The Bank of England's supervision of financial market infrastructures — Annual Report

(For the period 23 February 2017 — 20 February 2018)

BANK OF ENGLAND

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Presented to Parliament pursuant to section 203B of the Banking Act 2009 and paragraph 33 of Schedule 17A to the Financial Services and Markets Act 2000 (FSMA).

20 February 2018

(1) Please note, references to '2017' in this *Report* should be taken as referring to this reporting period.

Foreword

Jon Cunliffe
Deputy Governor, Financial Stability

Every day we rely on the functions provided by the financial market infrastructure (FMI) firms that are supervised by the Bank of England. We use them when we make payments to and from our bank accounts or to buy goods and services. They provide the services that the government needs when it borrows money to invest in public services. They allow banks to raise money so they can make loans to individuals and businesses and are vital to those who use financial markets to control risks.

The millions of financial transactions that take place in UK FMIs every day provide significant benefits both at home and abroad. So the safe operation of FMIs is a key plank for maintaining financial stability in the United Kingdom as well as in other countries. The Bank of England (the Bank) is committed to ensuring UK FMIs are operating safely and to working co-operatively with regulators globally.

Over the past year, the Bank's supervision of financial market infrastructures has played an important part in delivering the Bank's overall financial stability objective. This *Report* sets out how we have done that. Alongside our regular supervisory work, we have in 2017 had a particular focus on the operational resilience of FMIs. As they sit at the heart of the financial system, FMIs need to operate smoothly every day, so their availability and resilience is one of the key objectives of the Bank's supervisors. Supervisory reviews have also focussed on the firms that provide critical services to FMIs, those that FMIs outsource to more generally, and on business continuity plans. Chapter 3 presents some key findings of these reviews and work will continue in this area over the course of 2018.

As is often the case within the fast-moving FMI landscape, there have also been important changes to the population of FMIs we supervise. This includes the Bank of England which now has responsibility for operating the United Kingdom's high-value payment system, CHAPS. Box 2 sets out the Bank's approach to the continuing oversight of this system. And change in retail payment systems has also continued with the creation of the new payment system operator in July which, in 2018, is scheduled to take on responsibility for operating two of the payments systems the Bank supervises, Bacs and the Faster Payments Service. Further detail is outlined in Chapter 2 of the *Report*.

We have also continued to invest in developing our supervisory approach to ensure it remains at the leading edge internationally. Last year's *Report* set out the findings of the Bank's Independent Evaluation Office review, which recognised that: 'the Bank is an acknowledged world leader in the field of FMIs and the framework put in place for supervision has dealt effectively with the risks of the past few years'.(1) It made a series of recommendations on how we could further strengthen what we do. Most of these are now complete, including strengthening the Board in the Bank of England that oversees FMI supervision and increasing our access to specialist supervisory resources. More detail on these enhancements is contained in Box 1. This work will continue into 2018.

Finally, the Bank has been working to assess and mitigate any potential disruption to the provision of services provided by some FMIs as a result of EU withdrawal. This will continue to be an extremely important area of work throughout 2018. Box 4 sets out the Bank's work in this area in more detail.

This is the fifth year that the Bank has published a *Report* into FMI supervision.(2) I hope it demonstrates the Bank's commitment to openness and accountability for this area of its responsibility. To encourage greater understanding of this important but often technical area of the Bank's role, this year we have sought to provide a straightforward explanation of some of the basic functions that FMIs provide and how it benefits the public for those interested in the Bank's work in this area.

February 2018

(1) www.bankofengland.co.uk/-/media/boe/files/independent-evaluation-office/2017/evaluation-of-the-banks-approach-to-financial-market-infrastructure-supervision.pdf.
(2) Prior to this the Bank published the *Payment Systems Oversight Report*.

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Chapter 1: Financial market infrastructures — what are they and why do they matter?

Financial market infrastructures (FMIs) play a fundamental role in the economy. Many of us use FMIs on a daily basis, perhaps without even realising it. Whether it is to withdraw cash from a cash machine, pay our bills, or even buy a coffee with a card payment, FMIs form an important part of our lives. FMIs are also crucial to businesses and financial services because they provide confidence that transactions and payments will run smoothly and they provide essential risk management functions. FMIs that the Bank of England (the Bank) regulates do not just serve the domestic economy; they are also important to global financial markets.

1.1 What are FMIs?

At the most fundamental level, FMIs are networks of users that transact with each other. They exist to reduce the risks and costs involved in making payments and settling trades in financial instruments. FMIs make financial transactions more efficient and almost all transactions involve an FMI in some capacity. It is therefore essential that FMIs operate reliably and in the public interest.

There are three broad categories of FMI that the Bank regulates. Perhaps the most well-known are **payment systems**, which provide a number of functions that many will be familiar with. Generally, payment systems allow the transfer of funds from one person to another. They are used for many day-to-day purposes such as to buy goods and services, to receive salary and benefits payments, and to withdraw cash from cash machines.

To demonstrate their importance, imagine buying a house: when completing a house purchase, the money to pay for it needs to be exchanged between a buyer and seller. Without payment systems, physical cash would need to be exchanged. Using payment systems to get the money to the seller greatly diminishes the risk that it will get lost or stolen along the way. They also remove the need to transport cash to a safe and secure place.

Central securities depositories (CSDs) are systems which hold records of who owns individual securities, such as shares in a company. They also facilitate the transfer of ownership between people. If you want to buy a share then you need to exchange it for money. Without the use of FMIs, the only way that you can simultaneously exchange cash for the ownership of the share is for you to meet the seller in person.

In this instance, a CSD enables an exchange to take place between two parties who may be many miles apart. Both parties can have confidence in the exchange of ownership of money for the share because the CSD ensures it happens securely and at exactly the same time. It can also register the new owner of the share once the exchange takes place.

Central counterparties (CCPs), also known as clearing houses, give the buyers and sellers of financial contracts confidence that their contracts will be fulfilled. When a buyer and seller agree that a contract with each other will be centrally cleared, the CCP sits between them. Instead of holding the contract with each other, the buyer and seller each hold their side of the contract with the CCP instead. Collateral is placed with the CCP in case either party fails to meet their side of the contract. This way, if either the buyer or seller does not fulfil their contractual commitments then the CCP will step in to take their place. CCPs were first developed to manage risks that arose in agricultural markets. They allowed farmers to lock-in a price for their produce before it was ready to be harvested. As a result, farmers selling their produce and the buyers of that produce were protected from falls and rises in the market price. If either party could not complete their side of the contract then the CCP would step in.

CCPs have grown significantly over recent years and can now clear a wide range of financial instruments traded in both domestic and international markets. They provide some key functions to the economy. This includes **risk management** benefits by allowing members to manage and significantly reduce their exposure to counterparty credit risk (which is the risk that the party you are transacting with cannot meet their financial obligations when they are due).

CCPs also provide **funding** benefits as they facilitate the ability of financial institutions to raise money in wholesale funding markets, which are used by banks to meet their funding needs in excess of the retail deposits they hold. A common approach for banks is to raise such funds via sale-and-repurchase (or 'repo') transactions, in which they receive funding secured against high-quality collateral they hold. Where repo transactions are cleared through CCPs it enhances market liquidity by removing the need for their users to individually assess the creditworthiness of multiple counterparties.

Consequently, although CCPs are not risk-takers but risk-poolers, they help reduce the overall level of risk in the global financial system, which in turn brings benefits to the real economy. Fewer transactions would take place if participants feared they would not receive the money or goods that were due to them. This was demonstrated clearly during the 2007–09 financial crisis when concerns over the ability of financial firms to meet their contractual obligations to each other caused a loss of confidence throughout financial markets. CCPs thus bring more liquidity, more transparency and better price discovery to the wholesale markets. This allows banks to manage their risks more effectively, with the result that risks are also better priced in the retail market. For example, a small/medium-sized enterprise (SME) hedging variable-rate loans, and a homeowner with a fixed-rate mortgage, may both benefit from better price discovery arising from the liquidity and transparency that CCPs can provide.

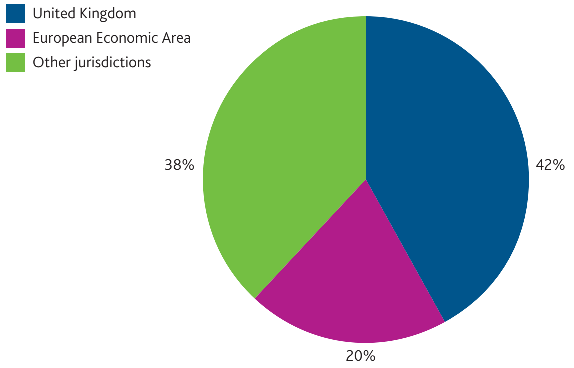
1.2 Why do FMIs matter?

Because of the important functions that they provide, FMIs play a unique role within the economy. Their users typically have no viable alternative to using FMIs to settle payments and securities transactions. While it is generally possible to avoid transacting with even the largest bank or insurer, this is typically not the case for many FMIs. This means that the services they provide are vital to the stability of the financial system and health of the real economy. **Figure 1** sets out, at a high-level, examples of the type of functions performed by FMIs.

FMIs can contribute to maintaining financial stability by ensuring they are resilient to financial and operational shocks. However, because of their position within the financial system, FMIs can promote financial stability in other ways. They can encourage or require their members to take steps that reduce risks in the end-to-end process of making payments, settling securities transactions and clearing trades.

The United Kingdom is one of the world's foremost financial hubs and at the centre of global connections between banks, financial institutions and businesses. In line with this, UK FMIs are not just integral to the UK economy; a number of them are critically important to the global economy too. As an example, **Chart 1** shows that a substantial proportion of initial margin requirements at UK CCPs was accounted for by clearing members that are not located in the United Kingdom. As already outlined under Section 1.1, these CCPs provide a number of significant financial stability benefits both within the United Kingdom and globally.

Chart 1 Distribution of initial margin requirements at UK CCPs by location of clearing member



Sources: ICE Clear Europe, LCH Ltd, LME Clear and Bank calculations.

1.3 The role of the Bank of England

The supervision of FMIs is central to the Bank's objective of maintaining financial stability. The Bank's role is to seek to ensure that FMIs are operating in a safe way and that they are looking to reduce systemic risks. The Bank's supervision of FMIs takes place in the context of a wider programme of FMI-related policy and research work which contributes to the further development of the FMI supervision regime and supervisory best practice.

There is a strong international dimension to the Bank's FMI-related activities. Further information on the Bank's international co-ordination can be found in Chapter 2.

Table A lists the FMIs which the Bank has legal powers to supervise.(1)

Table A The FMIs supervised by the Bank and a non-exhaustive selection of their functions

Central counterparties (CCPs)	Central securities depository (CSD)	Payment systems
ICE Clear Europe (Listed derivatives and over-the counter (OTC) credit default swaps)	Euroclear UK & Ireland (EUI) (Securities transactions)	Bacs (Paying bills) (Receiving benefits/pensions/ salaries)
LCH Ltd (Repos, listed and OTC derivatives and securities)		CHAPS(a) (High-value sterling payments) (Cross-border sterling payments) (House purchases)
LME Clear (Listed and OTC metals contracts)		CLS (High-value FX transactions)
		FPS (Internet, mobile, and telephone banking payments)
		LINK (Withdrawing cash)
		Visa Europe (Paying for goods/services)

(a) The Bank's FMI supervisory area continues to supervise the CHAPS system to the same standard as recognised payment systems even though it was derecognised in December 2017. Box 2 contains further detail.

(1) Annex 7 sets out the applicable legislation, regulation and standards that shape the Bank's supervision of FMIs. The Bank has responsibilities over payment systems which are recognised as systemically important by HM Treasury.

Figure 1 The functions that financial market infrastructures provide

Financial market infrastructures (FMIs) are fundamental to the smooth functioning of our economy. That's why the Bank of England plays an important role in supervising FMIs to help protect monetary and financial stability in the United Kingdom.

The Bank has legal powers to supervise three types of FMI…

1. Payment systems
2. Central securities depositories
3. Central counterparties

…and they support a number of functions within the economy:

1. Public and small businesses

- Buying goods and services without cash
- Buying a house
- Salary payments
- Withdrawing cash at ATMs
- Pension and benefit payments
- Buying and selling shares

2. Industry

- Foreign payments
- Wholesale payments
- Buying and selling bonds
- Buying and selling shares
- Risk management

3. Government

- Wholesale payments
- Pension and benefit payments
- Government borrowing

4. Financial services

- Foreign payments
- Wholesale payments
- Buying and selling bonds
- Buying and selling shares
- Risk management
- Funding

Chapter 2: How the Bank supervises FMIs, including work with other authorities in the United Kingdom and abroad

The Bank's powers to regulate FMIs come from UK and European law. In carrying out its supervisory activities, the Bank applies a number of internationally agreed regulatory standards, including through European regulations. FMIs supervised by the Bank are also important internationally and this global perspective means that the Bank is committed to working collaboratively with other authorities to ensure the risks posed to financial stability are understood and managed. This chapter sets out the Bank's supervisory approach and the changes to the FMI landscape over 2017.

2.1 How is the Bank's supervisory approach constructed?

Within the FMI context, the Bank has worked closely with international counterparts for nearly 40 years through the Committee on Payments and Market Infrastructures (CPMI) and its preceding entities. CPMI is a forum hosted by the Bank for International Settlements (BIS) which promotes the safety and efficiency of FMIs. It sets global standards that aim to strengthen FMI regulation, policies and practices through its members and across the globe.

CPMI, together with the International Organization of Securities Commissions (IOSCO), is responsible for the 'Principles for Financial Market Infrastructures' (PFMI).(1) The PFMI set out international standards that FMIs should follow in areas such as governance arrangements, financial resources, and the management of certain types of risk. The Bank contributed to the development of the PFMI, which were published in 2012, alongside colleagues from over 30 other regulatory authorities and oversight bodies. The PFMI underpin the European Union (EU) regulatory regime for some types of FMI. For example, the European Market Infrastructure Regulation (EMIR) which applies to CCPs and trade repositories (TRs)(2) and the Central Securities Depositories Regulation (CSDR) which applies to CSDs.

The Bank has developed a supervisory approach which is based on the PFMI. A key outcome of the approach is to ensure the continuity of service of FMIs as well as their due regard for managing systemic risk.

The Bank's supervision of FMIs is judgement-based and forward-looking. It is carried out using a supervisory risk assessment framework to identify **risks** that FMIs may be exposed to and the **mitigants** that FMIs have in place to guard against those risks. There are three broad categories of **risk mitigant** within the framework:

- **operational mitigants** which are processes that FMIs have in place to ensure their operational resilience. Examples include governance arrangements within FMIs and their risk management and controls;
- **financial mitigants** which are sufficient collateral (eg margin and default funds for CCPs), capital, and liquid resources to protect their financial resilience; and
- plans to ensure **recovery and resolvability** if the risks to which an FMI was exposed crystallised to such an extent that its continued operation is threatened.

The Bank makes an annual assessment of each FMI it supervises, from which it sets risk-mitigating actions it expects to be taken ('Priorities'). This is informed by a continuous cycle of supervisory engagement which is intended to identify risks as they emerge. The Bank also carries out a programme of core assurance reviews which correspond to the risk mitigants set out above. These reviews assess whether FMIs are suitably mitigating any risks across the broad range of their operations and are compliant with the relevant principles set out in the PFMI. Over 2017, a range of individual and thematic (cross-FMI) reviews were undertaken. Building on the recommendations made by the Bank's Independent Evaluation Office (see Box 1) the core assurance reviews this year drew in a number of specialist resources across the Bank.

(1) www.bis.org/cpmi/info_pfmi.htm.
(2) A trade repository is an entity that maintains a centralised electronic record (database) of transaction data.

Box 1
Reviews of the Bank's approach to FMI supervision

As part of the commitment to carry out its supervision of FMIs in an open and transparent manner, the Bank last year welcomed a report from the Independent Evaluation Office (IEO) on its supervision of FMIs. The IEO was established as part of the Bank's 2014 Strategic Plan. It is an independent evaluation function embedded within the Bank, reporting directly to the Chair of Court. The overall aim of the review was to give the Court assurance about the Bank's approach to its statutory responsibilities for FMI supervision, focusing particularly on inputs, supporting infrastructure and internal governance.(1)

The IEO assessment recognised that 'the Bank is an acknowledged world leader in the field of FMIs and the framework put in place for supervision has dealt effectively with the risks of the past few years' and that 'international engagement is strong, with the Bank making effective use of the various arrangements it has in place for cross-border collaboration'. The report also recognised that the Bank had strengthened its supervisory approach and found no evidence of material shortcomings. Changes in the FMI supervisory governance framework had been effective with good evidence of discussion, challenge and decision-making at appropriate levels. There had also been significant efforts to raise awareness of FMI-related issues around the Bank.

The IEO review identified three broad areas in which it believed the Bank could further strengthen its approach to the supervision of FMIs, to match their increasing importance. The IEO recommendations are set out below as well as the key actions taken by the Bank to address them.(2)

Clarifying the objectives and responsibilities of FMI supervision more fully

The IEO found that there was a clear and consistent understanding of how FMI supervision was part of the Bank's overall financial stability framework. However, the IEO saw scope to provide a fuller articulation of the Bank's FMI supervisory strategy and objectives. The Bank is in the process of reviewing and articulating its objectives with regard to FMI supervision, including the understanding of systemic risk management. A package of proposals which addresses these recommendations is expected to be finalised in 2018 and the Bank's FMI supervisory approach will be updated and published after this to reflect any changes.

Supporting FMI supervision by leveraging the wider expertise within the Bank as effectively as possible

The IEO acknowledged that the Bank employed a specialist resourcing model for FMI supervision. For the specialist model to make the most of its advantages and mitigate its potential drawbacks, the IEO identified a need for the Bank to leverage the wider organisation as effectively as possible. The Bank has therefore implemented a formalised approach to securing resources available across the Bank and Prudential Regulation Authority, which covers the use of Supervisory Risk Specialists, Senior Advisors, and the Supervisory Oversight Function. Additionally, there has been an increase in the proportion of FMI supervisors with operational risk and resilience expertise.

Further, the Bank has consulted on levying fees for FMI supervision,(3) which is currently funded through the Bank's Cash Ratio Deposit scheme. The IEO report stated that moving to a fee-based model could enhance the Bank's ability to adjust its staffing model and strengthen its ability to meet the resource requirements for large, one-off supervisory projects. A consultation paper was published in August 2017 which proposed that the Bank levies fees on FMIs according to their systemic importance to the financial system. In this way, fees would be levied in a consistent and transparent manner and according to the potential impact of regulated FMIs on UK financial stability. The Bank's response to the fees consultation will follow in 2018.

To strengthen internal governance, including by revisiting the question of third-party challenge

The IEO report found clear evidence of an effective governance framework following the changes made around the time of the Bank's 2014 Strategic Plan. Building on governance improvements over recent years and to broaden the range of opinions and challenge, the membership and terms of reference for internal committees for FMI supervision were reviewed. As a consequence of this review, the membership of the Bank's senior FMI decision-making body, FMI Board, was amended to bring in independent members. FMI Board membership is now as follows:

- Sir Jon Cunliffe, Deputy Governor Financial Stability (Chair)
- David Bailey, Director of FMI
- Sarah Breeden, Executive Director — International Banks
- Lyndon Nelson, Deputy CEO, Prudential Regulation Authority
- Victoria Saporta, Executive Director — Prudential Policy
- Elisabeth Stheeman, independent member(4)
- John Sutherland, independent member
- Mark Yallop, independent member.(5)

(1) www.bankofengland.co.uk/-/media/boe/files/independent-evaluation-office/2017/evaluation-of-the-banks-approach-to-financial-market-infrastructure-supervision.pdf.
(2) www.bankofengland.co.uk/-/media/boe/files/independent-evaluation-office/2017/boe-response-to-the-ieo-evaluation-of-fmi-supervision.pdf.
(3) www.bankofengland.co.uk/paper/2017/levying-fees-for-financial-market-infrastructure-supervision-consultation-paper.
(4) Elisabeth Stheeman is also a member of the Financial Policy Committee.
(5) Mark Yallop is also a member of the Prudential Regulation Committee.

To complement its supervisory approach, the Bank has legal powers to commission reviews into supervisory topics by third-party external experts.[1] They are important as they introduce an external perspective to the Bank's supervisory activities and can focus in detail on a specific issue. The commissioning of a third-party review is not viewed as a sign that an FMI has failed to meet its regulatory requirements. They are another tool which the Bank can use to help assess risks and maintain financial stability. Generally, FMIs which are regulated by the Bank can expect at least one third-party review a year, if the Bank considers it necessary.

The Bank pays close attention to how group structures affect the management of risk; it has certain legal powers over some parent companies of recognised clearing houses (RCHs).[2] The Bank is empowered to gather information from these qualifying parent undertakings and has a power to direct them in defined circumstances.

Further information on the Bank's supervisory approach (including enforcement powers) is set out in *The Bank of England's approach to the supervision of financial market infrastructures*.[3]

2.2 International co-operation

Co-operative supervision plays a fundamental role in protecting financial stability where FMIs operate across borders. Indeed, the PFMI sets expectations that relevant authorities should co-operate with each other both domestically and internationally in promoting the safety and efficiency of FMIs.[4] The Bank is committed to actively seeking input from other relevant authorities. This contributes to the effectiveness of the Bank's supervision of UK FMIs by broadening the range of expertise and perspectives which can be drawn upon. Co-operative supervision also increases transparency around the risks which UK FMIs may be exposed to.

To enable this co-operative supervision, the Bank has more than 50 separate memoranda of understanding (MoUs) in place with other authorities across the globe. Acknowledging the role that UK CCPs play on the global stage, the Bank remains at the forefront of international co-operative oversight through chairing global CCP colleges. These colleges bring together supervisors from other jurisdictions to allow discussion of the key risks that are posed by UK CCPs. The Bank is also, to our knowledge, unique in inviting other college members to participate in supervisory reviews of CCPs. During 2017, the Bank chaired four supervisory colleges for authorities from Europe and across the globe.

The Bank participates in colleges of non-UK FMIs that are systemically important to the UK financial system, but are supervised by other regulators. This includes participation in co-operative supervision and oversight arrangements for CLS (with the Federal Reserve Bank of New York), SWIFT (organised and led by the National Bank of Belgium, NBB), and Euroclear Group and Euroclear Bank (NBB). The Bank also participates in the colleges of ten European CCPs.

The Bank was the first authority to establish Crisis Management Groups (CMGs) which provide a framework for authorities to plan crisis management measures (including orderly resolution) for FMIs that are judged to be systemically important in more than one jurisdiction. During 2017, the Bank held a CMG meeting for LCH Ltd and ICE Clear Europe Ltd.

The Bank's FMI supervisory and policy teams contribute to many international FMI-related committees and working groups, for example those hosted by the G20 and the Financial Stability Board (FSB), the BIS, the European Central Bank (ECB) and the European Securities and Markets Authority (ESMA).

2.3 Domestic co-operation

Domestically, the Bank co-operates closely with both the Financial Conduct Authority (FCA) and the Payment Systems Regulator (PSR) in relation to supervising market infrastructure and payment systems respectively. The frameworks for co-operation are set out in MoUs which are reviewed annually by the parties involved, including by seeking feedback from supervised FMIs. Co-operation supports effective supervision and policymaking by sharing information between the regulators and promotes efficiency by minimising duplication.

2.3.1 MoU between the Bank and FCA

The Bank and FCA held a consultation with FMIs and reviewed their co-operation regarding market infrastructure in 2017. The authorities concluded that the MoU's arrangements for co-operation remain effective, with appropriate co-ordination and no material duplication. Industry respondents acknowledged the efforts made on co-operation and emphasised its growing importance given the changing environment. The Bank and FCA remain committed to effective co-operation and staff will work together to take forward those suggested improvements identified by industry — for example by joint industry working groups on issues of shared interest and representation at project boards. The authorities will also review the MoU to ensure it continues to appropriately reflect their respective roles and responsibilities once the United Kingdom has left the EU.

2.3.2 MoU between the Bank, FCA and PSR

The outcome of the review of the Bank, FCA and PSR MoU in 2017 was that co-operation and co-ordination is working well.

(1) Paragraph 12 of Schedule 17A to the Financial Services and Markets Act 2000 and section 195 of the Banking Act 2009.
(2) A list of RCHs is provided on the Bank's website: www.bankofengland.co.uk/financial-stability/financial-market-infrastructure-supervision.
(3) www.bankofengland.co.uk/-/media/boe/files/financial-stability/financial-market-infrastructure-supervision/the-boe-approach-to-the-supervision-of-fmi.pdf.
(4) www.bis.org/cpmi/info_pfmi.htm (Responsibility E).

The authorities have identified a number of areas to further improve co-operation and co-ordination, which are largely procedural in nature; these are being implemented. In conducting this review, the authorities emphasised their ongoing commitment to working together closely on issues of common regulatory interest and avoiding duplication.

2.4 Changes to the FMI landscape over 2017

This year has seen a number of statutory and non-statutory changes to the FMI regulatory landscape. This section highlights the main changes to the Bank's statutory powers, population of supervised FMIs, and supervisory approach. Where appropriate, the Bank has worked extensively with HM Treasury (HMT) on a number of these changes.

2.4.1 Legislative changes

In November 2017, HMT amended the Banking Act 2009 to enable it to bring specific service providers to recognised payment systems within the Bank's regulatory remit.(1) As defined by the PFMI, service providers are entities which provide a specific function or service to an FMI which is critical to its operational reliability. As such, an FMI may be operationally dependent upon a service provider, without which it may not be able to function. For systemically important payment systems, the failure of a service provider could adversely impact financial stability. Although the Bank has existing expectations of how recognised payment system operators (RPSOs) should manage their service providers, additional powers over certain service providers are appropriate to enable the Bank to effectively deliver its mandate.

RPSOs will continue to have a primary role to play in monitoring, managing and mitigating risks that their service providers pose to their systems. As such, the Bank's expectations in this regard are unchanged. The role of the Bank and RPSOs in overseeing risk from service providers will be different but complementary. The expectations around service providers to RPSOs and the Bank's approach to their supervision are set out in Annex 1.

The FMI landscape is continuously and rapidly developing as technology in this area advances. The growth of financial technology (FinTech) will increasingly compete with the services provided by some existing FMIs. To ensure the Bank is prepared for any future changes, the UK Parliament has amended, through the Digital Economy Act 2017, the definition of a payment system within the Banking Act 2009. This enables non-bank payment systems to be brought within the Bank's regulatory perimeter, if they become systemically important to the UK financial system.

The Settlement Finality Regulations (SFR) ensure that payments settled in SFR designated systems are irrevocable, meaning that they cannot be unwound in the event that the payer is declared insolvent. This year SFR protections have been expanded to cover 'non-bank' payment institutions. This will enable access to payment systems to be expanded beyond banks, while maintaining the protection of settlement finality.

2.4.2 Changes to the population of supervised FMIs

There have been significant changes to the UK retail payments landscape during 2017. This includes the proposed merger of three payment system operators: Bacs Payment Schemes Ltd (BPSL), the Faster Payments Scheme Ltd (FPSL) and the Cheque and Credit Clearing Company Limited (C&CCCL).(2) The consolidation of these operators follows a recommendation made by the Payments Strategy Forum (PSF) in November 2016.(3) The Bank, working alongside the PSR, has been closely involved in this work to ensure that the new payment system operator (NPSO), which will consolidate the three operators, will support delivery of the Bank's financial stability objective by strengthening the capacity and capability of the operators. The NPSO was incorporated in July 2017 and subsequently the NPSO Board was established and the Chief Executive Officer appointed.

The Bank will carry out statutory supervision of the NPSO when it becomes the operator of the recognised payment systems (Bacs and Faster Payments Service (FPS)). Concurrently, the Bank's supervision of BPSL and FPSL has focused on ensuring that there is a smooth transfer to the NPSO and that any transitional risks are sufficiently identified and managed. Until the transfer is complete, the Bank will continue to supervise the operators of the Bacs and FPS systems in line with its supervisory approach.

In December 2017, the United Kingdom's high-value payment system, CHAPS, was derecognised by HMT as a recognised payment system operator under Part 5 of the Banking Act 2009, given that it is now operated by the Bank. Notwithstanding its derecognition, the system will continue to be supervised to the same standard as recognised payment systems. Further information on this is provided in Box 2.

Over the course of 2017, the Bank supervised the first wind-down of a UK CCP since the introduction of EMIR, following CME Group's commercial decision to close CME Clearing Europe (CMECE) and the UK exchange, CME Europe (regulated by the FCA). The Bank oversaw CMECE's plans for winding down its activities in an orderly fashion with minimal disruption to market participants and financial stability, and to ensure it remained in compliance with regulatory requirements throughout the process. In October, the Bank issued a revocation order to withdraw CMECE's recognition as a CCP.

(1) www.legislation.gov.uk/id/uksi/2017/1167.
(2) BPSL and FPSL are recognised payment system operators and fall within the Bank's regulatory perimeter. C&CCCL has not been designated by HMT as systemically important and therefore is not supervised by the Bank as a payment system.
(3) The PSF was set up by the Payment Systems Regulator and comprised an independent chair and members from industry and advocates for consumers, retailers, government and banks.

Box 2
Supervision of the United Kingdom's high-value payment system

The largest and most systemically important payments in the United Kingdom are made over CHAPS, the United Kingdom's high-value payment system (HVPS).

Until recently the delivery model for the CHAPS system involved a split in responsibilities across two institutions. The core infrastructure was provided by the Bank, as part of its Real-Time Gross Settlement (RTGS) system. CHAPS Co, a private sector company owned by its members, was responsible for operating the system's governance and rulebook and managing risks across the CHAPS system as a whole. In November 2017, the functions performed by CHAPS Co were transferred into the Bank. The decision to make this change was made by the Bank following a public consultation, which concluded that financial stability would be enhanced if the HVPS adopted the 'direct delivery' model used in the overwhelming majority of jurisdictions globally. This conclusion was endorsed by the Financial Policy Committee (FPC) and responded to recommendations made by the International Monetary Fund.[1] Following transition to direct delivery, the Bank became the HVPS scheme operator alongside its pre-existing responsibilities for the RTGS infrastructure. The change to direct delivery of CHAPS was designed to give the United Kingdom a world-leading HVPS, enabling a single entity to manage risks right across the system, and building on the important progress achieved by CHAPS Co in recent years.

As a result of this change, CHAPS was de-recognised as a recognised payment system operator under the Banking Act 2009. Responsibility for the operation of the CHAPS system is led by the Bank's Banking, Payments and Financial Resilience Directorate while the Bank's FMI Directorate will continue to independently supervise its operation. Supervision of the system will be carried out on a non-statutory basis and to the same standard applied to recognised FMIs.

This includes:

- an annual assessment against the Bank's supervisory risk framework;
- periodic reporting requirements, regular supervisory meetings and a programme of core assurance reviews; and
- assessing proposed material changes to an FMI's business model or risk profile to ensure that it does not increase risks to financial stability.

In order to ensure the effective supervisory oversight and operational delivery of the HVPS within the same institution, the Bank has designed a model which emphasises transparency and independence between the areas of the Bank responsible for the operation and supervision of the CHAPS system. The Bank has put in place measures to ring-fence specialist resources for both functions, may make greater use of external third-party reviews as part of its supervision, and will report annually to the independent Chair of Court on the supervision of CHAPS. Regular updates will also be provided to the FPC on both the operation and supervision of the system.

Supervision in practice

Prior to the Bank assuming responsibility for CHAPS, FMI supervisors worked to ensure that the governance, management, risk oversight and controls that the Bank has put in place were adequate to enable it to operate the CHAPS system, including delivering a smooth transfer to direct delivery. This included reviewing operational plans against the FMI supervisory risk framework, the PFMI and the Bank's payment system code of practice.

(1) www.imf.org/external/pubs/ft/scr/2016/cr16156.pdf.

2.4.3 Changes to the Bank's supervisory approach

For the first time, the Bank is considering use of its statutory powers to levy fees on supervised entities for the supervisory activities that it undertakes. This follows a recommendation made by the Bank's Independent Evaluation Office (IEO). Box 1 contains further information.

As part of its commitment to increase openness and transparency, the Bank has also consulted on introducing an independent Enforcement Decision Making Committee (EDMC) to make decisions in contested enforcement cases.[1] In November 2017, the Bank published a consultation paper which set out the procedures for the EDMC.[2] The EDMC's remit includes decisions taken in relation to FMI-contested enforcement cases.

The Bank is currently undertaking a public consultation on a new rule which would support the UK Government's approach to the implementation of the EU Network and Information Systems Directive.[3] The consultation seeks feedback on a new rule the Bank is proposing to make relating to incident reporting, which will formalise the requirement for CCPs to notify the Bank of certain incidents having an impact on their network and information systems. The new rule will formalise existing reporting arrangements by CCPs and should be in place in 2018.

(1) www.bankofengland.co.uk/-/media/boe/files/paper/2016/establishment-of-the-enforcement-decision-making-committee.pdf.
(2) www.bankofengland.co.uk/paper/2017/procedure-for-the-enforcement-decision-making-committee.
(3) www.bankofengland.co.uk/-/media/boe/files/paper/2018/new-rule-for-central-counterparties-relating-to-incident-reporting.pdf.

Chapter 3: Report on the Bank's supervision of FMIs over the past year

FMI supervision supports the Bank in meeting its financial stability objective. Over the course of 2017, the Bank has continued to place a strong focus on governance arrangements at FMIs as well as their operational and financial resilience. This chapter sets out the key supervisory highlights of 2017 as well as the main FMI policy and research work that was undertaken in parallel.

3.1 Management and governance

The management and governance of a firm is critical to its safe and effective operation. Ultimately, the responsibility for an FMI to meet its regulatory requirements, and manage its risks effectively, rests with the FMI's board. Therefore, the Bank places a strong emphasis on ensuring that FMIs' boards comprise the right skills to carry out their roles effectively.

3.1.1 Interviews with FMI candidates for key roles

The Bank interviews candidates for key roles within FMIs (such as the chief executive officer or chairperson of the board or relevant committees) before they are appointed. There has been a high degree of change among senior management positions at UK FMIs this year. The Bank interviewed more than 20 candidates across seven FMIs for relevant positions with significant influence.

3.1.2 Payment system code of practice

In June 2017, the Bank published its first code of practice on the governance arrangements for RPSOs.(1) The code sets out expectations around the minimum governance requirements which all relevant RPSOs must follow and the Bank has legal powers to enforce it. The adoption of the code is designed to strengthen accountability and seek to encourage independent challenge within RPSOs. As a first step, RPSOs are expected to self-assess their compliance and meet the minimum requirements by June 2018. For some, this will require substantive changes such as moving powers and responsibilities from its members to the board and the appointment of additional independent Non-Executive Directors.

3.2 Operational resilience

The operational resilience of the financial system is critical to the Bank's financial stability objective. Because FMIs play a fundamental role in the economy, an operational outage can have far-reaching consequences. For example, if an FMI's systems are unavailable then this could mean that payments cannot be made and/or that transactions between participants cannot take place.

The Bank expects that regulated entities (including FMIs) within the financial services sector have the ability to absorb the impact of an unexpected event while continuing to perform their critical functions.(2) Causes of disruptions to an FMI can be wide-ranging and may include damage to a physical location, a cyber threat, the failure of a critical supplier to the FMI, or even the failure of a participating member.

As such, operational resilience is a key area of the Bank's supervisory regime. There are a number of core assurance modules which focus on an FMI's operational resilience. These include reviews of business continuity, IT resilience, outsourcing arrangements and cyber security. Each of these elements assesses an FMI's ability to prevent, detect and respond to incidents which could impact its critical services and wider financial stability.

Chart 2 shows the average yearly operational availability of Bank supervised FMIs. The following paragraphs set out highlights of operational resilience supervisory work carried out in 2017.

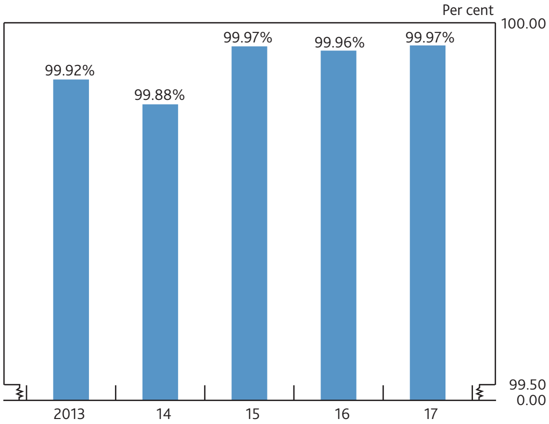
3.2.1 Thematic review of Critical Service Providers and outsourcing

As noted in Chapter 2, the PFMI state that an FMI may be dependent on the continuous and adequate functioning of service providers that are critical to an FMI's operations. Therefore, the Bank expects FMIs to identify and monitor their Critical Service Providers (CSPs). This includes ensuring their CSPs adhere to the expectations placed on them through Annex F of the PFMI. In essence, an FMI is expected to ensure that the operations provided by a CSP are held to the same standards as if the FMI provided the service itself.(3)

As part of its core assurance programme in 2017, the Bank carried out a thematic review into FMIs' use of CSPs, including outsourcing arrangements. The review assessed the soundness and effectiveness of FMIs' strategy and policy for managing

(1) www.bankofengland.co.uk/-/media/boe/files/financial-stability/financial-market-infrastructure-supervision/code-of-practice-relating-to-governance-of-recognised-payment-system-operators.pdf.
(2) www.bankofengland.co.uk/speech/2017/the-boes-approach-to-operational-resilience.
(3) www.bis.org/cpmi/publ/d101.htm.

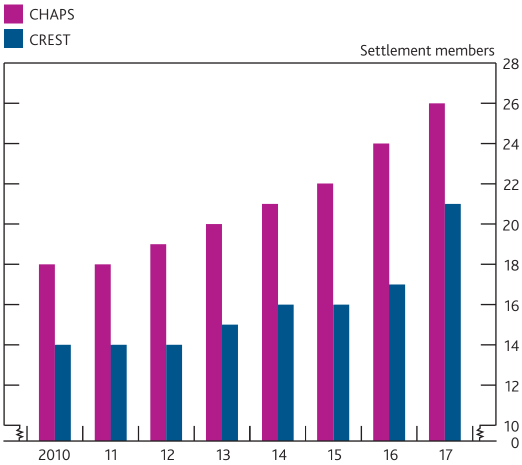
Chart 2 Average operational availability of FMIs supervised by the Bank[(a)(b)]



Sources: Bank calculations and reporting from Bank-regulated FMIs.

(a) For CCPs, operational availability of core systems is reported.
(b) Average of each FMI's own availability statistic.

Chart 3 Number of settlement members in CHAPS and CREST[(a)]



Sources: Bank of England, CHAPS Co. and Euroclear UK & Ireland.

(a) Total members at period end.

their relationship with any CSP. It also looked at both external and intra-group arrangements. The review found that FMIs' outsourcing arrangements were generally appropriate but identified areas in which FMIs could improve the way they risk manage and govern these relationships.

3.2.2 Business continuity management review

Continuing the focus on operational resilience, a cross-firm review of business continuity and IT disaster recovery capabilities started in 2017 and is currently ongoing. The exercise is an important opportunity to understand the preparedness of FMIs to respond to a business continuity incident. The review is focusing on governance, strategy and risk management as well as the assurance that each FMI has sought that its business continuity is operating as intended and in line with its risk appetite.

3.2.3 Tiering

Tiering within FMIs has been a strong area of focus for the Bank over a number of years. Tiering is an arrangement whereby some market participants access FMIs indirectly via a direct member. This arrangement can entail credit and liquidity exposures between direct and indirect participants. It can also have knock-on consequences if an operational outage of a direct member leads to a subsequent loss of access for indirect members. Encouraging a greater number of direct FMI participants can therefore reduce systemic risk.

Chart 3 shows how CHAPS and EUI (which operates the CREST system) have increased direct participation and, by doing so, have reduced tiering. In the case of EUI, the Bank's supervisory work resulted in a large custodian joining as a direct settlement bank. Separately, two direct participants were on-boarded to CHAPS in 2017.

The Bank has also reviewed tiering risk management at a number of FMIs. Feedback on these reviews emphasised that FMIs need to have a clear risk appetite for tiering risk (where relevant), as well as the means to monitor and meet that appetite.

3.3 Financial resilience

FMIs are expected to be resilient against the financial risks to which they are exposed. For example, the Bank expects FMIs to demonstrate that they hold at least the level of liquid resources required by the PFMI (and other applicable regulations) to withstand extreme but plausible stresses. For CCPs, which must protect themselves against counterparty risk, loss-absorbing resources also comprise collateral which is posted by their members (also known as margin), default funds and the CCP's own equity capital. The adequacy of these resources is assessed using stress tests. Box 3 sets out the work that the Bank has carried out this year regarding the supervisory stress-testing framework for CCPs.

The Bank started a number of comprehensive assessments into financial resilience of CCP clearing services, in certain cases involving members of the CCP colleges. This included looking in detail at risk models used to calculate margin requirements, default fund contributions, and collateral haircuts. During 2017, the Bank completed a comprehensive assessment of a clearing service at a CCP. The review reconfirmed the service is compliant with the relevant regulatory requirements.

Work continued throughout late 2017 and early 2018 with CCPs to assess how they could further mitigate risks associated with the investment of margin, particularly cash margin received late in the day. The actions identified included expanding central bank facilities, increasing the number of repo counterparties, and extending late day secured investment capacity.

Box 3
Supervisory stress-testing framework for CCPs

The Bank co-chaired a CPMI-IOSCO subgroup to develop an international framework for supervisory stress testing of CCPs. This was published for consultation in June 2017.

While a CCP's own stress-testing framework is designed to test that CCP's individual financial resilience, a supervisory stress test across CCPs can be used to assess the resilience of the clearing system. It can inform an assessment of the systemic effects associated with the collective response of multiple CCPs responding to the same stress events. In doing so, this approach can evaluate interdependencies which are not captured in CCPs' own individual stress tests. The CPMI-IOSCO framework provides authorities with guidelines and key principles for designing and building a supervisory stress test.

To inform its input to the CPMI-IOSCO framework the Bank ran a limited scope exercise during the course of 2017. The aim of the exercise was to evaluate the process set out in the draft CPMI-IOSCO framework. The three UK CCPs were included in the exercise — LCH Limited, ICE Clear Europe and LME Clear. Insights from the exercise were used to update the international framework and made available to supervisors and the relevant supervisory colleges.

There are inherent trade-offs involved in the design of the exercises that warrant consideration. For instance, moving towards greater standardisation may come at the expense of failing to fully reflect the specific risk framework, operational procedures, and rules under which each CCP operates. Similarly, a push for greater inclusion of CCP-specific risks can make the results more difficult to aggregate for a system-wide view.

In light of the finalisation of the CPMI-IOSCO framework, which is expected in 2018, the Bank is considering its approach to a supervisory stress-testing regime for UK CCPs.

Alongside the work undertaken in relation to the CPMI-IOSCO stress-testing framework, the Bank has continued to engage closely with the European Securities and Markets Authority (ESMA) stress tests. ESMA published the results of the 2017 EU-wide CCP stress test in February 2018.(1) This report concludes that EU CCPs, including UK CCPs, are overall resilient to common shocks and multiple defaults. The report highlights important points that the Bank, alongside the UK CCPs, will consider as part of the continuous assessment of CCPs' own stress-testing frameworks.

(1) www.esma.europa.eu/press-news/esma-news/esma-publishes-results-second-eu-wide-ccp-stress-test.

The Bank is also undertaking a thematic review to assess how UK CCPs meet the updated CPMI-IOSCO expectations regarding financial risk management on an ongoing basis. CPMI-IOSCO published this further guidance to the PFMI in July 2017.(1)

This year the Bank also conducted a thematic review of how payment systems manage financial risks. Although payment systems do not typically underwrite financial risks, the Bank nevertheless expects them to manage their financial resources prudently to avoid disruptions to the smooth operation of the payment system. The review highlighted areas in which payment systems could do more to improve how they demonstrate that their financial resources would enable a safe resolution or recovery if required. In addition, the review highlighted the importance of good governance to support financial decision-making and multi-year planning to enable RPSOs to deliver on their strategy.

3.4 Recovery and resolution

As set out in the Bank's published supervisory approach, FMIs are expected to have in place recovery plans to address threats to their viability that might prevent them from providing critical functions to the markets they serve.(2) In 2017 the Bank continued a review of certain CCP recovery plans. This concluded the arrangements were compliant with regulatory requirements but also made recommendations as to how they could be further enhanced.

The PFMI also outline an expectation that CCPs should be well prepared to implement their default rules and procedures when a member defaults on its obligations. To test this, CCPs are expected to carry out periodic 'fire drills' involving their members.(3) As the clearing landscape has evolved it is increasingly likely that a material clearing member default will impact multiple CCPs at the same time. To assess the effectiveness of default management procedures in a multi-CCP scenario, the Bank, in co-ordination with the BaFin, Bundesbank and CFTC, requested CME Inc, Eurex Clearing AG and LCH Ltd to undertake their 2017 fire drills in parallel. The Bank observed the fire drills, carried out post-drill meetings with the CCPs and eight of the largest participating clearing members, and also reviewed relevant procedures and documentation.

Overall, the authorities concluded that the CCPs had the required measures in place to complete the fire drills

(1) www.bis.org/cpmi/publ/d163.htm.
(2) www.bankofengland.co.uk/-/media/boe/files/financial-stability/financial-market-infrastructure-supervision/the-boe-approach-to-the-supervision-of-fmi.pdf.
(3) www.bis.org/cpmi/publ/d101.htm (Principle 13).

successfully. Moreover, clearing members are generally well rehearsed and familiar with fire drill processes, and there was strong participation in auction processes. However the authorities identified a number of recommendations to enhance the process at both CCPs and their members, which have been fed back to participants in the exercise. The Bank expects to conduct and observe further fire drill exercises in future.

3.5 Central Securities Depositories Regulation

The CSDR is a European regulation designed to improve the safety and efficiency of CSDs. Technical standards, which add more detail to the CSDR, were published in the Official Journal of the EU in March 2017. Preparation for the implementation of the CSDR continued to play a significant part in the supervisory activities of EUI. The Bank will continue to engage with EUI regarding its application to operate under the new regime.

3.6 Domestic and international FMI policy development

In 2017, there have been significant policy developments across the FMI landscape. Domestically, the Bank has continued to support HMT in preparation for the United Kingdom's withdrawal from the European Union. Further detail on this is contained in Box 4.

The Bank also undertook an in-depth assessment of the financial stability risks associated with derivatives transactions. This was commissioned by the FPC in November 2016, with the aim of assessing progress in implementing the G20-led post-crisis reforms of over-the-counter (OTC) derivatives markets and considering the implications for the resilience of the financial system. Further detail is contained in Box 5.

3.6.1 Policy work within CPMI and IOSCO

The Bank co-chaired a CPMI-IOSCO subgroup which is developing an international framework for supervisory stress testing of CCPs. Box 3 contains further detail.

In August 2016, CPMI-IOSCO published an implementation monitoring assessment of the consistency of selected CCPs' financial risk management and recovery arrangements with the PFMI.(1) During 2017, the Bank participated in CPMI-IOSCO follow-up work which looked at the arrangements implemented by selected CCPs (including UK and non-UK CCPs) with regard to recovery planning, financial coverage and liquidity stress testing. The findings will be published by CPMI-IOSCO in due course.

The Bank uses TR data for a range of activities (more detail is set out in Section 3.7). The Bank has continued to be directly involved in the CPMI-IOSCO-led work to develop global guidance on harmonisation of trade data elements that are reported to TRs. During the course of 2017, CPMI-IOSCO published technical guidance on two critical data elements: the Unique Transaction Identifier (UTI)(2) and the Unique Product Identifier (UPI).(3) The Bank has also continued to be an active participant of the FSB Working Group on UTI and UPI Governance (GUUG). The GUUG work led to the FSB publication of the UTI governance in December 2017(4) and of the FSB first consultation document on UPI governance in October 2017.(5)

In the light of various cyber attacks on some SWIFT users since 2016, the CPMI published a discussion paper in September 2017 on reducing the risk of wholesale payments fraud related to end-point security.(6) The Bank participated in the CPMI group that produced this paper which focused on how to reduce fraud risk in wholesale payments. The paper sets out a seven-part strategy to encourage and help focus industry efforts to reduce the risk of wholesale payments fraud and, in doing so, support financial stability. The strategy will be finalised in 2018.

3.6.2 Policy work within European fora

In June 2017, the European Commission published a proposal for enhanced supervision of CCPs. This includes proposals to enhance the role of ESMA and EU Central Banks of Issue in the supervision of EU and third-country CCPs. It proposes a framework for heightened supervision and enhanced co-operation in relation to third-country CCPs that are judged to be systemically important for EU markets. For third-country CCPs it also includes a mechanism to deny recognition to operate in the EU should the EU authorities conclude that the CCP is of such substantial systemic importance to the EU or a Member State that it should be located in the EU. The UK Government has indicated that the European Commission proposal appears inconsistent with the global approach that has been required to deliver the G20 commitments to reform OTC derivatives markets and could lead to market fragmentation. It has noted the systemic risks of clearing should instead be addressed through heightened supervision, deep co-operation and clear co-ordination.(7) The Bank has provided technical support to HMT for negotiations on this proposal.

Additionally, the European Commission's EMIR Review proposal ('EMIR REFIT') was published in May 2017. The proposal sets out a number of targeted modifications of EMIR, mainly to simplify the rules and make them more proportionate. The Bank has continued to work alongside the FCA to provide technical support to HMT in relation to these negotiations.

(1) www.bis.org/cpmi/publ/d148.pdf.
(2) www.bis.org/cpmi/publ/d158.pdf.
(3) www.bis.org/cpmi/publ/d169.pdf.
(4) www.fsb.org/2017/12/governance-arrangements-for-the-unique-transaction-identifier-uti-conclusions-and-implementation-plan/.
(5) www.fsb.org/wp-content/uploads/P031017.pdf.
(6) www.bis.org/cpmi/publ/d170.pdf.
(7) http://europeanmemoranda.cabinetoffice.gov.uk/files/2017/07/DOC130717-13072017090902.pdf.

Box 4
EU withdrawal

In March 2017, the UK Government notified the European Council of the United Kingdom's intention to withdraw from the European Union. This initiated a two-year period to negotiate and conclude a withdrawal agreement. The Government has confirmed its intention to ensure that the United Kingdom will cease to be a member of the European Union on 29 March 2019 ('exit day'). It has stated it is seeking to negotiate a new economic partnership with the European Union, with an implementation period lasting around two years from that date.[(1)]

As set out in the *Financial Stability Report* published on 28 November 2017, the FPC has judged that Brexit poses material risks to the provision of financial services to customers in both the United Kingdom and the European Union.

The Bank is working to mitigate potential disruption to the provision of FMI services resulting from EU withdrawal. This encompasses ensuring the new UK legal and regulatory framework for FMIs is in place for exit day; that UK FMIs and their members have made appropriate contingency plans; that the Bank is ready for any new responsibilities (for example, relevant responsibilities currently undertaken by EU bodies); and that the impact on services provided to UK clients by foreign FMIs has been appropriately addressed. More detail on each of these is provided below.

UK Rulebook
For CCPs and CSDs the current regulatory regime is largely determined by EU legislation. Ensuring a UK legal and regulatory framework for FMIs is in place is essential to financial stability. The Government has stated it plans to achieve this with the EU Withdrawal Bill and related secondary legislation by transferring the European Acquis across so that it applies in the UK immediately following withdrawal.[(2)] Through this, directly applicable EU law will be brought into UK law. However, certain provisions of EU law will need to be adapted when brought into UK law in order to ensure that they operate effectively, achieve legal certainty and reflect the new relationship between the United Kingdom and the European Union. Regulatory authorities, such as the Bank, will also need to make changes to their own rulebooks to reflect the new legislation. Firms will need to make any changes necessary to comply with the modified legal framework.

UK FMIs
As set out in Chapter 1, UK-based FMIs provide an important role in global financial markets. LCH (a UK-located central counterparty) clears over 90% of cleared interest rate swaps globally. And the ECB estimates that UK central counterparties (CCPs) clear approximately 90% of euro denominated interest rate swaps used by euro-area banks.[(3)]

Under the current EU legislative framework, UK CCPs would only be able to serve EEA customers after exit day if they have been 'recognised' by the European Securities and Markets Authority (ESMA).[(4)] The FPC noted in its November *Financial Stability Report* that there are material risks of disruption to the provision of clearing services in the EEA if the cross-border services provided by CCPs are disrupted. It is therefore important that UK FMIs have appropriate contingency plans in place for exit day. The Bank continues to have regular dialogue with all FMIs, including CCPs, on this.

Incoming FMIs
Non-UK FMIs will also need recognition in order to operate in the United Kingdom. In December 2017, the Bank wrote to non-UK CCPs outlining the circumstances in which, if they wish to operate in the United Kingdom, they would need to be recognised to do so by the UK authorities, and the approach to recognition the Bank expects to take.[(5)] The Bank anticipates that, at the point of exit, the UK authorities will apply the recognition regime currently in force in the EU. The Bank's presumption is that, subject to this process, non-UK CCPs operating here at present will be able to do so after the United Kingdom's withdrawal from the EU. The Government also announced its proposal to give the Bank of England functions and powers in relation to non-UK central counterparties (CCPs) and non-UK central securities depositories (CSDs); and announced its intention to provide the means for the Bank, should it be necessary, to create a temporary regime for those firms. Such a temporary regime should be viewed as a fall back option only.

New responsibilities
The United Kingdom's exit from the EU means that relevant roles currently performed by the EU bodies (such as ESMA) will in future be undertaken by the relevant UK authority. These tasks will be assigned as part of the Withdrawal Bill process but will include: rule setting for UK FMIs; deciding which classes of derivatives should be subject to mandatory clearing in the United Kingdom; performing equivalence assessments of overseas regimes and recognising non-UK FMIs intending to operate in the United Kingdom. The Bank is working with HMT and FCA on this allocation and preparation for the United Kingdom's new framework.

(1) See also November 2017 *Financial Stability Report*; www.bankofengland.co.uk/financial-stability-report/2017/november-2017.
(2) See the explanatory notes prepared by the Department for Exiting the European Union.
(3) 'European CCPs after Brexit', speech by Benoît Coeuré, Member of the Executive Board of the ECB, at the Global Financial Markets Association, Frankfurt am Main, 20 June 2017.
(4) The EU Commission has put forward legislative proposals to amend the EMIR framework which are currently under negotiation. This may impact the process through which UK CCPs access EEA markets.
(5) www.bankofengland.co.uk/-/media/boe/files/letter/2017/letter-to-ccps.pdf.

Box 5

In-depth assessment of the financial stability risks associated with derivatives transactions[1]

In 2016 the FPC, as part of its review of risks beyond the core banking sector, commissioned an in-depth assessment into derivatives.[2] This box summarises the conclusions of the assessment, which are aligned with those of the Financial Stability Board's (FSB's) 'Review of over-the-counter (OTC) derivatives market reforms' for G20 Leaders, published in June 2017.[3]

Derivatives markets provide important services to the economy, but the interconnectedness to which they give rise in the financial system can amplify shocks. This came into sharp relief during the global financial crisis. After the crisis, G20 Leaders agreed in 2009 and 2011 a series of reforms to global OTC derivatives markets, in part to mitigate systemic risk and improve transparency. Standardised products would be centrally cleared (ie through CCPs) and, where appropriate, traded on exchanges or electronic trading platforms. Uncleared transactions would be subject to higher capital requirements and mandatory margin requirements. Details of each transaction would be reported to TRs.

The FPC noted that these reforms have improved the resilience of the financial system. Globally, the rate of collateralisation of OTC derivatives exposures has increased, and over US$1 trillion more collateral (or 'margin') was held against OTC derivatives exposures at end-2014 compared to end-2006, according to industry estimates.[4]

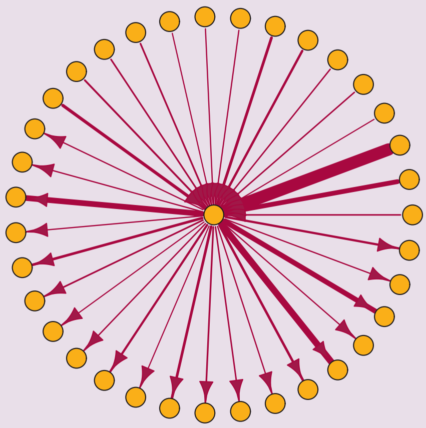
Promoting greater central clearing in OTC derivatives markets has been a key aspect of post crisis reforms, in order to make the network more resilient under stress. The rate of clearing for key OTC asset classes has increased substantially since the introduction of reforms such as mandatory clearing obligations and margin standards for uncleared OTC derivatives. For example, the percentage of outstanding single-currency OTC interest rate derivatives globally that are centrally cleared has increased from an estimated 24% at end-2008 to at least 62% at end-June 2017.

Figure A illustrates how central clearing can lead to a less complex, more transparent derivatives network, in which CCPs maximise the netting of offsetting exposures. If a market participant has two offsetting exposures but, with two different counterparties, these cannot be netted when they are uncleared, but they can be when they are both centrally cleared at the same CCP. This 'multilateral netting' at CCPs reduces aggregate counterparty credit risk and simplifies the network of exposures. Research suggests that, in a stress, greater netting of margin calls generated by price moves in a centrally cleared market promotes resilience by reducing the demand on firms' liquid assets.[5] Multilateral netting also leads to lower costs for market participants than if margin requirements were exchanged on a completely bilateral basis.

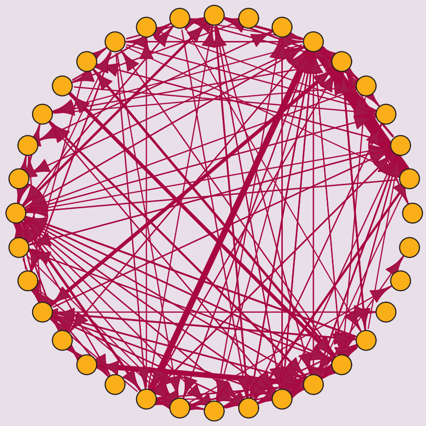
Figure A 'Multilateral netting' at CCPs reduces aggregate counterparty credit risk and simplifies the network of exposures

Centrally cleared trades executed on 20 February 2017 in sterling interest rate swaps referencing six-month Libor (top) — and the counterfactual had they not been centrally cleared (bottom)[a]

Centrally cleared trades



Counterfactual had they not been centrally cleared



Sources: DTCC Derivatives Repository Ltd, Unavista Ltd and Bank calculations.

(a) Each yellow node is a clearing member (the central node in the top chart is the CCP). An arrow pointing into/out of a clearing member from/to a counterparty denotes that, once all transactions between the clearing member and the counterparty on 20 February 2017 are netted with each other, the clearing member is receiving/paying a fixed rate from/to their counterparty. The thickness of the red arrows is proportional to the size of the net transactions (in terms of notional amount) between the clearing member and their counterparty.

(1) For further information please see the November 2017 *Financial Stability Report*; www.bankofengland.co.uk/financial-stability-report/2017/november-2017.
(2) Derivatives can be either traded as standardised instruments on exchanges or transacted bilaterally ('over-the-counter') between counterparties. All exchange traded derivatives are centrally cleared, ie they go via central counterparties (CCPs). Over-the-counter (OTC) derivatives can be either centrally cleared or uncleared. Introductions to CCPs and derivatives can be found in the following *Quarterly Bulletin* articles: www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2013/central-counterparties-what-are-they-why-do-they-matter-and-how-does-the-boe-supervise-them.pdf and www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2015/over-the-counter-derivatives-central-clearing-and-financial-stability.pdf.
(3) www.fsb.org/wp-content/uploads/P290617-1.pdf.
(4) US$290 billion of this is for centrally cleared trades.
(5) Heath, A, Kelly, G, Manning, M, Markose, S and Rais Shaghaghi, A (2016), 'CCPs and network stability in OTC derivatives markets', *Journal of Financial Stability*, No. 27, pages 217–33.

After reducing aggregate counterparty credit risk via multilateral netting, CCPs ensure robust collateralisation of the remaining exposures, and maintain a pre-funded default fund contributed to by all clearing members to mutualise extreme losses.[1] These pre-funded financial resources at UK CCPs' derivatives clearing services totalled approximately £120 billion on average in 2016. Even before post-crisis enhancements to CCP regulation, pre-funded financial resources at UK CCPs proved sufficient to withstand the bankruptcy of US investment bank Lehman Brothers in 2008. For example, LCH used around one third of the US$2 billion of the initial margin it had called from Lehman, the default fund was not required, and thus counterparties to Lehman's centrally cleared trades did not incur a loss.[2]

Since post-crisis reforms have made the financial system more dependent on CCPs in order to reduce systemic risk, reforms have also made the CCPs themselves more resilient, although further work is required by authorities globally to finalise and implement standards for CCP resolution. The most significant global CCPs are now expected to hold sufficient pre-funded resources to meet the losses that could arise from the default of their two largest clearing members in extreme but plausible market conditions, often referred to as the 'Cover 2' standard.

The FPC noted that not all derivatives are suitable for central clearing. However, greater collateral and bank capital have reduced systemic risk arising from the uncleared segment of the derivatives markets by increasing the resources available to cover institutions' exposures to their derivatives counterparties. The ongoing implementation of mandatory margin requirements for uncleared trades is a further positive step.

The FPC also examined the degree of procyclicality found in a margin model commonly used for calculating initial margin requirements for uncleared transactions. It found that these requirements are likely to be quite stable over the financial cycle, including during stress, when large increases in margin requirements might otherwise force liquidation of derivatives positions, thereby amplifying the stress. [3]

The FPC also noted that derivatives markets are now more transparent, and new TR data have enhanced UK authorities' analysis of these markets. However, there is further to go in this and other areas to enhance the positive benefits of derivatives reform. Further examples of the use of TR data are set out in Section 3.7.

(1) Clearing members are institutions with direct access to a CCP in order to centrally clear their own trades and/or those of their clients.
(2) Gregory, J (2014), *Central counterparties: mandatory central clearing and bilateral margin requirements for OTC derivatives*, John Wiley and Sons, pages 42–43.
(3) Derivatives margin requirements have two components. 'Initial margin' is posted at the beginning of a transaction to cover potential future adverse changes in the market value of the contract, and is recalculated on a regular basis. 'Variation margin' is exchanged to cover actual changes in the market value of the contract during its life.

The European Commission legislative proposal on CCP recovery and resolution was published in November 2016.[1] The purpose of the proposal was to ensure an orderly recovery and resolution in the event of CCP distress or failure so that financial stability is preserved, continuity of critical functions is ensured, and taxpayers are protected. Throughout 2017, the Bank has been involved in providing technical advice to HMT in support of EU negotiations on this dossier.

The Bank attends meetings of ESMA's Post-Trade Standing Committee, which is the primary forum for the consideration of post-trade regulatory matters across the EU. During 2017 this has included publication of an ESMA Opinion on portfolio margining requirements under EMIR (April 2017) and a Peer Review of CCP default management (December 2017), as well as Q&As with respect to the application of EMIR, CSDR and the Markets in Financial Instruments Regulation (MiFIR). The Bank is also part of the ESMA Task Force that is working to develop CSDR guidelines providing additional technical detail on certain provisions.

3.6.3 CSDR Settlement Discipline Regime Working Group

The implementation of the CSDR introduced a harmonised and strengthened regime to penalise counterparties for failing to settle their securities transactions. The Settlement Discipline Regime Working Group was convened in 2016 by the Bank, FCA and the Central Bank of Ireland to agree a co-ordinated approach to the implementation of the regime across CCPs, CSDs and participants for securities settled by EUI — equities, money market instruments and gilts. The Group continued to meet in 2017 with a particular focus on progressing work on trading, clearing and settlement.

3.7 FMI-related data

The Bank uses a range of FMI-related data to shape supervisory judgements and help inform policy development. The Bank therefore requests a range of data from the population of supervised FMIs.

As set out in Box 5, the Bank used the trade-level data from TRs as reported under EMIR to support the FPC's in-depth derivatives assessment; for example, to estimate the extent to which OTC derivatives are cleared in the United Kingdom and the relative importance of the different types of counterparties in those markets. The Bank has used TR data in a number of other ways, including:[2]

(1) https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/COM-2016-856-F1-EN-MAIN.PDF.
(2) For more information on the use of FMI data please see the November 2017 *Financial Stability Report*; www.bankofengland.co.uk/financial-stability-report/2017/november-2017.

(a) monitoring activity and positioning in derivatives markets around significant market events. For example TR data was used to identify which cross-border OTC derivative contracts could be affected by the United Kingdom's withdrawal from the EU;

(b) assessing the market impact of policy shocks, for example through analysing the implications of the Swiss franc's depeg from the euro in 2015;[1]

(c) understanding the structure of key derivatives markets to inform policymaking, for example by identifying the positions of market participants in the short sterling futures market, which provides information on monetary policy expectations; and

(d) supervisory decision-making, for example by informing reviews of applications by supervised firms to expand the scope of their derivatives activity.

The FPC's forthcoming in-depth assessment of how non-banks use leverage, including through derivatives, will also draw on TR data. Additionally, the EMIR TR data set supported areas of policy-making beyond the responsibilities of the FPC. For example, the Bank's support to HMT on EMIR REFIT benefited from the analysis of TR data on exchange-traded derivatives' market structure.

Chapter 4 sets out further developments in the Bank's use of FMI data over 2018, including the implementation of the Bank's CCP data project.

3.8 FMI-related research

The Bank's supervision of FMIs is complemented by a wider programme of FMI research and policy work. This contributes to the development of the supervisory regime, informs best practice and is used by other areas of the Bank, where relevant, to meet statutory objectives. The FMI research agenda is undertaken at both the domestic and international level.

The Bank was directly involved in the analysis of the FSB Study Group on Central Clearing Interdependencies aimed at mapping the interconnections between CCPs and their major clearing members and to assess the subsequent systemic implications.[2] This work provides a valuable insight into interdependencies across financial markets and may go on to inform further supervisory and/or policy work.

The Bank's FMI research team has produced a number of working papers and journal publications on FMI-related issues. This year, the research agenda has focussed on matters relating to the structure and interconnectedness of the OTC derivatives market, on CCPs' financial risk management and on the settlement fails regime in the CSDR. Full details of the Bank's FMI research activities over 2017 are outlined in Annex 8.

The Bank views engagement with other regulators, academics, and international policymakers as key to building a robust supervisory approach and to understand the evolving nature of FMIs and the risks that may be posed to financial stability. With this in mind, the Bank has co-organised a number of conferences this year with other central banks and universities to broaden discussion on FMI issues. These conferences covered a wide range of topics including developments in FinTech, recovery and resolution of CCPs, and algorithmic trading.

3.9 Structural reform

The Financial Services (Banking Reform) Act 2013 requires large UK banking groups (those with more than £25 billion of core deposits) to 'ring-fence' their core retail activities into ring-fenced bodies (RFBs) by 2019 to ensure the continuity of provision of 'core services' in the United Kingdom. The legislation also requires RFBs, in general, to participate directly in payment systems. These legislative changes have meant that some banks have to join payment systems as direct members. There are also changes to some bank customers' sort codes, utilising key payment systems infrastructure.

The Bank has been chairing a regular forum with the affected banks, payment systems/security settlement systems and other UK authorities, to ensure these changes are safely managed across all banks and to minimise operational risk. This includes work to prepare for the migration of customers between legal entities which is a necessary component of structural reform. The Bank has worked extensively with RPSOs, as well as the banks involved, to ensure risks to financial stability as a result of these migrations are sufficiently understood and mitigated.

(1) www.bankofengland.co.uk/financial-stability-paper/2017/gauging-market-dynamics-using-trade-repository-data-the-case-of-the-swiss-franc-de-pegging.
(2) www.bis.org/cpmi/publ/d165.pdf.

Chapter 4: Future developments and priorities for 2018

The FMI landscape is developing rapidly and the Bank will continue to monitor these changes to ensure that risks posed to, and by, FMIs are sufficiently mitigated. The ongoing negotiations regarding the United Kingdom's withdrawal from the EU will also significantly shape the work that the Bank undertakes. This chapter contains important supervisory and policy developments over the course of 2018.

4.1 Supervisory priorities for 2018

During 2018, there will be a continued focus on embedding the Bank's approach to supervision of operational resilience and cyber security. The Bank will continue its FMI core assurance reviews notably on IT resilience at payment systems and on financial risk models at CCPs.

4.1.1 Retail payment scheme consolidation

The Bank will continue to engage with the NPSO on its plans to deliver the improvements to governance and risk management that were envisaged by the PSF. Ahead of the transfer of responsibility for the Bacs and FPS systems, the Bank will undertake an operational readiness assessment of the NPSO to take on the role of operator of these systemically important payment systems.

4.1.2 Operational resilience

The Bank will continue its wide-ranging work on operational resilience. At a sector level the Bank will conduct work on its impact tolerance for operational disruptions; this will set a defined level of operational disruption that the Bank is willing to tolerate in line with its objectives. This will cascade down to set expectations at an FMI level and should enable the Bank to define required outcomes for the continued provision of FMI critical functions.

4.1.3 Cyber security and IT resilience

Cyber security continues to be an area of supervisory focus. The Bank considers the CBEST framework to be an important tool in complementing FMIs' own in-house testing and vulnerability assessment within the evolving cyber threat landscape.[1] CBEST delivers controlled, bespoke, intelligence-led cyber security tests, which provide the Bank with information on an FMI's capability to detect and respond to cyber attacks. The Bank will continue to work with firms, international regulators and government agencies to develop the future of CBEST and to ensure that, where possible, the approaches are aligned.

Additionally, the Bank is conducting a review of FMIs' self-assessments against the CPMI-IOSCO guidance on cyber resilience. FMIs undertook gap analyses against these standards in the second half of 2017, and this review will provide a stocktake of their progress.

Many FMIs are planning, or have under way, significant changes to their IT platforms. Indeed, many payment system operators intend to migrate to new systems over the coming years. This includes, for example, the NPSO's plans to design and build a 'New Payments Architecture', and the Bank's plans to build a new RTGS system. These are welcome developments in improving resilience and delivering a UK payments sector that remains world-class. Nevertheless, the process of designing, building and migrating to new systems creates risk. The Bank will assess closely how FMIs are managing these projects to ensure that their new systems give appropriate focus to robustness and resilience and that they have robust risk management in place to oversee their development and migration strategies.

In preparation for these significant changes, the Bank will conduct a thematic core assurance review across payment system operators on their approach to IT resilience.

4.1.4 Financial resilience

The Bank will continue the cycle of core assurance work reviewing CCPs' risk models across selected service lines. These reviews will incorporate initial margin methodologies, stress testing and default fund sizing, and collateral haircut models. The review will enable the Bank to form a comprehensive view of the counterparty credit risk management framework.

The Bank is evaluating CCPs' self-assessments against the CPMI-IOSCO guidance on CCP financial resilience which was published in July 2017 and came into force on 31 December 2017. The evaluation will highlight any areas where a CCP needs to make changes to its financial risk management framework to be consistent with the guidance.

(1) www.bankofengland.co.uk/financial-stability-report/2017/june-2017.

4.1.5 Recovery and resolution

As set out in Section 3.4, the ability for FMIs to recover from financial distress and, in extremis, continue providing their services to the market while in resolution is critical to financial stability. The Bank will continue its review of recovery plans of certain FMIs over the course of 2018.

4.2 FMI policy development in 2018

This section sets out the key areas of FMI policy that the Bank will be involved in over the course of 2018. An important area of work will be to address risks to the Bank's objectives relating to the United Kingdom's withdrawal from the EU. This work is set out further in Box 4.

4.2.1 Policy work within CPMI and IOSCO

During 2018, the Bank will contribute to CPMI-IOSCO work in a number of areas. This includes the finalisation of the framework for supervisory stress testing[1] after taking into account the comments received during the consultation carried out during the third quarter of 2017.[2] The Bank also continues to participate in work to monitor implementation of the PFMI. This will include peer reviews of jurisdictions' implementation of the PFMI, and thematic work to examine consistency of implementation outcomes across jurisdictions.

4.2.2 FSB Derivatives Assessment Team

The Bank is co-chair of the FSB Derivatives Assessment Team (DAT), which is conducting a review of incentives for the central clearing of derivatives arising from the implementation and interaction of post-crisis reforms. This important international workstream will help ensure the reforms to derivatives markets are delivering the benefits they were designed for, and the assessment will examine incentives to clear from a number of perspectives, including major dealers, client clearing service providers and their clients. The work of the DAT will be informed by the use of industry surveys distributed to a wide variety of derivatives market participants and a final report is expected by end-2018.[3]

4.2.3 Policy work within European fora

In 2018, the Bank will continue to support HMT in the negotiations of the EMIR REFIT, the EMIR supervisory framework for EU and third-country CCPs and the EU regime for CCP recovery and resolution. The Bank will also continue to work with the ESMA Task Force to develop detailed technical requirements under the CSDR. Further details on these activities can be found in Section 3.6.

4.2.4 MiFID II and MiFIR

The Markets in Financial Instruments Directive (MiFID II) and MiFIR came into effect on 3 January 2018 and aim to ensure fairer, safer and more efficient markets with greater transparency for all participants. MiFIR introduced requirements on CCPs as well as their users to introduce protections for indirect clients for instruments in addition to OTC derivatives. The Bank plans to conduct thematic work on indirect clearing in 2018.

MiFIR includes non-discriminatory and open access provisions for trading venues and CCPs which mandate the provision of access on request, including data feeds. ICE Clear Europe and LME Clear submitted applications to avail themselves of transitional arrangements under MiFIR in respect of these open access requirements. On 3 January 2018, the Bank, having taken into account the relevant risks to the orderly functioning of the CCPs as regards exchange-traded derivatives, granted temporary extensions to ICE Clear Europe and LME Clear allowing them an additional 30 months to 3 July 2020 to comply with MiFIR's open access provisions.[4]

4.3 Remaining vigilant to broader developments

As FMIs operate in an evolving environment, the Bank will ensure it actively monitors key developments which could impact on the stability of the supervised FMIs. The continued development of FinTech offers the opportunity for significant changes to how financial markets operate. The Bank will remain vigilant to developments in this area through horizon-scanning exercises and monitoring developments within the FMI landscape, including possible new entrants.

4.4 The Bank's evolving supervisory approach

The Bank keeps its supervisory approach to FMIs under constant review. As set out in Box 1, the recommendations from the IEO's report on FMI supervision will continue to be implemented. Following a re-articulation of FMI supervisory objectives, the Bank intends to publish an updated version of its FMI supervisory approach in due course. Work on revisions to this will begin in 2018.

4.4.1 CCP data project

A significant development to the Bank's FMI supervision will be the implementation of the CCP data project. Data from FMIs plays an essential role in helping to shape the Bank's supervisory judgements. As central nodes in the system CCPs both capture and calculate significant amounts of data, which is used to carry out core risk management activities such as calculating clearing member margins, estimating potential stressed losses upon a clearing member default, and quantifying their potential liquidity needs.

The principal use of this data will be by CCP supervisors, to monitor developments and risks in cleared markets with a level of depth and efficiency that was not previously possible. In this

(1) www.bis.org/cpmi/publ/d165.pdf.
(2) www.bis.org/cpmi/publ/d161.htm.
(3) www.bis.org/cpmi/publ/d165.pdf.
(4) www.bankofengland.co.uk/financial-stability/financial-market-infrastructure-supervision.

respect, the Bank intends to leverage new analytical tools to facilitate more dynamic, interactive and customised exploration of the data. The data will also be used by the Bank's FMI risk and research specialists to identify potential vulnerabilities in financial markets, and thereby also inform prudential supervision and policy, as well as other areas across the Bank, where appropriate.

CCPs have highly standardised formats and methods of data collection for ease of operational processing. However, one of the challenges of the project has been developing common standards for reporting across all CCPs to significantly improve the completeness and comparability of the resulting data set. This has required a high degree of collaboration and co-ordination with each of the CCPs, which have also devoted a significant amount of resources to the project. One of the key outputs of this process will be certification of the standards as ISO 20020 messages with the International Organization for Standardization, which can be more widely used by other firms and regulators. This project will complete in 2018.

4.4.2 Crisis management testing

The Bank is committed to continuously improving its approach to co-operative supervision. As part of the Bank's self-assessment of its effectiveness at running supervisory colleges, a scenario-based crisis management test is scheduled for 2018 with CCP college members. The exercise will assist the Bank, and other college members, in testing their crisis management procedures.

4.5 FMI data and research

The Bank will continue to invest in its capability and technology to collect, process and store current and future large-scale FMI data sets to inform the FMI agenda and contribute to financial stability outcomes. A new data architecture will be implemented in 2018 and will allow for the risk monitoring and analysis of the data collected from CCPs (as outlined in Section 4.4.1). The transaction and position-level data on derivatives that the Bank receives from TRs under EMIR will also be managed and analysed on the new architecture. Since 2014, the Bank has been entitled to receive TR data on derivatives transactions that are conducted within the European Union and are either: denominated in sterling, cleared through a UK CCP, where a UK firm is counterparty, or (eg in the case of credit default swaps), the derivative is based on a UK underlying.

As set out in Section 3.7, the Bank has made wide use of the TR data. Nevertheless, the size and complexity of the EMIR TR data set, which sees the Bank receive millions of reported transactions daily, has required significant technical development of the Bank's existing data platform. The new data architecture will allow the Bank to analyse larger volumes of data, across multiple TRs and across time, significantly faster.

The Bank is investigating how to use the same data architecture for data which will be available as a result of the CSDR and the Securities Financing Transactions Regulation (SFTR).

While UK firms and CSDs will not be required to provide data as a result of the CSDR until after 2018, the lead time for the technical delivery means a substantial amount of the development will take place this year. The CSDR will require all UK firms that settle securities transactions outside a CSD ('internalised settlement') to provide to the Bank quarterly aggregated reporting of the volumes and values of these securities transactions. CSDs will be required to provide monthly and annual data on transactions that failed to settle and the Bank will be able to access granular records kept by CSDs. These reporting requirements will significantly supplement the data the Bank currently receives and will contribute to the assessment of any potential risks related to securities settlement and broader financial stability.

The SFTR will give the Bank access to data regarding repo, buy/sell backs, securities lending, and margin lending trades. The Bank is investigating how to collect, process and store trade reports, when reporting comes into force, and to transmit aggregated securities financing transactions data to the FSB when the global data aggregation begins.(1) The SFTR data collection will allow the Bank to improve its understanding of the structure of, and the risks arising from, securities financing markets.

Over 2018, the Bank's FMI research agenda may include, for example, matters related to liquidity efficiency in payment systems, the impact of regulation on the functioning of OTC derivatives markets, or the implementation of the CSDR.

(1) www.fsb.org/wp-content/uploads/FSB-Standards-for-Global-Securities-Financing-Data-Collection.pdf.

Annex 1: The Bank of England's supervision of service providers to recognised payment systems

The Bank's approach to the supervision of service providers to recognised payment systems specified under the Banking Act 2009.

What is a service provider?

The ability of a recognised payment system to deliver its responsibilities may depend on the functioning of other infrastructure or service providers (SPs) to which it has outsourced critical parts of its operations. SPs deliver functions which are essential to the operation of a recognised payment system such as information technology, telecommunications, or messaging services.

Why has the Bank started supervising specified SPs?

HMT has extended the Banking Act 2009 ('The Act') under s.206A, allowing the Act to be applied to service providers to recognised payment systems. In order for this to occur, HMT must specify a service provider in the recognition order of the payment system to which it relates. This action brings a service provider into the Bank's direct supervision. Although the Bank has existing expectations of how RPSOs should manage their SPs, additional powers over certain SPs are considered necessary to enable the Bank to effectively deliver its mandate. In these cases, the Bank's ability to supervise SPs will support the Bank's objective of protecting and enhancing financial stability.

RPSOs will continue to have a primary role to play in monitoring, managing and mitigating risks that their service providers pose to their systems, and the Bank's expectations in this regard are unchanged. The role of the Bank and RPSOs in overseeing risk from service providers will be different and complementary.

What powers will the Bank have over specified SPs and what will specified SPs need to do?

Section 188 of the Act gives power to the Bank to publish principles to which service providers are to have regard. The Bank requires service providers specified under the Act to have regard to Annex F (Oversight expectations applicable to critical service providers) of the CPMI-IOSCO 'Principles for Financial Market Infrastructures'[1] (Annex F). The expectations set out in Annex F should ensure that the operations of an SP are held to the same standards as if the RPSO itself provided the service. The expectations are written at a broad level to allow SPs flexibility in demonstrating their compliance.

SPs have responsibility for satisfying the expectations as set out in Annex F. The Bank expects SPs to complete a self-assessment against the Annex F expectations annually, and to provide this to the Bank. This self-assessment is an important test of an SPs' ability and willingness to demonstrate their understanding of, and commitment to, risk objectives. Self-assessment does not, however, mean self-regulation. The SP's self-assessment does not replace the Bank's own judgement, but is one input to the Bank's assessment. It is viewed as indicative of the SP's own risk tolerance and risk management capability.

The expectations outlined in Annex F are specifically targeted at SPs and cover:

- risk identification and management;
- robust information security management;
- reliability and resilience;
- effective technology planning; and
- strong communications with users.

In addition to requiring specified SPs to have regard to Annex F, the Bank has a range of other powers and expectations of specified SPs. These include tools for intervention and enforcement in the event that SPs fail to satisfy supervisory requirements. These powers fall into four main areas (information gathering; imposing requirements and rules; powers of direction; and enforcement). They are set out in Part 5 of the Act. The most widely used powers and expectations include:

- The Bank requires data from SPs it supervises to inform its supervisory and systemic risk analysis. The Bank will discuss its data needs, and the appropriate mechanism to collect those data, with individual SPs.
- The Bank has powers to commission reports from external experts where it judges them necessary or useful — for example to diagnose risks. Reports from external experts may be required in response to specific needs as they arise.
- The Bank will assess some proposed appointments to an SP's board, and some senior executive positions, to determine if the Bank has any objection. The Bank will agree which roles it will assess with each SP.

(1) www.bis.org/cpmi/publ/d101a.pdf.

- The Bank will assess proposed changes to an SP's business that could materially alter its business model or risk profile to determine if the Bank has any objection. Examples of the types of changes which would fall within the scope of such an assessment include (but are not limited to):
  - launch of a significant new product or service that could materially alter the business model or risk profile;
  - material changes in the ownership, structure or governance of the SP;
  - material changes to the risk appetite; or
  - outsourcing/in-housing of critical functions.

How will the Bank supervise SPs?

The Bank's supervision will focus on elements of the SP that relate to the RPSO it serves. However, the Bank will supervise any area of an SP's business that could have a material impact on critical services provided to the RPSO. This will include, for example, elements of an SP's governance and overall risk management frameworks and other business areas if they could materially impact the services provided to the RPSO.

The Bank will conduct an assessment of an SP which will include an analysis of the main risks it presents to the Bank's objective of financial stability. This risk assessment is regularly reviewed including a full review at least annually. Following the Bank's annual assessment, or any other interim examinations and assessments as the Bank judges necessary, the Bank will set expectations for mitigating actions to be taken by the SP. The Bank expects there to be a relatively small number of prioritised issues on which supervisors will seek action from the SP, leaving responsibility for provision by provision alignment with the Annex F expectations to the SP itself.

The Bank's assessment against the Annex F expectations will use the Bank's standard supervisory risk element model (**Table A1** below), as used for FMIs, with the exception of two elements not applicable to SPs. For further detail on the key supervisory pillars as outlined in **Table A1**, please see the *Bank of England's approach to the supervision of financial market infrastructures*.[1]

The Bank carries out a programme of 'core assurance' which entails a broad and structured set of review into SPs' operations. These are intended to gain assurance that SPs are suitably mitigating risks across their operations, rather than focusing on the narrower key risk areas identified during the Bank's continuous assessment. The core assurance programme consists of a number of different modules which specify the areas reviewed by the Bank. These modules relate to the risks and mitigants which are set out in the Bank's supervisory risk model above, and ultimately to the Annex F expectations. The modules which are applicable to SPs are listed below in **Table A2**.

Table A2 Core assurance modules applicable to SPs and the risk model elements they relate to

Supervisory risk assessment model	Core assurance module
Management and governance	Governance
Risk management and controls	Enterprise-wide risk management
	IT infrastructure resilience
	Cyber resilience
	Outsourcing
	Internal audit
Disaster recovery plans	Business continuity/disaster recovery
Liquid resources	Liquidity management
Capital	Capital
Recovery and resolvability	Recovery plans
	Continuity (special administrative regime)[a] plans

(a) This applies where HMT has designated the SP under the Special Administrative Regime.

How will the Bank report on its supervision of SPs specified under the Banking Act 2009?

The Bank's responsibilities and powers in relation to supervision of SPs are conferred by Parliament. The Bank is committed to being transparent and accountable to Parliament and the public for performance of these responsibilities and use of these powers. It publishes an annual report specifically in relation to its supervisory priorities and activities in respect of FMIs, and supervision of SPs will be included within this report.

Table A1 High-level overview of the Bank's supervisory risk assessment model

<table>
<tr><th colspan="3">Risk</th><th colspan="8">Mitigating factors</th></tr>
<tr><td rowspan="2">Potential systemic impact</td><td colspan="2">Risk context</td><td colspan="4">Operational mitigants</td><td colspan="3">Financial mitigants</td><td>Structural mitigation</td></tr>
<tr><td>External risks</td><td>Internal risks</td><td>~~Promotion and maintenance of standards~~</td><td>Management and governance</td><td>Risk management and controls</td><td>Disaster recovery plans</td><td>~~Collateral/ Margin and Default Fund~~</td><td>Liquid resources</td><td>Capital</td><td>Recovery and resolvability</td></tr>
</table>

(1) www.bankofengland.co.uk/-/media/boe/files/financial-stability/financial-market-infrastructure-supervision/the-boe-approach-to-the-supervision-of-fmi.pdf.

Annex 2: FMIs supervised by the Bank and the key supervisory legislation to which they are subject

Central counterparties (CCPs) are regulated under **FSMA** as recognised clearing houses (**RCHs**) and under **EMIR**. The embedded payment systems of LCH Ltd and ICE Clear Europe are also both recognised payment systems under the **Banking Act 2009**.

ICE Clear Europe Limited	Clears a range of exchange-traded derivatives and OTC credit default swaps.
LCH Limited	Clears a range of repos, exchange-traded and OTC securities and derivatives.
LME Clear Limited	Clears a range of metal derivatives traded on the London Metal Exchange, and OTC metal contracts.

Payment systems meeting defined criteria may be recognised by HMT. Recognised payment systems are supervised by the Bank under the **Banking Act 2009**.

Bacs	Operated by Bacs Payment Schemes Limited (BPSL), processes higher-volume and lower-value payments, such as salary, benefit, Direct Credit and Direct Debit payments.
CHAPS[(a)]	Operated by the Bank of England, the CHAPS system is the United Kingdom's high-value payment system, providing real-time gross settlement of sterling transfers between participants.
CLS	Operates the world's largest multicurrency cash settlement system for foreign exchange transactions in 18 currencies, including sterling.
Faster Payments Service (FPS)	Operated by Faster Payments Scheme Limited (FPSL), processes standing orders and electronic retail transactions, including transactions generated in internet, mobile and telephone banking.
LINK	LINK is a network of card issuers and ATM deployers which allows cardholders to use their cards to withdraw cash at any ATM connected to LINK where the ATM deployer is not the same institution as the cardholder's issuing bank.
Visa Europe	A four party card scheme and cards payments processor operating in the EEA, Israel, Turkey and Switzerland, offering debit, credit, deferred debit and prepaid card products.

Securities settlement systems may be regulated under **FSMA** as RCHs and are subject to the **Uncertificated Securities Regulations 2001** in the United Kingdom. Euroclear UK and Ireland Limited operates the CREST system, which is also a recognised payment system under the **Banking Act 2009**.

Euroclear UK & Ireland Limited (EUI) CREST	EUI operates the CREST system — the securities settlement system for UK gilts and money market instruments, as well as UK equities — which settles on a gross delivery versus payment basis (EUI also operates CREST for the purposes of settling Irish equities).

(a) The Bank's FMI Directorate continues to supervise the CHAPS system to the same standard as recognised payment systems even though it was derecognised by HMT in December 2017 to reflect the fact that it is now operated by the Bank. Further information on this is provided in Box 2.

Annex 3: FMI data

Recognised payment systems and securities settlement system[a]

		Volume		Value (£ millions)		Number of settlement bank members	Operational availability[b]	Important payment types
		2017	2016	2017	2016	Dec. 2017	2017	
Bacs		25,187,221	24,580,024	19,539	18,880	19	100%	Direct Debits & Direct Credits.
CHAPS		165,285	154,006	333,661	298,710	26[c]	99.98%[d]	Financial markets and infrastructure, corporate treasury, other wholesale interbank, government, property completions and mortgages.
CLS	All currencies	766,303	805,587	4,039,717	3,587,377	67	99.98%	Settlement of foreign exchange transactions in 18 currencies, including sterling.
	Sterling	56,390	61,236	322,581	279,334			
CREST	Sterling	197,437	187,681	668,128	534,799	21	99.78%	Settlement of gilts, equities and money market instruments (including in respect of the Bank's Open Market Operations and repo markets transactions more generally).
	US dollar	7,733	7,253	1,692	1,755			
	Euro	5,161	4,852	977	912			
	Total CREST	210,331	199,786	670,796	537,466			
Faster Payments Service		6,544,753	5,636,731	5,541	4,700	20	100%	Electronic transactions, including transactions generated in internet, mobile and telephone banking together with standing orders.
LINK		8,507,406	8,687,123	355	355	37[e]	100%	Withdrawing cash from ATMs deployed by entities other than the withdrawer's card issuer.
Visa Europe[f]	All issuance	69,556,140	58,239,926	2,759	2,362	498	100%	Card payments.

(a) All value and volume data represent daily average unless otherwise stated.
(b) Operational availability as defined by each FMI.
(c) With two further payment service providers technically enabled as Direct Participants/settlement banks in CHAPS, and preparing for full participation.
(d) Operational availability for individual urgent payments.
(e) This refers to the total number of LINK members.
(f) Figures represent average daily volume for the year of 2017 based on processed transaction volume.

CCPs (by default waterfall)

		Total initial margin requirement (£ equivalent, millions)[a]		Default fund (£ equivalent, millions)[b]		Number of clearing members	Operational availability of core systems[c]	Products cleared
		2017	2016	2017	2016	As at 31 Dec. 2017	As at 31 Dec. 2017	
ICE Clear Europe	Credit default swap	4,920	5,276	759	824	22	99.99%	Clears a range of exchange traded derivatives and OTC credit default swaps.
	Futures and options	29,677	30,449	1,514	1,293	73		
LCH Ltd	CommodityClear[d]	82	78	14	11	19	99.97%	Clears OTC and exchange-traded interest rate derivatives, OTC FX derivatives, cash equities and equity derivatives, cash bonds and repos, and Commodity Derivatives.
	EquityClear	1,714	1,414	186	176	35		
	ForexClear	3,198	874	1,300	352	30		
	RepoClear	11,051	9,630	883	815	82		
	SwapClear[e]	90,047	67,853	4,979	3,947	109		
LME Clear	LME Base	6,754	6,248	538	313	46	100%	Clears a range of base metal and precious metal derivatives traded on the London Metal Exchange.
	LMEprecious[f]	223	n.a.	104	n.a.	9		

(a) The end of day total margin requirement per default waterfall, averaged over all business days in the period.
(b) The size of the clearing member prefunded default fund, averaged over all business days in the period.
(c) Operational availability as defined by each FMI.
(d) The CommodityClear service closed on 28 December 2017.
(e) The SwapClear line covers the SwapClear and Listed Rates services.
(f) LMEprecious was launched on 10 July 2017.

Annex 4: 2017 *Annual Report* commitments

2017 *Annual Report* section	2017 *Annual Report* commitment	2018 *Annual Report* section
3.2 Review of supervisory activity during 2016		
3.2.2	In the 2016 *Report*, The Bank committed to review whether any changes are necessary to the supervision of the **United Kingdom's high-value payment system**… This review includes assessing how the Bank supervises the high-value payment system. The Bank will announce the findings from this review in due course.	Box 2
3.2.4	The Bank has therefore started a review to determine how FMIs maintain oversight of **third-party providers** as part of its core assurance work. The Bank anticipates this review will be concluded in 2017.	3.2.1
3.2.6	To ensure payment systems are able to meet their obligations as they fall due, **the Bank has started a review into the design and resilience of the payment systems' sources of capital and processes for raising it for funding purposes**. The review will also cover how payment systems manage financial risks to their operations. This review will conclude in 2017.	3.3
3.2.7	Work is also under way with some **CCPs to assess how they could further mitigate risks associated with investment of margin**, for instance by increasing the number of investment counterparties they face and also how they engage with investment agents.	3.3
4.1 Supervisory priorities 2017		
4.1.1	The Bank will continue to work with EUI over the coming year in respect of its compliance with the requirements of the **CSDR ahead of EUI providing an application** for authorisation under it.	3.5
4.1.2	Building on the 2016 **multi-CCP default management fire drill**, the Bank has agreed with BaFin, Bundesbank and the CFTC to extend the 2017 exercise further to run across three CCPs.	3.4
4.1.3	**CCP data project** — The project to enhance the CCPs' supervisory data returns will result in a more regular and consistent set of supervisory data from CCPs to help support these goals.	4.4.1
4.1.4(a)	The Bank views the operational resilience of FMIs as a key area of focus. The Bank will therefore **extend the scope of its reviews of FMIs' operational resilience** to cover certain FMIs not in scope for review in 2016, and to cover additional aspects of resilience (such as business continuity planning and disaster recovery).	3.2
4.1.4(b)	While the Bank has already carried out a significant amount of work on reducing the risks associated with **tiering**, a key part of the Bank's planned supervisory assurance work in 2017 will be to review how FMIs are implementing relevant risk-reducing actions.	3.2.3
4.1.4(c)	The Bank will therefore carry out a **review into certain FMIs' recovery plans in 2017**.	3.4
4.1.5(a)	LSE and Deutsche Börse announced in March 2016 an **intention to merge** the two companies, which was approved by both sets of shareholders in July 2016. The Bank would have had to appraise the suitability of the proposed acquirer and the financial soundness of the proposed acquisition, and to co-operate closely with relevant competent authorities for other regulated entities within the merged group in relation to this assessment. However, the merger did not proceed.	n.a.
4.1.5(b)	The United Kingdom's **withdrawal from the European Union** could pose challenges for FMIs, including potential changes in the arrangements for providing cross-border services and the potential for further significant market moves. The Bank will seek to ensure through its supervision that FMIs are able to identify, manage, and mitigate any such risks.	Box 4
4.1.5(c)	The Bank and PSR have jointly set up the **Payment System Operator Delivery Group**. The group is comprised of an independent Chair, the Chairs of the entities that are proposed to be merged, and representatives from the PSF. The group will set out its proposals which will need to be endorsed by the Bank, PSR, and the Boards and shareholders of the merging entities. The process of consolidation should be under way during 2017.	2.4.2

2017 *Annual Report* section	2017 *Annual Report* commitment	2018 *Annual Report* section
4.2 Shaping the policy landscape		
4.2.1	CPMI-IOSCO has published draft guidance on **CCP resilience and recovery**; the Bank strongly supports the draft guidance and anticipates it will be finalised in 2017. When the guidance is finalised, the Bank will expect UK CCPs to make any enhancements necessary in order to implement it. Using CPMI-IOSCO framework, the Bank intends to conduct a **supervisory stress test of UK CCPs** in due course.	3.6.1 and Box 3
4.2.2	The Bank will publish **the governance section of its code of practice** for operators of recognised payment systems.	3.1.2
4.2.3	**CSDR settlement discipline**… As the new regime is a step change from current practice, the Bank, FCA, and Central Bank of Ireland have jointly convened a standing group consisting of representatives from financial institutions, clearing houses, and EUI to identify and overcome any practical issues associated with implementing the regime.	3.6.3
4.2.4	At present, **SFR protections** do not apply to 'non-bank' payment institutions and equivalent overseas firms. To widen access to the payment systems, the SFR protections are being extended to enable non-bank payment institutions which provide payment services to benefit from the preferential treatment afforded to banks concerning settlement finality.	2.4.1
4.4.1	The Bank will continually refine its approach, and as part of this the Bank's FMI and banking supervisors are jointly developing an **enhanced micro-supervisory approach to operational resilience**.	3.2 and Box 1
4.4.2	The Bank will **continue to deliver core assurance modules** alongside its forward-looking risk assessments.	Chapter 3
4.4.3	The Bank will consult on **levying fees** for its supervision of FMIs with a view to any changes commencing in 2018 when the Cash Ratio Deposit is renewed.	2.4.3 and Box 1
4.4.4	As part of its commitment to increase openness and transparency, the Bank has consulted on introducing an **independent Enforcement Decision Making Committee (EDMC)** to review cases where the Bank's enforcement decisions have been contested. The EDMC's remit includes enforcement decisions taken in relation to FMIs.	2.4.3

Annex 5: Glossary of terms

Central counterparty
An entity that interposes itself between counterparties to contracts traded in one or more financial markets, becoming the buyer to every seller and the seller to every buyer.

Central securities depository
An entity that provides securities accounts, central safekeeping services, and asset services, which may include the administration of corporate actions and redemptions, and plays an important role in helping to ensure the integrity of securities issues (that is, ensure that securities are not accidentally or fraudulently created or destroyed or their details changed).

Clearing members
Institutions with direct access to a CCP in order to centrally clear their own trades and/or those of their clients.

Collateral
An asset or third-party commitment used by a collateral provider to secure an obligation *vis-à-vis* a collateral taker.

Credit risk
The risk of loss due to the failure of a counterparty to perform on a contractual obligation on time and in full. Credit risk arises whenever future cash flows are due from parties who may not provide them.

Default fund
A fund consisting of assets contributed by members of a system that would be used to pay liabilities of defaulting members.

Deferred net settlement
A net settlement mechanism which settles on a net basis at the end of a predefined settlement cycle.

Exposure
An amount that can be lost due to the failure of one or more participants in an FMI.

G20
The G20 group comprises 19 countries and the European Union, representing the world's largest economies, whose finance ministers and central bank governors have met periodically since 1999.

Initial margin
Collateral which is posted at the beginning of a transaction by a member to a CCP to cover potential future adverse changes in the market value of the contract and is recalculated on a regular basis.

Interoperability
An arrangement in which two or more CCPs operate a clearing link which enables clearing members of one CCP to clear trades matched with clearing members of the other interoperable CCP(s).

Liquidity risk
The risk that a party does not have sufficient funds to meet an obligation when it becomes due, or can only obtain those funds at an unexpectedly high cost.

Loss allocation
Rules specifying how losses in excess of a CCP's pre-funded resources are allocated.

Margin
Combination of initial and variation margin.

Operational risk
The risk that deficiencies in information systems or internal processes, human errors, management failures, or disruptions from external events will result in the reduction, deterioration, or breakdown of services provided by an FMI.

Payment system
An entity enabling payments to be transferred and settled across an infrastructure according to a set of predetermined multilateral rules.

Securities settlement system
An entity enabling securities to be transferred and settled by book entry according to a set of predetermined multilateral rules. Such systems allow transfers of securities either free of payment or against payment.

Settlement risk
The general term used to designate the risk that settlement in a funds or securities transfer system will not take place as expected. This risk may comprise both credit and liquidity risk.

Systemic risk
The risk that the inability of one or more participants to perform as expected will cause other participants to be unable to meet their obligations when due.

Tiering
Tiered participation occurs when direct participants in a system provide services to other institutions to allow them to access the system indirectly.

Trade repository
An entity that maintains a centralised electronic record (database) of transaction data.

Variation margin
Collateral which is posted during the life of a contract by a member to a CCP to cover actual changes in the market value of a contract.

Annex 6: Abbreviations used in this *Report*

ATM	Automated teller machine
BIS	Bank for International Settlements
BPSL	Bacs Payment Schemes Limited
CCP	Central counterparty
CEO	Chief Executive Officer
CFTC	Commodity Futures Trading Commission
CHAPS	Clearing House Automated Payment System
CHAPS Co	CHAPS Clearing Company Limited
CLS	Continuous Linked Settlement
CME	Chicago Mercantile Exchange
CMG	Crisis Management Group
CPMI	Committee on Payments and Market Infrastructures
CSD	Central securities depositories
CSDR	Central Securities Depositories Regulation
DAT	Derivatives Assessment Team
EBA	European Banking Authority
ECB	European Central Bank
EEA	European Economic Area
EMIR	European Market Infrastructure Regulation
ESMA	European Securities and Markets Authority
EUI	Euroclear UK & Ireland Limited
FCA	Financial Conduct Authority
FMI	Financial market infrastructure
FPC	Financial Policy Committee
FPS	Faster Payments Service
FPSL	Faster Payments Scheme Limited
FSB	Financial Stability Board
FSMA	Financial Services and Markets Act 2000
ICE	Intercontinental Exchange
IOSCO	International Organization of Securities Commissions
LCH	London Clearing House
LME	London Metal Exchange
MiFID II	Markets in Financial Instruments Directive II
MiFIR	Markets in Financial Instruments Regulation
MoU	Memorandum of understanding
NPSO	New payment system operator
OTC	Over the counter
PFMI	Principles for Financial Market Infrastructures
PRA	Prudential Regulation Authority
PSF	Payment Strategy Forum
PSR	Payment Systems Regulator
RCH	Recognised clearing house
RFB	Ring-fenced body
RPSO	Recognised payment system operators
RTGS	Real-Time Gross Settlement
SFTR	Securities Financing Transactions Regulation
SP	Service provider
SWIFT	Society for Worldwide Interbank Financial Telecommunication
TR	Trade repository

Annex 7: Legislation, regulation and standards

The Bank's supervision of FMIs is shaped by different pieces of legislation, regulation and standards at UK, EU and international level.

UK legislation

The principal pieces of UK legislation that shape the Bank's supervision of FMIs are:

- Part 5 of the Banking Act 2009, which established the statutory oversight regime for payment systems and service providers to recognised payment systems;
- FSMA, which set out responsibilities and powers in respect of the supervision of RCHs; and
- the Uncertificated Securities Regulations 2001, to which operators of securities settlement systems are subject.

EU regulation

The activities of CCPs in the United Kingdom are subject to regulation by the Bank under EU law, namely the European Regulation on OTC derivatives, central counterparties and trade repositories of July 2012, commonly known as the European Market Infrastructure Regulation (EMIR). EMIR came into force in August 2012 and many of the main associated technical standards to support it came into force in March 2013. EMIR and the technical standards are directly applicable in the United Kingdom. Therefore, UK-incorporated CCPs need to satisfy the provisions of the Regulation and standards, together with any additional domestic requirements, in order to achieve and maintain authorisation under EMIR.

The Central Securities Depositories Regulation (CSDR), came into force in September 2014, and establishes common EU laws for Central Securities Depositories (CSDs). During 2014–16, the Bank, along with other EU authorities, assisted the European Securities and Markets Authority (ESMA) and the European Banking Authority (EBA) in developing the draft technical standards mandated by the CSDR which will set more detailed rules in many areas. ESMA and EBA's technical standards were published in March 2017. As with EMIR, the United Kingdom's existing regime will continue to apply to CSDs until a decision on an authorisation or recognition under the new regime has been reached.

The Securities Financing Transactions Regulation (SFTR) came into force in January 2016. It mandates the daily reporting of all securities financing transactions to trade repositories.

International standards

As part of the Bank's supervisory approach, each supervised UK FMI is assessed annually against international standards, as set out in the 'Principles for Financial Market Infrastructures' (PFMI) published by the Bank for International Settlements' Committee on Payments and Market Infrastructures and the International Organization of Securities Commissions (CPMI-IOSCO) in April 2012. The Bank expects supervised FMIs to perform an annual self-assessment against these standards as an input into the Bank's own assessment. Since both EMIR and the CSDR draw on the PFMI for much of their content, there is overlap between these international standards and the EU regulations for CCPs and CSDs. Under the Banking Act 2009 the Bank has adopted the PFMI without amendment as the principles to which operators of recognised payment systems are to have regard when operating their systems, and Annex F (Oversight expectations applicable to critical service providers) of the PFMI as the principles to which service providers are to have regard in the provision of services to recognised payment systems.

Settlement Finality Directive

The EU Directive on Settlement Finality in Payment and Securities Settlement Systems (Directive 98/26/EC) was implemented into UK law by the Financial Markets and Insolvency (Settlement Finality) Regulations 1999.(1) The Bank is the United Kingdom's designating authority.(2) Designated systems receive protections against the operation of normal insolvency law in order to ensure that transactions that have been submitted in the system are irrevocable, to reduce the likelihood of legal challenge to the finality of settlement and to ensure the enforceability of collateral security. The Bank maintains a list of UK designated systems on its website.(3)

Companies Act 1989

Under the Companies Act 1989, the Bank has various powers regarding CCP default rules. These include reviewing CCPs' default rules and giving directions concerning action taken under those default rules. The Bank can also make an Order recognising that the relevant provisions of the default rules of an EEA CCP or third-country CCP satisfy relevant requirements. The Bank must maintain and publish a register of Orders made.

(1) SI 1999/2979 (as amended from time to time).
(2) The FCA is the designating authority in respect of recognised investment exchanges.
(3) www.bankofengland.co.uk/financial-stability/financial-market-infrastructure-supervision.

Annex 8: List of Bank research papers on FMI topics published or accepted for publication

Bank of England Staff Working Papers

11 August 2017	Ferrara, G and Xin, L, 'Central counterparty auction design', *Bank of England Staff Working Paper No. 669*; www.bankofengland.co.uk/working-paper/2017/central-counterparty-auction-design.
18 August 2017	Benos, E, Garratt, R and Gurrola-Perez, P, 'The economics of distributed ledger technology for securities settlement', *Bank of England Staff Working Paper No. 670*; www.bankofengland.co.uk/working-paper/2017/the-economics-of-distributed-ledger-technology-for-securities-settlement.
1 September 2017	Houllier, M and Murphy, D, 'Borderline: judging the adequacy of return distribution estimation techniques in initial margin models', *Bank of England Staff Working Paper No. 673*; www.bankofengland.co.uk/working-paper/2017/borderline-judging-the-adequacy-of-return-distribution-estimation-techniques-initial-margin.
8 September 2017	Benos, E, Ferrara, G and Gurrola-Perez, P, 'The impact of de-tiering in the United Kingdom's large-value payment system', *Bank of England Staff Working Paper No. 676*; www.bankofengland.co.uk/working-paper/2017/the-impact-of-de-tiering-in-the-united-kingdoms-large-value-payment-system.

External publications in refereed journals

1 March 2017	Murphy, D, 'I've got you under my skin: large central counterparty financial resources and the incentives they create', *Journal of Financial Market Infrastructures*, Vol. 5, No. 3, pages 57–74.
7 July 2017	Benos, E, Gurrola-Perez, P and Wood, M, 'Managing market liquidity risk in central counterparties', *Journal of Financial Market Infrastructures*, Vol. 5, No. 4, pages 105–25.
7 July 2017	Houllier, M and Murphy, D, 'Initial margin model sensitivity analysis and volatility estimation', *Journal of Financial Market Infrastructures* ,Vol. 5, No. 4, pages 77–103.
25 July 2017	Benos, E, Brugler, J, Hjalmarsson, E and Zikes, F, 'Interactions among high-frequency traders', *Journal of Financial Quantitative Analysis*, Vol. 52, No. 4, pages 1,375–402; https://doi.org/10.1017/S0022109017000485.
14 September 2017	Karimalis, E N and Nomikos, N K, 'Measuring systemic risk in the European banking sector: a copula CoVaR approach', *The European Journal of Finance*, (published online 14 September 2017); http://dx.doi.org/10.1080/1351847X.2017.1366350.
1 October 2017	Braithwaite, J and Murphy, D, 'Get the balance right: private rights and public policy in the post-crisis regime for OTC derivatives', *Capital Markets Law Journal*, Vol. 12, No.4, pages 480–509; https://doi.org/10.1093/cmlj/kmx033.
2 October 2017	Vicente, L, Cerezetti, F and De Genaro, A, 'Estimating 'hedge and auction' liquidation costs in central counterparties: a closeout risk approach', *Journal of Financial Market Infrastructures* ,Vol. 6, No. 1, pages 1–27, DOI: 10.21314/JFMI.2017.084.
January 2018	Benos, E, Ferrara, G and Gurrola-Perez, P, 'The impact of de-tiering in the United Kingdom's large-value payment system', *Journal of Financial Market Infrastructures*, Vol. 6, No. 2/3, pages 1–32.
Forthcoming	Gurrola-Perez, P, 'The validation of filtered historical VaR models', *Journal of Model Risk Validation*.
Forthcoming	Benos, E and Zikes, F, 'Funding constraints and liquidity in two-tiered OTC markets', *Journal of Financial Markets*.

Other external publications

August 2017	Morrison, A, Vasios, M, Wilson, M and Zikes, F, 'Identifying contagion in a banking network' (a revised version of *Bank of England Staff Working Paper No. 642*), *Federal Reserve Board Working Paper in the Finance and Economics Discussion Series 2017–082*.
24 January 2018	Cerezetti, F, Karimalis, E, Shreyas, U and Sumawong, A, 'Trimming the hedge: how can CCPs efficiently manage a default?', Bank Underground; https://bankunderground.co.uk/2018/01/24/trimming-the-hedge-how-can-ccps-efficiently-manage-a-default/.