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FINANCIAL SECTOR ASSESSMENT PROGRAM

June 2016

SUPERVISION AND SYSTEMIC RISK MANAGEMENT OF FINANCIAL MARKET INFRASTRUCTURES—TECHNICAL NOTE

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SUPERVISION AND SYSTEMIC RISK MANAGEMENT OF
FINANCIAL MARKET INFRASTRUCTURES

Prepared By
**Monetary and Capital Markets
Department**

This Technical Note was prepared in the context of an IMF Financial Sector Assessment Program (FSAP) in the United Kingdom in November 2015 and February 2016 led by Dimitri Demekas. It contains technical analysis and detailed information underpinning the FSAP findings and recommendations. Further information on the FSAP program can be found at <http://www.imf.org/external/np/fsap/fssa.aspx>

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Glossary

APS	Assured Payments System (of ICE Clear Europe)
ARF	Authorities Response Framework
BoE	Bank of England
CCP	Central Counterparty
CDS	Credit Default Swaps
CLS	Continuous Linked Settlement
CME	Chicago Mercantile Exchange Inc.
CMG	Crisis Management Group
CPMI	Committee on Payments and Market Infrastructures
CPSS	Committee on Payment and Settlement Systems
CSD	Central Securities Depository
CSDR	Central Securities Depositories Regulation
CSP	Critical Service Provider
EMIR	European Market Infrastructure Regulation
ESMA	European Securities and Markets Authority
EU	European Union
EUI	Euroclear U.K. & Ireland Limited
FCA	Financial Conduct Authority
FSMA	Financial Services and Markets Act 2000
FMI	Financial Market Infrastructure
FMID	Financial Market Infrastructure Directorate
FPS	Faster Payments Service
HVPS	U.K.'s High Value Payment System
ICE	Intercontinental Exchange
IMF	International Monetary Fund
IOSCO	International Organization of Securities Commissions
IRS	Interest Rate Swap
LSE	London Stock Exchange
LME	London Metal Exchange
MOU	Memorandum of Understanding
MTF	Multilateral Trading Facility
PFMI	CPSS-IOSCO Principles for Financial Market Infrastructures
PPS	Protected Payment System (of LCH.Clearnet Ltd)
PRA	Prudential Regulation Authority
PSR	Payment Systems Regulator
OTC	Over the Counter
RTGS	Real Time Gross Settlement
SPS	Secure Payment System (of LME Clear)
SSS	Securities Settlement System
U.K.	United Kingdom

EXECUTIVE SUMMARY

Supervision of financial market infrastructures (FMIs) in the U.K. has significantly strengthened in recent years; the Bank of England (BoE) is one of the leaders worldwide in shaping reforms in this area. The decision to make the BoE the lead supervisor for all FMIs was appropriate in view of the systemic importance of FMIs, and enabled a consistent implementation of the CPSS-IOSCO Principles for Financial Market Infrastructures (PFMI) across all types of FMIs. Supervisory practices have become more formalized, disciplined, and standardized. In addition, the number of supervisory staff has increased. This combination under the one roof of FMI supervision, along with PRA's prudential supervision of FMI participants and central bank services allows for an approach that focuses on the resilience of FMIs in a broader context.

As a result, the risk management of U.K. FMIs has improved in line with international standards, which contributes to their greater safety and soundness. The BoE has required improvements in the governance structure of all types of FMIs. Central counterparties' (CCPs') models for credit and liquidity risks have been upgraded and model validation procedures have been strengthened. The largest retail payment systems have introduced prefunding as a tool to mitigate settlement risk. There is increased focus on operational risk, with cyber resilience high on the agenda of FMIs. Further work is ongoing, among others, in the area of margin models, recovery planning, operational risk management, and default management.

Given the systemic importance of U.K. CCPs, both for the U.K. financial system and globally, it is crucial that the BoE ensures current requirements are commensurate to the risks. Much has been done during recent years to increase the robustness of CCPs, in particular the adoption and implementation of the PFMI and the development of legislation, such as the European Market Infrastructure Regulation (EMIR). However, given that the PFMI do not necessarily prescribe detailed requirements for all risks, further work is warranted and is taking place at an international level to ensure that requirements are sufficiently strong—for example, in the areas of stress testing of financial resources, margin requirements, liquidity requirements, and the adequacy of CCPs' loss absorbing capacity. U.K. authorities are encouraged to continue pushing for increased robustness of CCPs, eventually adopting standards beyond the PFMI.

Despite the progress, the BoE could do more to monitor systemic-wide risks, in particular the interconnectedness between CCPs, financial institutions, and markets. The BoE recently conducted a study on pro-cyclicality effects of margin calls of the largest CCP. The regular monitoring of commercial banks providing services to CCPs is also an important step that has been taken. Further analysis of system-wide risks could be undertaken, for example, on (i) how membership in multiple CCPs may have a knock-on effect on surviving clearing members; (ii) the impact of fire sales if multiple CCPs try to sell collateral at the same time; and (iii) FMIs' dependency on banking services of a few U.S. global systemically important banks (G-SIBs). Such analysis would provide the basis for measures to reduce system-wide risks, if necessary. It requires additional

resources with the right skill set to conduct quantitative and qualitative analysis and to further develop the supervisory approach.

FMI's dependence on settlement banks should be further reduced through de-tiering and ideally through increased settlement in central bank money for CCP embedded payment systems. The largest indirect participants of CHAPS and EUI have in recent years successfully been transformed into direct participants. There is scope to reduce credit and liquidity risks, as well as operational dependencies, further by targeting other large banks that are currently still indirect participants. With regard to CCPs, the BoE provides CCPs with access to its balance sheet and to settlement in central bank money through the Sterling Monetary Framework and provision of concentration bank accounts. Despite this, CCPs are still dependent on commercial banks for the operation of their embedded payment systems. Although CCPs apply various risk measures to reduce their exposures to these banks, it cannot be excluded that a settlement bank might default, creating operational and financial stress for CCPs and clients of settlement banks. CCPs should therefore increase the number of transactions that settle entirely in central bank money using the U.K.'s High Value Payment System (HVPS). The BoE has launched a strategic review of the RTGS system. This development could take de-tiering and direct settlement of CCP transactions explicitly into account.

The current arrangements for the supervision of the HVPS have shortcomings. The BoE supervises the CHAPS system, which is operated by CHAPS Clearing Company Limited (CHAPS Co), which in turn outsources provision of its infrastructure to the BoE via the RTGS system. But CHAPS Co has limited powers to assess whether the RTGS system meets requirements and induce change, if needed, due to the unique position of the BoE as provider of the infrastructure. A self-assessment of the RTGS infrastructure by the BoE is underway, which would complement the completed self-assessment of CHAPS Co and the BoE's supervisory assessment of CHAPS. However, in the absence of formal oversight of the RTGS system, pressure to increase compliance may be weak. The BoE recognizes these shortcomings and is actively considering solutions.

The BoE is a global leader in the development of crisis management arrangements for FMIs, including recovery and resolution planning. Comprehensive domestic structures have been set up in the U.K. to manage crisis circumstances. The BoE is leading international colleges for U.K. CCPs. Memoranda of Understanding (MOUs) governing these colleges contain escalation procedures, but more is needed for successful cooperation and coordination in times of crisis, for example, development of procedures for different crisis scenarios, such as the default of a clearing member in multiple CCPs. As part of the resolution of CCPs, the BoE has set up a crisis management group (CMG) for authorities overseeing LCH.Clearnet Ltd. Although the current membership of the CMG is appropriate to stay flexible, additional information sharing arrangements should be established with authorities that are not represented in the CMG, but whose jurisdictions may potentially be systemically impacted by a default of the CCP, for example, because the CCP clears their currency or local banks members participate as clearing members.

Table 1. United Kingdom: Recommendations for FMI Supervision

Recommendations on the supervision and oversight of FMIs	Timing	Authorities
Consider alternative structures to reduce the current constraints related to the oversight and management of risk within the U.K. High Value Payments system and finalize the self-assessment of the RTGS infrastructure against the PFMI.	Short to medium term	BoE
Assess compliance of critical service providers against the CPMI-IOSCO oversight expectations.	Medium term	BoE
Enhance crisis management arrangements for supervisory colleges that are led by the BOE, through further development of crisis scenarios and testing.	Medium term	BoE and foreign authorities
Recommendations for the reduction of system-wide risks		
Further develop an approach for analyzing interdependencies among CCPs, financial institutions and markets that takes into account clearing members' multi-membership of CCPs, fire sales of CCPs' collateral and services provided to CCPs by commercial banks.	Short to medium term	BoE
Cooperate with U.S. supervisors to identify and manage risks related to the dependency of U.K. FMIs on services provided by U.S. banks.	Short to medium term	BoE, Federal Reserve
Continue with the de-tiering project for payment systems and EUI.	Medium term	BoE
Consider, as part of the RTGS review, increasing settlement in central bank money for CCP embedded payment system transactions, by increasing the number of CCP members that are also members of the HVPS	Short term	BoE
Recommendations on recovery and resolution		
Further develop resolution framework for FMIs, in line with progress made at the international level.	Medium term	BoE, HMT, international regulators
Develop information sharing arrangements with all authorities with an interest in global CCPs, while ensuring a flexible decision making structure (comparable to model proposed for G-SIB CMGs).	Medium term	BOE and foreign authorities

INTRODUCTION¹

1. The supervisory structure for FMIs has significantly changed in the aftermath of the crisis, with the BoE now being the main supervisor, reflecting the increased recognition of the systemic importance of FMIs. In 2013, the responsibility for the supervision of securities settlement systems (SSS) and CCPs transferred to the BoE from the Financial Services Authority, following the enactment of the Financial Services Act 2012 (systemically important interbank payment systems were already supervised by the BoE). An important feature of post crisis FMI supervision is the BoE's perspective to protect and enhance the stability of the financial system through safe and efficient FMIs.

2. The main objective of this Technical Note is to analyze the supervision and systemic risk management of FMIs in the U.K. It aims to analyze how well the new supervisory structure is able to identify and manage vulnerabilities related to FMIs which may potentially impact financial stability. The note does not contain a detailed assessment of individual FMIs, but focuses on:

- Supervision of FMIs, including the regulatory framework, supervisory practices, available resources, transparency, adoption of international standards and coordination and cooperation mechanisms among authorities, both domestically and cross-border. This also includes crisis management arrangements as these aim to facilitate effective and timely communication among stakeholders and can help to avoid or reduce the size of financial losses during crisis events.
- Identification and management of interdependencies among FMIs, clearing members and markets, as well as other mechanisms for monitoring of system-wide risks that may exacerbate a crisis and impact financial stability in the U.K. and worldwide.
- Recovery and resolution of FMIs as relatively new instruments to sustain critical operations and services in the event that an FMI may potentially become non-viable as a going concern, while avoiding a bail out at the expense of taxpayers' money.

3. Recommendations in this Note are based on the international agreed standards for FMIs, i.e., the CPSS-IOSCO Principles for Financial Market Infrastructures (PFMI). The analysis of the supervision of FMIs takes the five responsibilities for authorities of the PFMI as reference. In addition, the concepts of Principle 3 of the PFMI are the basis for the analysis of interconnections and interdependencies among FMIs and other stakeholders, as well as recovery planning (Box 1).

¹ The Technical Note was prepared by Froukelien Wendt, Senior Financial Sector Expert from the IMF Monetary and Capital Markets department, for the 2016 United Kingdom FSAP. Her analysis was based on publicly available information, background documentation provided by the BoE, self-assessments of U.K. FMIs as well as discussions with the BoE, FCA, PRA, PSR, LCH.Clearnet Ltd, ICE Clear Europe, CME Clearing Europe, LME Clear, FPS, Bacs, CHAPS, EUI, banks, and academics.

The Note also takes into account guidance prepared by the FSB and CPMI-IOSCO on respectively resolution and recovery of FMIs.

4. The analysis builds on findings of earlier assessments. The analysis takes into account the recommendations made during the 2011 U.K. FSAP as well as the findings of the CPMI-IOSCO implementation monitoring assessments.²

Box 1. PFMI Responsibility A–E

Responsibility A: Regulation, supervision, and oversight of FMIs

FMIs should be subject to appropriate and effective regulation, supervision, and oversight by a central bank, market regulator, or other relevant authority.

Responsibility B: Regulatory, supervisory, and oversight powers and resources

Central banks, market regulators, and other relevant authorities should have the powers and resources to carry out effectively their responsibilities in regulating, supervising, and overseeing FMIs.

Responsibility C: Disclosure of policies with respect to FMIs

Central banks, market regulators, and other relevant authorities should clearly define and disclose their regulatory, supervisory, and oversight policies with respect to FMIs.

Responsibility D: Application of the principles for FMIs

Central banks, market regulators, and other relevant authorities should adopt the CPSS-IOSCO Principles for financial market infrastructures and apply them consistently.

Responsibility E: Cooperation with other authorities

Central banks, market regulators, and other relevant authorities should cooperate with each other, both domestically and internationally, as appropriate, in promoting the safety and efficiency of FMIs.

Source: CPSS IOSCO Principles for Financial Market Infrastructures, April 2012.

² See CPMI/IOSCO 'Implementation monitoring of PFMI: Second update to Level 1 assessment report', June 2015; 'Implementation monitoring of PFMI: Level 2 assessment report for central counterparties and trade repositories – European Union', February 2015; and draft 'Assessment and review of application of Responsibilities for authorities', September 2015.

DESCRIPTION OF FINANCIAL MARKET INFRASTRUCTURES IN THE UNITED KINGDOM

Overview of Financial Market Infrastructures

5. The U.K. is home to a variety of FMIs. Appendix 1 illustrates the FMI landscape in the U.K., and the interconnections and interdependencies among FMIs and different financial markets. Appendix 2 provides a description of the risk management of the main FMIs, while Appendix 3 presents statistics per FMI.

- CHAPS, the HVPS, is operated by CHAPS Co with the infrastructure provided by the BoE through the RTGS system. It is the backbone of the U.K financial system, and settles mainly large value payments for other FMIs, such as the Continuous Linked Settlement (CLS), building societies, commercial banks and their clients. It includes payments arising from housing market transactions. In 2014, the average daily value of payments settled by CHAPS was nearly GBP 270 billion, from 144 thousand payment messages.
- Three retail payment systems are considered systemically important, i.e. Bacs, Faster Payments Service (FPS), and Visa Europe. Bacs clears mainly direct debits and credits, while FPS clears mainly credit transfers, Internet payments, mobile payments and other retail payment transactions. Visa Europe is a card scheme and the main processor of debit card transactions in the U.K. Bacs is the largest retail system with an average daily value of payments settled of GBP 17 billion, from 23 million payment messages in 2014. FPS cleared and settled a value of GBP 3.5 billion, from 4 million payment messages.
- Securities markets are cleared by LCH.Clearnet Ltd, notably for the London Stock Exchange and Multilateral Trading Facilities (MTFs) such as Turquoise. LCH.Clearnet Ltd also clears repo transactions. The 2014 average size of the initial margin and default fund of LCH.Clearnet Ltd for equities was 827 million GBP-equivalent and for repos 9 billion GBP-equivalent.
- Exchange-traded derivatives markets are cleared by various CCPs, with ICE Clear Europe clearing the majority of contracts. ICE EU and CME Clearing Europe compete for the clearing of listed energy derivatives. LME Clear is active in the niche market for commodities traded on the London Metal Exchange (LME).³ The 2014 average size of the initial margin and default fund of ICE Clear Europe was 18 billion GBP-equivalent and for LME Clear 6 billion GBP-equivalent. CME Clearing Europe is small with 151 million GBP-equivalent.
- OTC derivatives markets are cleared by various CCPs. LCH.Clearnet Ltd is the global market leader in the clearing of interest rate swaps (IRS). The 2014 average size of initial margin and

³ Since the 2011 FSAP the exchange-traded derivatives market saw new entrants that changed the CCP landscape. ICE Clear Europe took LCH.Clearnet Ltd's position in the clearing of derivatives traded on LIFFE, which is now ICE Futures Exchange. LME Clearing took LCH.Clearnet Ltd's position in the clearing of LME commodity derivatives.

default fund of LCH Swapclear was 23 billion GBP-equivalent. The size of its FX derivatives segment was GBP 338 million GBP-equivalent. ICE Clear Europe is large in credit default swaps (CDS), with an initial margin and default fund size of 5 billion GBP-equivalent. CME Clearing Europe recently entered the OTC derivatives market.

- Euroclear U.K. & Ireland (EUI) is the U.K.'s only central securities depository (CSD). It operates CREST which is the securities settlement system (SSS) for U.K. and Irish corporate and U.K. government securities. EUI settled a daily average of 677 billion GBP-equivalent, mainly sterling transactions.

6. Many U.K. FMIs are systemically important at the national level, while LCH.Clearnet Ltd and ICE Clear Europe are considered to be systemically important at a global level. The failure of one of the FMIs can be a source of financial shocks and may potentially severely impact the stability of the U.K. or global economy. The failure of one of the payment systems or EUI can result in an ineffective implementation of monetary policies and a loss of confidence in the financial system. LCH.Clearnet Ltd is one of the largest CCPs in the world and its importance is still growing, following the G20 mandate that all standardized OTC derivatives should be cleared through CCPs. ICE Clear Europe is a global player in CDS. As most global systemically important financial institutions participate in these CCPs, their failure may, in extreme circumstances, spread losses across international financial markets and global financial systems.

7. Some U.K. FMIs have links with foreign FMIs. LCH.Clearnet Ltd is interoperable with CCPs from the Netherlands (EuroCCP N.V.) and Switzerland (SIX x-clear), for cash equity products and equity derivatives. EUI has cross-border CSD links with CSDs in the United States (DTCC), Belgium (Euroclear Bank) and Switzerland (SIX SIS). The links with DTCC and Euroclear Bank support free-of-payment transactions, while the SIX SIS link also supports delivery versus payment. EUI doesn't extend credit or liquidity to these linked CSDs.

Overview of the supervisory and oversight framework

8. The BoE is the authority responsible for the supervision of systemically important FMIs in the U.K. The BoE supervises recognized payment systems, CCPs, SSS and CSDs. The BoE does not supervise trade repositories as the European Securities and Markets Authority (ESMA) is the sole supervisor of trade repositories established in the European Union (EU). Other U.K. authorities also have an interest in FMI supervision, although their responsibilities regarding FMIs are different (Table 2).

9. The supervision of FMIs is based on various U.K. and EU laws. Appendix 4 summarizes which law applies to which FMI and which authorities are involved. The BoE is required to provide a report to HM Treasury demonstrating how the BoE has met its financial stability objective through its supervision of recognized payment systems, CCPs and SSS. This report must then be laid before Parliament. The regulatory regime for CCPs is based on EU legislation and CSDs are currently transitioning from domestic to EU legislation. Three U.K. CCPs—CME Clearing Europe, LCH.Clearnet Ltd and LME Clear—have been authorized under EMIR. The BoE continues to assess ICE Clear

Europe's application. SSS and CSDs continue to be assessed against domestic requirements until the regulatory technical standards under the EU CSD Regulation (CSDR) come into force.

ASSESSMENT OF SELECTED ISSUES

A. Supervision of FMIs

Regulation, supervision and transparency (Responsibilities A, C and D)

10. The supervisory framework for FMIs is based on statutory powers and regulation clearly defines the criteria to identify FMIs subject to the BoE's supervision. The principal pieces of U.K. legislation that shape the BoE's supervision of FMIs are:

- Part 5 of the Banking Act 2009, which established the statutory oversight regime for interbank payment systems;
- The Financial Services and Markets Act 2000 (FSMA), which set out responsibilities and powers in respect of the supervision of CCPs and CSDs (included as Recognized Clearing Houses) under the FSMA but soon to be restyled as recognized CSDs under the U.K. implementation of the CSDR, and a residual domestic category of other recognized clearing houses; and
- The Uncertificated Securities Regulations 2001, to which operators of securities settlement systems are subject (currently applying to EUI as the U.K.'s only CSD).

The BoE publishes its key resources, principles and objectives in the area of FMI supervision on its website.

11. The BoE makes recommendations to ensure that all systemically important FMIs in the U.K. are subject to its supervision. With regard to payment systems, the BoE only supervises systemically important interbank payment systems subject to certain criteria.⁴ The BoE has a horizon scanning process to avoid that an interbank payment system that meets the criteria is not recognized. This process forms part of HM Treasury's regular consultation with the BoE considering whether any additional payment systems should be recognized. Entities established/incorporated in the U.K. and operating a CCP or CSDs are required to be authorized by the BoE and therefore fall

⁴ HM Treasury only makes a recognition order if a disruption of the system's operation would be likely (a) to threaten the stability of, or confidence in, the U.K. financial system, or (b) to have serious consequences for business or other interests throughout the U.K. HM Treasury therefore takes into account the number and value of the transactions that the system processes, the nature of transactions, whether those transactions could be handled by other systems, links with other systems, and whether the system is used for BoE's monetary policy operations.

Table 2. United Kingdom: Responsibilities of Different U.K. Authorities in Relation to FMIs

Authority	Responsibility in relation to FMIs	Types of FMIs
BoE	Supervision of FMIs	Payment systems, CCPs, SSS, CSDs
HM Treasury	Overall responsibility for U.K. financial system. Makes a recognition order in respect of a systemically important interbank payment system	Payment systems, CCPs, SSS, CSDs
Prudential Regulation Authority (PRA)	Prudential supervision of banks and insurance companies that participate in FMIs	Payment systems, CCPs, SSS, CSDs
Financial Conduct Authority (FCA)	Supervision of trading venues that rely on, or are connected with, FMIs as well as financial participants of FMIs	Payment systems, CCPs, CSDs
Payment Systems Regulator (PSR)—subsidiary of the FCA	Promotes innovation and competition in payments.	Payment systems

Source: BoE.

within the scope of the BoE's supervision.⁵ The total set of FMIs subject to BoE supervision is further divided in three categories, depending on their systemic importance.⁶ Supervisory governance and activities are defined per category.

12. The PFMI are implemented through legislation and policies of the BoE. For CCPs and CSDs, the PFMI are implemented through the respective EU regulations, i.e. EMIR and the CSDR. These regulations draw for a large part on the PFMI and are therefore largely consistent with the PFMI. The CPMI-IOSCO implementation monitoring exercise confirmed the U.K.'s high consistency with the PFMI (Appendix 5).⁷ The approach for recognized payment systems is different: the BoE has

⁵ Under EU legislation, CCPs and CSDs established/incorporated in other EU Member States are authorized by their relevant home EU Member State authorities, and those established/incorporated in certain third countries are authorized by ESMA.

⁶ Category 1 systems are the most significant systems which have the capacity to cause very significant disruption to the U.K. financial system. Category 2 systems are significant systems which have the capacity to cause some disruption, whereas Category 3 systems have the capacity to cause at most minor disruption.

⁷ CPMI-IOSCO did find some gaps between the PFMI and EMIR. The U.K. authorities have taken steps to close these gaps by amending the 2001 FSMA Recognition Requirements Regulations to impose additional recognition requirements on U.K. CCPs. These include requirements relating to loss allocation arrangements (paragraph 29A)

publicly stated that it adopted the PFMI without amendment as the principles relevant for payment systems. The different approaches are outlined in ‘The Bank of England’s approach to the supervision of financial market infrastructures’ of December 2012.

13. The BoE has significantly strengthened the supervision of FMIs. FMI supervision has been strengthened within the BoE, with a special FMI Directorate (FMID) that reports directly to the Deputy Governor for financial stability and dedicated decision-making committees.⁸ The BoE is also effective in inducing change within FMIs to enhance compliance with the PFMI. Internal BoE challenge sessions with quantitative experts (including counterparty and market risk experts from the PRA) scrutinize CCPs’ risk models as part of the model validation process. The BoE is also placing strong emphasis on sound governance structures of FMIs. Several FMIs have substantially reformed their board and committee structures at the instigation of the BOE. CCPs and clearing members have been invited to a governance workshop where the BoE expressed its expectations in relation to the functioning of CCPs’ risk committees. The largest retail payment systems have introduced prefunding as a tool to mitigate settlement risk. There is increased focus on operational risk with cyber resilience high on the agenda of FMIs. Further work is ongoing, among others, in the area of recovery planning, operational risk management and default management.

14. The BoE’s supervisory process is comprehensive. The supervision of domestic FMIs consists of regular monitoring of key statistics and risk information. The BoE expects supervised FMIs to perform an annual self-assessment against the PFMI that serves as an input into the BoE’s own assessment of FMIs. In addition, the BoE assesses the FMIs against any applicable EU regulations. Priorities and Observations are specified, indicating issues where the BoE seeks action from the FMIs.⁹ In addition, the BoE regularly defines sector broad themes to deepen understanding of practices in the sector and to fine tune policies. For example, the BoE decided to place a particular focus on the quality of governance at U.K. CCPs to ensure inter alia that commercial objectives are not inappropriately prioritized over systemic risk management, building on the PRA’s work during 2014 on governance at banks and insurers.

15. However, the current arrangement for the supervision of the HVPS through CHAPS Co has shortcomings. The BoE supervises the CHAPS system which is operated by CHAPS Co, which in turn outsources provision of its infrastructure to the BoE via the RTGS system. The RTGS system is not subject to direct oversight. The current structure limits the possibilities of CHAPS Co and the BoE to conduct their assurance and supervisory activities and for inducing change, if needed. There is no

and recovery plans (paragraph 29B). The BoE has also notified ESMA that it will comply with the ‘Guidelines and Recommendations regarding the implementation of the CPSS-IOSCO Principles for Financial Market Infrastructures in respect of Central Counterparties’ which states that EU competent authorities should ensure that CCPs established in their territory comply with EMIR in accordance with the PFMI and operate in a manner that is consistent with them (<http://www.esma.europa.eu/content/Guidelines-and-Recommendations-regarding-implementation-CPSS-IOSCO-Principles-Financial-Mark>).

⁸ The FMI Board for Category 1 systems and the FMI executive committee for Category 2 systems.

⁹ Priorities are the issues where the risk to the institution is judged to be greater. They are therefore monitored closely and require action by a pre-agreed deadline.

formal and binding contract between CHAPS Co and the RTGS system, other than a (non-binding) MOU. The current structure is considered less effective to ensure a safe and smooth functioning of the RTGS system. CHAPS Co has completed a self-assessment against international standards, which the BoE uses as an input to its own assessment and supervision of CHAPS. The BoE as operator, i.e. the Banking Directorate, has a self assessment in progress. However, in the absence of formal oversight of the RTGS system pressure to increase compliance may be weak

16. Aware of these shortcomings, the BoE is considering alternative options to enhance the supervisory structure. In this context, the BoE could consider practices of central banks worldwide. A relatively common arrangement among central banks is to have the RTGS operations overseen by the central bank oversight function. To manage conflicting interests, the BoE should have organizational separation between the oversight function and the operations function. Reporting lines are to different senior managers of governors of the board.¹⁰ Other models are possible. The Bank of Canada has a different model than most countries, where the RTGS system is operated by a private entity that is supervised by the Bank of Canada. The Swiss National Bank has outsourced the operations of the RTGS system to a private party, while keeping the ownership of the system.

17. The BoE also announced plans to design a blueprint for the HVPS for the coming years.¹¹ The aim of the blueprint is to consider how the RTGS system will need to evolve to meet payment needs in the coming decades, in close cooperation with the industry, while ensuring that financial stability objectives are met. The scope of the blueprint would be broad, including technological innovation, access to central bank money, and the role of the BoE.

18. The BoE should include critical service providers (CSPs) in its supervisory framework. The PFMI include oversight expectations for so-called CSPs (Annex F) and published an assessment methodology in December 2014. Outsourcing is a key issue for U.K. FMIs. As many are reliant on SWIFT the BoE participates in the National Bank of Belgium's oversight arrangements for SWIFT. VocaLink is an important CSP for FPS and Bacs. The BoE has yet to formally implement the oversight expectations for CSP.

Powers and resources (Responsibility B)

19. The Banking Act 2009, the FSMA, and the Uncertificated Securities Regulations grant the BoE with powers that enable them to carry out their responsibilities, in particular to obtain timely information and induce change. Powers include requesting information, commissioning independent reports, making on-site inspections, approving FMIs' rules, and giving directions. If the BoE's directions are not followed, the BoE also has powers under the FSMA and the 2009 Banking Act to induce change through sanctions, including publishing details of any compliance failures, imposing financial penalties, giving directions, disqualifications, seeking

¹⁰ See CPSS, Central bank oversight of payment and settlement systems, May 2005.

¹¹ See BoE speech 'A New Heart for a Changing Payments System', by Minouche Shafik, January 27, 2016.

appropriate court orders and ultimately closure. The ultimate sanction in relation to a recognized system, CCP, or SSS would be to revoke authorization. To aid its work on governance (and potentially other areas), the BoE expects to use its powers more frequently in the future to either commission independent expert reports into FMIs or to require FMIs themselves to commission such reports.

20. Resources should be strengthened. Resources in the FMID increased in recent years to nearly 65 FTE. However, the recommended work on stepping up the management of system-wide risks of FMIs requires additional staff to conduct quantitative and qualitative analysis in this area, as well as staff to implement a more system-wide approach in daily supervisory activities.

Cooperation in normal and stress circumstances (Responsibility E)

21. Domestic cooperation among U.K. authorities is effective in day-to-day supervision of FMIs. Cooperation in practice functions well, although experience with the PSR is short. Domestic cooperation agreements exist at two levels: (i) an MOU between the BoE, FCA and, where appropriate the PRA, that sets out how they co-operate in relation to the supervision of markets and market infrastructure; and (ii) an MOU between the BoE, FCA, PRA and PSR that sets out how they will cooperate, in relation to payment systems. The MOUs are reviewed annually and subject to a public evaluation. The first annual review of the MOU with the PSR is scheduled for Q2 2016.

22. U.K. authorities have comprehensive sector-wide crisis management arrangements in place that include FMIs and are regularly tested. HM Treasury, the BoE, and the FCA conduct regular industry-wide exercising/testing as a tool to enhance operational resilience of the sector. The exercising program established in 2003, led by the BoE and involving the industry, has delivered six large scale market-wide exercises to exercise collective response to disruptive scenarios.¹² FMIs play an active role in the organization and execution of exercises. Reports with key recommendations are shared with all participants and authorities, which may include the BoE's Financial Policy Committee. Key cooperation mechanisms are:

- The authorities participate in industry exercises to demonstrate their role and sector engagement in a crisis through the Authorities Response Framework (ARF). The ARF is the collective framework to coordinate the authorities and sectors' response to major operational disruption.
- The BoE (ED-Markets) chairs the Cross-Market Business Continuity Group which is a strategic forum of the major firms and FMIs to coordinate the sector's response during a crisis affecting wholesale markets. The key aims of this group are to pool information about the incident and market impacts and to facilitate decisions on workarounds and contingency actions. The Cross-

¹² Crisis scenarios were terrorism (2003–2005), flu pandemic (2006), severe weather (2009) and cyber/payments disruption (2011). Participation in these exercises typically includes FMIs. In 2013, the BoE established a 'sector exercising group' to coordinate and oversee delivery of smaller more targeted, industry led exercises. Recent exercises included Waking Shark cyber desktop exercises (2011 and 2013), Retail Resilience Exercises (2013 and 2014) and an FX settlements (Blackbox) desktop exercise (2015).

Market Operational Resilience Group is an out-of-crisis affiliate to the Cross-Market Business Continuity Group and provides a forum for authorities and market participants, including all FMIs, to identify cross-sector risks, develop crisis management arrangements and test those.

- The ARF and the Cross-Market Business Continuity Group are regularly rehearsed as part of the exercising program with the sector. The composition of the Cross-Market Business Continuity Group has recently been reviewed and will mirror the Cross-Market Operational Resilience Group, to include all FMIs.

23. Day to day cooperation with foreign authorities is streamlined through colleges. The BoE cooperates with a range of foreign authorities in supervising U.K. CCPs, non-U.K. CCPs and non-U.K. FMIs (CLS, Euroclear Bank and SWIFT). Appendix 6 lists the different international cooperation arrangements and authorities involved. Under EMIR Article 18, the BoE is required to set up EMIR colleges for each U.K. CCP. These colleges have a formal role, for example, in deciding upon the initial authorization of a CCP, information sharing and coordinating assessments among European supervisors. The BoE is also chairing global colleges for LCH.Clearnet Ltd and ICE Clear Europe that operate under MOUs and include a wider set of international authorities. A key question for global colleges is how to balance effective coordination structures with inclusion of all relevant authorities.

24. Cooperation agreements with foreign authorities should include cross-border crisis management arrangements, which are regularly tested. The BoE has introduced an ‘emergency protocol’ for each college that details arrangements for sharing information in a crisis and includes a crisis contact lists. More is needed, in particular agreements on how to cooperate and coordinate in different crisis scenarios, such as the simultaneous default of a clearing member in multiple CCPs. A good start has been made with a joint fire drill, agreed with the German authorities, involving a U.K. CCP and a German CCP in February 2016. Testing of such scenarios is important to identify particular cross-border communication issues during periods of market stress and improve the manner in which those are managed. The cooperation among authorities involved in the CCP interoperability arrangements should also develop a crisis management framework given the systemic relevance of the links.

B. System-wide Risks and Interdependencies

25. While the supervision of individual FMIs is well established, further work should be done at the system-wide level. U.K. FMIs operate in an interdependent, interconnected network of financial institutions and markets. It is therefore important to take an additional system-wide perspective in identifying risks that have a systemic nature, and that may not be necessarily identified within the scope of the supervision of individual FMIs.

26. Cybercrime is an example of system-wide risks that the U.K authorities are addressing. In 2013, the Financial Policy Committee recommended that HM Treasury, the PRA, the BoE and the FCA put in place a program to improve and test cyber resilience in close cooperation with the U.K. financial system. Since then authorities have gained insight into the cyber security practices of the U.K. financial sector, including FMIs. Where weaknesses were identified, these have been fed back to

the FMIs in the form of 2015 supervisory Priorities. Firms are encouraged to complete CBEST¹³ tests and adopt individual cyber resilience action plans. They are at different stages in the process, some have completed CBEST, some are undertaking testing and several FMIs are negotiating and agreeing their test scope with the BoE. The BoE is planning to develop a cyber security assessment tool for FMI and PRA supervisors to assess an FMI's cyber risk management capabilities.

27. The BoE's system-wide approach could be further strengthened by increased analysis of interdependencies between FMIs and other financial institutions and markets. Several BoE work streams already capture part of that work. The BoE has installed an internal BoE Risk Forum for FMIs issues to review system wide risks¹⁴ and has established a BoE-wide task force to define a consistent risk appetite and approach to operational resilience in the financial sector. The BoE recently conducted a study on pro-cyclicality effects of margin calls of the largest CCP. Also, the BoE monitors which financial institutions provide critically important services to U.K. FMIs (such as liquidity providers, settlement and concentration banks) and reports this on a regular basis to the BoE Risk Forum. The plan to include CCPs in the BoE's overall stress testing work is welcome.¹⁵ Additional systematic and quantitative analysis is needed to improve the BoE's understanding of contagion channels of credit and liquidity risks, for example:

- Membership of clearing participants in multiple CCPs and other FMIs: Various financial entities participate in more than one CCP. The default of such a participant may cause severe distress to multiple FMIs and markets and may have a knock-on effect on surviving members. The recent EU-wide CCP stress test exercise, under taken by ESMA, confirms that such a knock-on effect is highly plausible. The 2014 results for U.K. CCPs also show, however, that U.K. CCPs are robust to manage multiple (two or more) member defaults in a range of extreme-but-plausible market conditions (Box 2).
- Impact of fire sales: In case of a participant's default CCPs may try to dispose of collateral to cover their losses. If several CCPs try to sell the same type of assets, collateral markets will tend to exhibit high volatility and price peaks.
- FMIs' dependency on banking services of a few U.S. G-SIBs: Although risks are mainly of an operational nature a more explicit understanding of the risks that a failure of these banks pose to FMIs is warranted, for example, by explicit attention to these risks as part of the joint supervision with U.S. regulators and drills pretending the default of one of these G-SIBs.

¹³ CBEST was developed in 2014 by the U.K. financial authorities as a vulnerability test framework which seeks to provide firms and FMIs with tools to conduct intelligence led, controlled cyber security testing. CBEST provides a holistic assessment of a firm's cyber capabilities by testing people, processes and technology in a single test, see <http://www.bankofengland.co.uk/financialstability/fsc/Documents/anintroductiontocbest.pdf>.

¹⁴ Participants are from FMID, the Financial Stability Department and the PRA.

¹⁵ See BOE, 'The Bank of England's approach to stress testing the UK banking system', October 2015.

Cooperation with U.S. supervisors is expected to contribute to the identification and management of these risks.

28. Further de-tiering will help reduce the dependency of FMIs on settlement banks. Tiered participations in FMIs create credit and liquidity exposures between settlement banks and its participants as well as operational dependencies.¹⁶ These risks are recognized by the BoE, which has worked with CHAPS and EUI to turn the largest indirect participants into direct participants.¹⁷ CHAPS Co has also implemented a set of formal tiering criteria to identify which indirect participants should join CHAPS directly. Further de-tiering is needed as dependencies are still high (Table 3). Approximately half of the value of cleared transactions in CHAPS is still from indirect participants.¹⁸ This is expected to fall to approximately 30 percent as banks, which already committed to direct membership, join during 2016.¹⁹ De-tiering helps address (for its part) the too-big-to-fail nature of banks and will bring the U.K. more in line with international practices in, for example, the EU and the U.S., where most banks have direct access to the RTGS system. It will further reduce the dependency of thousands of indirect participants—active in London’s international financial centre—on only a few banks. The BoE has launched a strategic review of the RTGS system. This development could take further de-tiering explicitly into account.

¹⁶ See also IMF FSAP reports on the U.K. of 2003 and 2011.

¹⁷ State Street, and BNY Mellon joined CHAPS in 2014 and EUI enrolled State Street as a settlement bank. However, the program to reduce tiering was delayed following the BoE halting any system changes due to the RTGS outage in October 2014. Subsequently, BNP Paribas joined CHAPS in 2015 and ING, Northern Trust, Société Générale are scheduled to join in 2016/17. BNP Paribas, BNY Mellon and Northern Trust will become CREST settlement banks in 2016.

¹⁸ See ‘2014 CHAPS Co FMI disclosure report’, April 30, 2014.

¹⁹ Source: BoE Quarterly Bulletin, 2013 Q4, page 377

Box 2. ESMA's Stress Tests of CCPs' Interconnectedness¹

In 2015 the European Securities and Markets Authority (ESMA) initiated and coordinated the first annual EU wide stress test exercise for CCPs. The objective of the exercise was to test the resilience of CCPs to adverse market developments and measure the potential for systemic risk. ESMA's stress calculations combined market risk scenarios (historical and hypothetical) with the default of a given number of clearing members or clearing member groups with the highest exposure to CCPs. With regard to the different member default scenarios, the assumptions include the default of the two members with the largest exposures per CCP taking into account the common membership across CCPs and the default of the two groups of members EU-wide with the largest aggregate exposures to EU CCPs and with the largest exposures also weighted by their probability of default.

The 2014 results for EU CCPs, including the four UK CCPs, show that under a combined market risk scenario and clearing member default scenario, CCPs would be able to cover losses resulting from the default of the top two EU-wide clearing member groups combined with historical and hypothetical market stress scenarios with prefunded resources. The ESMA methodology results in scenarios that involve at least two and a maximum of 22 defaulting clearing members per CCP. The prefunded levels of the waterfall (initial margin, guarantee fund and CCPs' "skin in the game") would almost always be sufficient to absorb the losses. Only under the most extreme hypothetical market risk scenarios would one or more CCPs have to use their powers of assessment to obtain non-prefunded resources, such as a replenishment of the guarantee funds. And only in the most severe of those scenarios would powers of assessment be insufficient to cover losses, eventually requiring the activation of recovery plans.

One limitation of the ESMA exercise is that it is not possible to gauge directly the degree of severity and plausibility of the combined market/default scenario, because the scope of the exercise was limited to stressing CCPs' exposures. As the assumed defaults are not driven by the market shocks themselves but by the ranking of exposures, in a situation where the adverse scenario actually materialized, the number of defaults could be larger or smaller than the two largest members per CCP.² To make the assumptions on the defaults completely consistent with the market scenario, CCPs' clearing members should in principle be stress-tested against that scenario. In the case of the U.K., this would require running a joint stress test involving the four CCPs and their U.K. clearing members; modeling the interconnections between clearing members both through their common participation in different CCPs and through direct inter-bank exposures; and assessing the impact of the market risk scenario on the capacity of non-defaulting clearing members to provide non-prefunded resources to the CCP.

¹ See ESMA, Report EU-wide CCP Stress test 2015, April 29, 2016, 2016/658.

² It should be noted that in ESMA's exercise the simultaneous default of the two largest members per CCPs lead to a significant number of simultaneous defaults and also the scenario considering the two largest European groups effectively results in more than two defaults per CCPs for many CCPs.

Table 3. United Kingdom: Level of Tiering in the Payment Arrangements of Different U.K. FMIs (December 2014)

FMI	Direct participants	Indirect participants
CHAPS	22	7,100
EUI	16 settlement banks	219 users and 23,000 participants
Bacs	16	314 agency banks; 1,268 bureaux and 122,000 users
FPS	10 members and 1 agency	400 indirect agencies
LCH.Clearnet Ltd ¹	17	163 (ranging from 38–98 per segment)
ICE Clear Europe	9	81
LME Clear	10	43
CME Clearing Europe	5	18

Source: BoE Annual Report Supervision of FMIs, March 2015; statistics individual FMIs.

¹ For the 4 U.K. CCPs the information in the table relates to their payment and not clearing arrangements.

29. With regard to CCPs, settlement in central bank money should be pursued to reduce CCPs' risk exposures to settlement banks acting within the embedded payment systems. The BoE provides CCPs with access to its balance sheet and to settlement in central bank money through the Sterling Monetary Framework and provision of concentration bank accounts; this has reduced the dependencies of CCPs on commercial banks. Despite this, CCPs are still dependent on commercial banks for the operation of their embedded payment systems. Box 3 outlines the functioning of the embedded payment systems of CCPs. CCPs apply various risk management practices to reduce their exposures to settlement banks, such as setting minimum criteria for settlement banks and establishing payment deadlines; and recent rule changes, which introduced Extended Member Liability, meaning that CCPs do not incur credit exposures to payment banks intraday. All transfers, subject to certain conditions, are deemed final and therefore irrevocable.²⁰ The risk cannot be excluded, however, that a settlement bank, within the embedded payment system, will default, creating potentially significant operational and financial stress for CCP members. In line with the PFMI, settlement should be in central bank money when practical and available. CCPs should therefore take actions to increase the number of payments that settle entirely in central bank money using the HVPS. These benefits would be obtained by reducing tiering in the embedded payment systems and increasing the proportion of bilateral payments between members and the CCP. A key requirement would be increased membership of the HVPS by CCP members, under the condition that members have sufficient capacity to do so safely. In addition, CCPs themselves should become a member of the HVPS. Central bank provision of concentration accounts already ensures that payments settle in central bank money, but direct membership may reduce operational risk. At

²⁰ The CCPs' embedded payment systems are designated by the BoE as a Designated System under the Settlement Finality Regulations.

the time this report was drafted, the BoE was preparing to launch a strategic review of RTGS. The development of a potential new RTGS system could take further de-tiering explicitly into account.

30. The step of the BoE to provide CCPs with liquidity support through access to the Sterling Monetary Framework is welcome and appropriate. CCPs already had access to sterling concentration accounts at the BoE, which protect CCPs against the default of a commercial bank by allowing them to collect participants' sterling cash collateral at an account intraday with the BoE rather than a commercial bank.²¹ The BoE announced in 2014 that it will allow EMIR-authorized CCPs in the European Economic Area (EEA) (and ESMA-recognized CCPs established outside the EEA), operating in U.K. markets, to participate in its Sterling Monetary Framework. Furthermore, access to Operational Standing Facilities will help CCPs to manage unexpected sterling payment shocks. Third, CCPs will have access to sterling liquidity insurance via the Discount Window Facility in order to backstop CCPs' own management of their liquidity risk. Although private sector liquidity must constitute the first line of defense for CCPs against liquidity shortfalls, in a way that ensures that a CCP has adequate liquidity self-insurance, there could be extreme circumstances in which a CCP's liquid resources turn out to be insufficient or unavailable. In that case, access to central bank liquidity can provide an ultimate backstop arrangement.

31. The BoE considers it important for the safety and soundness of CCPs that it be able to provide access to liquidity arrangements in other currencies they clear. One potential source of foreign currency for the BoE to provide such support is the network of central bank swap lines. For example, the BoE announced on 29 March 2015 that its standing swap line with the European Central Bank could be used, should it be necessary and without pre-committing to the provision of liquidity, to facilitate the provision of multi-currency liquidity support to CCPs established in the U.K. and euro area.

32. A more systematic approach towards the estimation of the contingent draw on central bank liquidity that these arrangements imply could be established.²² The BoE has made calculations of the CCPs' liquidity needs in extreme circumstances to better understand the impact of potential liquidity support on the BoE's reserves. Further development of these calculations should include the liquidity needs of other CCPs, including eligible non-U.K. CCPs with potentially high liquidity needs. It would also be useful to estimate potential liquidity needs in other currencies, in particular those that are not covered through the network of central bank swap-lines.

²¹ Before investing cash collateral in line with their policies.

²² See also the FSAP 2016 Technical Note on Systemic Liquidity.

Box 3. Embedded Payment Systems of CCPs

All four U.K. CCPs operate their own embedded payment system.¹ The basic structure of these four systems is very similar, with cash flowing from a settlement bank to a concentration bank and on to an investment agent before being secured in the market. CCPs use an embedded payment system to transfer margin and to make and receive payments for final settlement. A CCP's embedded payment system is not a physical system but rather a collection of bank accounts governed by specific rules and legal protections. The reconciliation of net cash flows between settlement banks are conducted in RTGS systems for different currencies, for example, CHAPS for GBP or Fedwire for USD.

Settlement bank: The CCP approves several commercial banks to become settlement banks. The CCP has at least one account with each of these banks. Clearing members must hold an account with any one of these banks and need to ensure this is sufficiently funded to meet margin payments. The CCP has standing instructions to receive and make payments from these accounts that, as a result of Extended Member Liability, do not face intraday credit exposure to their settlement banks.

Concentration bank: Once all payments are received at and made from each settlement bank, net balances are transferred to the CCP's concentration account. CCPs have different concentration banks for different currencies with the BoE performing the role of sterling concentration bank.

Investment agent: The investment agent secures the funds in the market via reverse repos or outright security purchases. This function can either be in-house (LCH.Clearnet Ltd) or outsourced to a commercial bank.

Source: BoE.

¹ LCH.Clearnet Ltd: Protected Payment System (PPS); ICEU: Assured Payment System (APS); LMEC: Secure Payment System (SPS); CMECE: No own name—referred to as embedded payment system.

C. Recovery and Resolution

33. The U.K. is well ahead of most advanced economies with the development and implementation of recovery plans for FMIs. The regulatory framework requires CCPs to develop recovery plans and have loss-allocation rules for losses arising from a clearing member default and for investment losses.²³ U.K. CCPs implemented a first draft of their recovery plans by February 1, 2014, which have been subject to ongoing development since then. The CSDR requires EUI to develop a recovery plan prior to authorization although the BoE has already required EUI to develop one. There is no specific regulatory framework for payment systems to develop recovery plans. Nevertheless, the payment systems, together with the BoE, have been working to further developing recovery plans in line with international guidance.

34. The U.K. is spearheading international efforts in developing resolution planning for CCPs. The BoE is the only resolution authority responsible for CCPs, although the BoE must consult with HM Treasury and FCA, if applicable, whether certain conditions are met to determine whether a

²³ The BoE does not expect U.K. CCPs to introduce loss-allocation rules for non-default losses other than investment losses. The BoE is of the opinion that losses relating to general business risks are the responsibility of the owners of the FMI' and should be managed through other recovery tools, such as capital-raising, or insurance agreements.

CCP enters into resolution.²⁴ Part 8 of Financial Services Act of 2012 and secondary legislation give powers to resolve a failing CCP through the transfer of property to either a private sector purchaser or a bridge CCP owned by the BoE, or to transfer ownership of a CCP to any person. Under the statutory trigger, it is possible for a CCP to be placed into resolution before recovery tools are exhausted. The resolution regime does not confer on the resolution authority any specific loss-sharing powers for CCPs. U.K. authorities are now awaiting international consensus before further progressing with the resolution framework for FMIs. An EU legislative proposal on CCP recovery and resolution is expected in 2016.

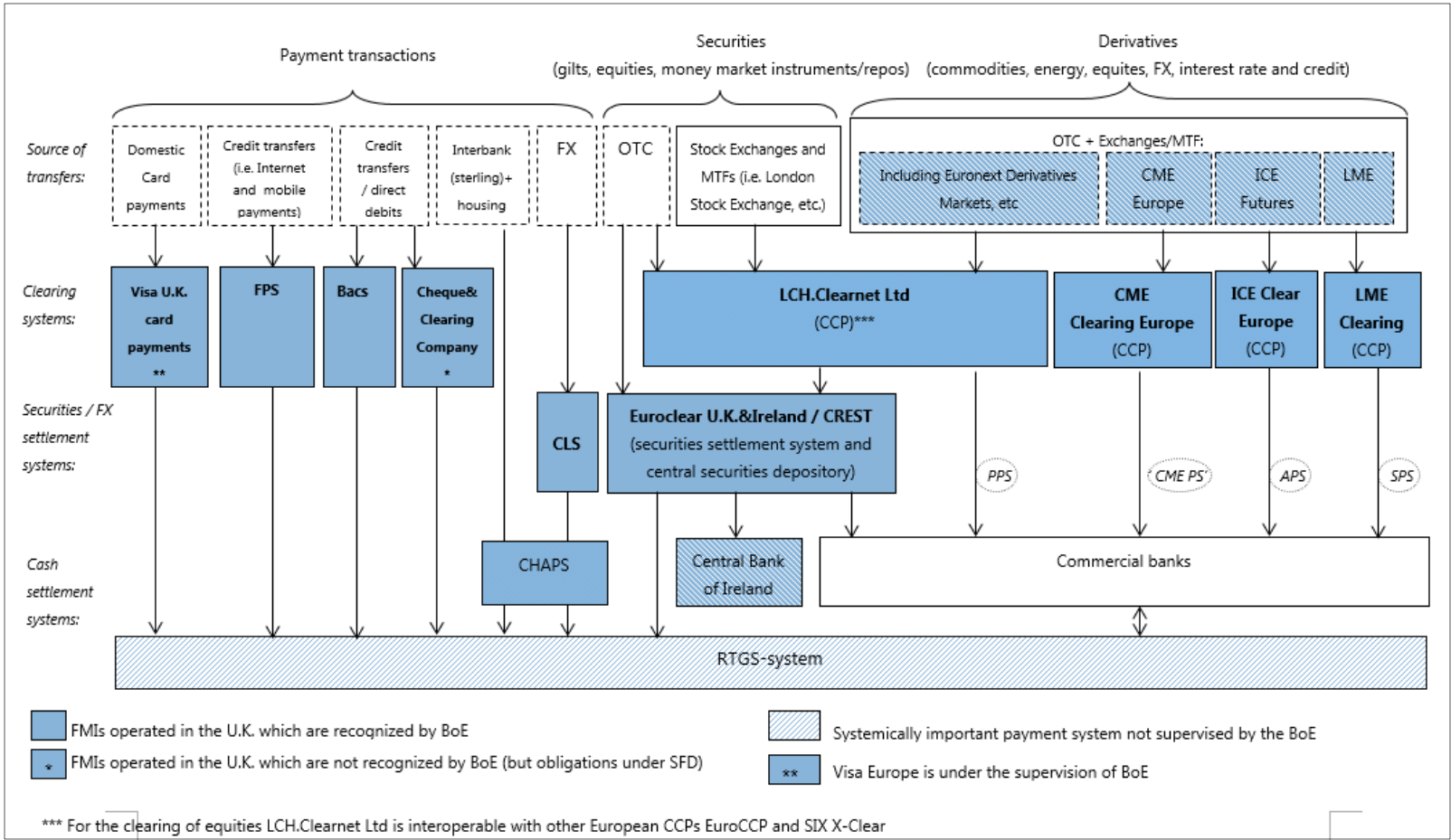
35. Resolution planning for payment systems and securities settlement systems is less developed. A Special Administration Regime for recognized interbank payment systems, operators of securities settlement systems (under the Uncertificated Securities Regulations) and firms, which have been designated as their CSPs, has been established by Part 6 of the 2013 Financial Services (Banking Reform) Act. Secondary legislation has yet to be made. Under this regime, the FMI administrator would be required to prioritize the continuation of services over maximizing returns to creditors. The BoE would appoint and have power of direction over the FMI administrator.

36. The global importance of LCH.Clearnet Ltd warrants additional arrangements for communication, cooperation, and information-sharing with authorities that are not represented in the CMG, but whose jurisdictions may potentially be systemically impacted by a default of LCH.Clearnet Ltd. The BoE has organized the first CMG for LCH.Clearnet Ltd authorities. Membership reflects an appropriate balance between efficiency and inclusiveness, and therefore not all authorities with an interest can participate. Given the systemic presence of LCH.Clearnet Ltd, and potentially other CCPs in the U.K., in other jurisdictions, it is important to give non-CMG authorities access to resolution plans and information on measures that could have an impact on their jurisdiction.²⁵ Clearing members of LCH.Clearnet Ltd from other jurisdictions would be exposed to the unlikely—but not impossible—failure of the CCP, and could thus be confronted with residual losses through loss-sharing arrangements or other recovery and resolutions tools. To that end, the BoE as the home jurisdiction of U.K. CCPs, should introduce processes for communication, cooperation, and information-sharing with those jurisdictions that are not members of the CMG but have an interest, subject to adequate confidentiality safeguards.²⁶ The BoE has already agreed to do this for members of the LCH.Clearnet Ltd supervisory college, but should consider arrangements for other relevant authorities.

²⁴ HM Treasury published the Code of Practice, which includes specific guidance for the entry of CCPs into resolution. The statutory criteria are: (i) The CCP is failing or likely to fail; (ii) not reasonably likely action will be taken by CCP to enable CCP to maintain continuity of critical services; and (iii) Condition 1 treated as met if it would be met but for the possible withdrawal of critical clearing services by CCP.

²⁵This is in line with KA 8.1 of the FSB Key Attributes of Effective Resolution Regimes for Financial Institutions, 15 October 2014.

²⁶ See FSB, Guidance on Cooperation and Information Sharing with Host Authorities of Jurisdictions, where a G-SIFI has a Systemic Presence that are Not Represented on its CMG, November 2015.



Appendix I. FMI Landscape in the U.K.

Appendix II. Overview of Risk Management Practices of Main U.K. FMIs²⁷

Large value payment systems—CHAPS

37. CHAPS is the high-value payment system in the U.K., providing real-time gross settlement for sterling transactions. There are currently 22 direct members of CHAPS (including the BoE and CLS Bank). Direct members operate as correspondent banks for other banks, processing payments on their behalf. Although CHAPS is designed primarily for high-value payments, there is no lower (or upper) limit on the value of payments. It handles nearly all large-value same-day sterling payments between banks, with a small part is settled by Bacs and FPS. Some retail transactions such as house purchases also go through CHAPS. Payments are made in real time and are irrevocable and final at the point at which the relevant member's settlement account is debited. Members are allowed to use balances held with the BoE on their reserve accounts to fund payments. If members require further liquidity, the BoE provides collateralized intraday liquidity.

38. CHAPS is operated by CHAPS Clearing Company Limited (CHAPS Co), whereas the infrastructure is provided by the BoE. A MOU between the BoE and CHAPS Co sets out the services which the RTGS system will provide as well as the service levels expected. The CHAPS Company is member-owned, with each member holding one share in the company (Table 6).

39. Operational risk is limited through a second and third backup site. If the RTGS were to become inoperable at both its primary and recovery site for a substantial period of time, the Market Infrastructure Resiliency Service offers the main contingency option, with final settlement in real time on a transaction by transaction basis. MIRS is developed by SWIFT and implemented by the BoE in 2014. Soon after, on October 20, 2014, the RTGS system suffered an outage of approximately nine hours. A decision was made not to use MIRS, because the problems could be solved on the same day without reverting to MIRS. The payment system was ultimately able to settle all payments on the same day, thereby limiting the impact on financial stability, but the outage affected housing transactions due to be settled on that day.²⁸ Based on lessons learned the BoE is improving its internal crisis management as well as contingency plans and backups, among others.²⁹

40. Liquidity risk is the most prevalent form of financial risk associated with CHAPS. In April 2013, the BoE introduced a Liquidity Saving Mechanism to the RTGS system for CHAPS payments. The Liquidity Saving Mechanism has reduced CHAPS banks' intraday liquidity requirements by around 20 percent (or GBP 4 billion) through settling underlying payments

²⁷ The information in this annex benefited from the CPSS Red Book 'Payment, Clearing and Settlement Systems in the U.K.', 2012, in combination with updated information on Internet and discussions with FMIs and the BoE.

²⁸ Up to 30 percent of housing transactions may not have completed on the day.

²⁹ An independent study concluded that design defects, as well as weaknesses in the testing regime and governance of the system caused the incident, see Deloitte, 'Independent Review of RTGS Outage on October 20, 2014', March 23, 2015.

simultaneously.³⁰ This simultaneous settlement of obligations increased operational risk slightly, as there is a small period between the point that most CHAPS payments are submitted to the RTGS infrastructure and when they are settled. Whilst this ‘queuing’ of payments is a well-established practice which allows the delivery of liquidity benefits it presents a limited risk that, in the event of an interruption to the service, it will be necessary to identify whether or not settlement had occurred for payments between these two points in the payment process. In turn the impact of switching from using the principal infrastructure to the contingency solution increased.

Retail payment systems—Bacs, FPS and Visa Europe

41. Bacs, operated by Bacs Payment Schemes Limited, processes high volume, lower value retail payments in sterling. Bacs is the U.K.’s largest retail payment system by volume, providing automated clearing house services for salary payments, credit transfers and direct debits. The interbank obligations that arise in Bacs are settled at the BoE on a multilateral net basis on day 3 of the clearing cycle. Sixteen financial institutions are members of Bacs, including the BoE and one building society. Direct members are able to sponsor other organizations as indirect users of the Bacs payment system.

42. FPS, operated by Faster Payments Scheme Limited, is a near real-time system, used primarily for low-value immediate payments; in particular standing orders and electronic retail transactions, including transactions generated in internet, mobile and telephone banking. At present 10 financial institutions are direct members. FPS has the functionality to allow other participants, sponsored by a direct member, to input transactions directly into the central processing infrastructure; the direct member remains responsible for end-of-cycle settlement with other members. FPS also has a program underway to extend its direct membership. FPS is a multilateral deferred net settlement system. There are three interbank clearing cycles each working day, settling at 07:15, 13:00 and 15:45. Settlement occurs across accounts held by direct members in the RTGS system at the BoE.

43. Bacs and FPS recently introduced ‘prefunding’ to eliminate settlement risk in their deferred net settlement payment systems. Settlement risk, the risk that another member does not settle its transactions, is eliminated in Bacs and FPS by requiring that members fully cover their net obligations, before settlement, with cash held at the central bank. A net cap is specified per participant to ensure that exposures do not exceed the prefunded amounts. Each member is required to back its net obligation to other members with cash held at the central bank. This goes beyond the PFMI’s recommendation by covering the failure of all participants and their affiliates and not just the largest two.

44. Bacs and FPS both manage operational risks through supplier assurance controls. As part of their risk management framework they regularly assess the risks posed by their suppliers, in

³⁰ Nick Davey, Daniel Gray, ‘How has the Liquidity Saving Mechanism reduced banks’ intraday liquidity costs in CHAPS?’, Bank of England Quarterly Bulletin 2014 Q2.

particular Vocalink (IT infrastructure), the RTGS system (settlement) and U.K. Payments Administration (HR, Finance and IT).

45. VISA Europe was recognized by HM Treasury as a systemically important payment system in March 2015. Since then it is subject to supervision by the BoE.

Table 1. United Kingdom: Governance Structures of Main U.K. FMIs

U.K. FMI	Operated by	Ownership
CHAPS	CHAPS Clearing Company (CHAPS Co). Infrastructure is provided by the BoE.	The CHAPS Company is owned by its members (22 banks in October 2015), each member holding one share in the company.
Bacs	Bacs Payment Schemes Ltd	Bacs Payment Schemes Ltd is owned by its members.
FPS	Faster payments Schemes Ltd	Faster payments Schemes Ltd is owned by its members.
Visa Europe	Visa Europe	Owned by its members ¹
LCH.Clearnet Ltd	Owned by Paris based LCH.Clearnet Group Ltd.	LCH.Clearnet Group Ltd is majority owned by the London Stock Exchange, with the remainder being owned by its users and other exchanges. The London Stock Exchange is a publicly listed company.
ICE Clear Europe	Intercontinental Exchange.	Publicly listed company on the New York Stock Exchange
CME Europe	Owned by the CME Group.	Publicly listed company
LME	Owned by the Hong Kong Exchanges and Clearing Ltd	Publicly listed company in Hong Kong
EUI	Owned by Euroclear SA/NV with EUI, Euroclear France, Euroclear Nederland, Euroclear Sweden, Euroclear Finland, Euroclear Belgium and Euroclear Bank as its subsidiaries.	Euroclear Plc, which owns Euroclear SA/NV is a U.K.-registered private company owned by around 200 user-shareholders, mainly major banks and brokers

Source: CCPs.

¹Owned by its members.

CCPs: CME Clearing Europe, ICE Clear Europe, LCH.Clearnet Ltd and LME Clear

46. The U.K. CCPs generally clear different products and markets, although there is competition in certain segments. LCH.Clearnet Ltd is the largest CCP worldwide for OTC traded IRS contracts and also clears other types of OTC derivatives contracts as well as gilt and Bund repos (Table 7). It also clears equity transactions for the London Stock Exchange. ICE Clear Europe Limited is large in European corporate and sovereign CDS as well as exchange-traded derivatives traded on ICE Futures Europe. LME Clear clears LME traded non-ferrous metal derivatives. CME Clearing

Europe Limited clears a range of OTC and exchange-traded derivatives and spot commodities contracts.

47. All CCPs are exposed to credit and liquidity losses following the potential default of a participant. To reduce this risk they have the following lines of defense:

- The CCPs set and monitor participation requirements for clearing members. The requirements include minimum levels of financial resources and creditworthiness, and adequate operational capacity. Requirements vary depending on the type of membership and the markets/products cleared. For example, ICE Clear Europe sets additional requirements for CDS clearing members.
- The CCPs calculate initial margin and variation margin on all positions they clear using different margin methodologies that are tailored to the risk characteristics of the market cleared. For example, LCH.Clearnet Ltd uses the SPAN methodology for exchange-traded derivatives and proprietary methodologies for interest rate swap products. All cleared positions are subject to a mark to market variation margin on at least a daily basis. CCPs can make intraday margin calls. Margin models are regularly back tested.
- Margin payments are done in accordance with the CCPs' list of eligible collateral. All CCPs accept only high quality collateral, such as cash, in a set of internationally eligible currencies, or in government bonds. Typically, variation margin must be covered fully in cash. LCH.Clearnet Ltd accepts only cash as contributions to default funds.
- Clearing members are obliged to make minimum contributions to the guarantee fund. ICE Clear Europe maintains two separate guarantee funds: one for futures and options and one for CDS. These mutualize losses under extreme market scenarios. LCH.Clearnet Ltd holds six different default funds for different markets that it clears. The result of segregated default funds is that financial contributions of non-defaulting participants in other services cannot be utilized to meet losses arising from the default of participants in one specific service. Further, this segregation provides for the continuation of other services should any single service close.
- All CCPs provide skin in the game. LCH.Clearnet Ltd places a portion of its own resources, an amount equal to 25 percent of its minimum net capital held in accordance with EMIR, ahead of all non-defaulting members' contributions to the mutualized default funds. ICE Clear Europe has committed USD 100 million as 'skin in the game' for its Futures and Options segment. For its CDS segment, ICE has lined up USD 25 million ahead of all non-defaulting members' contributions to the CDS default fund and contributed another USD 25 million to the CDS guarantee fund.³¹
- The default funds are sized to cover at a minimum the sum of the two largest members' stress-test losses (including the stress-test losses of their affiliates and clients) in excess of margin. Stress losses on each clearing member's positions, including those of its clients and affiliates, are

³¹ See ICE Clear Europe Compliance with Principles for Financial Market Infrastructure, Disclosure, November 2015.

modeled each day against the set of extreme but plausible stress scenarios. In addition, reverse stress testing is carried out to examine the stress testing results to determine whether there exists a combination of more than two members defaulting under the same scenario which would result in the default fund being exhausted.

48. To manage liquidity risks the CCPs carry out daily stress tests. For example, LCH.Clearnet Ltd models its liquidity out to 30 days to ensure sufficient liquidity to cover ongoing operations while simultaneously withstanding the default of the two participant groups that would give rise to the largest first day liquidity requirement. The size of the liquidity requirements are calculated for all relevant currencies. LCH.Clearnet Ltd's primary liquid resources consist of cash and highly marketable securities (including those provided by a defaulted member as collateral). As of June 30, 2015, LCH.Clearnet Ltd had prearranged funding arrangements with 27 counterparties, including counterparties with particular expertise and capacity in specific collateral markets. LCH.Clearnet Ltd engages in reverse repurchase transactions for investment purposes, and has a regular program of test repurchase (i.e. borrowing) transactions, which are reported through the risk governance process. LCH.Clearnet Ltd also has prearranged funding arrangements with major international CSDs.

49. LCH.Clearnet Ltd manages interoperability risks through additional margin. A Master Clearing Link Agreement is in place between LCH.Clearnet Ltd and each of the interoperable CCPs, i.e. EuroCCP and SIX x-clear. Under the agreement, interoperable CCPs are subject to the same risk management framework as clearing members and as such the CCPs have the right and ability to call additional margins, including concentration and liquidity margins of interoperating CCPs as well as intra-day margins. LCH.Clearnet Ltd models interoperable CCPs as a clearing member for the purposes of calculating the daily stress testing to a Cover 2 standard for liquidity purposes and to size the default fund. Collateral provided by interoperable CCPs is held via a pledge agreement with Clearstream Banking Luxembourg. At least on an annual basis, LCH.Clearnet Ltd assesses its interoperating CCPs' risk profiles, based on: (1) return on equity ratio; (2) external ratings; (3) initial margin/default fund ratio; (4) confidence interval of margin models; (5) whether default resources are cover 1 or cover 2; and 6) operational capability/business strategy (including the CCP's membership and other risks).

EUI

50. EUI operates the CREST system, which is the only SSS established in the U.K. The CREST system supports securities settlement for U.K. and Irish equities as well as corporate bonds, government debt, money market instruments and exchange traded funds. As regards the U.K., the Uncertificated Securities Regulations only allow the settlement within the CREST system of securities constituted under English, Scottish or Northern Irish laws. However, under a multi-jurisdictional model, securities constituted under Irish, Jersey, Guernsey and Isle of Man laws are also capable of being settled within the CREST system pursuant to the laws of those jurisdictions.

Table 2. United Kingdom: Products and Markets Cleared by U.K. CCPs

FMI	Markets	Products
LCH.Clearnet Ltd	LSE, NYSE Euronext, SIX Swiss Exchange, BATS CHI-X and other exchanges and MTFs	Equities and equity-like products such as ETFs
	NASDAQ OMX NLX, LSE Derivatives Markets	Listed Derivatives
	OTC markets for IRS ('Swapclear'), supporting venues such as Bloomberg, ICAP, MTS, Tradeweb and others	Interest rate swaps in 17 currencies
	OTC markets for government securities and repos ('Repoclear'), supporting venues such as MTS and BrokerTec	Government securities and repos
	OTC markets for FX ('ForexClear'), supporting venues such as Bloomberg and MarkitServ	Non-deliverable FX forwards in 11 currency pairs
	Baltex, other exchanges and OTC markets	Commodities
ICE Clear Europe Ltd	ICE Futures Europe, ICE Endex and ICE Futures U.S.	Energy derivatives
	ICE Futures Europe and LIFEE A&M	Financial derivatives
	OTC markets	European single name and index CDS contracts Oil, gas, coal and electricity futures and options
CME Clearing Europe	OTC markets	Interest rate swaps Commodity derivatives
	CME	Commodity derivatives FX futures
LME Clearing	LME	Ferrous, non-ferrous and minor metals
	OTC markets	Precious metals (not active yet)

Source: Websites CCPs.

51. CREST is important for the BoE's monetary policy operations. The BoE uses CREST to receive collateral to support its monetary policy operations and provide intraday liquidity to eligible RTGS members. CREST also acts as the U.K. Debt Management Office's settlement agent for the issuance and management of U.K. gilts and Treasury bills in CREST.

52. EUI is part of the Brussels based Euroclear Group. Parent company Euroclear SA/NV provides and supports the technical CREST services for EUI. On its turn EUI is the U.K. regulated body and the Board of Directors of EUI is responsible for providing the CREST services to the U.K.

and Irish markets. EUI's International Service enables CREST members to hold and settle transactions in foreign securities through links with other CSDs.³²

53. EUI's delivery-versus-payment (DVP) settlement significantly reduces credit and liquidity risks, although a residual credit risk remains for U.S. dollar settlements. EUI settles sterling and euro transactions on a gross delivery versus payment basis (DVP model 1) in central bank money with simultaneous and irrevocable transfer of cash and securities. For U.S. dollar settlements the CREST system provides DVP model 2 settlement in commercial bank money. U.S. dollar transactions are settled in the CREST system during the settlement day. However, CREST settlement banks discharge their net bilateral US dollar payment obligations at the end of the day outside the CREST system. This results in a residual interbank credit risk which accounts for 1.3 percent of EUI's cash settlement, which is not compliant with the PFMI or the CSD Regulation.

54. A limited number of settlement banks are used for cash settlement in the RTGS system. EUI has 16 settlement banks that have to comply with access criteria set out in the CREST Rules. A buyer of securities will have to use a settlement bank for the settlement of its cash leg in the RTGS system. CREST settlement banks are contractually bound to settle debts incurred in the CREST system by their customers. The settlement banks provide their customers with intraday credit in the CREST system, limiting their own exposure by setting up debit caps within the system; EUI itself provides no credit facilities. The debit cap represents the maximum debit position that a settlement bank is willing to assume for a given customer and is a combination of unsecured credit and secured credit advanced in return for a charge over securities held by their customer in the CREST system. To increase the supply of intraday sterling liquidity available to the settlement banks, EUI and the BoE support demand-driven auto-collateralization repo arrangements whereby a purchasing CREST member may use eligible securities (mainly U.K. government securities) in the course of settlement to generate intraday sterling liquidity for its settlement bank.

55. Operational risks are mitigated through an operational risk management framework that includes business continuity plans. The policy for managing operational risk is set by the board of the parent company Euroclear SA/NV. Systems, policies, procedures, and controls are in place to identify and manage various types of operational risk. The business continuity framework describes roles, responsibilities and objectives for the timely resumption of critical operations. Euroclear has three data centers, of which two are nearby data centers that provide real-time synchronized data mirroring. The third data center is located hundreds of kilometers away from the two synchronized sites and should allow for recovery in the event of a regional disaster that affects the two other data centers. It receives asynchronously replicated data.

³² See Disclosure Framework Observance by Euroclear UK & Ireland of the CPSS-IOSCO Principles for Financial Market Infrastructures, May 2015.

Appendix III. Statistics of U.K. FMIs

**Table 1. United Kingdom: Average Size of Initial Margin and Default Fund
(GBP equivalent, millions)**

CCP	Segment	Initial margin	Default fund	Total
CME Clearing Europe		16	135	151
ICE Clear Europe	Credit default swaps	4,492	876	5,368
	Futures and options	17,593	974	18,567
LCH.Clearnet Ltd	Commodities	527	147	674
	Equities	642	185	827
	ForexClear	136	202	338
	Listed Interest Rate	6	16	22
	RepoClear	8,382	793	9,175
	SwapClear	21,003	2,577	23,580
LMC Clear		5,487	391	5,878

Source: BoE Annual Report Supervision of FMIs, March 2015.

**Table 2. United Kingdom: Daily Average Volume and Value of Transactions Settled by
Recognized Payment Systems**

FMI	Currency	Volume 2014	Change (in percent) 2014/2013	Value 2014 (GBP equivalent, mIn)	Change (in percent) 2014/2013
Bacs	Sterling	23,087,866	3	17,473	5
CHAPS	Sterling	144,352	4	268,615	-3
CLS	All currencies	790,346	0	3,101,570	-3
	Sterling	56,521	6	236,564	-3
EUI	Sterling	181,329	1	675,678	-18
	US dollar	5,244	31	1,356	38
	Euro	4,139	14	650	15
	Total EUI	190,712	1	677,684	-18
FPS	Sterling	4,351,502	14	3,572	17

Source: BoE Annual Report Supervision of FMIs, March 2015.

Appendix IV. Relevant Acts for the Supervision of U.K. FMIs

Law	Scope	Authority	FMIs
Banking Act 2009	An FMI which also operates an interbank payment system may be recognized by HM Treasury and supervised by the BoE under Part 5 of the Banking Act 2009. Recognition criteria are set out in section 185 of the Act.	BoE, HM Treasury	Bacs, CHAPS, CLS, CREST, LCH.Clearnet Ltd, FPS, ICE Clear Europe, Visa Europe
Financial Services and Markets Act 2000 (FSMA)	Section 285 of the FSMA 2000 defines two types of recognized clearing house (RCH) that are eligible under the Act, a CCP and a clearing house which provides clearing services in the U.K., without doing so as a central counterparty (typically a SSS). Recognition requirements for SSS are in Parts 3 and 4 and for CCPs in Parts 5 and 6 of FSMA 2000 Regulations 2001.	BoE	CME, CME Clearing Europe Ltd, EUI, ICE Clear Europe Ltd, ICE Clear U.S. Inc., LCH.Clearnet Ltd, LME Clear Ltd, SIX x-clear ¹
Uncertificated Securities Regulations 2001	In order to operate a securities settlement system which supports the electronic transfer of title to U.K. securities the operator of the SSS must be approved by the BoE under the Uncertificated Securities Regulations 2001. The operator must satisfy requirements of the 2001 Regulations.	BoE	EUI
EMIR	Provides for the regulatory and supervisory framework for CCPs, and includes authorization and ongoing requirements for CCPs, as well as requirements for authorities of CCPs. Level 2 regulation is provided in Regulatory Technical Standards.	BoE, National Competent Authorities, ESMA	CME Clearing Europe Ltd, LCH.Clearnet Ltd, LME Clear Ltd
CSD Regulation	Provides for the regulatory and supervisory framework for SSS and CSDs, and includes authorization and ongoing requirements for CSDs and SSS, as well as requirements for their authorities. ²	BoE, National Competent Authorities, ESMA	EUI
Settlement Finality Directive (SFD)	Contains provisions to reduce the risk linked to the insolvency of a participant of FMIs. System rules of a system designated under the SFD in relation to the irrevocability of payments and finality of settlement, and the provision of/enforcement of collateral are protected against challenge by insolvency practitioners.	BoE	Bacs, CME Clearing Europe Ltd, CHAPS, CLS, CREST, FPS, ICE Clear Europe, LCH.Clearnet Ltd, LME Clear Ltd, SIX x-clear, Cheque and Credit Clearing Company

Source: BoE.

¹ CME, ICE Clear U.S. and Six x-clear are Recognized Overseas Clearing Houses, however, that status will fall away once a decision is taken by EMSA on their recognition under EMIR.

² Technical standards mandated by the CSDR were published for consultation by the European Securities and Markets Authority (ESMA) in December 2014 and by the European Banking Authority in February 2015.

Appendix V. CPMI-IOSCO Implementation Monitoring Assessment Results for the U.K.

CPMI-IOSCO Implementation Monitoring Level	Assessment results for the U.K.	Publication
Level 1 - Assess whether a jurisdiction has completed the process of adopting the legislation and other policies that will enable it to implement the principles and responsibilities;	The U.K. jurisdiction has the highest ratings in all categories, meaning that final implementation measures are in force for all types of FMIs, both for the Principles as well as the Responsibilities.	CPMI-IOSCO 'Implementation monitoring of PFMI: Second update to Level 1 assessment report', June 2015
Level 2 - Assess whether the content of new legislation and policies is complete and consistent with the principles and responsibilities;	Certain gaps and inconsistencies were found for the EMIR framework for CCPs. However, when the oversight framework for eight European countries, including the U.K., is layered on top of the EMIR framework, it is able to bridge the identified gaps and move to the highest rating 'consistent' for those countries.	CPMI-IOSCO 'Implementation monitoring of PFMI: Level 2 assessment report for central counterparties and trade repositories – European Union', February 2015
Level 2/3 - Assess whether the content of new legislation and policies are complete and consistent with the responsibilities and implemented by the authorities;	The BoE is assessed to observe all responsibilities.	Draft CPMI-IOSCO 'Assessment and review of application of Responsibilities for authorities', September 2015

Source: CPMI-IOSCO Implementation monitoring publications.

Appendix VI. Cooperation Agreements Between U.K Authorities and Foreign Authorities

U.K. FMI	Type	U.K. authorities	Other authorities
CME Clearing Europe	EMIR college	BoE–FMID (chair), PRA, FCA	ESMA, European authorities
ICE Clear Europe Ltd	EMIR college	BoE–FMID (chair), PRA, FCA	ESMA, European authorities
ICE Clear Europe Ltd	Global college	BoE–FMID (chair), PRA, FCA	ESMA, 8 global authorities
LCH.Clearnet Ltd	EMIR college	BoE–FMID (chair), PRA, FCA	ESMA, European authorities
LCH.Clearnet Ltd	Global college	BoE–FMID (chair), PRA, FCA	ESMA, 13 global authorities
LME Clear	EMIR college	BoE–FMID (chair), PRA, FCA	ESMA, European authorities
EUI	Bilateral MOUs	BoE–FMID	Central Bank of Ireland, Guernsey Financial Services Commission, Jersey Financial Services Commission and the Isle of Man Financial Supervision Commission.
CHAPS	Bilateral MOU	BoE–FMID	ECB
LCH.Clearnet Ltd	Exchange of letter on interoperability	BoE–FMID	Dutch and Swiss authorities
LCH.Clearnet Ltd	Co-operation agreement covering LCH Ltd and LCH SA	BoE–FMID	The BoE, Banque de France, ACPR and AMF

Non-U.K. CCP	Type	U.K. authorities	Other authorities
AthexClear SA	EMIR college	PRA	HCMC (chair), ESMA, other European authorities
BME Clearing	EMIR college	PRA	CNMV (chair), ESMA, other European authorities
CC&G	EMIR college	PRA	Banca d'Italia (chair), ESMA, other European authorities
CCP Austria	EMIR college	PRA	FMA (chair), ESMA, other European authorities
Eurex Clearing	EMIR college	BoE–FMID, PRA	BaFin (chair), ESMA, other European authorities
EuroCCP	EMIR college	BoE–FMID, PRA	De Nederlandsche Bank (chair), ESMA, other European authorities
ECC	EMIR college	PRA	BaFin (chair), ESMA, other European authorities
LCH.Clearnet SA	EMIR college	PRA	Banque de France (chair), ESMA, other European authorities

Non-U.K. CCP	Type	U.K. authorities	Other authorities
NasdaqOMX AB	EMIR college	PRA	FI (chair), ESMA, other European authorities
OMI Clear – C SA	EMIR college	PRA	CMVM (chair), ESMA, other European authorities

Non-U.K. FMI	Type	U.K. authorities	Other authorities
CLS	CLS Oversight Committee	BoE–FMID	Federal Reserve of New York (chair), other central banks worldwide
Euroclear SA/NV	ESA Higher level committee and ESA Technical committee	BoE–FMID	National Bank of Belgium (chair), other authorities worldwide
SWIFT	International SWIFT Oversight arrangements	BoE–FMID	National Bank of Belgium (chair), other central banks worldwide
Source: BoE.			