

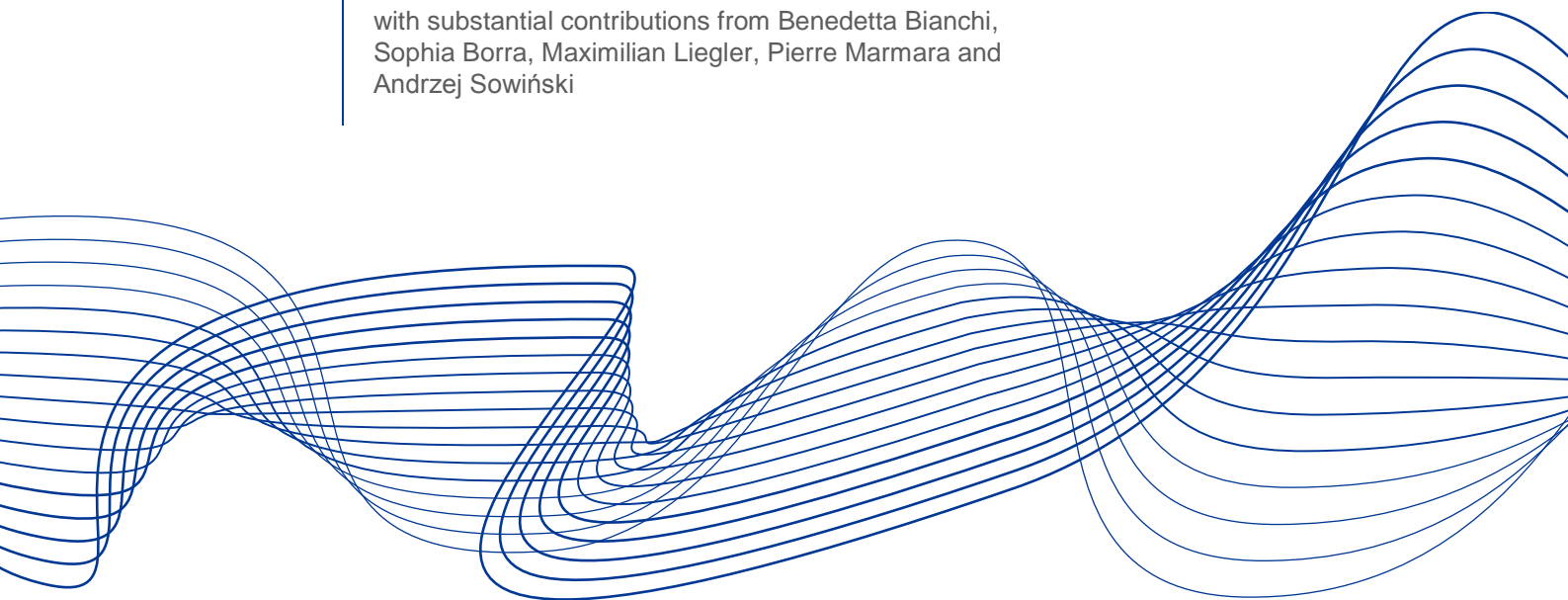
# Occasional Paper Series

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## Indicators for the monitoring of central counterparties in the EU

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# Contents

<b>1</b>	<b>Executive Summary</b>	<b>3</b>
<b>2</b>	<b>Introduction</b>	<b>4</b>
<b>3</b>	<b>Central clearing in the EU</b>	<b>6</b>
	Box 1 Central clearing obligation in the European Union	8
<b>4</b>	<b>Data and the ESRB's monitoring framework</b>	<b>11</b>
4.1	The ESRB's monitoring framework	11
4.2	The CPMI-IOSCO public quantitative disclosure framework	11
4.3	ESRB analysis of PQD data	12
<b>5</b>	<b>CCP indicators</b>	<b>14</b>
5.1	Prefunded default resources	14
	Box 2 Measuring the size of a CCP	18
5.2	Haircut and margining policies	21
5.3	Collateral practices	24
5.4	Liquidity policies	25
5.5	Market structure and concentration at CCP level	29
	Box 3 Market concentration	33
5.6	Winding-down ratio	36
5.7	Income structure	37
5.8	Client clearing	37
5.9	Interoperability arrangements	39
<b>6</b>	<b>Overview of data gaps</b>	<b>42</b>
<b>7</b>	<b>Conclusion</b>	<b>45</b>
<b>8</b>	<b>References</b>	<b>46</b>



<b>9</b>	<b>Annexes</b>	<b>48</b>
9.1	List of authorised CCPs	48
9.2	List of the indicators and the formulas used	48
<b>10</b>	<b>Abbreviations</b>	<b>54</b>
<b>11</b>	<b>Imprint and acknowledgements</b>	<b>55</b>



# 1 Executive Summary

This ESRB Occasional Paper complements the publication of indicators on central counterparties (CCPs) in the ESRB's Risk Dashboard as part of its monitoring framework. It provides a methodological background to the development of the individual measures and discusses different aspects that should be considered when designing a monitoring framework for CCPs. The paper also highlights a number of areas in which more granular data are required in order, for example, to monitor the interconnectedness of CCPs within the broader financial system.

CCPs play a key role in financial markets, as they reduce counterparty credit risk. This role is now heightened following post-crisis reforms of the over-the-counter (OTC) derivatives markets. Since CCPs may be viewed as systemically important institutions, it is crucial to ensure that they are regulated and monitored effectively. The ESRB has, therefore, sought to strengthen the framework used to analyse developments at CCPs in the EU from a macroprudential perspective.

Each monitoring framework relies on the availability of suitable data. It is therefore positive that CCPs publish data on a quarterly basis under the CPMI-IOSCO public quantitative disclosure framework. These data provide a rich source of information covering several aspects of CCPs' functioning and are the basis of the indicators the ESRB has developed to analyse developments in central clearing in the EU.

The indicators are designed to provide a macroprudential view over time of CCPs' resources, liquidity and collateral policies, margin and haircut requirements, interoperability arrangements as well as market structure and concentration at CCP level. The indicators cover all CCPs that are authorised within the EU, although the values of individual measures across CCPs should be analysed and interpreted with caution, bearing in mind that there are significant differences between individual CCPs' business models, membership structures and products cleared.

The indicators included in the ESRB Risk Dashboard are presented in this Occasional Paper, along with further additional indicators developed by the ESRB.

**JEL codes:** G10, G18, G23, G28

**Keywords:** central counterparties, systemic risk, PQD data, monitoring



## 2 Introduction

Central counterparties (CCPs) are a key component of the financial system and perform an important function in that they intermediate exposures between market participants and guarantee that the financial obligations of counterparties are met. CCPs manage post-trade risks in financial markets and reduce counterparty credit risk. Following the introduction of the central clearing obligation for certain standardised and liquid over-the-counter (OTC) derivatives in major jurisdictions and with market participants increasingly preferring to collateralise their transactions, CCPs have become key nodes in the financial system. Central clearing is likely to increase over the next few years, driven by the gradual introduction of margin requirements for non-centrally cleared transactions (European Commission, 2016c) and by mandatory central clearing coming into force for further categories of counterparties in the EU (see Box 1), or potentially being extended to other classes of OTC derivatives.

Given the specific, central role CCPs play in the financial system it is important to ensure that these financial market infrastructures are adequately regulated and monitored, and that they are financially sound. CCPs are receiving greater attention from regulators in the EU as a response to the increased role played by CCPs in the effective functioning of the derivatives and other financial markets. While the proposed amendments to the European Market Infrastructure Regulation (EMIR)<sup>1</sup> are expected to set further requirements regarding the risk management and supervision of CCPs, the legislative proposal of a recovery and resolution regime for CCPs<sup>2</sup> seeks to ensure that the distress, or even failure, of a CCP can be properly managed without any impairment of financial stability.

In order to account for the importance of CCPs for the EU financial system, the ESRB has developed a framework to monitor trends in central clearing in the EU from a macroprudential perspective. The indicators developed by the ESRB are included in the ESRB Risk Dashboard and are published on a quarterly basis. They also feed into internal monitoring processes, as well as the development of macroprudential policy and its implementation.

To avoid imposing additional disclosure requirements on CCPs, the indicators were designed based on the information already available to the ESRB, i.e. mainly data published by CCPs under the CPMI-IOSCO public quantitative disclosure framework (PQD). These data provide a rich source of information on CCPs' functioning, and the ESRB's analysis has benefited from an increasing number of studies using the PQD dataset (e.g. Armakolla and Bianchi, 2017; and Murphy, 2017). The ESRB's indicators provide a macroprudential view over time of CCPs' resources, liquidity and collateral policies, margin and haircut requirements, interoperability arrangements, as well as market structure and concentration at CCP level.

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<sup>1</sup> See, in particular, European Commission, Proposal of June 2017 (COM/2017/0331) and of May 2017 (COM/2017/0208).

<sup>2</sup> See, European Commission, Proposal for a Regulation of the European Parliament and of the Council on a framework for the recovery and resolution of central counterparties and amending Regulations (EU) No 1095/2010, (EU) No 648/2012, and (EU) 2015/2365, COM/2016/856 final - 2016/0365 (COD).



This Occasional Paper complements the publication of the CCP indicators in the ESRB Risk Dashboard by providing further methodological and analytical details of the development of individual measures, with the aim of initiating a discussion of CCPs' monitoring framework. For this purpose, additional indicators supplement those included in the ESRB Risk Dashboard, in order to show a broader range of information on CCP functioning. Furthermore, the paper provides an overview of the central clearing landscape in the EU and discusses the various aspects which should be considered when the measures are designed. The paper points to different possible interpretations in respect of the meaning of some PQD data fields and raises issues in relation to the harmonisation and validation of the dataset used.

The structure of the paper is as follows: Section 3 offers an overview of the central clearing landscape in the EU. Section 4 presents the data used in the construction of the ESRB CCP indicators while Section 5 discusses the rationale for the indicators and their drawbacks. Section 6 describes a number of data issues identified during the analytical process, as well as some potential solutions. Section 7 concludes the paper.



### 3 Central clearing in the EU

There are currently 16 authorised CCPs headquartered in 11 EU Member States (see Table 4 in Annex 9.1 for details). Due to market and regulatory fragmentation in the past, CCPs have traditionally been organised in terms of national or regional borders, adapting to the needs of the local markets. At the same time, CCPs have always been linked to foreign financial systems, given their clearing members and the trading venues they provide clearing services for. There are currently nine EU countries with a single CCP (Austria, France, Greece, Hungary, Italy, Poland, Portugal, Spain and Sweden). Germany and the Netherlands each have two CCPs while the United Kingdom has three. Over half of the EU countries (mostly the smaller countries, namely Belgium, Bulgaria, Croatia<sup>3</sup>, Cyprus, Denmark, Finland, Ireland, Luxemburg, Malta, Romania, Slovenia, Slovakia and the Baltic countries) do not have their own CCP and use CCPs located in other EU countries instead (for example the Irish Stock Exchange uses Eurex Clearing – a German CCP).<sup>4</sup>

Several CCPs predominantly serve their domestic financial institutions, which may be reflected in a high number of domestic clearing members. Moreover, CCPs and their participants (including clearing members and clients)<sup>5</sup> are strongly interconnected and several clearing members, particularly the largest, participate in a number of CCPs. This is also described in FSB, CPMI, IOSCO, BCBS (2017) which finds that CCPs and their clearing members are highly interconnected. This is especially the case for the largest clearing members, which are usually members of several CCPs. As Fiedor et al. (2017) point out for the EU interest rate derivatives market, the geography of risk changes significantly if not only clearing members but also their clients are taken into consideration.

As for CCPs in other parts of the world, the majority of European CCPs are vertically integrated with stock exchanges as majority stakeholders. CCPs are also often linked to other financial market infrastructures via group structures, and the entities within a group are engaged in offering a range of services in the trading, clearing and settlement of transactions in financial instruments. Two CCPs in the EU (KDPW\_CCP and Keler CCP) are indirectly governed by the public sector (the national state treasury and/or central bank are the owners of central securities depositories which are, in turn, the owners of the CCPs) and two CCPs (CCP.A and EuroCCP) are partly owned by one or more local banks. All four CCPs also have exchanges in their ownership structures.

There is significant diversity in terms of the products CCPs are authorised to clear. While most CCPs may clear derivative transactions, substantial differences exist in terms of the number of asset classes they are authorised for (see Box 1 for detailed information on the derivatives subject to the clearing obligation). There are several specialised CCPs that deal only with single asset

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<sup>3</sup> The Croatian CCP SKDD-CCP Smart Clear D.D. submitted an application for authorisation to provide clearing services in accordance with the EMIR regulatory framework.

<sup>4</sup> There are also clearing houses in some countries (for example in Poland) which are not considered to be CCPs in accordance with EMIR provisions.

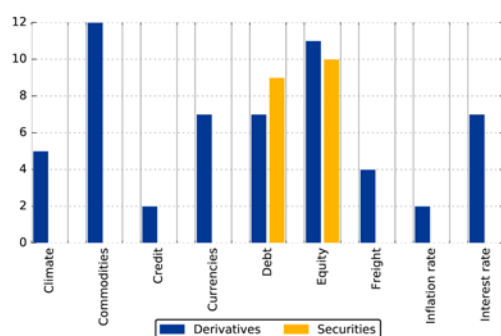
<sup>5</sup> The term "CCP participants" will henceforth be used to refer to both the clearing members of CCPs as well as their clients who are not direct members of the CCPs.



classes, such as commodity derivatives (LMEC, OMIClear), equity securities (EuroCCP), equity derivatives (ICE NL) or a limited number of financial instruments such as securities (CCP.A) or niche instruments such as energy derivatives (ECC), while the remaining CCPs are authorised for a broad list of different financial instruments. Most EU CCPs provide clearing services for a growing number of instruments, with seven CCPs having been granted extensions to their authorisation since 2015.<sup>6</sup> CCPs are also expanding the range of services they offer, e.g. collateral management, trade reporting or portfolio compression services for OTC derivatives.

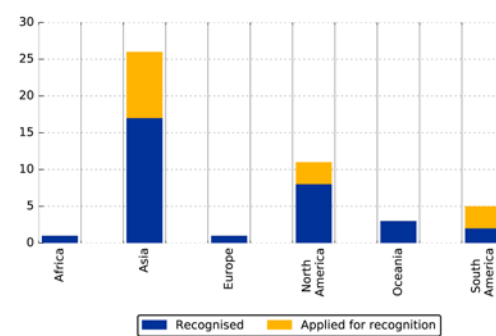
From an asset class perspective, there are usually several CCPs which provide clearing services for a given type of financial instrument (see Chart 1). Inflation rate and credit derivatives are exceptions, and may currently only be cleared by one of two EU-based CCPs.

**Chart 1**  
**CCP authorisation (by asset classes)**



Sources: ESMA (2017c), authors' compilation.  
Notes: Both OTC and exchange traded markets are considered. Other financial instruments that are not MiFID financial instruments are not included.

**Chart 2**  
**Number of third-country CCPs (by geographic regions)**



Sources: ESMA (2017c) and ESMA (2017d), authors' compilation.

In terms of clearing volumes, central clearing appears to be quite concentrated for several asset classes, including those with a large number of authorised CCPs. For example, as outlined by the National Bank of Belgium (2017), most of the centrally cleared interest rate swaps (IRS) in the EU are cleared by a single CCP, while the clearing of credit default swaps (CDS) is concentrated within two CCPs. The central clearing of repo trades is shared equally by three EU-based CCPs.

In addition to the authorised CCPs, the central clearing landscape in the EU is complemented by 32 third-country CCPs, which have been recognised as providers of clearing services and activities in the EU in accordance with EMIR (ESMA 2017c). They further increase the heterogeneity of the clearing services in the EU in terms of products cleared, their governance structures and their business models. The recognition of third-country CCPs is based on EMIR equivalence, where the legal and supervisory framework of a third (non-EU) country is assessed by the European

<sup>6</sup> See ESMA (2017b). It should be noted, however, that two of those extended authorisations have been renounced and withdrawn.





Commission as being comparable with the requirements of EMIR and its delegated acts, particularly with regard to the overall outcome of both sets of rules. Based on such a decision, the European Securities and Markets Authority (ESMA) may recognise a third-country CCP for the purposes of providing clearing services in the EU. The number of recognised third-country CCPs has increased gradually from 11 in 2015 to 32 in 2017, while several CCPs are still awaiting ESMA recognition. In terms of geographical reach, CCPs from all over the world have applied for recognition in the EU, with most CCPs located in Asia and Northern America (see Chart 2). Third-country CCPs are not considered in this paper although they may be included in the monitoring framework of the ESRB in the future.

The CCP landscape in the EU is expected to evolve in the coming years. The recent regulatory initiatives in Europe, in particular the introduction of EMIR and its upcoming revision, as well as the proposal for the recovery and resolution framework for EU-based CCPs, are aimed at achieving a higher level of harmonisation in post-trade practices and standardising post-trade services. Further developments, such as the potential extension of the clearing obligation to other asset classes, the potential entry of additional providers of central clearing services (for example third-country CCPs) or the regulatory implications of Brexit could also contribute to a changing environment in the post-trade industry. These new developments should be monitored from a macroprudential point of view using the proposed indicators.

#### Box 1

#### Central clearing obligation in the European Union

In response to the financial crisis, the G20 leaders mandated reform of the global OTC derivatives markets. It was agreed, in September 2009, to trade all standardised OTC derivative contracts on exchanges or electronic platforms and to clear them through CCPs.

In the EU, the obligation to centrally clear certain classes of OTC derivative contracts through CCPs was introduced with EMIR. The classes subject to the clearing obligation are identified by ESMA and are approved by the European Commission based on various criteria including the degree of standardisation, the volume and liquidity, the availability of reliable information in the market for a specific contract (defined, inter alia, by its currency of denomination and maturity) as well as the significance of a given class of derivative from a system risk perspective (e.g. taking market concentration into account). The central clearing obligation in the EU currently covers certain classes of OTC interest rate derivatives (IRD) denominated in selected currencies and index CDS (see Table 1).

Of the 16 authorised EU-domiciled CCPs and the 32 recognised CCPs in non-EU jurisdictions, seven authorised and four recognised CCPs are active in OTC derivatives markets with a clearing obligation (see Table 1). Some CCPs provide partial coverage only and do not clear all maturities, currencies or notional types of classes with a clearing obligation. However, the number of CCPs clearing asset classes subject to a clearing obligation may increase.



Table 1

**Derivatives' central clearing obligation (by type of instrument)**

		Authorised European CCPs							Authorised European CCPs			
		BMEC (ES)	EurexC (DE)	ICEU (UK)	KDPW_ CCP (PL)	LCH SA(FR)	LCH Ltd (UK)	NOMX (SE)	CME (US)	ICC (US)	JSCC (JP)	OTC HK (HK)
IRD	Basis Swap Classes	€	€ £ ¥ \$		€		€ £ ¥ \$		€ £ ¥ \$		€ ¥ \$	€ \$
	Fixed-to- Float Interest Rate Swap Classes	€	€ £ ¥ \$		€ PLN		€ £ ¥ \$ NOK PLN SEK	€ NOK SEK	€ £ ¥ \$ NOK PLN SEK		€ ¥ \$	€ \$
	Forward Rate Agreement Classes	€	€ £ \$		€ PLN		€ £ \$ NOK PLN SEK	€ NOK SEK	€ £ \$			
	Overnight Index Swap Classes	€	€ £ \$		€		€ £ \$	€	€ £ \$			
CDS	European Untranch ed Index CDS Classes			€		€			€	€		

Sources: ESMA (2017a) and author's compilation. Abbreviation for authorised CCPs as in ESMA (2017a) and for recognised CCPs as in ESMA (2017c). The name EurexC is used, as suggested by the German authorities.

Notes: Some CCPs provide partial coverage and, therefore, do not clear all maturities, currencies or notional types of the mandatory classes.

The central clearing obligation in the EU covers a wide range of counterparties and applies to EU entities that are counterparties to an OTC derivative transaction.<sup>7</sup> Both financial and non-financial counterparties are included. However, members of the latter group are subject to the obligation only if their positions in OTC derivatives contracts exceed certain clearing thresholds, while contracts for hedging purposes are exempted from the obligation. Pension funds are, currently, temporarily exempted from the central clearing obligation in the EU. Permanent exemptions have been introduced in other jurisdictions, e.g. for entities which only enter into derivatives transactions on an

<sup>7</sup> Under certain circumstances, the obligation could also apply to non-EU counterparties.



occasional and/or non-significant basis. The EU intends to introduce similar permanent exemptions (i.e. for small financial counterparties) in the EMIR review provisions<sup>8</sup>.

The clearing obligation in the EU was introduced gradually for different types of counterparties, which were grouped into four categories based on the type of business and the volumes cleared. Categories 1-3 cover financial counterparties<sup>9</sup> while category 4 covers non-financial counterparties. The first central clearing obligation for IRD denominated in USD, EUR, GBP and JPY came into effect on 21 June 2016, although the last counterparty category will only be obliged to clear centrally in mid-2019 (see Table 2). Other jurisdictions, such as the USA, had tighter deadlines for applying the clearing obligation to different counterparty groups (ESRB 2016b).

Currently, the clearing rate for new IRS is 62% in the EU (compared to 87% in the US) and for OTC credit derivatives it is 37% in the EU (compared with 80% in the US for index CDS; FSB, 2017). However, the clearing rates in the EU and US may not be entirely comparable since the clearing obligation in the US came into effect before it did in the EU and does not cover the same entity base.

Table 2

**Compliance deadlines for the central clearing obligation in the EU**

	G4 IRD transactions	CDS transactions	Non-G4 IRD transactions
Category 1	June 2016	February 2017	February 2017
Category 2	December 2016	August 2017	August 2017
Category 3	June 2019	June 2019	June 2019
Category 4	December 2018	May 2019	August 2019

Sources: Commission Delegated Regulations (EU) 2015/2205, (EU) 2016/592, (EU) 2016/1178 and (EU) 2017/751.

Notes: G4 IRD transactions refer to interest rate OTC derivatives in EUR, USD, JPY and GBP, CDS transactions to credit OTC derivatives denominated in EUR and non-G4 IRD transactions to interest rate OTC derivatives in PLN, NOK and SEK.

<sup>8</sup> Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) No 648/2012 with regard to the clearing obligation, the suspension of the clearing obligation, the reporting requirements, the risk-mitigation techniques for OTC derivatives contracts not cleared by a central counterparty, the registration and supervision of trade repositories and the requirements for trade repositories, May 2017.

<sup>9</sup> Category 1 refers to clearing members of an authorised or recognised CCP in respect of relevant OTC derivatives at the moment the clearing obligation is introduced. Category 2 and Category 3 refer to financial counterparties which are not clearing members at that moment, and which also differ in terms of volumes cleared.



## 4 Data and the ESRB's monitoring framework

### 4.1 The ESRB's monitoring framework

In its monitoring activities, the ESRB takes a broad perspective of the EU financial system, covering both banks and non-bank financial institutions such as insurance undertakings, asset managers, shadow banking entities and financial market infrastructures. This is also reflected in the ESRB Risk Dashboard which represents a part of the ESRB monitoring framework and includes quantitative and qualitative indicators of systemic risk in the EU financial system. It considers measures of interlinkages and composite measures of systemic risk, macro risk, credit risk, funding and liquidity, market risk, profitability and solvency, structural risk as well as measures of the functioning of CCPs.

Selected indicators for monitoring CCPs are included in a dedicated section of the ESRB Risk Dashboard. Unlike other sectors covered, the measures for CCPs are presented at entity level rather than country, EU or euro area level. This is due to the specific nature of the data which are publicly reported by individual CCPs at CCP level under the PQD framework, and also due to the variety of business models employed by EU CCPs, which prevents a meaningful aggregation of the data. In addition, the time lag for reporting is longer than it is for other sectors since the data are reported for a specific quarter with a lag of three months.

### 4.2 The CPMI-IOSCO public quantitative disclosure framework

The CCP indicators included in the ESRB Risk Dashboard are based on the data published by CCPs under the PQD framework developed by CPMI-IOSCO (CPMI-IOSCO, 2015). These data represent a unique and valuable source of information with regard to the functioning and risk management framework of CCPs and improve the transparency of their activities. Due to the efforts of CPMI-IOSCO and the reporting CCPs, more information on these financial market infrastructures is now available to public authorities, market participants, researchers and other interested parties (OFR, 2017).

The PQD data have been used and analysed in an increasing number of studies. In particular, OFR (2017) examines the data and shows how they can be used to analyse the default waterfalls, resources, counterparty's concentration and stress measures for CCPs. In addition, Murphy, Holden and Houllier (2016) have used the disclosure data to discuss the systemic risk of the collateralised derivatives market and collateral eligibility criteria. Murphy (2017) gives an overview of financial resources disclosures for four main clearing services using the new data available. Armakolla and Bianchi (2017) provide a description of the centrally cleared markets in the EU, based on the PQD data.

CCPs started publishing the data according to the PQD framework as of January 2016, covering 2015 Q3. The data are released on the websites of individual CCPs each quarter with a three



month lag. Although the reporting is voluntary, all CCPs are expected to publish the data according to CPMI-IOSCO (2015) – in practice, most CCPs authorised in the EU publish these data, albeit only gradually. In the future, it might also be a possibility to cover third-country CCPs in the ESRB Risk Dashboard, given the strong interlinkages of counterparties in the global financial markets and the cross-country characteristics of CCP operations.

The PQD framework represents the minimum disclosures expected from CCPs in accordance with the CPSS-IOSCO<sup>10</sup> Principles for Financial Market Infrastructures (PFMI; CPSS-IOSCO, 2012). The disclosure standards for CCPs establish a set of data on transaction volumes and values and a common minimum set of quantitative data on the financial condition, financial resources, collateral and operational risk of a CCP. This focuses on the data that most CCPs collect and maintain as part of day-to-day business and risk management. Supervisory authorities and clearing members continue to receive more detailed confidential information from CCPs.

The need for publicly available information regarding the risk management and functioning of CCPs is based on Principle 23 of the PFMI. The PQD data aim at enabling all stakeholders (including public authorities, CCP participants and the general public) to reach a clear understanding and assessment of the risks associated with a CCP, a CCP's systemic importance and its impact on systemic risk in all jurisdictions in which it provides services, and the risk of participating in CCPs (CPMI-IOSCO, 2015).

The structure of the PQD data mirrors the PFMI and the variables are grouped according to the principles of the PFMI: credit risk (Principle 4), collateral (Principle 5), margin (Principle 6), liquidity risk (Principle 7), exchange of value settlement systems (Principle 12), default rules and procedures (Principle 13), segregation and portability (Principle 14), general business risk (Principle 15), custody and investment risk (Principle 16), operational risk (Principle 17), access and participation requirements (Principle 18), tiered participation arrangements (Principle 19), FMI links (Principle 20) and disclosure of rules, key procedures and market data (Principle 23). There are no quantitative disclosure requirements relating to PFMI Principles 1-3, 8-11, 21, 22 and 24, which explains the gaps in the numbering of variables within the PQD.

### 4.3 ESRB analysis of PQD data

The Global Association of Central Counterparties (GACCP) has developed a common template for the publication of quantitative disclosures in order to ensure the consistency and standardisation of reporting. Most EU-based CCPs follow this spreadsheet-based template which facilitates the comparison and aggregation of data across CCPs.<sup>11</sup> One CCP in the EU (AthexC) does not publish these data at all while another CCP (ECC) reports data in a format which is not useable for the ESRB's analysis. As a consequence, the measures for the ESRB Risk Dashboard and all charts in this paper include all 16 authorised CCPs located in the EU, although the data are only presented

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<sup>10</sup> CPSS was later renamed CPMI.

<sup>11</sup> The template can be accessed following the [link](#).



for 14 CCPs. While the following analysis mainly includes PQD data, the ECB Central Counterparty Clearing Statistics are used to complement data in one case.

As also outlined in Armakolla and Bianchi (2017), the PQD data are provided at three different levels, i.e. the CCP level covering the whole CCP, the default fund level referring to products covered by a segregated default fund, and the clearing service level if there are different clearing services covered by one default fund. Depending on the structure of a CCP, the different reporting levels could be the same – e.g. if there is only one default fund covering all products cleared, the CCP level and the default fund level would be similar. For the ESRB indicators for CCPs, most variables have been aggregated at CCP level as due to the large diversity of their business models (e.g. in respect of the division of default funds and clearing services) more detailed measures would not be comparable.



## 5 CCP indicators

The ESRB CCP indicators are designed to monitor a range of CCP characteristics, including CCPs' resources, liquidity and collateral policies, margin and haircut requirements, interoperability arrangements, as well as market structure and concentration at CCP level. They provide a macroprudential perspective over time and deliver insights into the CCPs' functioning and the usage of CCPs by financial market participants. Differences between the indicators across CCPs may reflect differences in business models, the products that are cleared or risk management frameworks. As an example, a CCP clearing instruments with higher price volatility would also tend to demand higher initial margins. The indicators build on publicly available information (see Section 4). The availability of time series for these indicators will allow trends to be identified that affect central clearing in the EU and will contribute to the development of macroprudential policies in the context of other quantitative data and qualitative information regarding CCPs' activities and their associated risk.

The following sections provide background to the CCP indicators which are included in the ESRB Risk Dashboard and which are considered to show the main characteristics of CCPs. In addition, further indicators developed by the ESRB are presented for each category to provide a broader range of information on the central clearing landscape in the EU. Box 2 and Box 3 show potential indicators for the size of CCPs and market concentration which cannot currently be used for the monitoring of CCPs due to conceptual or reporting issues. All charts in Section 5 show data from Q3 2016 to Q3 2017. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data (see Section 4).

### 5.1 Prefunded default resources

The default management process is an integral part of CCP risk management and is, therefore, interesting from a macroprudential point of view. In the EU, EMIR (Article 45) defines the order in which prefunded financial resources should be used by a CCP (this is known as the CCP's default waterfall). Following the default of a clearing member, the CCP first uses the initial margin posted by the defaulting clearing member to cover losses. If this margin is exhausted, the CCP draws on the defaulting member's contribution to the default fund. To provide incentives for proper and sound risk management, the CCP's dedicated own funds, also referred to as "skin-in-the-game", represent the next layer of the default waterfall. Article 35 of EMIR RTS 153/2013 requires these funds to be equal to at least 25% of the CCP's capital requirement. This amount is ex ante allocated to individual default funds according to their size, if a CCP uses several default funds. If losses exceed the abovementioned resources, the CCP uses prefunded contributions to the default fund from the remaining clearing members, which marks the beginning of the mutualisation of losses. This mechanism is important from a systemic risk perspective, as in times of stress it can be a potential channel of contagion for market participants. Some CCPs have a single default fund, while others maintain separate default funds. Default funds are segregated in order to isolate members clearing a certain group of assets from the credit risk of members clearing a different group of assets. While segregation may ensure less risk of contagion, it may also lead to a smaller pool of loss absorbing funds for each service compared with that provided by one large single default fund. There is, therefore, a risk of quicker closure of services than for non-segregated default funds. If the

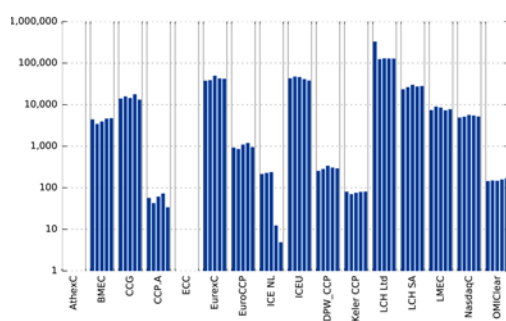


default fund is also insufficient, the CCP could call upon the surviving clearing members for additional resources, according to the EMIR provisions in Article 43 (3), up to a pre-determined limit, activate other recovery tools or even use the remaining part of its own capital.

The indicators presented in this section take the structure and composition of prefunded default resources available to a CCP into consideration, including components of the default waterfall, i.e. the initial margin of clearing members, default fund contributions and CCPs' own capital. Given the scope of the available PQD, data which are not consistent across CCPs' segregated default funds have been aggregated into a single structure for the ESRB Risk Dashboard indicator.

**Chart 3**  
**Size of prefunded default resources**

(quarter-end, in EUR millions, log scale)

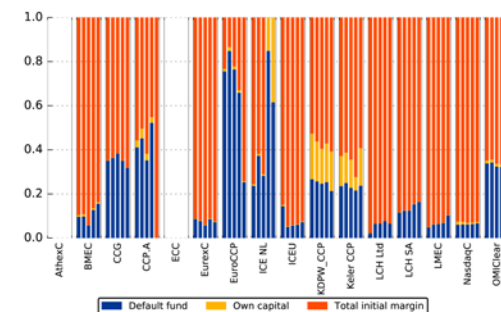


Sources: PQD 4.1.1, 4.1.2, 4.1.3, 4.1.4, 6.1.1; ESRB calculations.

Note: Data provided for segregated clearing services have been aggregated into a single structure. Each bar represents a quarter. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data.

**Chart 4**  
**Structure of prefunded default resources**

(quarter-end, ratio)



Sources: PQD 4.1.1, 4.1.2, 4.1.3, 4.1.4, 6.1.1; ESRB calculations.

Notes: ICE NL reports 6.1.1 as zeros in 2017 Q2. Data provided for segregated clearing services have been aggregated into a single structure. Each bar represents a quarter. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data.

The first measures consider the size and the structure of the prefunded financial resources available to a CCP to cover losses arising from the default of one or several clearing members. Chart 3 shows the amount of prefunded default resources for the different CCPs under consideration. To clarify the composition of the resources available at a CCP, Chart 4 breaks the prefunded default resources down into the default fund contributions of clearing members, the CCP's own capital and the total initial margin required from clearing members. The indicators offer insights into the prefunded financial resources of CCPs and their main components, which differ over time between CCPs. Since only aggregated data for total initial margin are available in the PQD data, the main drawback of the two indicators is that they do not properly describe the amount and structure of prefunded resources that would immediately be available to cover losses arising from the default of one (for example the largest) clearing member before the CCP's own dedicated resources or the contributions to the default fund of the surviving clearing members were used. Instead of the initial margin posted by the defaulting clearing member, these indicators take into account the total initial margin required from *all* clearing members from *all* clearing services. According to the EMIR provisions (Article 45(4)), a CCP must not use the margins posted by non-defaulting clearing members to cover losses resulting from the default of another clearing member.





So, if a clearing member defaulted, the initial margin at the disposal of a CCP in the default waterfall (i.e. the initial margin posted by the defaulting clearing member) would typically constitute only a small share of the total initial margin used to calculate the above indicators. As a result, Chart 3 substantially overstates the amount of financial resources that would be available to cover the losses arising from the default of a particular clearing member. In addition, the indicator only takes the prefunded resources into account, while CCPs may have other tools available to cope with clearing member defaults, e.g. position allocation tools.

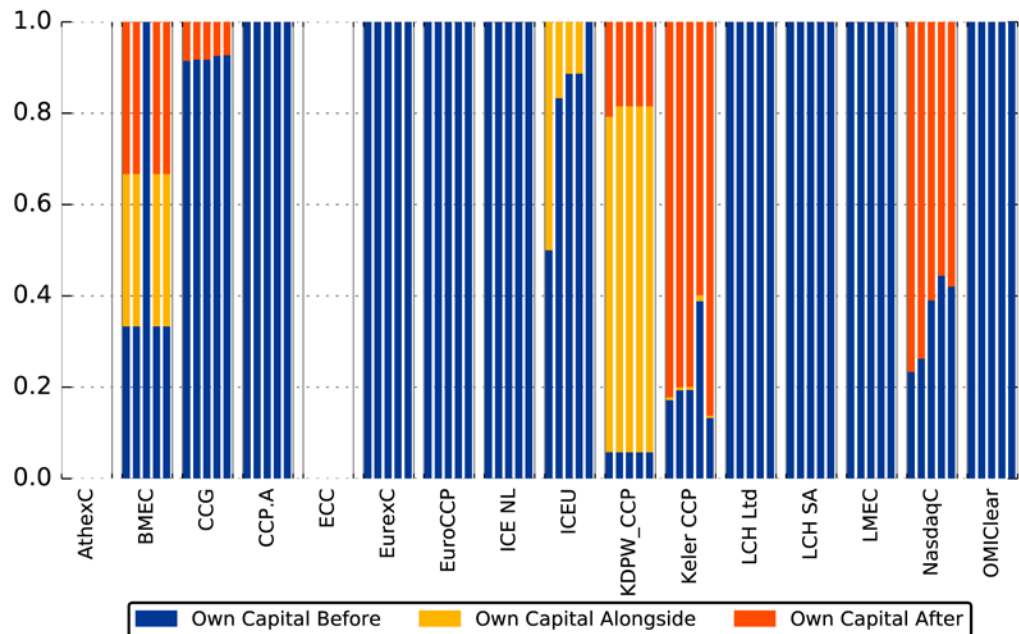
Looking at the components of the prefunded default resources in greater detail, Chart 5 provides a breakdown of CCPs' own capital into subparts which can be used before (blue bars), alongside (yellow bars) and after (red bars) non-defaulting clearing members' contributions. This breakdown therefore shows the individual categories of CCPs' own capital used at different stages of the default waterfall. Nonetheless, this structure does not constitute a standalone measure and should be analysed in conjunction with another indicator (e.g. Chart 6), preferably showing whether the amount of a CCP's own capital forming part of the default waterfall is aligned with the scale of the CCP's activity or the risk to which it could be exposed. According to the PQD framework, the term "own capital" refers to the part of a CCP's own funds which can be used to cover default related losses. Depending on national insolvency law, the part of own funds which is dedicated to cover non-default losses (e.g. resulting from the materialisation of operational or investment risk) may or may not be used in the default waterfall of individual CCPs. Therefore, it may not be included in the own capital shown in Chart 5. In addition, CCPs have further financial and non-financial tools, including assessment rights, gains haircutting, parental guarantees and position allocation tools, which are available to distribute or cover losses. Only some of these tools are included in the PQD.



Chart 5

### Structure of CCPs' own capital in the default waterfall

(quarter-end, ratio)



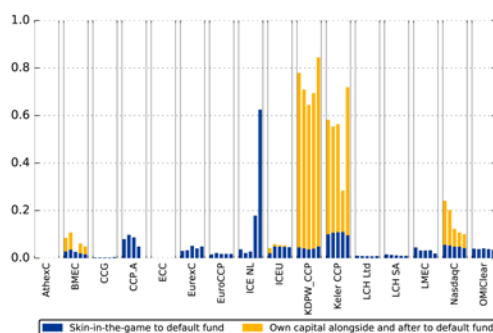
Sources: PQD 4.1.1, 4.1.2, 4.1.3; ESRB calculations.

Note: Data provided for segregated clearing services have been aggregated into a single structure. Each bar represents a quarter. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data.

Chart 6

### Ratio of own capital to default fund

(quarter-end, ratio)



Sources: PQD 4.1.1, 4.1.2, 4.1.3, 4.1.4; ESRB calculations.

Note: Data provided for segregated clearing services have been aggregated into a single structure. Each bar represents a quarter. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data.

Chart 6 (included in the ESRB Risk Dashboard) illustrates the ratio of own capital to the default fund contributions provided by the clearing members. The subparts of own capital (skin-in-the-game as well as own capital alongside and after) are marked in blue and yellow. The indicator includes the prefunded contributions of CCPs as the numerator and the prefunded contributions of clearing members to the mutualised default fund as the denominator. The measure sheds light not only on the relative size of skin-in-the-game, which indicates the key economic incentive for prudent risk management by a CCP, but also on the remainder of the CCP's own capital which forms part of the waterfall and therefore has the potential to reduce contagion effects in the event of the default of a clearing member. It could be argued that on the basis of the EMIR



provisions there is no direct relationship between the skin-in-the-game and the default funds, as the former is calculated in relation to the capital requirement (which is not directly linked to the amount of risk arising from the scale of a CCP's clearing activity) while the latter is calculated in relation to the risk underlying the transactions cleared by the CCP. The indicator shows high ratios in the case of low clearing activity, which could be misleading. However, the absence of any relationship may not represent a great shortcoming of the indicator, as it is related to the way skin-in-the-game is calculated. As expressed in ESRB (2015), it may be considered preferable to align the amount of skin-in-the-game held by a CCP with the level of a CCP's clearing activity (e.g. by linking skin-in-the-game with the overall size of margins and default funds).

Some arguments may also be made in favour of including a CCP's parental guarantees in the proposed indicator. The decision not to blend prefunded with committed default resources in the indicator was based on their significantly different characteristics, especially in terms of liquidity risk. When interpreting the time evolution of the indicator, it should be borne in mind that changes in the default fund size may stem from CCPs' amendments to stress test scenarios, which may affect clearing members' contributions. A drop in the value of the indicator (which may be intuitively perceived as a reduction in economic incentives for prudent risk management or a lower loss absorbing capacity of the CCP) could in fact be the consequence of taking a more conservative approach to risk management, leading to an overall increase in initial margin and a subsequent reduction in the overall amount of the default fund contribution, since both variables operate in reciprocity.

## Box 2

### Measuring the size of a CCP

In the context of the discussion of systemic risks related to CCPs, e.g. with regard to the substitutability of CCPs for clearing members and the concentration of clearing services at specific CCPs, it may be useful to develop indicators of the size of CCPs. However, in practice there are difficulties relating to how to capture the size of a CCP. This box outlines the difficulties associated with constructing indicators of the size of CCPs using the PQD data. As a result of these issues, it has been decided that, for the time being, indicators measuring the size of CCPs will not be proposed for the ESRB Risk Dashboard.

In order to manage the counterparty credit risk in a financial transaction (as well as other types of risk, e.g. contingent market risk), a CCP collects margins and establishes a default fund (or several default funds) which constitute the critical components of its default waterfall (see Section 5.1). The natural candidates for measuring the size of a CCP are therefore as follows: the number of its clearing members (or, alternatively, all participants, including clearing members' clients), the value of transactions submitted to a CCP for clearing, and the value of the total prefunded financial resources (initial margins and default fund) a CCP has at its disposal.

There are several reasons why it is not sufficient to classify the size of a CCP by only one of the above mentioned indicators. For example, although considering the number of participants would appear to be the most straightforward way of measuring the size of any given CCP, this could lead to distorted conclusions since it does not take into account any clearing activity (volume or turnover) or the different underlying structures of the markets cleared (e.g. risks related to the various financial products in the clearing services and market concentration). These features

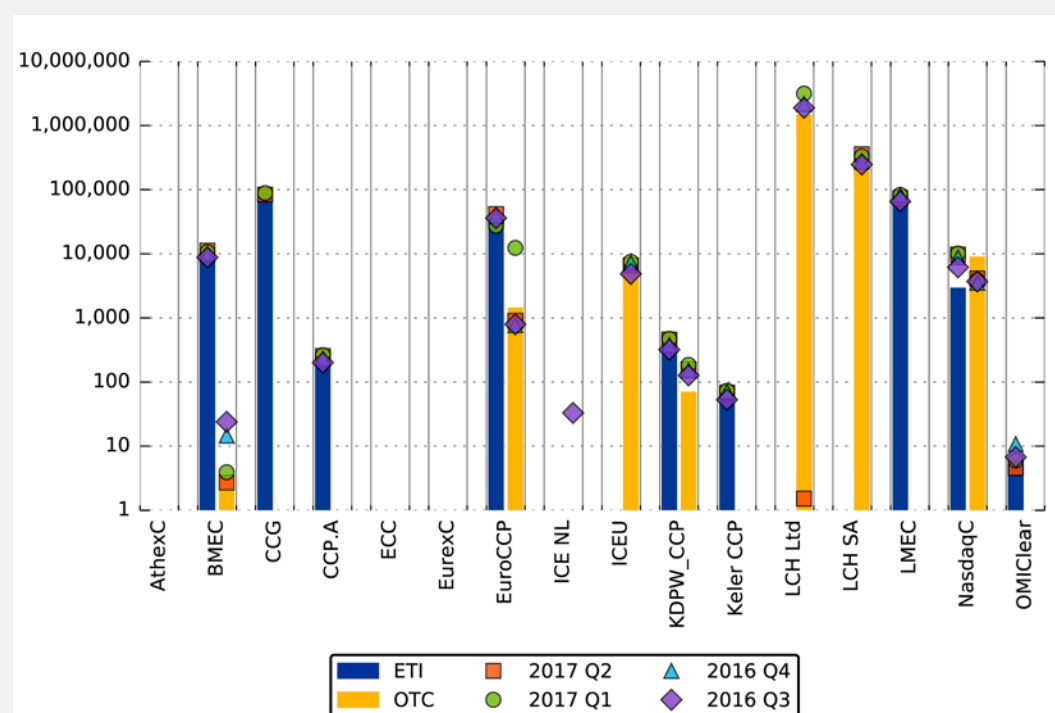


determine the clearing model adopted by each CCP, including the length and complexity of the clearing chain (e.g. the ratio of direct to indirect clearing members or the number of “layers” of indirect participants). As no comprehensive data are available for all CCPs in respect of indirect market participants, it is only possible, in practice, to compare figures for direct clearing members. These figures would not, however, account for differences in the membership requirements of individual CCPs. For example, some CCPs with more stringent membership requirements may be perceived as “smaller” than CCPs with less stringent requirements.

An additional way of assessing the size of a CCP would be to look at the value of transactions submitted to a CCP for clearing. As no information on their market value or open interest is provided under the PQD, the size indicator could only be based on notional values. Hence, following a static approach one could only make use of the gross notional outstanding value of novated but not-yet-settled transactions at a given point in time. A more dynamic approach could be to measure, for example, the daily average notional value of trades cleared over a given period. The charts below show two examples of this.

Chart 7  
Size (daily average notional value)

(in EUR millions, log scale)



Sources: PQD 23.1.2 (Total OTC and Total ETD), ESRB calculations.

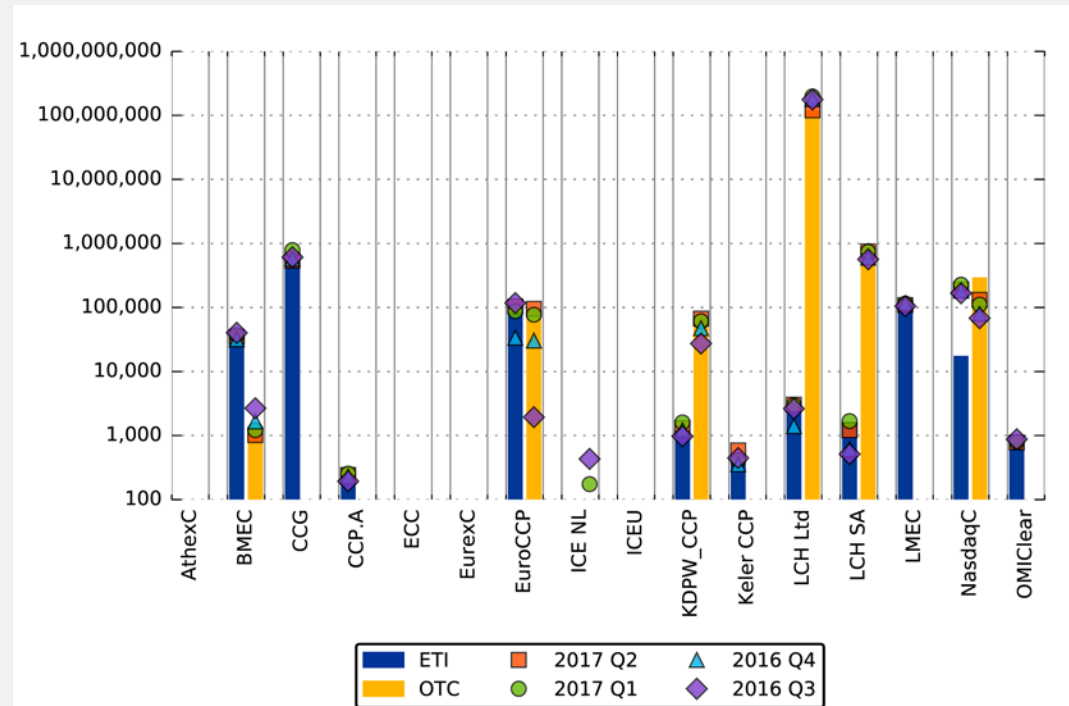
Note: The blue and yellow bars refer to 2017 Q3. No data are reported for EurexC (for any period) or ICE NL (except for 2016 Q3). Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data.



Chart 8

### Size (gross national outstanding)

(in EUR millions, log scale)



Sources: PQD 23.2.1 (Total OTC and Total ETD), ESRB calculations.

Note: The blue and yellow bars refer to 2017 Q3. No data are reported by EurexC and ICEU in any of the periods. ICE NL reports zeros for 2017 Q3 and Q2 as well as for 2016 Q4. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data.

However, only data for broad categories, i.e. exchange traded instruments and OTC instruments, are consistently reported across CCPs. Due to the great diversity of instruments EU CCPs are licensed to clear, the above figures are difficult to interpret and use to assess the respective size of CCPs. For example, interest rate derivatives are typically characterised by a very large notional value in comparison with actual payments and cash flows (and the underlying risk) resulting from these transactions. Equity or commodity derivative contracts, due to the greater price volatility of their underlying assets, are usually associated with payments representing higher percentages of their notional values. As a result, the values of indicators based on notional outstanding and on the value of trades for a CCP clearing interest rate swaps may be significantly higher than those for a CCP clearing mainly commodity forwards, even though this may not reflect the risks of the products cleared. In addition, the actual meaning of notional amount for derivative transactions, due to embedded leverage, is significantly different from the concept of notional value of cash securities and repo transactions. For the above-mentioned reasons neither an indicator based on notional outstanding nor an indicator based on the value of trades would be well-suited to measuring the size of a CCP.



A third potential approach to measuring the size of a CCP could be to examine the value of total prefunded financial resources. Although there are differences in the way initial margins and default fund contributions are calculated by individual CCPs, total prefunded financial resources are strictly related to the amount of risk generated by the transactions submitted for clearing and to the CCP's risk management procedures. Such indicators would therefore reflect the scale of a CCP's activity from the perspective of counterparty credit risk mitigation. However, the measure would also have some significant shortcomings in that, for example, instead of providing for a neutral comparison it depends on the risk calculation of each CCP and the resulting calibration of default fund contributions and margin provision. A further drawback would derive from the different nature of derivative contracts compared with cash securities and repo transactions. With regard to cash and short-term repo transactions, CCPs require substantially lower initial margins than is the case for derivatives. As a result, in terms of the amounts of total prefunded financial resources, the size of a CCP focusing on the clearing of cash or repo transactions would be severely underestimated compared with CCPs which predominantly clear derivative contracts.

## 5.2 Haircut and margining policies

CCPs have to manage the defaults of their clearing members in order to protect the surviving clearing members from the adverse impact of such defaults. However, while preventing stress from spreading into the financial system is the core financial stability function of CCPs, their actions could also have a significant effect on market participants. In the event of a clearing member defaulting, a CCP would be exposed to a market risk on the outstanding contracts of the defaulting member. This risk is mitigated by CCP risk management practices, i.e. by taking collateral (margin) from counterparties and imposing haircuts to account for the risk of the collateral's market value falling.<sup>12</sup> However, the measures adopted by a CCP in an extreme default situation – probably accompanied by market stress – could generate some risks for its clearing members. For example, the CCP could ask for further financial contributions to cover default related losses, which could, in turn, put the remaining clearing members under liquidity pressure.

As outlined in more detail in ESRB (2017a), margins are designed to protect a CCP against losses resulting from a clearing member's default, and cover two types of risk. The variation margin covers the market price movements of the cleared financial instruments (or the underlying asset in the case of derivatives). It is used for financial instruments with longer maturities (e.g. derivatives), and is collected by the CCP and exchanged between the two original counterparties via the CCP on a regular (mostly daily) basis. The initial margin, which is collected at the beginning of a transaction and sometimes adapted to changes in the market environment (e.g. an increase in volatility), is in place to cover the future exposures which could arise if the CCP is not able to fully liquidate or replace trading positions following the default of a clearing member. As described above, haircuts

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<sup>12</sup> A detailed description of CCPs' risk management practices is included in ESRB (2017a).

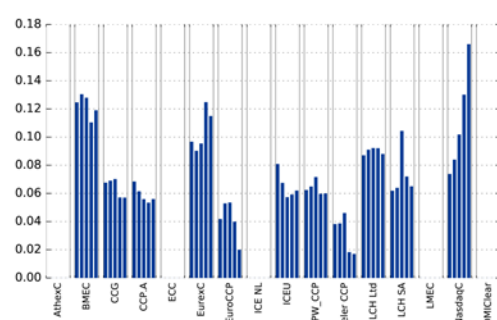


are in place to account for the risk of the market value of the collateral posted by clearing members falling and are, therefore, specific to the collateral posted. Thus, margin and haircut requirements fulfil the important function of managing the risk of the CCP and absorbing potential losses (ESRB, 2017a).

However, as further outlined in ESRB (2017a), the margin and haircut requirements of CCPs may have a significant impact on market participants' behaviour and must be considered from a systemic risk perspective. Since CCP models generally link the calculation of margin and haircut requirements to price volatility, they are inherently procyclical and can contribute to the build-up of excessive leverage in the financial system during upswings, while causing deleveraging processes during downswings. It is therefore important to monitor margin and haircut setting practices, including the impact on clearing members and clients, and to assess the impact of these practices on financial stability. The data available in the PQD on initial and variation margin and collateral haircuts are therefore used in this paper to generate some insights into this central part of the CCPs' risk management framework.

**Chart 9**  
**Haircut on non-cash initial margin**

(quarter-end, ratio)



Sources: PQD 6.2.15, 16.1.1; ESRB calculations

Note: Reported haircuts for ICE NL, LMEC and OMIClear are equal to zero. PQD 20.2.1 is added to PQD 6.2.15 for CC&G as data do not include initial margin resulting from interoperability arrangements in PQD 6.2.15. Data provided for segregated clearing services have been aggregated into a single structure. Each bar represents a quarter. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data.

Due to data issues in the PQD, only haircut levels in respect of non-cash collateral provided for initial margins are considered for the ESRB Risk Dashboard, while further data on initial and variation margins are presented in this paper. In addition, haircuts may also be applied by CCPs to cash collateral posted in currencies other than the currency of exposure. However, given the scope of PQD data, the indicator was narrowed to non-cash collateral.

With regard to the indicator, Chart 9 (included in the ESRB Risk Dashboard) shows the overall haircut rate applied to the non-cash collateral posted by clearing members for the provision of initial margin requirements. Cash collateral was not taken into account in the construction of the indicator. The indicator aims to provide insight into the procyclicality of haircut practices and values should therefore be compared over time rather than between CCPs. An increase in the

indicator between CCPs may imply a more prudent haircut policy (applying larger haircuts to individual securities posted as collateral), adjusting haircuts to a higher historical volatility of securities' prices or receiving more collateral of lower quality. A downward trend in the value of the indicator could imply that future market volatility is underestimated by CCPs, market participants have more scope to build up leverage or clearing members are posting more high quality collateral to CCPs. Given this complexity, changes in the value of the indicator should be analysed and conclusions should be drawn in conjunction with the structure of the collateral posted as initial margin (collateral held in initial margin, Chart 12), as well as in the context of securities' price volatility. In addition, the PQD only includes quarter-end data. Since the procyclicality of margin and

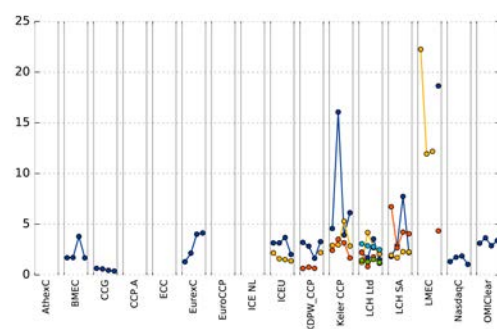


haircut requirements is likely to occur at a higher frequency this would not necessarily be visible in the data and in the values of the indicator.

Chart 10 shows the changes in variation margin and provides an indication of how distant clearing members' liquidity needs due to variation margin calls can be from the mean. It looks at the ratio of the difference between the maximum total variation margin paid to the CCP on any given business day over the period analysed and the average total variation margin paid to the CCP by participants on each business day, relative to this average. The higher the values of the indicator, the more liquidity clearing members have had to provide to CCPs to cover mark-to-market losses. The indicator is calculated at CCP level or for individual business segments, if applicable. However, it should be borne in mind that the indicator may be strongly influenced by changes in the value of transactions cleared in a given CCP and in the size of a clearing member's net position at portfolio level.

**Chart 10**  
**Changes in variation margin**

(in a quarter, ratio)

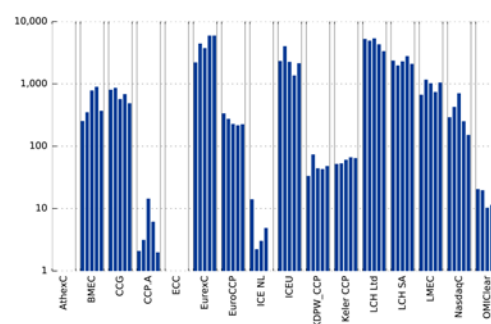


Sources: PQD 6.6.1, 6.7.1; ESRB calculations.

Note: No data reported by CCP.A and for EuroCCP in any of the periods. ICE NL reports only zeros from 2016 Q3 onwards. For ICEU, KDPW\_CCP, Keler, LCH Ltd and LCH SA, data are provided at clearing service level. Each dot represents a quarter. Colours are used to show changes for individual clearing services. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data.

**Chart 11**  
**Maximum initial margin call**

(in a quarter, in EUR millions, log scale)



Sources: PQD 6.8.1; ESRB calculations.

Note: Data provided for segregated clearing services have been aggregated into a single structure. Each bar represents a quarter. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data.

Chart 11 shows the maximum aggregate initial margin call. This can provide an indication of clearing members' increased liquidity needs arising from financial markets events contributing to significant price volatility and/or increased trading activity. However, high values of the indicator could result from the scale of activity and the net position of clearing members of individual CCPs as well as from the CCP's portfolio-margining policy. For this reason values of the indicator should be compared over time rather than between CCPs, given that it is not fully comparable between CCPs.



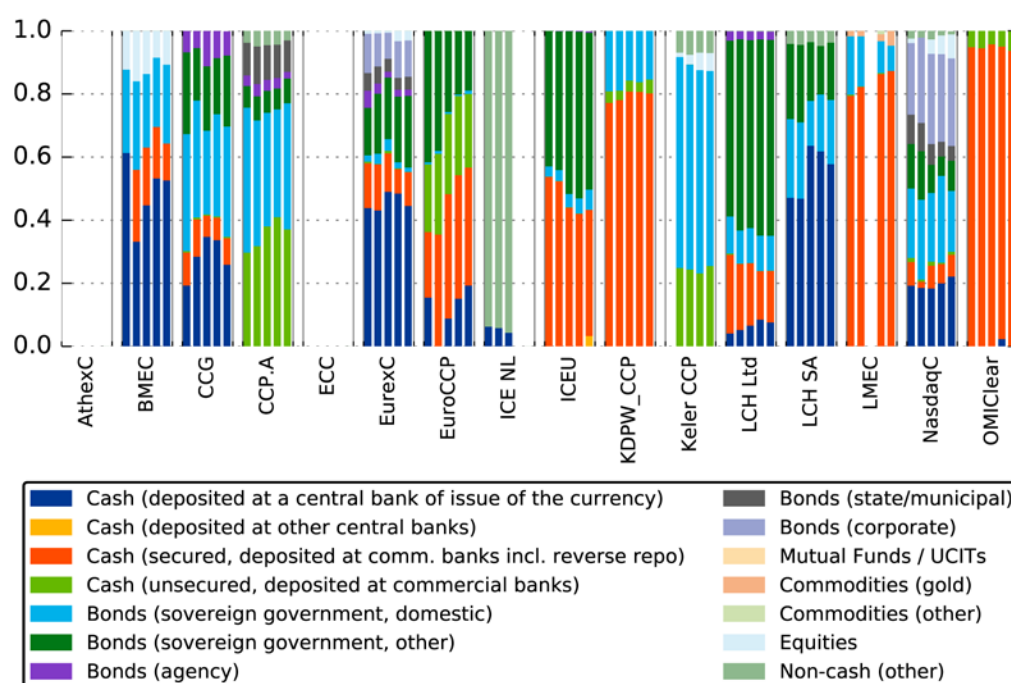


## 5.3 Collateral practices

Collateral posted by clearing members as an initial margin is a key element of the CCPs' risk management framework. According to Article 46 of EMIR, initial margins may be provided in the form of cash or highly liquid securities with minimum credit and market risk, such as government bonds or shares listed on major stock indices. The different components of initial margin held by the CCPs are broken down in Chart 12 and highlight differences in collateral practices at EU CCPs. As described above, this collateral may be subject to a haircut (discount) applied by a CCP.

**Chart 12**  
**Initial margin held**

(quarter-end, ratio)



Sources: PQD 6.2.1. - 6.2.14; ESRB calculations.

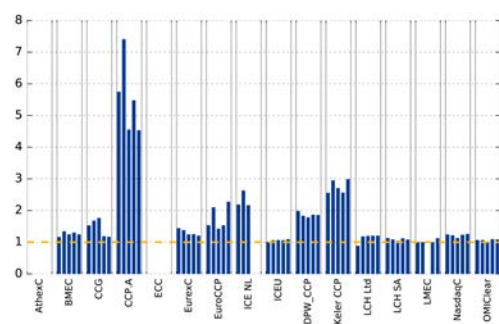
Note: ICE NL reports only zeros for 2017 Q2 and Q3. No data are reported by Keler for 2016 Q3 or by LMEC for 2017 Q1. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data. Data provided for segregated clearing services have been aggregated into a single structure. Each bar represents a quarter.

Article 41 of EMIR lays down minimum rules for the calculation of initial margins collected by CCPs, although CCPs are allowed to use more stringent criteria and may require higher margins from their clearing members. Also, the values of initial margins are influenced by changes to the risk parameters of models used by CCPs (e.g. time horizons for the liquidation period and confidence intervals). As a result, the level of collateral required may vary significantly between CCPs. In addition, clearing members may often, on a voluntarily basis, hold a buffer of excess collateral in order to reduce operational complexity.



**Chart 13**  
**Collateralisation**

(quarter-end, ratio)



Sources: PQD 6.1.1, 6.2.15, 20.2.1 (for CC&G); ESRB calculations.

Note: No data are available for LMEC in 2017 Q1 for PQD 6.2.15 and there are no data for PQD 6.1.1 and 6.2.15 for ICE NL in 2017 Q2 and Q3. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data. PQD 20.2.1 is added to PQD 6.2.15 for CC&G from 2016 Q3 onwards as data do not include the initial margin resulting from interoperability arrangements in PQD 6.2.15. Data provided for segregated clearing services have been aggregated into a single structure. Each bar represents a quarter.

(denominator) at CCP level. Under the PQD, only aggregated numbers are provided, and the indicator therefore presents the theoretical capacity of all members together, and not the real capacity of individual members, to smoothly respond to higher margin requirements in a short period of time. Moreover, when this indicator is interpreted for individual CCPs it should be borne in mind that overcollateralisation could arise from different sources, depending on the structure of client accounts offered by a given CCP, and may not be equally distributed among its clearing members. For example, it may be that mainly the smaller clearing members are overcollateralised (in order to avoid having to react to changes in collateral requirements on an hourly basis) or that the additional collateral originates from the excess margin posted by clearing members' clients which has been passed on to the CCP under the EMIR rules relating to individually segregated accounts.

Chart 13, which is included in the ESRB Risk Dashboard, sheds light on the aggregated degree of collateralisation by clearing members at CCP level. A value above 1 (marked by a dotted yellow line) indicates overcollateralisation, while a value below 1 would indicate undercollateralisation. As previously mentioned, a clearing member is permitted to transfer more collateral in the form of initial margin than that required by a CCP, to cover changes in both the trading positions (which result in higher total margin requirements) and the margin and haircut parameters calibrated and used by CCPs. This reduces the operational complexity of clearing members posting additional collateral in a short time frame, e.g. in response to a margin call. Clearing members may, however, quickly withdraw this overcapacity in times of stress.

The indicator is built by taking into account both total initial margin post-haircut held (the numerator)<sup>13</sup> and total initial margin required

## 5.4 Liquidity policies

CCPs are exposed to liquidity risk arising from their need to meet their payment obligations towards their members as they fall due. This could be the case in day-to-day business when a clearing

<sup>13</sup> For CCPs which do not include the value of initial margin or equivalent financial resources provided to linked CCPs (PQD 20.2.1) in total initial margin held (PQD 6.2.15) the formula was adjusted by adding PQD 20.2.1 to the numerator.

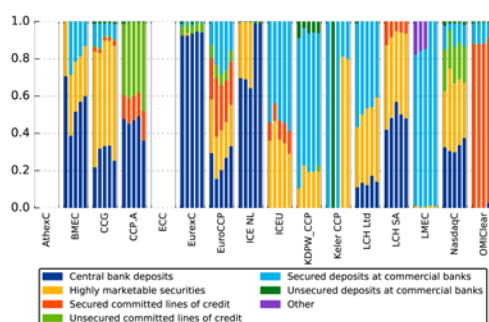


member closes out its positions and wants to receive its initial margin back, when a clearing member delays its payment of variation margin and the CCP needs to cover this payment for the clearing member representing the other leg of the original contract, or in a crisis situation following the default of a clearing member which may require the liquidation of the collateral it has posted to cover its initial margin (e.g. the liquidation of non-cash collateral) and default fund contribution. CCPs rely on their holdings of liquid assets which have been posted as initial margins and contributions to default funds by clearing members, as well as on the timely collection of payments from clearing members in order to make timely payments to other clearing members. For example, variation margin payments between clearing members are made on a daily basis in response to changes in the market value of the respective positions, with the CCP acting as an intermediary.

CCPs are required to hold a sufficient amount of their funding resources as qualifying liquid resources (QLR) that should be available in the event of a default. QLR include, inter alia, cash deposited at central banks and authorised credit institutions, committed credit lines, repurchase agreements, and highly marketable financial instruments. Chart 14 illustrates the structure of QLR broken down into its components which differ in terms of how quickly and how smoothly the resources can be accessed, particularly under stressed conditions. While all types of QLR comply with EMIR requirements, they may imply certain trade-offs and display varying degrees of risk sensitivity. For example, CCPs relying to a higher degree on secured deposits in commercial banks or committed lines of credit (as opposed to central bank deposits which not all CCPs have access to) may be exposed to higher risk, particularly if liquidity providers are, at the same time, clearing members of the CCP.

**Chart 14**  
**Structure of qualifying liquid resources**

(quarter-end, ratio)

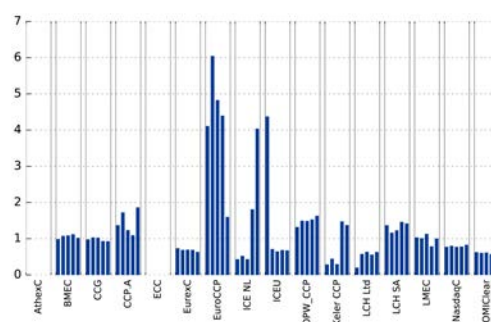


Sources: PQD 7.1.2. - 7.1.9; ESRB calculations.

Note: Each bar represents a quarter. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data.

**Chart 15**  
**Ratio of qualifying liquid resources to prefunded default resources**

(quarter-end, ratio)



Sources: PQD 4.1.1 - 4.1.4, 6.1.1, 7.1.2.- 7.1.9; ESRB calculations.

Note: Each bar represents a quarter. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data.

The indicator illustrated in Chart 15 shows the ratio of QLR to prefunded default resources (including initial margin posted by all clearing members). Prefunded financial resources are sized based on credit risk stress tests and are intended to cover losses incurred by the CCP in certain default scenarios coupled with market shocks. Liquid (funding) sources are sized based on liquidity



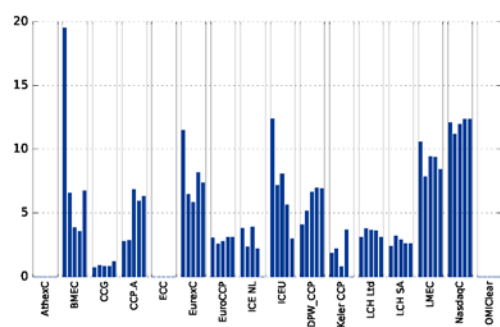
risk stress tests and are intended to cover payment obligations arising under certain default scenarios coupled with market stress. The indicator compares the liquid assets with prefunded resources. Values above or equal to 1 mean that the CCP would have enough liquidity to immediately repay all of its prefunded resources which is, contrary to the ratio in Chart 16, not a requirement under EMIR. However, some drawbacks of the indicator should be taken into consideration. First, one component of the indicator is overall initial margin while only the initial margin of the defaulting clearing member would be used. Second, variation margin flows are just part of the payment obligations the CCP would need to meet in a default scenario. Third, the indicator does not reflect the further liquidity needs of CCPs, including the exchange of cash collateral into non-cash.

Chart 16 (included in the ESRB Risk Dashboard) shows the ratio of QLR to the estimated largest same-day payment obligation. The latter may arise from the default of a single clearing member and its affiliates (including transactions cleared for their clients) under extreme but plausible market conditions. In compliance with EMIR, CCPs are obliged to hold enough QLR to cover the liquidity risk generated by the default of at least the two clearing members to which CCPs have the largest exposures. The ratio in Chart 16 could be perceived as a forward-looking measure of liquidity risk. The higher the values of this indicator, the more (intraday) liquidity a CCP will have if severe market conditions cause the default of the clearing member generating the largest liquidity-related losses. A downward trend for the value of the indicator may have different causes – it could be a signal to take a closer look at the CCP's investment policy, e.g. to identify if there is a need to increase the share of liquid assets.



Chart 16  
Ratio of qualifying liquid resources to  
estimated largest same-day payment  
obligation

(in a quarter, ratio)

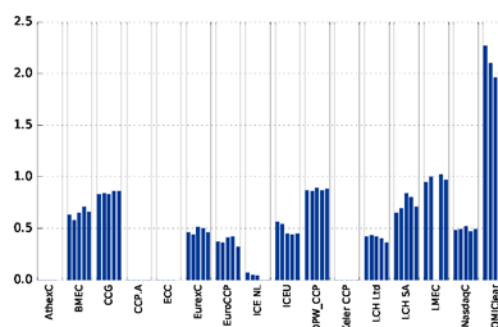


Sources: PQD 7.1.2. - 7.1.9, 7.3.1; ESRB calculations.

Note: No data are available for OmiClear for PQD 7.3.1. Data for Keler CCP in 2017 Q3 could not be included at this point. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data. Each bar represents a quarter. Average values have been taken for PQD 7.1.2-7.1.9 in order to align stocks with flows.

Chart 17  
Cash ratio

(quarter-end, ratio)



Sources: PQD 6.2.15, 16.1.1; ESRB calculations.

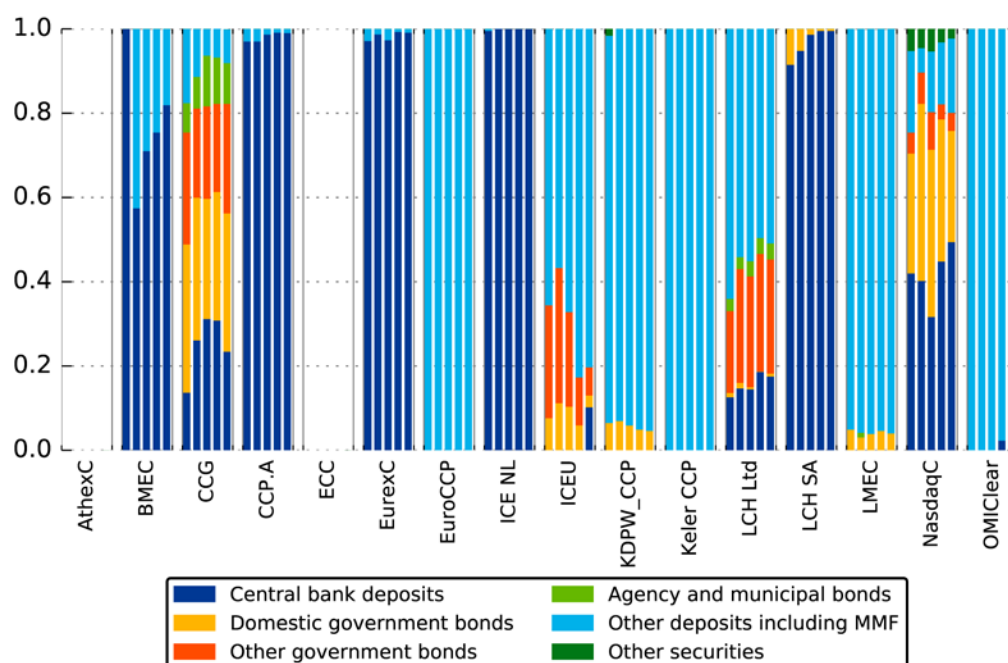
Note: Keler reports zero values for PQD 16.1.1 in each quarter and no data are available for ICE NL on 6.2.15 in 2017 Q2 and Q3 and for LMEC in 2017 Q1. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data. Each bar represents a quarter. PQD 20.2.1 is added to PQD 6.2.15 for CC&G from 2016 Q3 onwards since data do not include the initial margin resulting from interoperability arrangements in PQD 6.2.15. OmiClear includes excess collateral in 16.1.1 which results in a value of greater than 1.

EMIR requires CCPs to maintain sufficient liquid resources that are commensurate with their liquidity requirements. The second measure included in the ESRB Risk Dashboard on liquidity risk (Chart 17) shows the amount of initial margin that a CCP has received in cash and, therefore, indicates how liquid the biggest part of the prefunded resources of a CCP, i.e. the initial margin, is. However, this cash received could also be invested and may, therefore, actually be held in a less liquid form. This measure should therefore be read in conjunction with Chart 18 in order to assess how the cash collateral is actually held by the CCP. Since cash is only one component of the total initial margin the ratio in Chart 17 should not be higher than 1. As may be observed in the chart, there are issues in the reporting of the PQD data given that values higher than 1 are present. This could point to inconsistencies in the reporting of CCPs.



Chart 18  
Cash reinvestment policies

(quarter-end, ratio)



Sources: PQD 16.2.2 - 16.2.7, 16.2.10 - 16.2.14; ESRB calculations.

Note: Each bar represents a quarter. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data.

Chart 18 shows the investment strategies applied by a CCP to its clearing members' cash collateral. It shows the percentage of cash that is reinvested into different classes of instruments. In line with EMIR requirements, a CCP may either deposit the cash received at a central bank or other financial institution, or reinvest it in highly liquid securities of minimal credit and market risk, including domestic or foreign government bonds. As for the QLR (Chart 14), choices made between reinvestment policies could imply trade-offs and could entail varying degrees of risk-sensitivity.

## 5.5 Market structure and concentration at CCP level

The growing role of CCPs reduces the complexity of the web of otherwise bilaterally cleared exposures in comparison with the financial landscape before the financial crisis. However, the exposures are more concentrated within the CCPs themselves and the CCPs are highly



interconnected with market participants due to their clearing memberships.<sup>14</sup> Given this interconnectedness and the concentration of the clearing activity within them, CCPs are viewed as systemically important financial market infrastructures. They are crucial to the smooth, efficient and stable execution of financial transactions, although they could also impair the stability of the financial system if not properly managed and resourced. It is, therefore, important to monitor the concentration of clearing members' exposures at a CCP. In addition to providing insights into various aspects of the CCPs' risk management framework, the indicator in Chart 19 also allows for an analysis of the market structure and concentration within CCPs at the level of default fund, initial margin and client clearing.

The indicator in Chart 19 (included in the ESRB Risk Dashboard) illustrates concentration measures for different CCPs based on the contributions of the five largest clearing members with regard to initial margin, default fund contributions and client clearing. Unfortunately, the PQD only provides data on concentration at clearing service level but does not include the percentage of initial margin and default fund posted by the five largest clearing members at CCP level. Therefore, it does not show the overall concentration in terms of the contributions of the largest clearing members at the CCP since these might differ across clearing services. Hence, the indicator is constructed at individual clearing service level and then aggregated to compute an estimate of concentration in initial margin, default fund and client clearing.

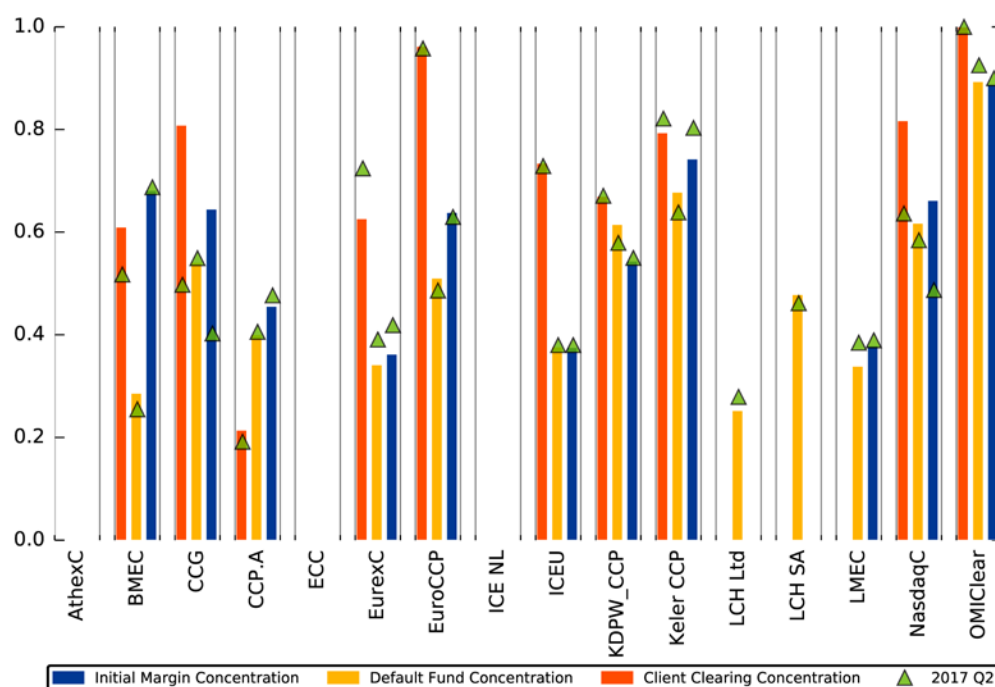
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<sup>14</sup> Furthermore, CCPs are interconnected with each other directly due to interoperability arrangements and indirectly due to the common and overlapping membership of large clearing members.



Chart 19

## Concentration at CCP level



Sources: PQD 4.1.5, 6.2.15, 18.3.1, 18.3.2, 18.4.1, 18.4.2, 19.1.3.2, 19.1.4.2., ESRB calculations

Note: All bars refer to 2017 Q3. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data. No data are available for LCH Ltd and LCH SA on initial margin and client clearing concentration in both quarters. No data are available for LMEC for PQD 6.2. PQD 18.3 and 18.4 show quarter averages and therefore averages are taken for PQD 6.2.15 and PQD 4.1.5 to match stocks with flows. The ratios are calculated based on data for the five largest clearing members.

Initial margin and the default fund contributions are important within a CCPs' loss absorption mechanism as they aim to protect a CCP against losses deriving from its clearing member. They also give an idea of the CCP's exposures to its clearing members. The concentration measure for initial margin in Chart 19 (blue bars) shows an estimate of the five largest clearing members' average contributions to total initial margin posted at clearing service level, thereby giving an indication of the distribution of initial margin. A figure of 0.4 (40%) would therefore mean that the five largest clearing members contribute, on average, to 40% of the initial margin held at a CCP. An increase in concentration indicates an increase in the exposures of a CCP to the largest clearing members compared with the exposures to the residual clearing members which, in turn, could mean that losses will have to be covered from default waterfall resources if a clearing member defaults. It therefore provides a useful measure of systemic risk considerations.

The second measure included in this indicator shows an estimate of the five largest clearing member's average contributions to the default fund at clearing service level (yellow bars), and therefore provides an indication of the distribution of default fund contributions. The default fund plays a key role in the CCPs' risk pooling and sharing mechanism and an increase in the concentration measure indicates that the risk at a CCP is more concentrated within these five members.





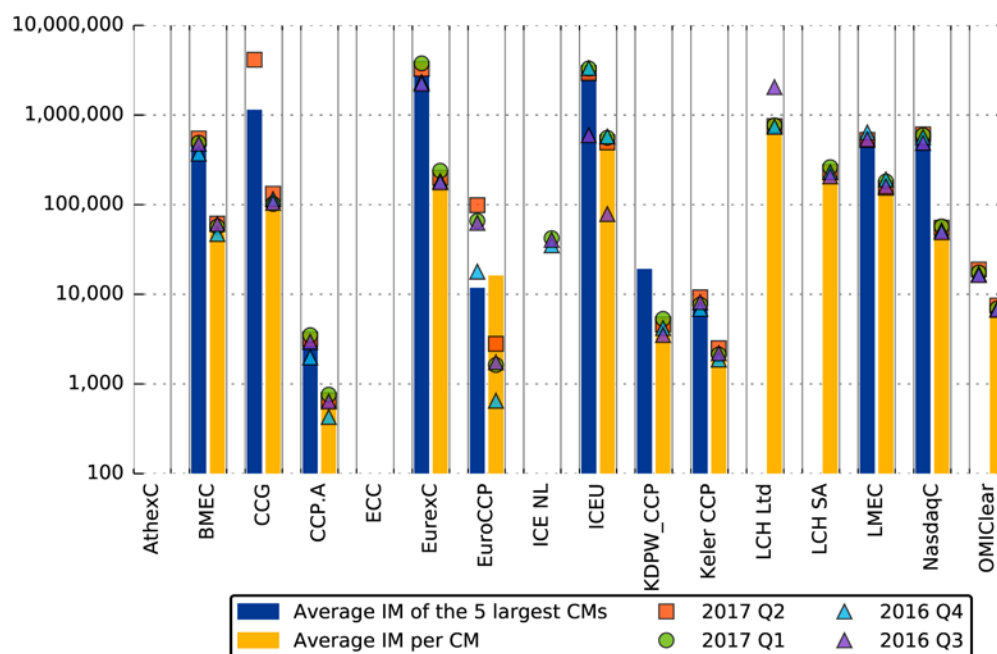
The final concentration measure (red bars) provides an estimate of the five largest clearing members' average contribution to client clearing transactions at clearing service level at a CCP. If client clearing activities are concentrated in a small number of clearing members, the default of one large clearing member could have major implications for its respective clients and could transmit distress to a wider range of financial institutions. Client clearing could also have an impact on the CCP if it is required to close out the positions of the clients of a defaulting clearing member if no other clearing member is willing or able to take over those clients.

In addition to the indicator showing the three different concentration measures included in the ESRB Risk Dashboard, three other indicators are shown in the chart below.

Chart 20

### Average size of the initial margin of the five largest clearing members

(in EUR millions, log scale)



Sources: PQD 6.1.1, 6.2.15, 18.3.1, 18.3.2; ECB Central Counterparty Clearing Statistics; ESRB calculations

Note: Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data. No data on IM were reported by ICE NL in 2017 Q2 and Q3. No ECB CCCS data were reported for BMEC, CME CE, ICE NL and OMIClear. The average initial margin of one of the five largest clearing members cannot be calculated for KDPW\_CCP, LCH Ltd and LCH SA, due to the different split for the variables used. For BMEC, EurexC, ICEU, Keler, LMEC, and NasdaqC, data at clearing level have been aggregated to CCP level under the assumption that the same clearing members are the five largest clearing members across the clearing services. For ICE NL, data on the number of clearing members (PQD 18.1.1.2) were used as a denominator. Each bar represents a quarter. IM stands for initial margin and CM for clearing members.

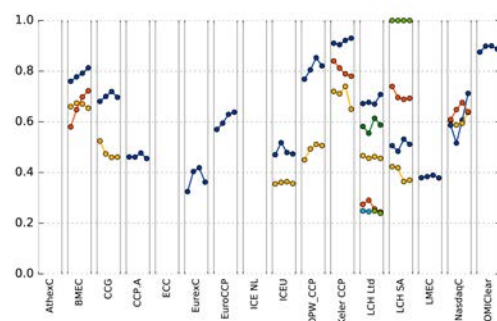
The yellow bars in Chart 20 show the average initial margin required from each clearing member. Since the initial margin depends on the notional amount of a transaction, taking this into account as this indicator does could help to clarify the average exposure per clearing member. Once again, higher exposures of CCPs to clearing members could mean that higher losses will have to be covered from default waterfall resources if a clearing member defaults. However, this indicator does



not take into account the fact that exposures, and therefore initial margins, may not be distributed equally. For example, a high amount of initial margin might be concentrated in some large clearing members. In addition, the PQD data only include the number of clearing members broken down by clearing service but not at the level of the entire CCP. Since there might be an overlap of clearing members for the different clearing services, it is not possible to compute an aggregate number of clearing members. For this reason, data are used from the ECB Central Counterparty Clearing Statistics on clearing members per CCP, the disadvantage being that these data are only available annually while the PQD is reported on a quarterly basis. In addition, the blue bars show the average initial margin posted by the five largest clearing members. Since this is only provided at clearing service level, it is assumed that the five largest clearing members are the same clearing members across all clearing services in order to construct the measure and aggregate it over all clearing services.

The following two indicators shed more light on the concentration of clearing members' exposures at clearing service level. Chart 21 illustrates the concentration of initial margin posted by the five largest clearing members per clearing service. This gives an indication of the distribution of the initial margin and shows the clearing services in which the concentration of initial margin is the highest. Similarly, Chart 22 shows the distribution of the default fund contributions of the five largest clearing members by clearing service.

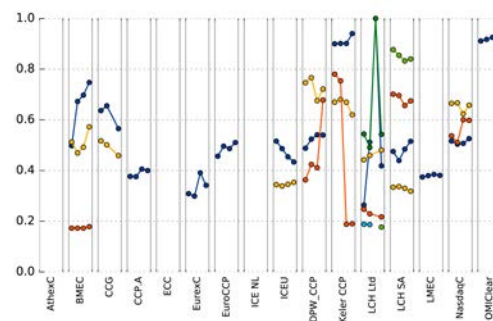
**Chart 21**  
**Initial margin concentration of the five largest clearing members**



Sources: PQD 18.3.1, 18.3.2; ESRB calculations.

Note: Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data. Data are at clearing service level, when provided. Each dot represents a quarter. No data are available for ICE NL, although since it has fewer than five clearing members, concentration equals 1. Colours are used to show changes for individual clearing services.

**Chart 22**  
**Segregated default fund concentration of the five largest clearing members**



Sources: PQD 18.4.1, 18.4.2; ESRB calculations.

Note: Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data. Data are at segregated default fund level, when provided. Each bar represents a quarter. No data are available for ICE NL, although since it has fewer than five clearing members, concentration equals 1. Colours are used to show changes for individual default funds.

### Box 3 Market concentration

As described in Section 3, the clearing of the various asset classes seems to be concentrated at a number of CCPs and not equally distributed among the CCPs that offer clearing services in the EU. The benefits deriving from a higher degree of market concentration through multilateral netting



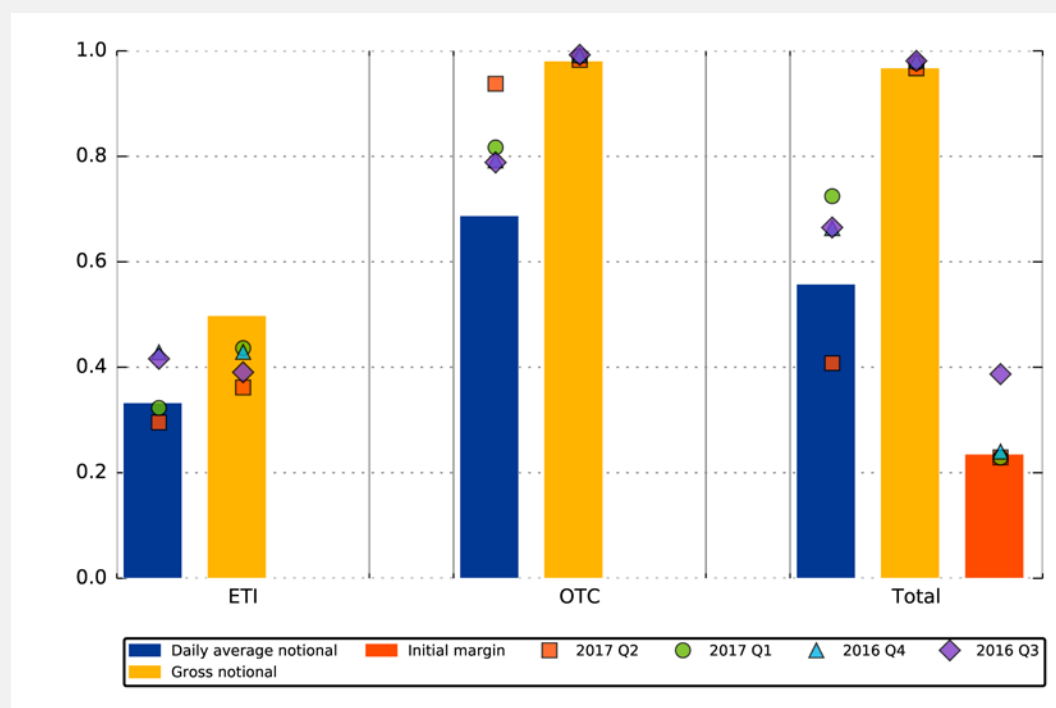
must therefore be weighed against increased single point of failure risk, so market concentration is important from a financial stability point of view. A potential indicator for market concentration based on the PQD data is presented below. Unfortunately, due to reporting issues this indicator does not currently provide an adequate picture of market concentration and has therefore not been considered for inclusion in the ESRB Risk Dashboard.

The indicator illustrated in Chart 23 shows the overall degree of market concentration based on the Herfindahl-Hirschmann index (HHI), thereby providing a picture of the level of fragmentation versus concentration in the system. This index is a statistical measure defined as the sum of the squared market shares (s) of the k CCPs competing in the market:

$$HHI = \sum_{i=1}^k s_i^2$$

One feature of the index is that by summing the squared market shares it assigns additional weight to firms of a larger size, thereby taking the relative size distribution of firms into account. Therefore, the HHI corresponds to the theoretical notion in economics in that an increase in the HHI indicates an increase in concentration of output by a small number of firms and therefore a greater likelihood that competition will be weak. A decrease in HHI, on the other hand, indicates a decrease in concentration. This feature makes the index a more useful indicator of respective clearing activity than the size indicators presented in Box 2.

Chart 23  
Market concentration (HHI)



Sources: PQD 23.1.2, 6.1.1, 23.2.1; ESRB calculations.

Note: All bars refer to 2017 Q3. No data were reported by AthexC and ECC on any of the inputs for the concentration index and no data were reported by EurexC on the daily average notional value and the gross notional outstanding value. An index value above 0.25 indicates high concentration.



The indicator for total market concentration uses HHIs based on daily average notional, gross notional outstanding and initial margin (see Chart 23). An increase in the HHI based on notional values could be a sign of cleared transactions aggregating around a smaller number of CCPs. Initial margin aims to protect the CCP against losses in the event of a counterparty defaulting and is a proxy for the level of risk exposure. Therefore, the HHI based on initial margin can help to provide an understanding of market concentration based on the exposures of the clearing members at a CCP.

Concentration measures based on daily average notional and gross notional are presented for two broad categories of assets, i.e. separately for OTC and exchange traded instruments (ETI). Given that the data are aggregated into two broad categories – which are not further specified in the PQD – the indicator cannot be understood as providing comprehensive evidence of the netting benefits achieved by CCPs with regard to single point of failure risk. This would only be possible if individual asset classes were taken into consideration. For example, a CCP specialising in a specific asset class could be a source of single point of failure risk despite its small size, if no other CCP provides similar services. Although the framework foresees that CCPs should provide details of asset classes, product types and product codes for volumes reported under PQD 23.1.2 and PQD 23.2.1, this is not done in a consistent way across CCPs, which limits further comparative analysis. An additional issue is that there is large diversity in terms of the products that CCPs are licenced to clear (see Section 3), which limits the value of an indicator aggregating these various numbers. Moreover, in addition to the authorised CCPs in the EU, the picture needs to be complemented by 32 third-country CCPs, which have been recognised for the purpose of offering services and activities in the EU, in line with EMIR.

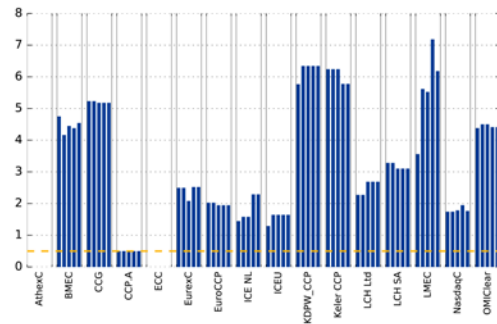
Unfortunately, since the fields needed to construct this indicator are not reported by all CCPs in the EU (including major EU CCPs) Chart 23 does not give a realistic picture of market concentration in the EU. This indicator will, therefore, only be a useful proxy for market concentration once data reporting has improved, and is not included in the ESRB Risk Dashboard due to these data quality issues.



## 5.6 Winding-down ratio

Chart 24  
Winding-down ratio

(annual, ratio)



Sources: PQD 15.1.1, 15.1.2; ESRB calculations.

Note: Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data. Each bar represents a quarter.

This indicator (included in the ESRB Risk Dashboard) describes the amount of liquid net assets funded by equity an individual CCP has on its balance sheet in comparison with its annual current operating expenses. PFMI Principle 15 stipulates that a CCP should base its capital needs for an orderly wind-down on the length of time needed to wind down the business (CPSS-IOSCO, 2012). This period should not be less than six months. The requirement is reflected in Article 2(2) of the EMIR RTS on capital requirements for central counterparties<sup>15</sup>, according to which “the estimated time span shall be sufficient to ensure, including in stressed market conditions, an orderly winding down or restructuring of its activities, reorganising its operations, liquidating

its clearing portfolio or transferring its clearing activities to another CCP”, and “the time span for winding down or restructuring its activities used for the calculation of the capital requirement is subject to a minimum number of six months”. In order to comply with these requirements, the value must be at least 0.5 (corresponding to half a year) which is indicated by the horizontal dashed yellow line in Chart 24. For example, a value of 2 indicates liquid net assets funded by equity covering two years of current operating expenses.

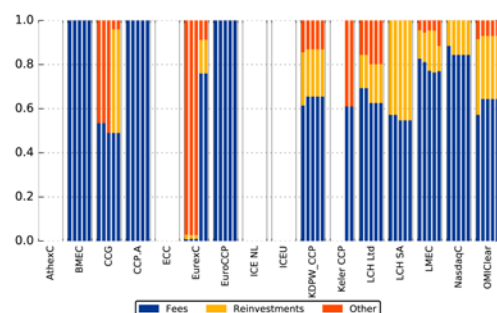
<sup>15</sup> Commission Delegated Regulation (EU) No 152/2013 of 19 December 2012 supplementing Regulation (EU) No 648/2012 of the European Parliament and of the Council with regard to regulatory technical standards on capital requirements for central counterparties.



## 5.7 Income structure

Chart 25  
Income structure

(annual, ratio)



Sources: PQD 15.3.1, 15.3.2; ESRB calculations

Note: Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data. No data were reported by ICE NL and ICE EU in any of the periods and by Keler CCP only as of 2017 Q2. Each bar represents a quarter.

The generation of income can impact CCP incentives. For example, CCPs which rely on the proceeds deriving from the reinvestment of clearing members' collateral may seek to maximise yield as a part of their investment strategy, which may lead them to increase their investment and liquidity risk (within the investment constraints set by EMIR). Hence, even though CCPs seek to maintain a balanced position at all times and should not be exposed to market risk and potential stress under normal conditions, the reinvestment of cash collateral received from clearing members could, in principle, lead to the exposure of a CCP to price movements and potential losses if it is forced to quickly liquidate the collateral it holds. In addition, it may be in CCPs' interests to increase margin requirements in order to have a larger pool of assets at their disposal.

Conversely, CCPs which generate most of their income from clearing fees would not have any incentive to increase returns in their investment strategies, although they might be tempted to grow their clearing volumes by for example lowering margin or haircut requirements, regardless of market conditions (a "race to the bottom"). There is, however, no clear link between income drivers and systemic risk since both approaches have their drawbacks, as explained above.

In order to shed some light on the income sources of a CCP, Chart 25 breaks down the CCP income structure into the components set out in the PQD, i.e. fees, reinvestments and "other", and therefore allows a comparison to be made between the different incentives for CCPs across the central clearing landscape. Unfortunately, "other" sources of income are not further specified in the PQD. One CCP (Eurex Clearing) reports that other sources consist of earnings received from trading venues for the services that the CCP provides for them (i.e. participants pay only one fee for trade execution and clearing and this fee is split between the trading venue and the CCP). In order to reflect the different business models of CCPs, the categories of CCP income could also include the proceeds generated by the provision of other services such as portfolio compression or the proceeds deriving from the reinvestment of regulatory capital. This indicator could also be analysed in conjunction with Chart 18, which shows the assets in which CCPs have reinvested the cash received from clearing members. Unfortunately, the missing bars in Chart 25 demonstrate that some fields in the PQD are not fully reported, which impairs the explanatory power of this indicator.

## 5.8 Client clearing

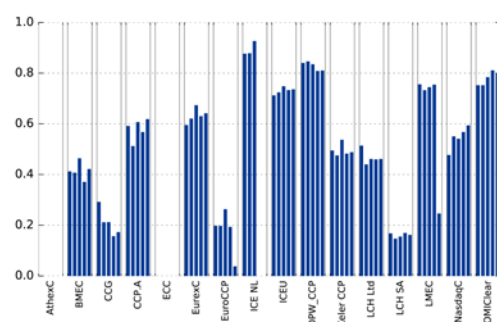
Financial market participants which wish to or are required by the clearing obligation to centrally clear financial transactions may either become direct members of a CCP or may clear transactions through clearing members that offer client clearing. Since not all firms which are required to or wish



to clear derivative or other financial transactions are clearing members of CCPs, e.g. due to high costs and infrastructure requirements, client clearing is essential to ensure that all firms have access to central clearing. Fiedor et al. (2017) highlight the importance of client clearing for the IRD market in the EU, given that it accounts for approximately 90% of all counterparty relations in the IRD market and influences the structure and interconnections of this part of the derivatives market. They argue that although the clients of clearing members are not generally of a systemic nature at individual level, they may be systemic as a group. For this reason, the PQD data on client clearing were used in order to construct indicators demonstrating the extent of client clearing and the structure of client accounts, in order to offer more insights into this part of the central clearing landscape.

**Chart 26**  
**Share of client clearing**

(quarter-end, ratio)

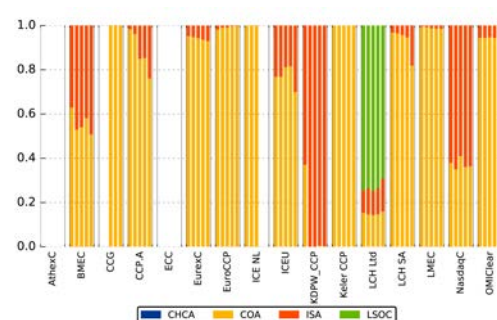


Sources: PQD 6.1.1; ESRB calculations.

Note: ICE NL only report zeros for 2017 Q2 and Q3. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data. Each bar represents a quarter. Data provided for segregated clearing services have been aggregated into a single structure.

**Chart 27**  
**Structure of client accounts**

(quarter-end, ratio)



Sources: PQD 14.1.1 - 14.1.4; ESRB calculations.

Note: ICE NL only report zeros for 2017 Q2 and Q3. Data for AthexC and ECC were either not reported or were reported in a way which does not permit analysis of the data. Data were reported for CCG as of 2017 Q1. Each bar represents a quarter. CHCA refers to "comingled house and client accounts", COA refers to "omnibus client-only accounts", ISA refers to "individually segregated accounts", LSOC refers to "legally segregated but operationally comingled accounts".

Chart 26 illustrates the share of client clearing at a CCP: a share of 0.25, for example, means that 25% of the total initial margin required by the CCP represents client clearing transactions. The indicator therefore offers insights into the importance of client clearing services provided by clearing members for a given CCP. Clearing members are responsible for meeting the minimum initial margin requirements on behalf of their clients, and the relative size of client margins and clearing members own (house) margin reflects their positions and risk exposures. The indicator also highlights interconnections in the central clearing landscape. A high share of client clearing indicates that the (potentially procyclical) margin and haircut requirements of a CCP are not only transmitted to its direct members but also to a number of clients. In addition, the default of a clearing member active on the client clearing side would impact not only the CCP but also the clients of the respective clearing member.

One measure used to mitigate the negative impact of a clearing member's default on its client is the segregation of accounts at CCP level. Article 39 of EMIR requires CCPs to offer the option of



keeping separate accounts for the assets and other positions of clearing members and their clients. Chart 27 shows the different models of segregation at the EU CCPs, ranging from individually segregated accounts (orange bars) to omnibus client accounts (yellow bars), with the latter offering less protection to the clients of a clearing member and the former being associated with higher costs for the client. The indicator therefore highlights the level of segregation, providing an indication of how operationally complex clearing member defaults can be from the perspective of a particular CCP and its participants. Note that comingled house and client accounts are used in the US but are not permitted under EMIR requirements and cannot, therefore, be observed in the PQD data of EU CCPs.

## 5.9 Interoperability arrangements

An interoperability arrangement is a mechanism that allows two CCPs their clearing systems to connect to each other. It enables market participants belonging different financial market infrastructures to trade with each other without any need to participate in the same CCP.

Interoperability arrangements provide certain advantages although they also give rise to risks. Their main advantages are increased competition, potentially bigger central clearing volumes, greater efficiency, increased netting benefits and enhanced market liquidity due to reduced market fragmentation. On the other hand, interoperability arrangements may have systemic risk implications since arrangements of this type introduce additional complexity into the overall risk management system and may serve as a channel for contagion between CCPs (ESRB, 2016a).

Five interoperability arrangements currently exist in the EU: CC&G – LCH SA, Euro CCP – LCH Ltd, EuroCCP – Six x-clear AG (CH), LCH Ltd – Six x-clear AG (CH), LCH Ltd – Six x-clear Norwegian branch (CH/NO). This number might increase going forward. Table 3 gives an overview of the currently established links and their characteristics.





Table 3  
Overview of interoperability arrangements<sup>16</sup>

Interoperability link	CCG & LCH SA	EuroCCP - LCH Ltd	EuroCCP - SIX x-clear AG	LCH Ltd - SIX x-clear AG	LCH Ltd - SIX x-clear NB (Norwegian branch)
<b>Starting date</b>	August 2004	January 2012	January 2012	May 2003	November 2003
<b>EMIR approval date</b>	May 2014	June 2014	April 2014	June 2014	June 2014
<b>Financial instruments cleared</b>	Italian government bonds (cash and repos)	Cash equities	Cash equities	Cash equities	Cash equities and equity derivatives

Sources: ESRB (2016a).

Note: If the interoperability link is between two EU-based CCPs, the latter approval date is reported in this table.

Chart 28 shows the value of transactions cleared through each interoperability link as a share of the CCP's total clearing activity. The indicator seeks to assess the relative magnitude of interoperability links for the individual CCPs which have established such links, thereby providing an indication of the potential effects stemming from disruptions to the linked CCPs. The indicator also shows whether two linked CCPs are facing different contagion risks from the same link, i.e. if the relative magnitude of the link is significantly more important for one of the two CCPs. However, the clearing volumes are an imperfect proxy for default-related risk.

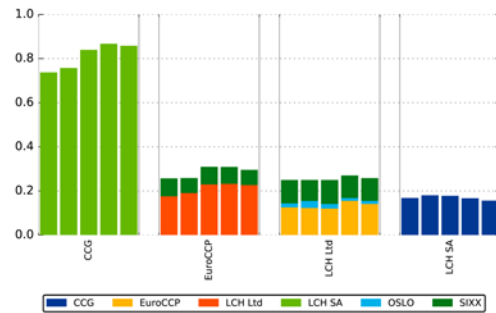
The indicator in Chart 29 (included in the ESRB Risk Dashboard) illustrates the share of initial margin provided for interoperability arrangements of total initial margin and also seeks to measure the relative importance of interoperability arrangements to an individual CCP. Although the indicator in Chart 28 focuses on clearing activity, the indicator in Chart 29 is based on a more risk-sensitive measure, i.e. the share of initial margin for interoperability related losses of CCPs' total initial margin and is, therefore, better suited to a macroprudential analysis of interoperability arrangements.

<sup>16</sup> EuroCCP was created in 2013 as a merger of two CCPs, which both had an interoperability arrangement with SIX x-clear AG. The starting date of the latter interoperability arrangement is reported in this table.



Chart 28  
Share of interoperability arrangements of total trade volume

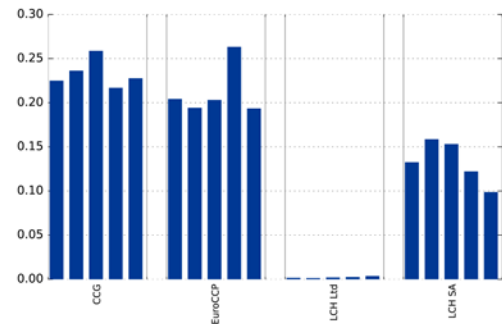
(quarter-end, ratio)



Sources: PQD 20.1.1; ESRB calculations.  
Note: OSLO refers to the Oslo branch of SIXX. Each bar represents a quarter.

Chart 29  
Share of initial margin provided for interoperability arrangements of total initial margin

(quarter-end, ratio)



Sources: PQD 6.2.15, 20.2.1, 20.5.1.1; ESRB calculations.  
Note: Each bar represents a quarter. PQD 20.2.1 is added to PQD 6.2.15 for CC&G from 2016 Q3 as data do not include initial margin resulting from interoperability arrangements in PQD 6.2.15.



## 6 Overview of data gaps

The data published by CCPs on a voluntary basis under the PQD are a rich source of information on the functioning of CCPs for public authorities, market participants and researchers. As outlined in Section 4, the data provide a set of quantitative information regarding the financial conditions, financial resources and risk management of CCPs and are available as of January 2016 (covering Q3 2015).

CCPs publish exhaustive information on their websites but, due to a lack of consistency, their differing business models and the various financial products cleared, it has been difficult to compare these data across CCPs over time. Other publicly available datasets are quite scarce and, even when they do exist, factors such as level of detail, frequency of publication and CCP coverage have hindered their broad use.<sup>17</sup> The data reported under the PQD represent, therefore, the first dataset facilitating a sector-wide analysis of CCPs across the world. They have filled the gap by requiring consistent reporting on the main aspects of CCPs' functioning and are a significant step forward towards improving transparency in CCP operations. As a result of the efforts of CPMI-IOSCO, CCP12 and CCPs, researchers now have access to a broad dataset covering CCPs' functioning which has been used in recent publications, e.g. in Armakolla and Bianchi (2017), OFR (2017) and Murphy (2017).

Although it is understood that most CCPs provide extensive information under the PQD framework, the dataset could be even more useful if certain issues regarding the consistency and quality of the data and the reporting were addressed. There is still one authorised EU-CCP which does not publish data at all, another CCP which publishes data in a format which is not useable for the ESRB's analysis, and there are a number of CCPs which do not report individual variables, e.g. those relating to clearing activity and CCP income (see, for example, Box 3 and Section 5.7). Given the data's added value and their increased use it would be beneficial for the relevant authorities to work closely with CCPs to improve data quality. The authors would like to reiterate the previously published ESRB position introducing the requirement for CCPs to publish data according to the framework. This will allow data shortcomings to be addressed and supervisors to require action from CCPs if reporting inaccuracies are identified or if CCPs are not reporting the data (ESRB, 2017b). The following section summarises the issues raised in the previous chapters as well as general comments on the overall framework.

- Common template and unified data structure

A common template for data reporting has been developed by the global association of CCPs (CCP12), in cooperation with its members. The template provides a common data structure which facilitates the aggregation of data and the construction of time series and indicators. Most authorised CCPs publish their quantitative disclosures in accordance with the common template

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<sup>17</sup> For example, the ECB Central Counterparty Clearing Statistics provide data on European CCPs as of 2006, although the public data only cover information on CCP membership and the volumes cleared by European CCPs. Data are only published on an annual basis.



and the authors would like to encourage the remaining CCPs to use the common template as well. Moreover, after working with the data for two years, CCPs have collected relevant feedback from participants, authorities and the general public. They should, therefore, in line with guidance received from the relevant overseers or supervisors and CPMI-IOSCO, consider updating the common template to address lessons learned and improve the quality of data provided. A common understanding should be developed in cases where data fields are interpreted differently. For example, for a number of CCPs some specific PQD variables add up to 100% while others do not.

- Accessibility of data

In the EU, CCPs are encouraged to provide PQD data in an accessible format and to avoid PDF documents. Moreover, the analysis of the data published would be facilitated if the data were made available as a time series and, therefore, including all reported quarters in one file instead of having one file for each quarter, including updated quarters. As a common practice and in the interests of transparency, previous reports should continue to be available on the CCPs' websites. The date of publication of data as well as the date of any updates should also be clearly documented. In addition, using hyperlinks to CCP websites should be avoided in the disclosures since these data are often not comparable with data reported under the PQD and vary on a regular basis.

- Consistency of the reporting level

The standards for the PQD have been developed to avoid revealing confidential information about individual clearing members, clients or other relevant stakeholders. The data are largely anonymised and aggregated and the degree of granularity has been set to avoid revealing sensitive information regarding the positions of individual CCP participants. Three different reporting levels, i.e. CCP, clearing service and default fund levels, have been introduced, although the CCP perspective is sometimes omitted. This applies in particular to data, which are reported at default fund or clearing service level and for which a simple summing up at CCP level would lead to data overlapping (e.g. data on clearing membership, see Section 5.1). Reporting at CCP level should be introduced for these overlapping data and, moreover, CCPs should not change reporting levels unless this is justified. In addition, some variables are reported at different levels across CCPs, e.g. data relating to interoperability arrangements which impair the analysis of these variables and require the data to be cleaned further.

- Consistency in the reporting of volumes and currencies

The analysis of the data reported would be enhanced if the data could be broken down using a broad definition of asset classes or instruments, e.g. in line with the structure provided by ESMA in the list of authorised EU CCPs in ESMA (2017b). This would allow the indicators to be broken down by asset class and would facilitate a more risk-based analysis based on the different characteristics of the instruments cleared by EU CCPs. Furthermore, the currency in which the variables are denominated is not always clear – something which could be further clarified in the reported data.

- Definition of OTC and exchange traded instruments

CCPs are required to split some PQD variables, for example 23.1.2 and 23.2.1, into OTC and exchange traded instruments. However, it is not clear what definition is used for this breakdown and this is not specified in the CPMI-IOSCO framework. This could be clarified in a revision of the framework, thereby ensuring that all CCPs report consistently. In addition, it might be worth



considering whether a separation between OTC and exchanged traded instruments provides much insight into a CCP's risk management.



## 7 Conclusion

The publication of data by CCPs under the PQD developed by CPMI-IOSCO is a milestone in enhancing the transparency of CCPs in respect of their functioning, financial resources, collateral and operational risk. The establishment of the framework and the voluntary reporting of the CCPs provide public authorities, CCP participants, academics and the interested public with detailed insights into CCPs' functioning and risk management. The growing interest in the PQD is reflected, inter alia, in recent publications.

When the data were first reported in 2016, the ESRB started by analysing and using the data reported by the authorised EU CCPs. On the basis of these data, the ESRB developed a number of indicators of CCPs' resources, liquidity and collateral policies, margin and haircut requirements, interoperability arrangements, as well as market structure and concentration at CCP level as presented in this Occasional Paper. Selected indicators have been included in the ESRB Risk Dashboard and will be updated on a quarterly basis. As demonstrated in this paper, the PQD data provide important insights into CCPs' functioning and are a valuable source of information for public authorities, also with regard to the potential development of macroprudential policies. In the future, the indicators may be extended to selected third-country CCPs.

Currently, not all EU CCPs report the data and some CCPs do not report all the variables covered by the PQD framework. In addition, the relevant data are not always reported consistently across variables and CCPs. The analytical value of the data reported under the PQD framework could therefore be enhanced if the reporting practices of the CCPs were further improved and harmonised.



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## 9 Annexes

### 9.1 List of authorised CCPs

Table 4  
List of CCPs

	European CCP	Short Name	Country of establishment
1	Athens Exchange Clearing House	AthexC	GR
2	BME Clearing	BMEC	ES
3	Cassa di Compensazione e Garanzia S.p.A	CCG	IT
4	CCP Austria Abwicklungsstelle für Börsengeschäfte GmbH	CCP.A	AT
5	Eurex Clearing AG	EurexC	DE
6	European Central Counterparty N.V.	EuroCCP	NL
7	European Commodity Clearing	ECC	DE
8	ICE Clear Europe Limited	ICEU	UK
9	ICE Clear Netherlands B.V.	ICE NL	NL
10	KDPW_CCP S.A.	KDPW_CCP	PL
11	Keler CCP	Keler	HU
12	LCH Ltd	LCH Ltd	UK
13	LCH SA	LCH SA	FR
14	LME Clear Ltd	LMEC	UK
15	Nasdaq Clearing AB	NasdaqC	SE
16	OMIClear - C.C., S.A.	OMIClear	PT

Sources: ESMA's Public Register for the Clearing Obligation under EMIR (3 October 2016) and ESMA's List of Central Counterparties authorised to offer services and activities in the Union (30 August 2017) and CCP websites.

Notes: Short name used for Eurex Clearing AG (EurexC) and Nasdaq Clearing (NasdaqC) as proposed by authorities.

### 9.2 List of the indicators and the formulas used

#### Chart 3 - Size of prefunded default resources

Prefunded default resources + total initial margin required

PQD 4.1.1 (Total) + PQD 4.1.2 (Total) + PQD 4.1.3 (Total) + PQD 4.1.4 (Total) + PQD 6.1.1 (Sum of Total)

#### Chart 4 - Structure of prefunded default resources

Structure of prefunded default resources (as a % of size of prefunded default resources)



Breakdown into prepaid default fund contributions [sum of PQD 4.1.4 (Total)], own capital (sum of PQD 4.1.1 – PQD 4.1.3) and total initial margin required PQD 6.1.1 (Sum of Total)

$$\text{PQD 4.1.4 (Total)} / [\text{PQD 4.1.1 (Total)} + \text{PQD 4.1.2 (Total)} + \text{PQD 4.1.3 (Total)} + \text{PQD 4.1.4 (Total)} + \text{PQD 6.1.1 (Sum of Total)}]$$

$$[\text{PQD 4.1.1 (Total)} + \text{PQD 4.1.2 (Total)} + \text{PQD 4.1.3 (Total)}] / [\text{PQD 4.1.1 (Total)} + \text{PQD 4.1.2 (Total)} + \text{PQD 4.1.3 (Total)} + \text{PQD 4.1.4 (Total)} + \text{PQD 6.1.1 (Sum of Total)}]$$

$$\text{PQD 6.1.1 (Sum of Total)} / [\text{PQD 4.1.1 (Total)} + \text{PQD 4.1.2 (Total)} + \text{PQD 4.1.3 (Total)} + \text{PQD 4.1.4 (Total)} + \text{PQD 6.1.1 (Sum of Total)}]$$

#### **Chart 5 - Structure of CCPs' own capital in the default waterfall**

Breakdown into prefunded own capital before (PQD 4.1.1), prefunded own capital alongside (PQD 4.1.2) and prefunded own capital after (PQD 4.1.3)

$$\text{PQD 4.1.1 (Total)} / [\text{PQD 4.1.1 (Total)} + \text{PQD 4.1.2 (Total)} + \text{PQD 4.1.3 (Total)}]$$

$$\text{PQD 4.1.2 (Total)} / [\text{PQD 4.1.1 (Total)} + \text{PQD 4.1.2 (Total)} + \text{PQD 4.1.3 (Total)}]$$

$$\text{PQD 4.1.3 (Total)} / [\text{PQD 4.1.1 (Total)} + \text{PQD 4.1.2 (Total)} + \text{PQD 4.1.3 (Total)}]$$

#### **Chart 6 - Ratio of own capital to default fund**

$$\text{PQD 4.1.1 (Total)} / \text{PQD 4.1.4 (Total)}$$

$$[\text{PQD 4.1.2 (Total)} + \text{PQD 4.1.3 (Total)}] / \text{PQD 4.1.4 (Total)}$$

#### **Chart 7 - Size (daily average notional value)**

Daily average notional value of over-the-counter (OTC) transactions cleared in the specified quarter

PQD 23.1.2 (Total\_OTC)

Daily average notional value of exchange-traded transactions cleared in the specified quarter

PQD 23.1.2 (Total\_ETD)

#### **Chart 8 - Size (gross notional outstanding)**

Gross notional outstanding value of novated but not-yet-settled OTC transactions at end-quarter

PQD 23.2.1 (Total\_OTC)

Gross notional outstanding value of novated but not-yet-settled exchange-traded transactions at end-quarter

PQD 23.2.1 (Total\_ETD)



#### **Chart 9 - Haircut on non-cash initial margin**

[Non-cash initial margin (pre-haircut) – non-cash initial margin (post-haircut)] / non-cash initial margin (pre-haircut)

$$\frac{[\text{PQD 6.2.15 (TotalIM\_PreHaircut)} - \text{PQD 16.1.1 (Total)}] - [\text{PQD 6.2.15 (TotalIM\_PostHaircut)} - \text{PQD 16.1.1 (Total)}]}{[\text{PQD 6.2.15 (TotalIM\_PreHaircut)} - \text{PQD 16.1.1 (Total)}]}$$

#### **Chart 10 - Changes in variation margin**

(Maximum total variation margin paid to the CCP – average total variation margin paid to the CCP) / average total variation margin paid to the CCP

$$(\text{PQD 6.7.1} - \text{PQD 6.6.1}) / \text{PQD 6.6.1}$$

#### **Chart 11 - Maximum initial margin call**

Maximum aggregate initial margin call

PQD 6.8.1

#### **Chart 12 - Initial margin held**

Structure of initial margin held

Breakdown into PQD 6.2.1 to 6.2.14 as a percentage of (PQD 6.2.1 + ... + PQD 6.2.14)

#### **Chart 13 - Collateralisation**

Total initial margin held / total initial margin required

$$\text{PQD 6.2.15 (TotalIM\_PostHaircut)} / \text{PQD 6.1.1 (Sum of Total)}$$

#### **Chart 14 - Structure of qualifying liquid resources**

Structure of qualifying liquid resources (as a % of total)

Breakdown into PQD 7.1.2 to 7.1.9 as a percentage of (PQD 7.1.2 + ... + PQD 7.1.9)

#### **Chart 15 - Ratio of qualifying liquid resources to prefunded default resources**

Qualifying liquid resources / (total initial margin required + prefunded default resources)

$$\frac{(\text{PQD 7.1.2} + \dots + \text{PQD 7.1.9})}{[\text{PQD 6.1.1 (Sum of Total)} + \text{PQD 4.1.1 (Total)} + \text{PQD 4.1.2 (Total)} + \text{PQD 4.1.3 (Total)} + \text{PQD 4.1.4}]}$$

#### **Chart 16 - Ratio of qualifying liquid resources to estimated largest same-day payment obligation**

Qualifying liquid resources / estimated largest same-day payment obligation

$$(\text{PQD 7.1.2} + \dots + \text{PQD 7.1.9}) / \text{PQD 7.3.1 (SameDay\_Payment\_Total)}$$



#### Chart 17 - Cash ratio

Amount of total cash received from participants (as a share of total initial margin)

$\text{PQD 16.1.1 (Total Cash)} / [\text{PQD 6.2.15 (TotalIM\_PostHaircut)}]$

#### Chart 18 - Cash reinvestment policies

Structure of reinvested cash (as a % of total)

Breakdown into PQD 16.2.2 to 16.2.7 and PQD 16.2.10 to 16.2.14 as a percentage of  $[\text{PQD 16.2.2} + \dots + \text{PQD 16.2.7} + \text{PQD 16.2.10} + \dots + \text{PQD 16.2.14}]$

#### Chart 19 - Indicator on concentration at CCP level

Initial margin concentration

$\sum [(\text{PQD 18.3.1. or PQD 18.3.2}) * \text{PQD 6.2.15 (TotalIM\_PostHaircut, split by clearing service)}] / \text{PQD 6.2.15 (TotalIM\_PostHaircut)}$

Default fund concentration

$\sum [(\text{PQD 18.4.1. or PQD 18.4.2}) * \text{PQD 4.1.5 (split by clearing service)}] / \text{PQD 4.1.5 (Total)}$

Client clearing concentration

$\sum [(\text{PQD 19.1.3.2 or PQD 19.1.4.2}) * \text{PQD 6.2.15 (TotalIM\_PostHaircut, split by clearing service)}] / \text{PQD 6.2.15 (TotalIM\_PostHaircut)}$

#### Chart 20 - Average size of the initial margin of the five largest clearing members

Average initial margin per clearing member

$\text{PQD 6.1.1 (Sum of Total)} / \text{total number of clearing members [ECB Central Counterparty Clearing Statistics]}$

Average initial margin of one of the five largest clearing members

$\text{PQD 6.1.1 (Sum of Total)} / [\text{PQD 18.3.1 or PQD 18.3.2 (AverageInQuarter)} \text{ by clearing service and weighted by PQD 6.2.15 (sum of PostHaircut, for both ClientIM and HouseIM)}]$

#### Chart 21 - Initial margin concentration of the five largest clearing members

Percentage of initial margin posted by the five largest clearing members per clearing service (both for clearing services with fewer than 25 members and for those with 25 or more clearing members)

$\text{PQD 18.3.1 or PQD 18.3.2 (AverageInQuarter)}$  and

$\text{PQD 18.3.1 or PQD 18.3.2 (PeakInQuarter)}$

#### Chart 22 - Segregated default fund concentration of five largest clearing members (quarter-end, ratio)



Segregated default fund concentration of the five largest clearing members

PQD 18.4.1 or PQD 18.4.2

#### **Chart 23 - Market concentration (HHI)**

Herfindahl-Hirschman Index (HHI) for overall market concentration using daily average notional value of over-the-counter (OTC) and exchange-traded transactions (ETI) cleared in the specified quarter

HHI of PQD 23.1.2 (Total\_OTC), PQD 23.1.2 (Total\_ETI) and PQD 23.1.2 (Sum of Total OTC and ETI)

HHI for overall market concentration using total initial margin

HHI of PQD 6.1.1 (Sum of Total)

HHI for market concentration using gross notional outstanding value of OTC transactions and ETI at quarter-end

HHI of PQD 23.2.1 (Total\_OTC), PQD 23.2.1 (Total\_ETI) and PQD 23.2.1 (Sum of Total OTC and ETI)

#### **Chart 24 - Winding-down ratio**

Value of liquid net assets funded by equity / twelve months of current operating expenses

PQD 15.1.1 / (PQD 15.1.2 \* 2)

#### **Chart 25 - Income structure**

Percentage of total income from fees related to the provision of clearing services

PQD 15.3.1

Percentage of total income from the reinvestment (or rehypothecation) of assets provided by clearing participants

PQD 15.3.2

Percentage of total income other than fees or reinvestments

1 - (PQD 15.3.1 + PQD 15.3.2)

#### **Chart 26 - Share of client clearing**

Share of total initial margin required for client clearing (as a % of total initial margin)

PQD 6.1.1 (Sum\_of\_Client\_Gross and Client\_Net) / PQD 6.1.1 (Sum of Total)

#### **Chart 27 - Structure of client accounts**

Structure of segregation of clients' positions



Breakdown into PQD 14.1.1 to 14.1.4 as a percentage of (PQD 14.1.1 + ... + PQD 14.1.4)

#### **Chart 28 - Share of interoperability arrangements in total trade volume**

Share of trades cleared through each link of total trades cleared

PQD 20.1.1 (Total)

#### **Chart 29 - Share of initial margin provided for interoperability arrangements in total initial margin**

Share of initial margin provided to each linked CCP of total initial margin

$\text{PQD 20.2.1} / [\text{PQD 20.2.1} + \text{PQD 20.5.1.1} + \text{PQD 6.2.15 (TotalIM\_PostHaircut)}]$



## 10 Abbreviations

### Countries and currencies

<b>CH</b>	Switzerland	<b>GBP</b>	British Pound	<b>PLN</b>	Polish Zloty
<b>EUR</b>	Euro	<b>JPY</b>	Japanese Yen	<b>SEK</b>	Swedish Krona
<b>G4</b>	A group of liquid and heavily traded currencies including USD, GBP, JPY and EUR	<b>NO</b>	Norway	<b>USD</b>	US Dollar
		<b>Non-G4</b>	Currencies other than G4 currencies		
		<b>NOK</b>	Norwegian Krona		

### Other

<b>CCP</b>	Central Counterparty
<b>CCP12</b>	Global Association of Central Counterparties
<b>CDS</b>	Credit Default Swaps
<b>CPMI</b>	Committee on Payments and Market Infrastructures
<b>EMIR</b>	European Market Infrastructure Regulation
<b>ESMA</b>	European Securities and Markets Authority
<b>ETI</b>	Exchange traded instruments
<b>FSB</b>	Financial Stability Board
<b>G20</b>	Group of Twenty
<b>HHI</b>	Herfindahl-Hirschman-Index
<b>IOSCO</b>	International Organisation of Securities Commissions
<b>IRD</b>	Interest rate derivatives
<b>IRS</b>	Interest rate swaps
<b>OTC</b>	Over-the-counter
<b>PFMI</b>	Principles for financial market infrastructures
<b>PQD</b>	Public quantitative disclosure framework
<b>QLR</b>	Qualifying liquid resources



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