard to OTC derivatives is a pivotal strand of work looking ahead.

Where global infrastructures and service providers may emerge, the effective involvement of the competent authorities of all concerned jurisdictions and currencies in their ongoing oversight is crucial. For instance, in the case of the settlement activities of CLS for its payment-versus-payment foreign exchange business, the Eurosystem has granted an exemption from its location policy requirement, on the grounds that payment systems related to foreign exchange trades that are settled by multi-currency systems on a payment-versus-payment basis are, by definition, offshore with respect to one or several currency areas. At the same time, the Eurosystem has insisted on its close involvement in the oversight activities for CLS conducted by the central bank with primary oversight responsibility, the Federal Reserve System of the United States.

Similar cooperative arrangements could possibly be considered for trade data repositories for certain OTC derivatives products, such as DTCC's TIW for CDS. While data repositories are not comparable with clearing and settlement systems in terms of systemic risk implications, given that their risks are largely operational in nature, their safety, resilience and efficiency

is still significant from a financial stability perspective in view of the reliance of a large number of market participants, public authorities and market infrastructures on the availability and accuracy of the data stored in these entities.

## ANNEX

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