INNOVATE FINANCE

BLOCKCHAIN, DLT AND THE CAPITAL MARKETS JOURNEY

NAVIGATING THE REGULATORY AND LEGAL LANDSCAPE

In association with:

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NAVIGATING THE REGULATORY AND LEGAL LANDSCAPE FOR DLT

DISCLAIMER

This material has been prepared for general informational purposes only and is not intended to be relied upon as legal, accounting, tax or other professional advice. Please refer to your advisors for specific advice.

CHANGING THE TRADE LIFECYCLE:

QUESTIONS AND ANSWERS IN THIS REPORT

Trade cycle overview Source EY, HL, IF Analysis

The structure of this paper is in Q&A format, addressing 10 key legal and regulatory questions relating to the use of distributed ledger technology in capital markets. The diagram below maps these questions across the value chain of an equities transaction using current trade lifecycle components: order matching, trade execution, trade processing, asset lifecycle events and portfolio reconciliation. It also demonstrates where distributed ledger technology could sit within a trade lifecycle.
Questions are numbered as they appear in the Q&A.

OVERARCHING QUESTIONS

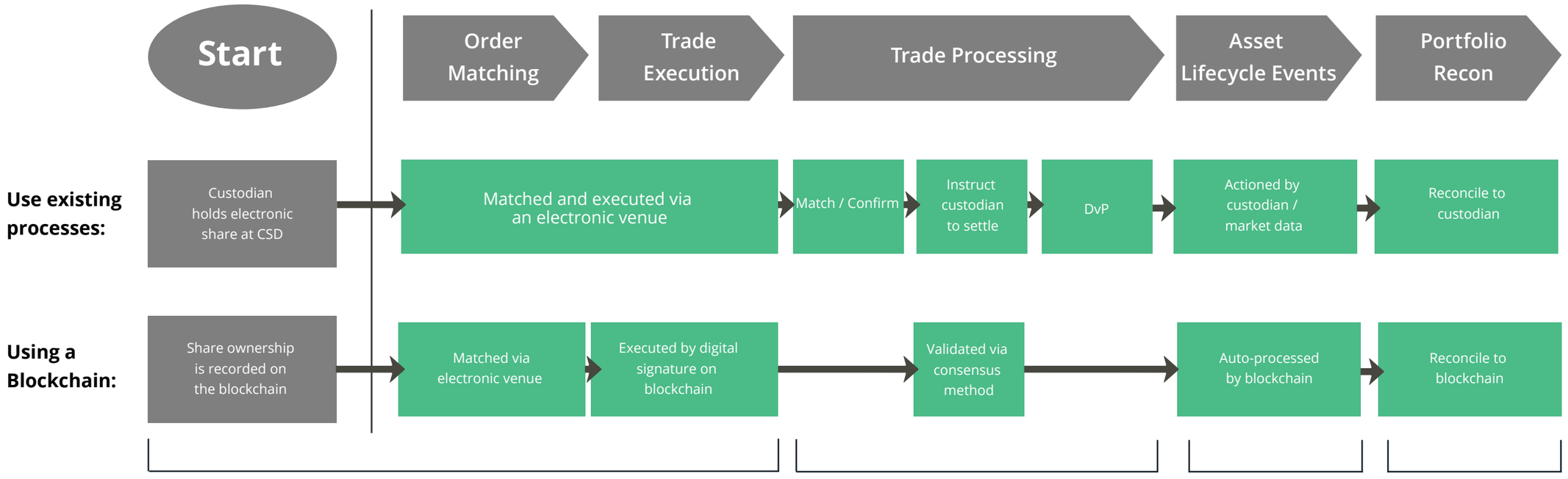
Q2. Could a security traded on a DLT system be used as collateral for another obligation?

Q4. Does current regulation facilitate execution of smart contracts on a DLT system?

Q8. What data protection issues could a DLT system give rise to?

Q9. Will competition law help or hinder collaboration in developing DLT solutions?

Q10. What roles will national and supra-national regulators play?



Q5. Could DLT solutions, operating as intended, eliminate the need for certain functions in firms, or indeed current market participants?

Q3. Could DLT systems facilitate the simultaneous execution, clearing and settlement of transactions in listed securities?

Q6. Would current risks inherent in securities transactions increase or decrease with the use of DLT systems?

Q1. From a legal perspective, is it possible to use DLT to record and transfer interests in securities or execute financial transactions using smart contracts?

Q7. What happens if a DLT solution is implemented but contains latent defects?

FOREWORD
LAWRENCE WINTERMEYER
CEO, INNOVATE FINANCE

The potential of blockchain, or distributed ledger technology (DLT) more broadly, to substantially reduce the complexity of counterparty relationships in capital markets captured the imagination of the financial services world in 2015. Investment in blockchain startups, propositions and proofs-of-concept that target points across the trading and settlement process has led corporate investment in this space over the past calendar year, with trade finance and identity management being the other areas of increased focus.

The industry is coming to a point where DLT solutions are expected to deliver on their early promises. Gartner research from August 2016 placed blockchain close to the peak of inflated expectations. For the technology to progress towards productivity, broad industry collaboration and regulatory certainty are critical.

Innovate Finance has collaborated with our strategic partners Hogan Lovells and member EY to identify the key issues that DLT capital market products must navigate in the UK's legal and regulatory landscape.

A number of the key issues arise as existing processes are being supported or replaced via blockchain solutions. Complexities increase significantly when considering the potential of DLT to redraw the traditional transactional lines and risk management processes in capital markets.

The advancement of DLT poses a broader challenge to regulatory regimes and legal frameworks – how can supervisors and standard setting authorities keep apace with innovative technologies without rushing to rule-making while such technologies are still evolving?

This report formulates a number of recommendations which seek to enable the level of collaboration between industry and regulators required to ensure that authorities formulate a right-touch approach to DLT regulation and DLT solutions are developed with an adequate risk framework in mind. The report also outlines a number of industry-level decisions required to address issues such as interoperability, legal certainty, and redress.

As an independent members association for FinTech, Innovate Finance aims to identify such key issues where industry-level engagement is critical to drive innovation forward.

ABOUT
THIS REPORT

IMRAN GULAMHUSEINWALA

EY Partner — Global FinTech Leader

In the post-financial crisis era, nearly all capital markets' entities within large investment banks are struggling to deliver returns on equity above their cost of capital. Blockchain technology has the potential to revolutionise the profitability of capital markets: delivering operational efficiency, freeing up capital and reducing risk. However, high quality thinking on the regulatory and legal aspects of blockchain, for the most part, has been deferred whilst IT and business leaders have tried to come to grips with the technology and where it might best be applied.

We do not have all the answers yet, but it is clear that the full benefits of blockchain will require substantial changes to the regulatory and legal frameworks governing capital markets. It is only by addressing major regulatory and legal axioms (such as legal title, contract enforceability and the role of market infrastructure intermediaries) that blockchain technology can deliver on the promise of risk mitigation and capital efficiency — and the operational benefits associated with eliminating reconciliations. Indeed, it may be that the full benefits are only realised with the real-time cash settlement of transactions, thereby freeing up cash, providing collateral and minimising counterparty risk.

We believe that now is the right time to bring the regulators and law makers more actively into the debate to help mitigate some of the inherent blockers in the current frameworks and, more importantly, to shape the future architecture of blockchain. In this report, we have sought to address some of the most important legal and regulatory questions affecting the development of blockchain in order to help kick-start the debate. The questions range from the organisational (how does competition law view cross-industry collaboration) to the philosophical (should regulators actively participate as nodes on blockchains).

We hope that this report can support technology leaders and regulators to work together to ask better questions and create better solutions. We also recognize that the onus inevitably will fall on the industry to make clear and specific requests of regulators and law makers to enact change and, at EY, we look forward to working hard with all stakeholders to make that a reality.

RACHEL KENT

Global Head, Financial Institutions Sector, Hogan Lovells

Progressing the journey for Blockchain and DLT will mean navigating a complex matrix of law and regulations. Law and regulations which were not designed with this technology in mind – which could limit their effectiveness. Equally, some DLT solutions may not have the legal matrix front of mind – which could limit their potential. We are at a point of convergence where the two worlds need to evolve to operate as one if the full potential of DLT is to be realised and any regulatory risk mitigated. This is particularly true in the high value and highly regulated arena of the capital markets.

Developing viable and valuable DLT solutions requires a granular understanding of all the technicalities. From a technology perspective the starting-point is the functionality required by its market, for example, to reduce settlement time or multiple reconciliations. But it is also critical for developers and investors to understand the functionality required to satisfy regulators that a DLT solution will be compliant. From a regulatory perspective, it means not only knowing how regulation will categorise the technology but also understanding how and when dialogue with regulators should form part of the process. Knowing if technicalities rather than policy stand in the way, requires an understanding of the regulatory objectives and how to engage with policy-makers to re-shape it.

Yet looking at the potential issues just through a financial regulatory lens risks missing the bigger picture. There is a wider world of legal issues which may impact on the intended operation of DLT solutions. The interplay between law and technology will affect the extent to which code could prevail, such as if there is insolvency or fraud. It is important to understand the unintended consequences which can arise by operation of law in order to design around them. This report looks beyond pure financial regulation to add insights on contract law, competition law, privacy, litigation and insolvency. By understanding the wider legal context, we can help to mitigate some of the early adopter risk whilst the law races to catch up. Creative solutions come from a heritage of experience and legal innovation.

Similar legal and regulatory issues arise outside the UK, so this report can also help inform the thinking on developing DLT solutions for other markets. Likewise, much of the legal analysis would apply to the introduction of other forms of transformative technologies in capital markets, beyond DLT. The emergence of a transformative technology is a fascinating time for law, just as when the internet gained traction. It requires critical thinking and analysis of the implications across legal disciplines to guide pioneers as they journey to their promised land, anticipating potential areas of concern and finding solutions.

Brexit would mean that the UK's regulatory framework would need to be re-cast. By grasping the nettle and designing regulatory structures which enable the emergence of transformative technologies, whilst managing risk, the UK could show its commitment to staying at the heart of progressing better financial regulation internationally. Developing a co-ordinated response to facilitate the current wave of DLT innovations could be a catalyst for a new era of working with regulators in the EU, and beyond, with a commonality of interest still at its core.

Collaboration will be critical to the integration of DLT into the capital markets. We are delighted to be capturing the zeitgeist by collaborating with Innovate Finance and EY on this report. We are also grateful for the collaborative support given by many contributors currently working on DLT opportunities in this area. We hope that the answers the report provides to some of the questions which DLT raises will help propel the technology on its journey in the capital markets.

EXECUTIVE SUMMARY

Blockchain has generated a significant amount of interest within the capital markets community, as FinTech start-ups, market infrastructure providers and global banks evaluate technology and potential use cases. Yet, there is a lack of clarity and many unanswered questions remain as to how blockchain fits into the current regulatory and legal infrastructure of capital markets.

For blockchain, or other forms of DLT, to deliver viable and valuable solutions in the highly-regulated environment of capital markets, it will need to navigate that legal and regulatory landscape – either by evolving solutions which conform, or by engaging with policymakers to reshape its contours. The first step is to understand the legal and regulatory context in which DLT solutions would operate.

The report focuses on the UK's regulatory and legal environment (including, where applicable, by reference to EU law) as a stepping-stone to understanding the analysis to be applied in other markets as the issues and concepts identified here tend to give rise to similar concerns in other jurisdictions. Given the need for international co-operation in responding to a global technology, it is hoped that this analysis will also help progress the thinking on the regulatory and legal issues to be navigated in other jurisdictions.

Innovate Finance has collaborated with Hogan Lovells and EY to produce this report which outlines, in Q&A format, the legal and regulatory challenges of using DLT in capital markets, including the over-the-counter (OTC) derivatives market.

The executive summary outlines the key themes which frame the analysis and recommendations for regulators and policy-makers. The objectives of the report are to:

- **Inform industry, policy-makers and regulators of the potential impact of legal and regulatory requirements on proposed DLT-use cases**
- **Provide regulatory insights for potential product buyers of a product (i.e., buyside firms)**
- **Recommend actions to support regulatory reform in the UK and European Union (EU) to accommodate DLT blockchain solutions**

DLT AND THE REGULATORY CONTEXT

DLT solutions will need to comply with the regulatory and legal framework in which they operate. This is a particular challenge for a "distributed" technology which, in most cases, would need to operate across national boundaries to optimise the potential. Whilst the regulatory agenda in financial services is increasingly co-ordinated at an international level, so far, there is no framework that serves all jurisdictions, nor is there one form of DLT. As a result, there is a tendency to defer the legal analysis and focus mainly on use cases. But, as DLT applications emerge from the development phase, addressing the regulatory and legal issues has become more urgent.

This report focuses on the UK where, as in other markets, the current regulatory framework was not designed to accommodate DLT technology. Significant elements of the regulatory landscape in the UK relating to the capital markets are defined by EU law, such as the Markets in Financial Instruments Directive (MiFID), European Market Infrastructure Regulation (EMIR), and Central Securities Depositories Regulation (CSDR), none of which were drafted to accommodate DLT. The regulatory framework needs to be re-examined in light of DLT developments. Regulators also need to understand where and how DLT can deliver benefit without introducing additional risk.

Brexit adds another layer of complexity, given its uncertain impact on existing EU and UK regulatory infrastructures. Much will depend on whether the UK mirrors existing EU law and regulation or diverges to form an independent regulatory perspective. Brexit may present opportunities to launch DLT solutions in the UK if it enables legislation to be updated to reflect the emergence of DLT solutions and remove the legal technicalities that obstruct implementation. The UK government could also draft new laws and regulations to support and enable the use of DLT technology in capital markets though, given the cross-border nature of the market, this alone would not be sufficient. Indeed, if Brexit were to result in a significantly divergent approach to regulating use of DLT in the UK and the EU, it may not be possible to realise potential cross-border efficiencies. More recognition of this technology in other jurisdictions would still be needed but, with regulatory support, the UK could be the fulcrum for its emergence on to a wider stage with its regulatory characteristics better understood.

FRAMING THE ANALYSIS: KEY THEMES

DLT will have many impacts at operational and strategic levels should it be introduced to capital markets and OTC derivatives infrastructure.

1 DISINTERMEDIATION OF MARKET PLAYERS

DLT can conceivably be used as a medium for issuing and transferring securities. The settlement and depository functions employed in existing clearing systems would be largely unnecessary in an efficient DLT system; this presents the possibility of the partial or, in some cases, complete, disintermediation of market participants currently undertaking these functions.

Under current clearing and settlement arrangements, a Central Counterparty Clearing House (CCP) offers benefits beyond the pure function of clearing, including netting risk exposures, payments or transfers, reducing balance sheets, and increasing market transparency. Central Securities Depositories (CSDs) hold securities in dematerialised form so trades between parties can be made by book entry without issuing physical certificates of ownership. A CSD also provides clearing and settlement functions and potentially mitigates operational risk.

The Central Securities Depositories Regulation (CSDR) applies common EU rules to CSDs with the aim of improving the safety of settlement. Due to the regulatory requirements imposed under CSDR, a DLT solution to disintermediate CSDs would be impossible without a change in legislation. While CSDs focus on the transfer of security ownership, CCPs intervene between trade execution and settlement and play a key role in managing counterparty credit risk.

Regulators will likely support disintermediation by a DLT solution only if it offers similar benefits to the current role of a CCP or CSD, without increasing systemic risk.

Notwithstanding the potential for such disintermediation, we think it likely that regulators will want to ensure that any DLT system has an effective governance arrangement, and there will need to be clarity as to which entity or entities take regulatory responsibility for the orderly operation of this. There is likely to be resistance to implementation of a DLT system that completely disintermediates third parties and indeed, certain representative bodies are already taking a public position to this effect.

2 CERTAINTY AND IMMUTABILITY

One of the key features of DLT systems is that they provide an immutable record.

There is a difference between immutability of fact, which is dependent on whether the technology creates a record that cannot be changed, and immutability in law, which is dependent on whether a DLT system would be regarded as a definitive record as a matter of law. In a case where a DLT solution is used to record the ownership of assets and, in the absence of specific legislation that would allow for this, a court would not consider the ownership data in itself as a definitive title to the asset without supporting documentation. It could potentially be used as evidence, but there would be no certainty that a court would find true legal ownership to be reflected in the data. A possible exception is that a DLT solution could be used as a definitive register for the ownership of dematerialised registered securities, but this is yet to be tested in the UK and would give rise to certain impracticalities under existing legislation. Participants in the capital markets would need certainty on the degree to which data is to be treated as immutable for legal purposes. This could be achieved contractually but, in most instances, (particularly in the context of using DLT to transfer interests in securities and other assets), statutory recognition of these arrangements could help propel wider adoption of this technology.

One development worth highlighting is the recently reported technology which allows for a blockchain ledger to be "edited." As this technology is relatively unknown, and given the importance of immutability characteristics to many potential applications of DLT, this report focuses on DLT systems that are, by design, not open to post-trade modification.

3 FLEXIBILITY OF SMART CONTRACTS AND REDRESS – "CODE IS LAW"

One focus of the discussion on DLT has been whether the technology can be used to execute financial contracts, particularly through the use of smart contracts.

A legal contract needs to set out the parties' intentions with clarity and certainty. Furthermore, for regulated firms, contracts need to be written so that they can be readily understood by regulators. A smart contract by which contract obligations are encoded on to a DLT could be accompanied by a written agreement, although legal status would be crucial: is the written document the contract or does it simply evidence the smart contract? Which has primacy if the two differ? Smart contracts are useful mechanisms to drive operational efficiencies, but they are not an optimum medium for legal agreements with complex terms or optionality, or which rely on the parties' discretion. It must also be possible to unwind transactions and have the flexibility to enforce rights to redress.

4 REGULATORY UNCERTAINTY AND POTENTIAL COMPLIANCE BENEFITS

DLT solutions have the potential to deliver a number of legal and regulatory benefits, including enabling the reporting of transactions and positions directly to the regulator via direct access to the shared ledger, which could potentially disintermediate Trade Repositories (TRs) and Approved Reporting Mechanisms (ARMs). DLT solutions could also reduce trade errors, operational risk, and counterparty risk by introducing true straight-through processing and instantaneous execution and settlement.

The distributed nature of DLT solutions allows multiple users to share a record and makes the technology inherently resistant to cyberattacks and data corruption. However, as the regulatory framework around the provision of financial services at present has not been written with smart contracts or DLT specifically in mind, use of DLT solutions in any particular context will need to be examined against the precise terms of applicable financial services law to ascertain whether additional compliance measures are necessary.

5 HOW DOES COMPETITION LAW APPLY TO PERMISSIONED DLT SYSTEMS?

DLT consortia must be mindful of competition law when developing and operating a DLT solution. If a DLT solution was to become the default network, then additional obligations may be imposed to ensure effective competition. A SWIFT-type model could be used, but any consortium would need to be open to new participants who meet objective and transparent criteria, and that access must be on fair, reasonable and non-discriminatory terms. Regulators should also consider how their actions will drive competition, and not take action in relation to DLT that hinders competition and innovation.

6 TRANSPARENCY AND DATA PRIVACY

There is a distinction between market data transparency (it cannot be opaque) versus private data transparency (needs to be safeguarded). Under EU General Data Protection Regulation (GDPR), DLT solutions that hold personal data should have specific contractual terms in place to govern data processors. Data encryption is not sufficient to excuse obligations for data protection. The right of erasure needs to be further explored.

POLICY AND INDUSTRY RECOMMENDATIONS

The conclusion to this report includes a number of proposed next steps and recommendations covering legal, market impact, operational and regulatory matters. These cover two main areas:

- **Regulatory collaboration:** Engaging regulators and policy makers as DLT and its use cases mature is imperative to ensure that regulatory regimes do not create barriers to innovation and that DLT solutions are developed with the necessary risk mitigation in mind. Knowledge sharing and practical testing are key enablers of well-designed systems and policies. For example, industry and regulatory sandboxes can be a powerful tool to enable participants to develop robust solutions and gain rapid regulatory feedback in a controlled environment.

- **Industry-level system design decisions:** There is a host of important design considerations in how a DLT system will operate, including clear governance structures and rules that industry participants will have to make to ensure the orderly functioning of a DLT system. Legal and operational uncertainties can be further mitigated by express agreement on issues such as smart contract intent and dispute resolution.

This report is focused primarily on the UK market; however in view of the fact that DLT would need to be used across jurisdictions to achieve its full potential, regulators and policy-makers in different jurisdictions should seek to develop a common approach which recognises and facilitates the use of blockchain and other forms of DLT.

KEY TERMS

BLOCKCHAIN AND THE DIFFERENCE **IT MIGHT MAKE TO CAPITAL MARKETS**

CORE CHARACTERISTICS OF BLOCKCHAIN AND OTHER DLT SYSTEMS

1. Blockchain, in simple terms, is a technology that enables a shared ledger to be maintained by multiple parties and updated simultaneously. It has the potential to create significant efficiencies in capital markets.

2. New transactions are entered in blocks into the shared ledger once validated in accordance with agreed protocols, known as consensus, and are protected by encryption. These entries generate a time-stamped record of history and audit trail, with the possibility of automatic identity verification. This report focuses on permissioned (rather than public) blockchains and other DLT solutions; i.e., where only participants who are authorised in accordance with the relevant consensus protocols have access.

A blockchain is a database – an electronic file where data is kept – that is shared between multiple participants. There is no central storage of the data recorded on a blockchain ledger. Instead, all participants hold an identical local copy of the ledger, which can be used in the same way as the traditional ledger, principally to record transfers, receipts and transactions in a variety of assets.

To update a blockchain ledger with new data, a participant can propose an amendment by transmitting it to all other blockchain participants. Updates are accepted onto the ledger using a consensus method – which means that some or all participants (the number depends on the consensus protocol used by the particular blockchain) check and ascertain that the update meets pre-agreed validation criteria before the ledger is updated.

No single participant has independent or exceptional control over the data. Each data entry is added to a block when it is validated and the validated data set in a block becomes an encrypted and time-stamped transaction that is embedded to form a chain. Each block in the chain contains encrypted details of the link immediately before it, so that when a block is added, it effectively embeds the prior block.
The distributed nature of the ledger, the validation requirements for adding entries and the way each transaction is bound to the one before it, operates in such a way that transactions cannot be edited or deleted after they are embedded. Thus, a blockchain creates an immutable record of entered transactions. The only way to alter the data held within the blockchain (for example, reverse an erroneous transaction) is to create a new data entry which is accepted through the adopted consensus protocol and makes the required change through the new entry. The consensus protocol applicable to a blockchain system is therefore very important and should be designed around the agreed requirements of participants in the system. A key question is whether, if an error is made (for example, erroneous information entered by a participant), should there be a universally accepted way to correct it through a later update to the chain?

A blockchain or distributed ledger is "distributed" in that all participants have an identical copy, and, depending on the consensus protocol used, are responsible for agreeing whether changes are valid, with any proposed change made either to all linked copies of the ledger or to none. If participants in a particular blockchain system are located in multiple countries, questions may arise on where the ledger is situated for legal purposes and which courts have jurisdiction to decide disputes. Consideration should be given as to whether it is a condition of system participation at the outset for all to agree on general

DEFINING BLOCKCHAIN: STRUCTURAL FEATURES AND COMMON CHARACTERISTICS

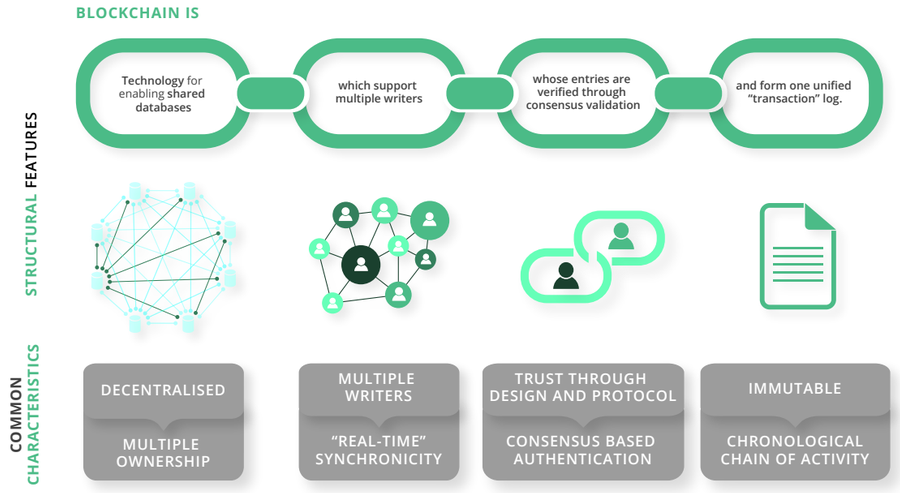


Figure 1: High-level Blockchain concepts
Source: EY analysis

governing rules about the structure. In the bitcoin blockchain system, generally speaking, there is no centralised governance authority, but this would present challenges for the wholesale automation of post-trade capital markets. A permissioned system may obviate these difficulties and for this reason, this report focuses on permissioned blockchains.

Where the technology which underpins a blockchain ledger is "immutable," it means that the record cannot be amended except through the applicable consensus protocol. Theoretically, forgery should be impossible or, at the very least, pointless because it should be easily detected. Once the validation criteria have been met, a blockchain ledger should be perfectly accurate, with all participants having the same record of transactions. Since the ledger is updated as soon as a new event is validated, the ledger, and smart contracts written on it, can create events, record them, and disseminate information with close to zero latency. The DLT solutions, which the analysis in this report covers, share the key characteristics of blockchain outlined above, though the technical way in which entries are validated, stored or bound together to create a reliable record, may vary in different solutions.

POTENTIAL BENEFITS FOR MARKET INFRASTRUCTURE AND TRADE SETTLEMENT

> ***"Creating a single 'version of the truth' for recording trades, that can be accessed in real-time for those who have a right or need to know, has tremendous potential to reduce errors, costs, inefficiency and risk. Blockchain could allow post-trade confirmations (including settlement confirmations) to be performed directly on a platform, bringing about more control and visibility to post-trade processes. Such a solution could also be used to give increased transparency to regulators and reduce capital requirements for financial institutions."***
>
> *Gordon Weir, Head of Delivery, Digital Asset Holdings*

DLT technology can be used to automate trade settlement, with the parties' settlement obligations potentially being discharged immediately upon execution. Accordingly, much of the focus in financial services to date has been on developing DLT use cases in mid-and back- office functions that could be utilised to increase efficiency and provide savings, for example, streamlining the transfer of securities. These efficiencies could include reducing counterparty risk, holding less capital against unsettled trades, limiting human error in matching trades, employing fewer professionals for administrative and settlement-related functions, and expediting the timeline for trade settlement.

Participants have also considered the potential for DLT systems to replace the intermediary functions currently played by CCPs and CSDs in the securities and derivatives markets. Potential applications could be extraordinary and liberating. Many of the common risks that the current post-trade infrastructure presents could be eliminated or at least be significantly reduced. In an optimum DLT end-state, simultaneous execution and settlement of securities transactions would limit counterparty risk, and thereby reduce the need for firms to maintain costly levels of regulatory capital (although it should be noted that simultaneous execution and settlement is neither feasible or desirable in the context of a derivative or term-product transaction). Ideally, visibility of a single DLT record could eliminate the need for reconciliation activity, enhance regulatory monitoring and surveillance, reduce the incidence of financial crime, and aid other important policy concerns such as ownership transparency. Participants would benefit by streamlining their current mid-and back-office functions.

That said, it is important to recognise that a DLT system will not be a panacea which eliminates counterparty risk; a DLT system cannot obviate the need for contracting parties to fund the performance of, and ultimately perform, their contractual obligations.

A HIGHER LEVEL OF REGULATORY CERTAINTY IS NEEDED

A DLT solution will have the most significant benefit if it acts as the definitive record of legal title to assets, such as loans, debt instruments or shares. If that can be achieved, its integration into the trading infrastructure could result in significant process efficiencies. We expect that the highest level of commitment will accrue the greatest benefit. Questions remain as to how a DLT system would operate within current financial services law and regulation and indeed, if some aspects of current law and regulation may limit potential use cases. There is also uncertainty risk: although DLT is now relatively established, it is not currently used to a material degree in the financial services industry As such it is untested; any failure has the potential to cause damage and undermine market confidence to a profound degree. Further, any implementation would need to be flexible enough to take into account future changes in the technology.

If capital market participants develop suitable DLT systems and market infrastructure, we envisage that the most vulnerable period will be the transition, where DLT operates and interfaces with existing proprietary systems, market infrastructure and law and regulations. In this period, vulnerability – to cybercrime, undesirables being allowed access to the market and to data loss and corruption – will be at its greatest. Indeed, these operational or transition risks may be a major deterrent for regulators to advocate and support DLT systems to the extent that we believe will be needed.

When financial institutions are distributed ledger participants, and act as agents of clients who use the distributed ledger, the current conduct risks (conflicts, mis-selling, fair remuneration disclosures) will remain. Care must be taken to ensure that the complexities of DLT are regulated in a way which does not allow for breaches of obligations to treat customers fairly. Regulators will likely expect that if cost savings do accrue, end clients should see the benefits.

SMART CONTRACTS IN THE **CONTEXT OF FINANCIAL SERVICES**

Smart contracts are computer programs designed to facilitate, verify, and/or enforce the performance of a conventional contract or, alternatively, an obligation which may otherwise be reflected in a conventional contract. Smart contracts have the potential to make the use of a conventional contract unnecessary in some circumstances. Smart contracts are created using computer code, which is able to validate and execute commercial actions agreed by the contracting parties. A smart contract would typically be maintained on a distributed ledger to execute (i.e. perform) its terms.

For example, a smart contract could be created to execute a straightforward option between two contracting parties. They would enter the agreed terms of the option into a DLT system on which the smart contract will be executed. Actions to be performed by the smart contract, otherwise known as the output code, would be validated and recorded by DLT participants. The smart contract code would automatically confirm whether the option was in or out of the money at the point of exercise and, if it was, debit the option seller's account and credit the option buyer's account with the relevant settlement amount. The price or level underlying the option would probably be derived from an external source (known as the "oracle"), agreed by the parties in advance, captured in the smart contract and automatically checked at the relevant point of calculation.

This raises an important issue that is also relevant to some other matters discussed in this report: to some degree DLT benefits are compromised when the system is reliant on any third-party system or information feed. These interactions may import operational risk into the DLT system as the efficacy of the DLT solution is dependent on the external input. However, incorporating a wider range of activities and processes into the DLT system to reduce third party reliance will increase cost and time to full transition, and elevate systemic risk because of greater dependency on the DLT system's operation (we call this the scope dilemma).

We have deliberately used the example of a derivative contract, notwithstanding that smart contracts can conceivably be used to execute a variety of contracts, because this is one of the areas where smart contracts could present significant potential efficiency gains in the near term.

QUESTIONS **AND ANSWERS**

1

FROM A LEGAL PERSPECTIVE,
IS IT POSSIBLE TO USE DLT TO RECORD AND TRANSFER INTERESTS IN SECURITIES OR EXECUTE FINANCIAL TRANSACTIONS USING SMART CONTRACTS?

The focus of many capital market participants is on developing DLT systems to settle transactions in securities or execute financial transactions using smart contracts. This gives rise to the following legal considerations.

TRANSFERRING SECURITIES

From a practical perspective, it is possible for a distributed ledger to record transactions in securities. However, the key question is whether an entry on a DLT system, as a digital representation of real assets, will be treated as dispositive proof of ownership of those assets. If the data held within a DLT system is definitive, then it can be used – conclusively – to transfer property rights in securities.

Under current law and regulation, a DLT system could not be used to transfer or definitely record legal title to securities in bearer form; legal title can only be transferred by delivering the physical instrument representing the security. However, a DLT system could conceivably be used to transfer legal title to a dematerialised registered security or, alternatively, beneficial title in an immobilised bearer security, in much the same way as clearing systems operate. However, the conceptual possibilities here are limited by the uncertainty inherent in the current law as it relates to DLT. The uncertainties principally concern the jurisdiction in which the register would be located and hence the law that would govern transfer of the securities. This is untested in the English courts but, notwithstanding these uncertainties, it is interesting and positive that there is a precedent in the United States for using DLT to transfer title to dematerialised securities.

There are two major differences between issuing and trading securities using a DLT system – and doing so in traditional securities markets. The first is the lack of physical documentation. The use of traditional book-entry systems in company books, certificates or notes could be replaced with a DLT record in the form of an entry on a distributed ledger that will confirm trades and reveal asset ownership. The issuer maintains the digital securities registry, including the proprietary ledger and customer information – and thus has access to real-time information on the identity of record holders of digital securities, the amount of securities held and transaction date.

In addition to increasing the transparency of the record holder, a key benefit of a DLT solution could be elimination of the intermediary structure whereby intermediaries hold securities, or interests in securities, on behalf of investors. The intermediary structure removes the names of investors from the issuer register by way of nominees who hold securities on trust for investors or, more likely, other intermediaries. A chain of intermediaries can create obstacles such as difficulty in reaching investors or the ability of shareholders in exercising their voting rights. With a digital book-entry system, the issuer or its transfer agent can easily identify the record holders of digital securities and coordinate mailing of proxies or other compliance filings with applicable regulatory and securities laws.

It has been argued that transparency and disintermediation could create an imbalance of information if issuers see the identity of investors. This could significantly impact hostile takeover attempts, for example, proxy solicitation and marketing of follow-up offerings. As the degree of separation between the issuer and investor diminishes, some systems could become redundant and others, from broker-dealers to custodians and post-trading clearing agencies, may see their roles evolve.

The second major change in a digital ledger-based system would be the shortening of settlement time. DLT could significantly reduce the complexity and cost of post-trade activities. Some proponents argue that the clearing and settlement of transactions could combine into a single step, creating an almost instantaneous process.

CREST CASE STUDY

As discussed, a DLT system can only be used as a definitive record of legal title to dematerialised registered securities. However, the uncertainties under existing law as to the status of DLT registered securities and, in particular, the law that would govern transfer of securities in a multi-jurisdictional system, means that a legislative framework would substantially facilitate the practical use of DLT in this context. With respect to securities in another form, it is unlikely that a court would hold that a DLT record conclusively determines legal title to securities in the absence of legislation to that effect. In circumstances where a DLT system was used to record title to securities that were not in dematerialised registered form and, in the event of a dispute, we believe that a court would treat the data held in the distributed ledger as strong evidence of ownership. The adduced state of the DLT would be a form of hearsay evidence that a court would likely admit and consider on the merits under well-understood exceptions to the hearsay rule. However, to open up to review the merits of DLT as an unimpeachable record of title in an adversarial environment would be far from ideal. Legislative intervention may also be beneficial in this context.

CREST, which operates under the authority of the Uncertificated Securities Regulations 2001, and is analogous to DLT in certain respects, has set a precedent in this field. CREST securities are issued in dematerialised form, which means that physical certificates or documents of title are replaced with securities that exist only as computer records. Legal title to CREST securities is prima facie determined, both inside and outside the system, by registration within CREST. The usual statutory requirements for written transfers are not applicable. Legislation akin to the Uncertificated Securities Regulations 2001 could be passed for the use of a DLT system, though the levels of assurance likely to be required by legislators would be significantly greater. The administration of CREST requires a number of human interventions and reconciliations between CREST and others (the registrars of the issuing companies, participants' settlement banks and third- party custodians) and between internal functions within CREST. For a distributed ledger system, which creates one definitive record and eliminates the need for data alignment, the amount of expert assurance, trialling and assessment that the market and legislators would require would be substantial.

Any DLT system created to transfer, or record the transfer of, securities must operate within existing financial services law and regulation and associated guidelines. There are questions about how existing law and regulation would apply. For example, it is not clear that digitised securities transferred via a DLT system would be within the scope of existing financial collateral law and regulations. These specifics of how a proposed solution would fit with the law and regulation then applicable to it need to be considered before a DLT system could be widely used to transfer securities.

USING SMART CONTRACTS FOR FINANCIAL TRANSACTIONS

In principle, there is no reason why transacting parties cannot enter into a binding agreement using a smart contract based on computer code, except for the few instances where legislation prescribes formalities that need to be followed; provided the clear intention of the parties to a smart contract is to create a legally enforceable relationship, courts should give effect to their intention.

One question which arises is how smart contracts would be enforced in a dispute, given that the terms would be in computer code. How courts will interpret computer code is justifiably an area of concern given the absence of case law in this area. However, we would not expect this to be an obstacle to enforcement in the long term. Where a smart contract is in dispute, it should be possible for expert evidence to be adduced to interpret the intended obligations, the protocol to encode those obligations and compliance with (or deviations from) the protocol. The infrastructure of the English courts, and in particular the specialist divisions within the High Court, should be well-equipped to consider any issues arising in relation to the technology and this should facilitate development of a body of case law over time, if smart contracts are used (and presumably also litigated) extensively.

If DLT data is relied on as evidence in court proceedings, whether as dispositive evidence or not, consideration should be given to the publication of guidance, industry codes and other methods by which this could be achieved in a straightforward manner without undue cost. At present, complex expert evidence may be needed to explain and interpret the code data (unless the parties in dispute agree to those issues). This would add to the costs and complexity of such court proceedings.

SMART CONTRACTS CREATE OTHER ISSUES

Aside from the generally favourable position of enforceability, there are a number of other legal considerations for parties that typically address how existing common law doctrines would apply to a smart contract. Contracting parties should consider, for example, the extent to which the doctrine of frustration might apply to potential performance issues, such as a technology failure, or whether the risks of an unexpected event, such as unavailability of data from a reference source, should be otherwise allocated by the parties. Financial institutions, in particular, need to determine how to comply with existing obligations when entering into smart contracts. For instance, banks should think about compliance with confidentiality when executing smart contracts on a distributed ledger maintained by other entities.

Given the nature of DLT, these considerations necessarily need to be agreed and applied by all entities participating in the relevant DLT. This is crucial during system protocol design, and is an area where further consultation and market consensus between participants in the capital markets and regulatory authorities would be beneficial. Assuming that any DLT system that executes smart contracts must be widely used and (at least initially) standardised in order to be economically feasible, it may be practical for DLT consensus protocols to incorporate agreed dispute resolution procedures.

Nevertheless, we envisage that practicalities rather than legal acceptance will impact progress-at least in the short term. This is most easily demonstrated in the context — of derivatives executed as smart contracts, presently an application which is subject to testing by certain financial institutions. If we take an over-the-counter (OTC) call option in respect of a share by way of example, it is easy to see how complexity could undermine DLT's practical benefits. Here, we envisage challenges in using computer code as a medium for expressing all the terms of the contract; it is difficult to conceive current technology enforcing obligations and other provisions which are not binary payment or delivery obligations.

At present, parties documenting a contract of this type would probably use template documentation from the International Swaps and Derivatives Association, Inc. (ISDA) — specifically an ISDA Master Agreement, trade confirmation and, for example, definitions in the 2002 ISDA Equity Derivatives Definitions (together, ISDA Documentation). ISDA Documentation sets out the parties' rights, obligations and the consequences of various events which may occur in respect of the transaction or the parties, such as changes in tax or other law, and events which may impact the share underlying the transaction, such as a merger or insolvency.

While a smart contract could conceivably be created on the basis that ISDA documentation is incorporated by reference, the parties would need to agree on what would happen if an event occurred, which required a degree of analysis or discretion. DLT systems are not yet at the stage where they can determine whether, for example, a merger had occurred in respect of the underlying share without some form of external input, bringing the scope dilemma into play.

When DLT systems are available, there may be a surge in activity in creating contracts that can be encoded on to those systems. Within a short period, previously prohibitively complex arrangements may be converted to self-executing smart contracts. Care will be needed to ensure that users fully understand these smart contracts and their implications.

> ***"If you would like a succinct definition, a smart contract is an agreement whose execution is both automatable and enforceable. Automatable by computer, although some parts may require human input and control. Enforceable by either legal enforcement of rights and obligations or tamper-proof execution. This is sufficiently abstract to cover both 'smart legal contracts' (where the agreement is a legal agreement, which is then capable of automatic execution in software) and 'smart contract code' (which may not necessarily be linked to a formal legal agreement, yet must be executed automatically)."***
>
> *Lee Braine, Investment Bank CTO Office, Barclays*

FEATURES AND BENEFITS POTENTIALLY OUTWEIGH THE CHALLENGES

The fact that the smart contract would not be fully capable of performing the parties' obligations without external input does not mean that smart contracts would not yield significant benefits. An attractive feature is the potential for contractual performance to be accepted to the DLT system through the consensus protocol, enabling it to be part of the DLT's immutable record. Performance would be judged instantaneously for compliance, removing a potential source of disagreement. This is a double-edged sword, of course; parties may gain certainty, but may need to cede a degree of the current flexibility afforded under OTC derivative contract documentation in circumstances where one of the parties defaults. Currently, this flexibility enables parties to take a strategic approach to closing out transactions in order to minimise associated risks and costs. If this flexibility cannot be applied fully to a smart contract, parties may prefer not to use the technology to execute certain transactions.

Using smart contracts to execute derivative contracts also raises questions of whether DLT systems can accommodate payment netting for one or more smart contracts. More importantly, it is unclear whether the technology could incorporate a practical close-out netting feature which would allow for parties to recognise a net exposure to one another. If not, transacting parties may be obliged to hold greater capital against exposure under smart derivative contracts than they do under traditional contracts, which would probably be prohibitive to widespread use of smart derivatives contracts.

2

COULD A SECURITY **TRADED ON A DLT SYSTEM BE USED AS COLLATERAL FOR ANOTHER OBLIGATION?**

This is a key question; if securities traded on DLT systems cannot be used to effectively collateralise other obligations, the potential benefits of issuing securities through a DLT system are significantly diminished.

Collateral arrangements typically provide for title (legal or beneficial, as the case may be) to the collateral to be passed from the party providing collateral to the one receiving it. Sometimes, title is not transferred, but instead, secured in favour of the collateralised party. In either case, it is important that the party providing collateral has title, which can be transferred either on delivery or following enforcement of a security interest.

As discussed above, a DLT system could be used to transfer title to securities, assuming a supportive legislative framework. Accordingly, it is possible for two participants in a DLT system to transfer securities between themselves in order to collateralise another obligation, such as exposure under a derivatives contract or a repo agreement. Additional questions arise when the parties use a security collateral arrangement rather than a title transfer collateral arrangement. Conceptually, it should be possible to create a security interest over securities held in a DLT system, but it would be difficult, and perhaps undesirable, for the security to be subject to an automated enforcement process. Contracting parties need to carefully consider how such a security arrangement would operate and whether the requirements for creating effective security, such as ensuring sufficient control of a secured asset, could be satisfied.

CLARIFYING THE LAW ON FINANCIAL COLLATERAL ARRANGEMENTS

Another important concern for many collateral takers will be whether law and regulations on financial collateral would extend to collateral arrangements over digitised securities maintained on a DLT system. If they do not, then the parties' collateral arrangement would not receive the favourable enforcement treatment afforded by the law and regulations on financial collateral. The Financial Collateral Arrangements Regulations 2003 (SI 2003/3226) makes special provision in English law for financial collateral arrangements. It recognises that financial collateral may consist of financial instruments, title to which is evidenced in an account or register maintained by or on behalf of an intermediary, such as CREST, Clearstream or Euroclear. Collateral arrangements over securities of this type will generally benefit from the preferential collateral provisions of English law. Yet, it is less clear how securities transferred through a DLT system would be treated for this regulation. This is an area where the statutory position would require clarification if the issue of securities through a DLT system was to become widespread.

The lack of certainty under English law is likely to be a feature of other European jurisdictions which have implemented the Financial Collateral Directive 2002/47/EC (which the Financial Collateral Regulations implement in the UK). Complications inherent in national laws may be compounded by the fact that many collateral arrangements take place cross border where different insolvency laws and regulations apply. Accordingly, legal recognition in one jurisdiction of collateral arrangements over securities traded on a DLT system will not necessarily be sufficient in cross-border arrangements. In this situation, transactions involving such securities may not benefit from the protective provisions of European financial collateral law and regulations, but efficient settlement may nevertheless reduce counterparty risk to a significant extent.

Many recipients of financial collateral need to consider whether collateral received can be recognised for the purposes of meeting regulatory exposure and capital retention requirements. European financial institutions must review DLT securities received by way of collateral in the context of the Capital Requirements Directive and EMIR.

COLLATERALISATION OFFERS IDENTIFIABLE BENEFITS

In conclusion, collateralisation is probably one of the main areas where the potential benefits of DLT systems are clearly identifiable, at least in relation to title transfer collateral arrangements. The DLT system can be programmed to transfer securities based on contingent events and for the purposes of collateralising contracts (whether smart or otherwise). Transfers can be automatically processed based on conditions coded into the relevant contract. Because of the efficiency gains the technology offers, trading parties can reduce the time in which they are uncollateralised and for which capital has to be held against that exposure. However, parties proposing to exchange DLT-traded securities by way of collateral will need to consider whether their collateralisation arrangement will be treated as a conventional arrangement under applicable laws and regulations. The limited scope of existing law and regulation may limit the practical implementation benefits.

Dematerialised clearing systems have certainly facilitated collateral arrangements, securities lending and repo transactions. DLT-created securities would have the potential to do the same, and more, although implementation may be difficult.

3

COULD DLT SYSTEMS FACILITATE THE **SIMULTANEOUS EXECUTION, CLEARING AND SETTLEMENT OF TRANSACTIONS IN LISTED SECURITIES?**

DLT and smart contract solutions could enable simultaneous execution and settlement of trades. Upon executing a trade, the terms and parties to the transaction would be recorded, and the title immediately transferred to the security. The DLT system would act both as the record of the execution of the trade and the mechanism to transfer legal title.

Delivery versus payment is an essential requirement of capital market participants, meaning that the buyer's receipt of securities is timed precisely with the seller's receipt of the agreed consideration, typically money. Because the securities are a creation of the distributed ledger, the buyer is ensured of legal title to the securities when the distributed ledger is updated to record the transfer. The distributed ledger is able to credit the seller's account with the cash consideration at the precise time of the securities transfer, but what does that mean for the seller?

The seller probably has a claim to the money against a bank – either his own settlement bank or the buyer's – and if that bank becomes insolvent prior to his receipt of cash, he might argue that the trade fails to achieve delivery versus payment. This may seem like a subordinate issue but, particularly in respect to high value trades, having to accept the risk of commercial bank failure, even for a short time, may be unacceptable. It may necessitate a prudent trader to engage in numerous risk mitigation activities, which defeat some of the advantages of implementing a distributed ledger solution. This is one of the most serious manifestations of the scope dilemma.

One option is to deposit central bank money into the system, limiting exposure to commercial bank credit risk. Another is to require participants to deposit electronic money onto the DLT system, which, unless rigorous cash management is implemented, may cause failed trades when there are shortfalls, or tie-up valuable cash unnecessarily, if an overly cautious approach is adopted. We are aware of a number of initiatives to develop a "settlement coin" that can be transferred via a distributed ledger. Provided that the settlement coin is used by each participant in the system to transfer the security title, and that the settlement of the security and cash operate simultaneously, such a mechanism could potentially solve the cash payment dilemma.

In any event, it will be crucial to ensure that the cash side of a securities transaction operates not only in concert with the securities, but also in such a way that the principle of DVP is maintained.

4

DOES CURRENT REGULATION FACILITATE **EXECUTION OF SMART CONTRACTS ON A DLT SYSTEM?**

Generally speaking, the current financial services regulatory environment does not make specific provision for smart contracts. Although this could change if these contracts become more widely used, existing law and regulation may actually impede their use.

For instance, EMIR's risk mitigation provisions may effectively preclude the use of smart contracts to execute many derivative transactions. It is reasonable to assume that many of the derivatives transactions that could be executed using a smart contract may be subject to the clearing obligation under EMIR (as those transactions would probably be relatively straightforward and executed between financial counterparties). However, it is difficult to conceive a DLT system which would allow smart contracts to be cleared through a regulated CCP (although this has been discussed in ESMA's recent DLT paper).[1] Correspondingly, derivative transactions that are less standardised and/or entered into by non-financial entities may not be suitable for execution through a DLT system. To a certain extent this may be mitigated by non-financial counterparties engaging with financial counterparties who will effectively act as their agent and sponsor, but it is unclear if this would allow the full benefits of a DLT system to be achieved.

That said, compliance with some provisions of existing law and regulation may be facilitated through a DLT system. Again, taking EMIR as an example, a DLT system could assist parties in complying with their obligation to have agreed detailed procedures and processes on the identification, recording and monitoring of disputes and their timely resolution.

There is no reason why smart contracts executed on a DLT system could not encode the dispute resolution requirements prescribed by EMIR. In this way, the recording of a dispute or reporting the details to regulators can take place without human intervention. There is, of course, a question as to whether this degree of automation is desirable.

An on-going issue is that resolving disputes often requires the exercise of judgment, by the parties themselves, or by a third party. This cannot easily be integrated into an automated system, such as a smart contract, but may develop over time. For example, a resolution framework might require a party to state its case by a particular date with a failure to comply resulting in an automatic award, perhaps triggering an immediate payment. Alternatively, a party may be required to set out the sums it disputes, meaning that, if any part of the claim is accepted that balance can be immediately and automatically paid to the other party. These innovations would likely require significant modelling and trialling given that (and this is inherent in the nature of a DLT system) any wrong award would be very difficult to open-up, review and revise.

A DLT system could also facilitate portfolio reconciliation, as prescribed by EMIR and, potentially, render the process irrelevant as a technique for actually reducing risk. If contracting parties with reconciliation obligations are DLT system participants, no reconciliation is needed; each need only consult its copy of the shared distributed ledger record. In a similar manner, it is entirely feasible for a DLT system to facilitate compliance with parties' transaction reporting and timely confirmation obligations; conceivably, these could become entirely automated procedures. These various compliance uses of DLT may require firms to use multiple DLT systems. As noted by the International Swaps and Derivatives Association, Inc. in its recent whitepaper on the future of derivatives processing and market infrastructure, seamless interaction between these systems would result in the most meaningful efficiency gains.

Smart contracts and the use of DLT will present challenges and benefits outside of EMIR. For example, where regulatory requirements promote speed of activity or standardised compliance, DLT systems should be a significant risk mitigant, given that all participants will see the trade details immediately. For firms to realise significant efficiencies, however, they will need to conduct a full compliance analysis to ensure that a DLT solution complies with regulatory requirements. In time, law and regulation should develop to facilitate DLT solutions if the related benefits can be adequately demonstrated. It is a positive sign that executive bodies, including the UK Government and regulators, such as ESMA, are engaging with market participants to address compliance issues.

1 ESMA discussion paper: "The Distributed Ledger Technology Applied to Securities Markets", 2 June 2016

5

COULD DLT SOLUTIONS, **OPERATING AS INTENDED, ELIMINATE THE NEED FOR CERTAIN FUNCTIONS IN FIRMS, OR INDEED CURRENT MARKET PARTICIPANTS?**

CENTRAL CLEARING COUNTERPARTIES

In any system where there is a period within which an executed trade is not settled, there is a risk that one of the counterparties to the trade could become insolvent and therefore unable to perform its obligations. In such systems, it is important to ensure that there is certainty in dealing with the trade. Under the current clearing and settlement arrangements, this certainty can be provided by:

- CCPs, which help to ensure that non-defaulting parties continue to have their own rights and obligations discharged, notwithstanding the default of the counterparty that they originally traded with.

- Designated systems where orders relating to the transfer of securities or cash are protected from revocation in the event that one of the parties defaults. This enables a designated system, such as a CCP or CSD, to process a transfer that is "in flight" at the time a counterparty defaults.

However, if the system could operate in such a manner so that there is no gap between execution and settlement (no "scintilla of time"), there would be no need for a CCP to act as the guarantor of the trade settlement or to rely on a designated system to ensure that transaction payment and delivery continue to be performed.

Effective, simultaneous execution and settlement would necessitate having a definitive record of the legal title to the securities that is automatically and immediately updated when the transaction is executed. The system would need to be linked to the matching engine of the trading venue on which the trade is executed.

This would also necessitate that parties maintain liquidity accessible to the DLT system at all times to allow traders to execute trades.

In the context of derivatives transactions, it seems unlikely that a DLT system could eliminate the need for a CCP, as derivatives trades are, by their nature, open for a period of time between execution and settlement. Furthermore, legislation such as EMIR requires that derivative contracts subject to the clearing obligation in EMIR be cleared in an authorised CCP. It is therefore difficult to see any potential for derivatives CCPs to be disintermediated by DLT systems.

CENTRAL SECURITIES DEPOSITORIES

CSDs are the institutions which hold accounts for immobilised or dematerialised securities, so that trades between securities' holders can be effected by book entry through the updating of digital records. They provide both clearing and settlement services. Where a DLT system can achieve the instantaneous execution and settlement of trades, and provide all affected parties with perfect visibility of trades undertaken, a wholesale DLT solution would render CSDs redundant.

As an alternative to the DLT system representing the register of legal title, the CSD at which the dematerialised security is held could arrange for the register of legal title to be updated automatically when the distributed ledger is updated. However, this would create a dependency on the third-party system, and the prospect of dispute where the distributed ledger and CSD record differ. The CSD could perhaps fulfil the role of the "oracle".

In order for such a regime to work on a practical basis, with full settlement achieved at the time of execution, the regime would need to ensure that:

- Technology that reconciles the execution and settlement (the distributed ledger) is integrated into the systems of both trading parties, the trading venue and the CSD. This way, both organisations are able to reconcile their records against the same ledger, thereby avoiding mismatch of the records of execution and legal title.

- Securities that are the subject of the transaction would need to be available to the seller prior to the execution of the transaction, and capable of being delivered to the buyer on execution.

- The payment amount for the securities is available to the buyer prior to executing the transaction, and capable of being paid to the seller on execution.

- The settlement mechanism could facilitate the instantaneous transfer of the legal title of the securities and corresponding payment of the settlement price.

As explained in the Legal Requirements Appendix under CSDR, for transactions in transferable securities that take place on a trading venue, relevant securities must be recorded in book entry form in a CSD on or prior to the intended settlement date. This limits the ability of a DLT system to replace a CSD, unless CSDR is amended. For example, the requirement could be potentially removed for transactions where a distributed ledger, meeting such requirements as the regulators may specify, records the transfer of the legal title of the security.

THE ROLE OF CUSTODIANS

Custodians perform two primary functions: safekeeping and settlement. Safekeeping suggests that securities can be defaced, destroyed or lost, though those issues do not apply to the vast number of securities issued and held in decentralised, digital form. Despite that, electronic securities continue to be held by custodians, often as trustees for the ultimate client beneficiary. With a custodian legally owning the security, the client does not have to transact directly with potential buyers and sellers; it has only one relationship with the custodian. Equally, the counterparty will generally prefer to deal with the custodian directly, as principal, rather than as the client's agent.

The custodian will maintain the account with the bank or electronic trading system in its own name or that of the nominee company it controls. Only the custodian – not the bank or electronic system – will know the client's identity.

It is not clear whether, just because a DLT system enables a bank or electronic system to have full information about the client and its holdings that the market will operate to disintermediate custodians. Clients may still prefer to deal with custodians, which the DLT system would allow. However, this would erode many of the benefits of a DLT system. Regulators may insist that the DLT records ultimate ownership, so as to collapse the levels of custodianship which are a feature of the current system. If that occurs, the custodian "safekeeping" function may disappear.

Custodians also play a key role in settlement, as they hold securities in systems such as CREST which record the security under their nominee's name. A DLT system may eliminate this, with securities recorded in the name of the ultimate client. Custodian firms may still be a sponsor (i.e., as they are under the CREST system), but their central role in settlement will be diminished.

RECONCILIATIONS MAY BE ELIMINATED

The current system generates massive amounts of intermediation. The 2001 Giovannini Report[2] identified trades which involved 11 intermediaries and 14 sets of instructions flowing between parties. In the managed funds industry, the chain may be even longer. These various parties will maintain records – showing their view of asset ownership, stage of a transaction, flow of funds to pay for securities – which may or not be accurate. The fallibility of records is caused in part by human data entry failures, siloed IT systems with little degree of interoperability, and inevitable timing errors. To ensure greater accuracy, the records are reconciled regularly – one internal record may be reconciled with another or with that of a third party.

But as various regulatory and internal investigations have revealed since the 2008 financial crisis, reconciliations are not always performed or conducted with sufficient care or frequency, and when discrepancies are revealed, they are not properly investigated and resolved. Often reconciliations are manual actions, as taxing as they are tedious. Using a distributed ledger has the potential to eliminate the need for reconciliations, with participants having access to one accurate record.

2 Cross-Border Clearing and Settlement Arrangements in the EU, The Giovannini Group, November 2001

ASSET SERVICING MAY REMAIN RELATIVELY UNCHANGED

Asset servicing comprises a range of activities, mainly performed by custodian banks that include: collecting dividends and interest payments, applying on behalf of clients for tax relief and managing corporate actions – the latter being a broad term that covers events involving the issuer which require some action by the security holder.

DLT systems and smart contracts could be used to automatically withdraw monies from an issuer's account and transfer it to a client's. However, some solution would need to be found as to how the DLT system could link to an interoperable cash account, given that in many DLT models issuers and end clients will sit outside the DLT system, while their appointed agents may sit within it. This may limit the opportunities it presents in the near term. Some corporate actions – for example, the ability to attend and vote at meetings - clearly cannot be undertaken by technology. Mandatory actions – for example, replacing shares of one class with those of another – could be achieved via self-executing smart contracts operating without human intervention.

THE REMAINING NEED FOR GOVERNANCE

Notwithstanding the potential for disintermediation of some existing market infrastructure participants, it is difficult to see regulators allowing a DLT system to operate as a part of the market infrastructure without there being an entity that the regulators can look to as the body responsible for the governance of that market infrastructure.

From a practical perspective, there will be a need for someone to determine when changes to the DLT system are required to accommodate operational developments or to respond to regulatory changes.

Similarly, where there is a need to unwind erroneous transactions, or to implement directions issued by a court or regulator, the presence of an administering entity will be beneficial.

The manner in which such entity is established or controlled will be an important element of the regulators' assessment of the systemic risks presented by the system. Where a DLT system is used to facilitate the settlement of transactions effected on an exchange, the exchange operator could potentially perform the governance role. Other governance structures would also be possible. However, a decentralised governance arrangement that simply operated as a set of contractual rules between the users of the system is likely to be less attractive to regulators as it would make it more complicated for the regulators to supervise the system. The nature of the governance arrangement would therefore need to be carefully considered by the promoters of any proposed DLT system.

6

WOULD RISKS INHERENT **IN SECURITIES TRANSACTIONS OR COUNTERPARTY RISK INCREASE OR DECREASE WITH WITH THE USE OF A DLT SYSTEM?**

There seems little doubt that many of the risks inherent in current post-trade activity would decrease. Principal risk, for example, is the risk that one counterparty who has not performed his responsibilities will default on the other (typically due to insolvency) before delivering the agreed assets. For principal risk to be eliminated in a DLT system, the delivery of securities will need to be synchronised with the corresponding delivery of cash (DVP). All trading regimes strive for perfect DVP, and while a DLT system can ensure synchronicity of activities in the respective seller's and buyer's securities and cash accounts, some level of certainty is required for delivery.

Replacement risk is the risk that, after execution but before settlement, the securities' value changes, leaving one party out of the money before the other defaults. While this is a form of credit risk, it arises even if DVP is achieved and is a function of the delay between execution and settlement. Insofar as a DLT system eliminates that delay, this risk would be close to zero.

Operational risk was defined in the Basel Capital Accord as: "the risk of loss resulting from inadequate or failed internal processes, people or systems or from external events." Unless regulators can be assured that overall operational risk will reduce in a DLT post-trade environment, it is doubtful that the move to a DLT system would be given the sanction from regulators which is likely to be needed to encourage investment and innovation. There are reasons for optimism. Many current operational risks arise from reconciliation activity, weakly interoperable systems, delays in straight-through processing and failures to achieve DVP. A DLT system, when operating as intended, should reduce these risks considerably.

WOULD A DLT SYSTEM HELP REGULATORS IDENTIFY RISKS OR MARKET TRANSGRESSIONS?

In the CPSS/IOSCO Principles, systemic risk is: "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." The higher the degree of co-dependency, the greater the systemic risk. In a sense, a DLT system creates the ultimate in co-dependency as all the participants are reliant on the one shared record being accurate. If the distributed ledger fails and the single record is found to be false, it would be time consuming and expensive to unravel trades and identify what the ownership environment would be without the error. It may be impossible to do this to a standard that satisfies all parties, thus resulting in litigation. One might say that systemic or co-dependency risk will likely increase with DLT solutions, though the hope is that this will be off-set by the reduction in trade failures.

Risk of unjust enrichment is the risk, frequently mentioned by lawyers, that a particular party may receive a benefit to which he or she is not entitled. The nature of DLT systems will inherently make it very difficult to identify such a situation and affect redress. One concern is that with an immutable record, instantly updated, erroneous trades could not be cancelled to prevent the transfer of legal title to the security. Therefore, there would need to be a mechanism to reverse erroneous trades. This would be subject to some form of governance to ensure that a party that has benefited from an erroneous trade does not simply refuse to unwind it. Such governance could be performed by an exchange operator, and enforced via its rulebook or through an agreed form of dispute resolution.

Financial crime risk is the risk that a money launderer or person involved in terrorist financing or acting in breach of financial sanction laws and regulations, would be able to utilise DLT-facilitated trading. Financial crime risk exists at present, and is dealt with by "know your client or customer" due diligence (KYC/CDD) and transaction monitoring requirements; it is not suggested that DLT removes the need for KYC nor increases the risk of financial crime. The concern is more that by enshrining the illicit transaction in the immutable DLT record in a more automated manner and perhaps with less of an experienced risk assessment being made at each stage, the transaction becomes cloaked in legitimacy which may obscure its unlawful origins. Because each transaction record builds on previous records, participants have little motivation to rigorously open and review previous transactions, which seems likely to limit the scope for DLT to reduce financial crime risk. In time though, DLT may allow for the creation of some type of digital passport, which reveals a user's entire transaction history over all asset classes and enables KYC or CDD to be undertaken rapidly, perhaps even automatically. The fear though is that before such technology becomes proven, it will be open to manipulation.

Aligned with this is the concern that a distributed ledger's immutability and the trusted position of its participants should not be used to avoid legal obligations or court orders. For example, assume that a trade is undertaken as a result of fraudulent misrepresentation and the court orders the transaction to be reversed. There will need to be an entity responsible for the administration or representation of the DLT on which the court can serve its order compelling performance, should the fraudster refuse or disappear.

WOULD MARKETS BE MORE OR LESS TRANSPARENT?

DLT would enhance transparency, potentially eliminating the burdens of regulatory reporting, discouraging market abuse and assisting regulators in identifying issues, such as illiquidity, build-up of leverage or collateral shortages. Heightened transparency may make some uneasy or conflict with confidentiality and data protection concerns, necessitating a change in attitude or technology which masks transparency to be introduced, as some developers are exploring. Society may be willing to accept that, with some exceptions, the full details of financial transactions are matters of public record.

> ***"A specific area of interest for me is understanding where legal and regulatory liabilities would lie in a distributed platform. The blockchain vision is built on the premise of a 'trust network' but I am not sure that 'trust' carries much weight in a court of law.***
>
> ***I am also very interested in exploring the term 'immutability'. It is used a lot in blockchain discussions but I do not believe it has a very well defined legal meaning. The bitcoin blockchain asserts immutability because its users 'trust' that the ledger cannot be changed or deleted. Ultimately though, this definition of immutability relies on 'trust' or more specifically trust in the technology. Investors in DAO are now discovering what happens when that goes wrong. The legal and regulatory perspectives on the topic of immutability seem to need further consideration by policymakers and regulators. They will rightly set a high bar in determining what makes a robust (and trustworthy) system."***
>
> *Anthony Woolley, Managing Director, Societe Generale*

COMPARATIVE RISK MATRIX

> When fully operational, blockchain will likely result in a reduction in reconciliation activity, the elimination of some market participants and the end of many oversight and monitoring activities; these activities, many of which have an important risk management function, will not be deemed necessary in a blockchain trading and settlement environment. However, this environment will be particularly vulnerable to failures, whether defects in system, unenvisaged misuses, human error or attempts at economic crime thought unlikely because of their very low chances of success.

RISK	BLOCKCHAIN IMPACT	REASONING	MITIGATION MEASURES
Principal risk	↓	Blockchain can ensure synchronicity of activities in the respective seller's and buyer's securities and cash accounts	The delivery of securities will need to be synchronised with the corresponding delivery of cash (DVP)
Replacement risk	↓	As blockchain eliminates the delay between trading and settlement, this risk would be brought close to zero	
Operational risk	↓	Blockchain should reduce current operational risks from reconciliation activity, weakly interoperable systems or delays in STP	
Systemic risk	↔	Blockchain creates co-dependency as the model only works if there is consensus around transactions. If the single record is found to be false, unravelling trades and identifying the ownership environment would be time consuming and expensive	The reduction in trade failures is expected to off-set this increase in risk. There would need to be a mechanism for reversing erroneous trades, subject to some form of governance
Unjust enrichment	↑	With an immutable record, instantly updated, erroneous trades would not be capable of being cancelled in order to prevent the transfer of the legal title to the security	A mechanism for reversing erroneous trades subject to governance
Financial crime risk	↔	By enshrining an illicit transaction in the immutable blockchain record, a transaction becomes cloaked in legitimacy, and it becomes harder to track its unlawful origins. In the absence of a digital passport, the technology can be highly manipulatable	Blockchain may in time allow for the creation of a digital passport to reveal the entire transaction history enabling rapid and potentially automatic KYC / CDD There will need to be a single entity upon whom the court can serve an order should the fraudster refuse or disappear.
Cybersecurity risk	↔	A decentralised ledger removes the risk of a single centrally-stored database being compromised. However, a shared ledger increases the number of entry points for a fraudulent or criminal transfer of value to be effected	Regulators will need to be satisfied that any blockchain solution improves rather than increases cybersecurity risk

7

WHAT HAPPENS IF A **DLT SOLUTION IS IMPLEMENTED BUT CONTAINS LATENT DEFECTS?**

As part of prudent risk management, scenarios must be developed and modelled where the DLT solution fails, either wholly or in part. This is essential. When fully operational, DLT will likely cause disintermediation, a reduction in reconciliation activity, elimination of some market participants and the end of many oversight and monitoring activities. Many of these have an important risk management function, yet will not be deemed necessary in a DLT trading and settlement environment. Such an environment will be vulnerable to failures, whether defects in system, not envisaged misuses, human error or attempts at economic crime thought unlikely because of their low chances of success.

DLT product developers may believe that some of these risks could never occur, but they still need to plan for these. Regulators will expect a precautionary mind-set to be adopted. Contingency plans should be developed, even though this will increase the cost and time of migration to a DLT platform.

Some market participants' proprietary systems are struggling with current levels of activity, and it may be too much to expect that they will successfully interface with a DLT system or be able to facilitate the creation or implementation of smart contracts. An alternative would be to set up the DLT in parallel, mirroring traditional processes in a secure laboratory-type environment. This would be costly, but may be the safest approach.

UK regulators have commented on the deficient manner in which IT projects are implemented in some financial services firms. Common issues include:

- Overly-optimistic project planning, allowing too little time for key stages and failing to include contingency
- Under-budgeting, leading to subsequent cost-cutting measures
- Limited senior-level oversight and monitoring, management provided with false-positive reports of project progress, lack of good quality management information which would be an early indication of project difficulties
- Lack of appropriate internal expertise on critical issues, coupled with a reluctance to work with partners who have the expertise needed
- Insufficient testing prior to implementation
- Reluctance to undertake phased implementation, thus allowing focused risk monitoring

Crucially, the risk of failure and ability to recover will need to be designed into the system. Some element of redundancy may be required to provide resilience in key areas, even if the risk of failure is judged to be very low. Crisis recovery planning will be needed. Regulators will want assurance that in the event of disasters:

- Users' ownership rights can eventually be restored
- Cash holdings will not be irretrievably lost
- Failures in key sub-systems can be isolated to avoid contagion
- Developments around the periphery of the DLT system are monitored to avoid the build-up of systematic risk
- Alternative independent systems can be operated in case of DLT failures
- In extreme cases, manual workarounds and human takeover can be implemented

By designing DLT systems which meet these criteria, product developers are more likely to create solutions which will be supported by regulators

8

WHAT DATA PROTECTION ISSUES **COULD A DLT SYSTEM GIVE RISE TO?**

Despite its shared nature, information on a DLT system is regarded as secure because certain aspects of the transaction are pseudonymised or encrypted. The effectiveness of this concealment needs to be considered for each use case and implications will differ depending on whether it is the personal data of individuals or other legal entities' data which is being handled. In marketplaces where there are a limited number of participants who transact with each other repeatedly, participants may eventually be able to identify pseudonymised parties to transactions, and make certain inferences or deductions about transactions appearing on the distributed ledger to which they are not party. This will create challenges about how to protect transaction confidentiality and provisions in parties' standard terms of business may need to be modified.

THE REGULATORY ISSUE: WHO CONTROLS THE DATA?

Most capital markets participants are legal entities. However, some will be individuals, which means that, from an EU perspective, transactions relating to those participants may constitute personal data. This raises questions of how the EU Data Protection Directive and (in the future) the EU General Data Protection Regulation will apply.

The Data Protection Directive defines personal data as data relating to an identified or identifiable individual. An identifiable person is one "who can be identified directly or indirectly, in particular by reference to an identification number." There has been much debate over whether this means that websites who hold data against an IP address, without knowing the visitor's "real world" identity, are processing personal data. Most data protection authorities now maintain that this information constitutes personal data because it enables the website operator to single out the individual (with different treatment as a result), even if it cannot identify him in "real life." This is not dissimilar to the position of a distributed ledger holder. Despite the apparent obscuring of the transacting parties' identity on the distributed ledger, in many cases holders of the distributed ledger will need to behave as if they are processing personal data, because they can distinguish between transacting parties, even if they cannot identify them.

To determine the implications from a regulatory perspective, one needs to understand the concepts of data controllers and data processors. Data controllers are defined in the legislation as those who "determine the manner and purposes of the data processing," and data processors are those who merely process data on their behalf. It is possible to have co-controllers or joint controllers for data, depending on where the decision-making activity resides. Whether a party is a controller or a processor is ultimately a factual question, although parties can sometimes influence the answer by agreeing how they will structure a particular arrangement or who makes the decisions. At present, only data controllers have statutory responsibilities, but they are also required to ensure processors comply with statutory requirements by including certain obligations in their contractual arrangements. Under the forthcoming reform of EU General Data Protection Regulation (GDPR), these contractual obligations will be more detailed. Data processors will also acquire some direct statutory responsibilities, particularly relating to security. Fines will increase significantly under GDPR (in certain cases up to 4% of the undertaking's annual global turnover), which means it is unwise to leave these issues unaddressed.

How each participant would see its role, either as the controller or processer, in a DLT system is unclear. A central promoter or clearing function in a DLT application might seek to argue it is the main decision-maker, but if it is the only data controller, the other ledger holders would be classified as data processors. This would mean accepting certain contractual obligations from the central promoter, such as acting only on the central promoter's instructions for the DLT system and, under GDPR, restricting their right to use sub-contractors. Ledger holders might not be prepared to do this and may question the responsibilities. For example, it seems unlikely that a ledger holder would accept an obligation to delete a copy of the ledger at the request of the central promoter. Instead, the ledger holders will control the data jointly and share their respective responsibilities for compliance with data protection legislation.

Cybersecurity is clearly a major concern in relation to any internet-connected system which holds or transfers value. Whilst a shared ledger has the potential to increase the number of entry points for a fraudulent or criminal transfer of value to be effected, the consensus protocols required to make changes to the ledger and the multiple copies held also arguably increase the resilience of the system to cyber-attacks. Regulators will need assurance that any DLT solution improves rather than increases cybersecurity risk.

9

WILL COMPETITION LAW HELP OR **HINDER COLLABORATION IN DEVELOPING DLT SOLUTIONS?**

It should be possible to develop and operate a DLT system in a way that complies with applicable competition laws. Yet, there are a number of areas where these laws may have a bearing on both the initial development of the DLT solution and its subsequent operation. We focus here on possible issues under EU and UK competition law. However, it is equally conceivable that competition laws of other jurisdictions would also be relevant, and that similar issues would arise under those regimes.

Assuming that the DLT system would be permission-based, as is generally accepted for securities markets, then an obvious area where competition law concerns will apply is in the criteria used to approve or reject prospective authorised participants. This will be even more relevant if a particular DLT system were to obtain market power by becoming the default network in a certain market. With this in mind, objective and transparent admission criteria should be developed at the outset, with access granted to prospective participants who meet the criteria on fair, reasonable and non-discriminatory terms. Those criteria will be able to take into account, for example, the need to protect against systemic risk.

There are existing models that provide useful templates and guidance as to how this could be achieved, for example SWIFT, which was subject to antitrust scrutiny from the European Commission. That scrutiny resulted in SWIFT changing its rules to allow access to its network and services on the basis of objectively justified admission criteria – specifically satisfaction of the criteria laid down by the European Monetary Institute for access to a European Payment System – applied in a non-discriminatory way. An alternative approach could be to develop a system of indirect access, similar to those used in some payment systems, where smaller players could obtain access through main participants. If such an approach was adopted, it would be important to ensure that direct access does not confer a competitive advantage over indirect access.

It is also important to ensure compliance with competition law when developing standards for using DLT in securities markets. Participation in any standard-setting body should be unrestricted, such that all affected market competitors are able to take part in developing a transparent standard. It is unlikely to be acceptable for only the largest financial institutions to do so. Furthermore, the participants in any such standard-setting body must be free to choose whether or not to adopt the standard once it has been determined – and the choice must be based on fair, reasonable and non-discriminatory terms.

OTHER COMPETITION LAW ISSUES MAY ARISE

Once the DLT system is used to effect transactions, further competition law issues will come into play.

First, care will need to be taken to ensure that the DLT system does not become a vehicle for collusion by, or unlawful information exchange between, its participants. Agencies tend to be suspicious of platforms that enable businesses to obtain information about their competitor's commercial activities or increase market transparency. Close scrutiny from relevant agencies should be expected and appropriate safeguards developed to mitigate these risks from the outset.

Second, if only a handful of firms are able to satisfy the criteria of a particular type of transaction using a DLT solution, then it could act as a barrier to entering the underlying market. It could adversely affect competition and lead agencies to take remedial steps. This situation is likely to become more acute as the use of the DLT solution for that type of transaction becomes more prevalent.

Over time, if the adoption of a DLT solution becomes the default network in a particular market, then the competition laws relating to the conduct of dominant firms may become relevant. If the DLT solution has not been designed with possible future dominance in mind, as the DLT solution becomes more successful it will be necessary for it to review, and potentially change business practices to comply with these additional obligations – which would be the “price of success.” One possible issue could be the interoperability between different DLT systems – if a DLT system becomes the default network in a particular market, then competition law issues may arise if steps were taken that prevented other DLT systems from operating with it.

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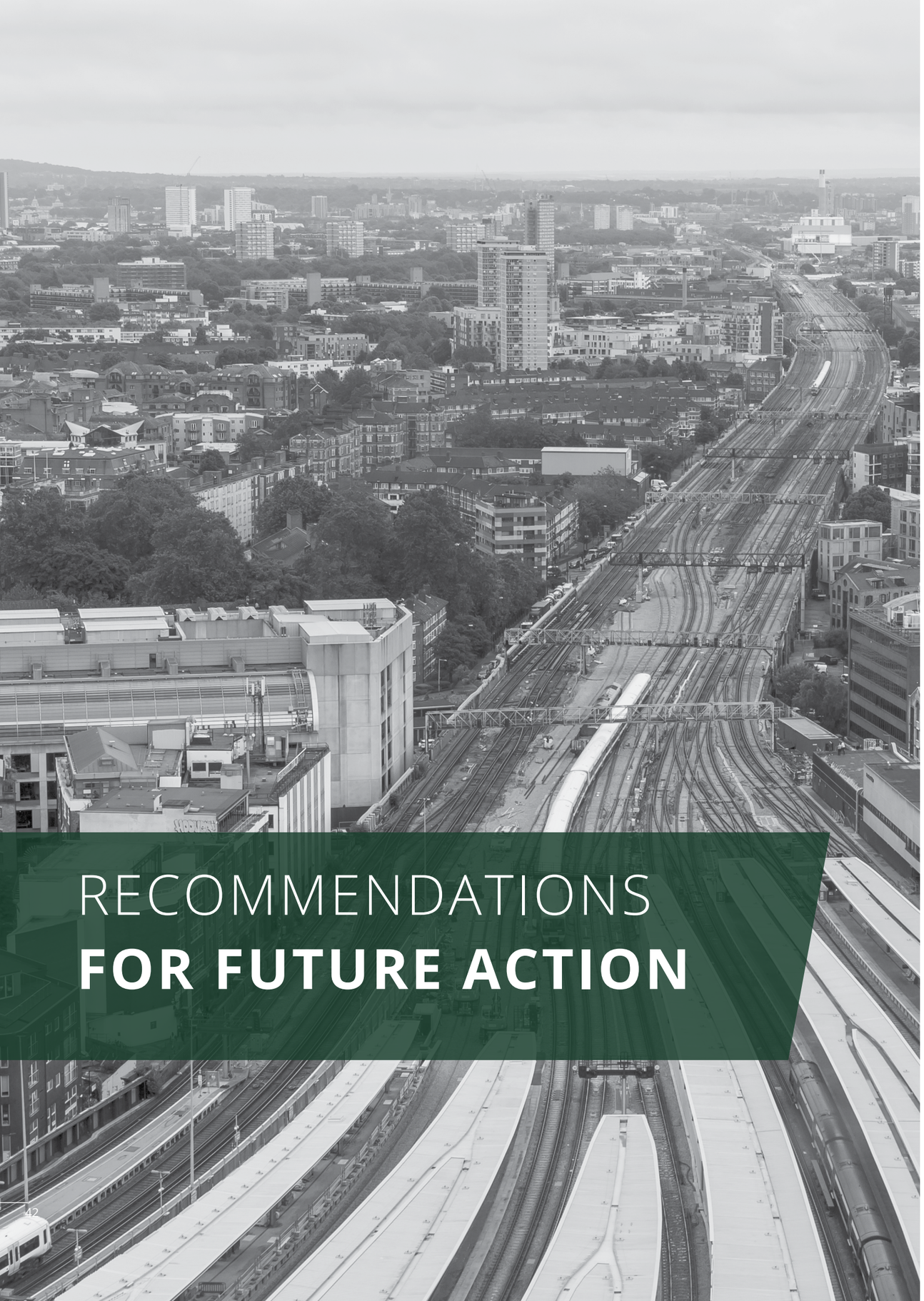
WHAT ROLES WILL **NATIONAL AND SUPRA-NATIONAL REGULATORS PLAY?**

Market participants, most of whom are regulated, will be unable to reach a unilateral decision – i.e., one made without consulting with regulators – that a DLT system should be adopted for the purpose of reducing or enabling better management of post-trade risk. So significant is this issue that the market will need regulatory agreement to proceed – likely at EU level or with the G20 and Financial Stability Board. It is worth noting that the main future challenge for CREST is its effort to integrate more effectively with foreign systems. A UK capital markets DLT system, introduced without significant foreign interest or intervention, appears unlikely despite what unfolds with Brexit. We also envisage that the administration of a DLT system and certain governance tasks undertaken by entities within the system will likely become regulated.

The global financial crisis has caused a significant reduction in regulators’ confidence to predict and manage the risks arising from financial innovation. Regulators have become notably risk averse, and will not easily be persuaded that a DLT system creates records so unimpeachably correct that no check against any other record is required. DLT has the potential to reduce post-trade costs, which should benefit clients, including consumers with pensions and savings accounts. There is already plenty of evidence of regulator and government engagement at the highest levels.

We believe that government-led advocacy will be crucial to attracting the levels of commitment needed to launch a comprehensive DLT initiative. Without strong government or regulator support, thinly capitalised start-ups may struggle to secure the funding they need if there is a view that regulatory risk is too great to make a significant investment. Typically, regulators wait for fully developed business propositions before they issue or refuse a licence. This approach will not be sufficient. A collaborative approach with regulators would help generate the confidence needed by many to invest capital in a DLT project. It may be that the development of robust regulatory criteria which a system must meet to be able to obtain a licence could satisfy both sides.

If a key issue for regulators is their perception of IT solutions, then they will also require high levels of assurance about the quality of the board of the presenting entity. Regulators have come to believe that much of what goes wrong in firms is caused by failures at the top; by insufficiently knowledgeable or wrongly-motivated directors. A DLT capital markets project will present formidable challenges and will require the necessary skills to play a leadership role in implementation.



RECOMMENDATIONS
FOR FUTURE ACTION

Opportunities for DLT solutions in the capital markets are appearing on the horizon. There has been considerable focus to date on the technical and commercial elements needed to propel these on their journey, with some proofs of concept developed among industry participants and within dedicated consortia.

This report identifies critical areas which need to be addressed for DLT solutions to progress on their adoption journey in capital markets at two key levels: collaboration within the industry and between the industry and regulators:

REGULATORY COLLABORATION

1. **Working together to increase regulatory understanding:** Product developers of, and investors in, DLT solutions should engage with policy-makers to support regulatory understanding and demonstrate robustness of principles-criteria-based guidance, participating in sandbox opportunities where available. These can serve both to increase regulatory understanding to develop a principles-criteria-based approach and to gain feedback on DLT solutions in off-market or on-market testing environments. It could also allow developers to demonstrate regulatory advantages, as well as give DLT solutions a route to market in a controlled way. Participating in dedicated consultations, such as those issued by ESMA, will also enable the industry to shape its regulatory operating environment.

2. **UK Financial Regulators' support for 'right-touch' regulation of DLT:** The PRA and FCA could help create a supportive regulatory environment for DLT solutions by conducting a consultation process on post-trade DLT-based infrastructure, which will address:

    a. Authorisation options, and the possibility of a new regulated activity "to operate a distributed ledger settlement system" or, alternatively, the creation of a new category of recognised body under the Recognition Regulations.

    b. Regulators' perspectives on pre-application feedback to potential operators via the promotion of collaborative initiatives or the extension of current ones.

    c. Options for implementing transition of activity from current systems to a new DLT system, and regulators' views on how operational risk during transition should be managed.

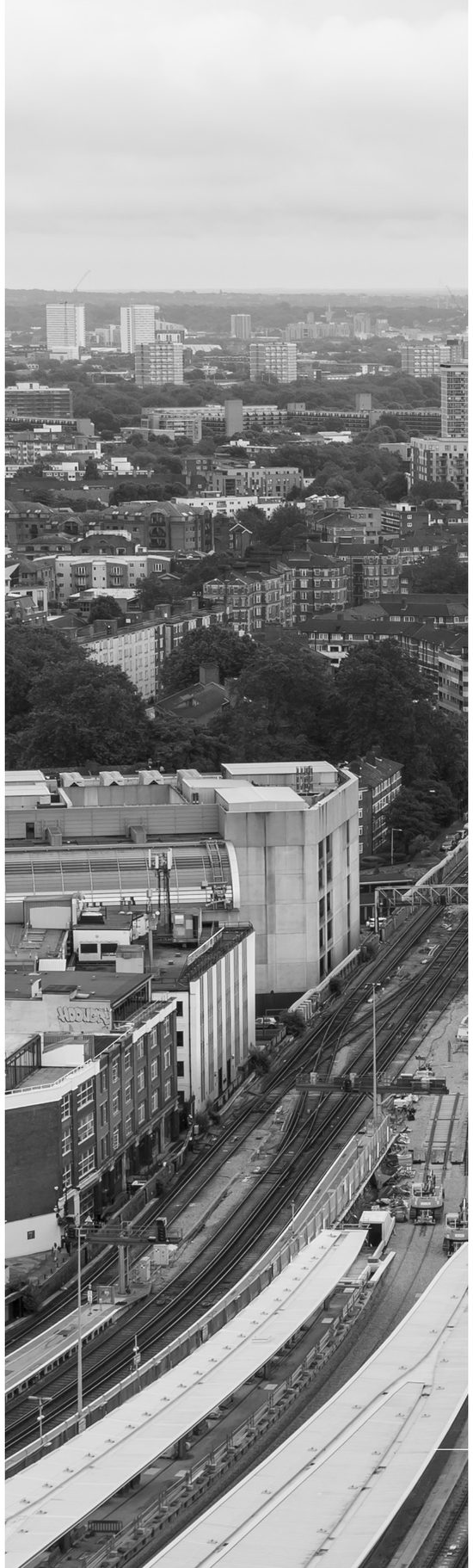
    d. Options for ensuring that the operation of a DLT system is robust and predictable, even in the context of the insolvency of a participant. Careful consideration should be given to the extent to which protections on settlement finality and default rules, which currently exist in the context of market infrastructure such as CCPs and CSDs, should be extended to DLT systems.

3. **Developing principles-based regulatory guidance:** There may be DLT solutions which meet regulatory policy objectives but are prohibited or not expressly permitted by current regulation simply because the regulation was not designed for DLT solutions; e.g. the case of CSDR we discuss in this report. Regulators should develop regulatory guidance which moves from setting out "system requirements" (i.e. specifying how something must be done) to the principles it should adhere to (i.e. specifying what the solution must achieve to be permitted). This would enable the development of DLT solutions to meet supervisory principles while offering innovative solutions. Such an approach, which is embedded in UK regulatory thinking, will benefit customers, market participants and regulators by enabling better DLT solutions to come to market more rapidly.

4. **Building flexibility through the Brexit process:** Work is underway in many quarters on assessing the legislative response needed to transpose or replace EU laws currently embedded in the UK's regulatory environment. If 'regulatory equivalence' becomes the UK's regulatory objective, then it may be possible to achieve it by implementing legislation which has the equivalent regulatory effect but does not reflect the precise terms used in EU laws. This is a complex area, legally and politically, but it indicates scope for a more flexible principles-based approach to be taken to DLT in the UK post-Brexit. This is an area in which the industry should collaborate with policy-makers to transition rules which are relevant to DLT, so flexibility can be improved rather than just status quo preserved.

5. **International regulators' collaborating across borders:** To maximise the potential of DLT systems in the capital markets would require a consistent international regulatory framework being applied across the plethora of regulatory and legal environments which this form of technology solution may touch. Achieving that would require a significant degree of international collaboration among regulators. Adopting a principles-based approach, outlined in Recommendation 3, may ease this process – for example, if a regulator could issue guidance that a solution which meets "agreed international principles" will be deemed to comply with domestic regulation for a DLT solution performing a specified function. The UK regulators' could help take the lead on this by developing a potential framework at a domestic level and then engaging with EU and international regulatory authorities. This may be an opportunity to demonstrate that the UK remains committed to engaging with EU and other regulatory authorities in order to improve global standards in managing financial risk, irrespective of its vote to leave the EU.

6. **Engaging on the wider regulatory agenda:** Industry should engage early with other relevant regulators (possibly the Competition and Markets Authority in conjunction with the FCA and PSR) and the Information Commissioner to ensure that DLT consortia or permissioned DLT solutions are formed in a way that is robust in terms of future regulatory attention.



MAKING INDUSTRY-LEVEL **DESIGN DECISIONS**

1. **Interoperability and defining industry standards for DLT and smart contracts:** Collaboration and interoperability between DLT solutions appear likely to be integral to delivering the greatest benefit from DLT. Industry should seek opportunities to agree common defined terms and operating standards which can be recognised and utilised across borders. It should do this through an international standard setting body. Open source protocols, where feasible, can aid in this process.

2. **Creating a governance structure:** In developing a DLT solution, participants should consider or take guidance on the extent to which it is necessary for their proposed use case to have a central administrator or operator to perform governance functions. This may involve developing or co-ordinating changes to the operating rules to accommodate operational changes or implementing regulatory developments, or acting as the primary point of contact with the regulator for matters relating to the DLT system**.**

3. **Agreeing clear governance rules:** In designing a DLT system, participants should agree at the outset, perhaps through the DLT protocol, on the general governing rules and agreed standards for the operation of the DLT system. This would be applicable to all participants, covering the areas typically addressed by contract or market standards to cover unforeseen and predictable issues, for example, addition or withdrawal of participants, allocation of liability, or governing law.

4. **Mitigating legal uncertainty by agreement:** As the legal and regulatory response to DLT systems continues to evolve, participants can mitigate some of the potential legal uncertainty by agreeing expressly to resolve disputes by way of international arbitration or determining how to apply legal remedies in a DLT context so that if an error is made (for example, mistaken information entry by a participant), there is a contractually binding way of correcting it by committing participants to authorise an entry updating the chain to nullify the effect of the mistaken entry. Assuming the entry could be ascertained clearly to have met the qualifying definition of "mistaken information", this contractual right could then be relied on where the remedy available at law may otherwise be uncertain due to the nature of the DLT solution.

5. **Mapping "smart contract" outputs to parties' intentions:** If developing a DLT system involving a smart contract solution, consider obtaining a legal opinion to provide guidance to investors and regulators on the actions the smart contract is designed to implement. This will ensure alignment of expectations on potential areas of risk to mitigate (e.g. inclusion of a "kill switch", substitution for a defunct oracle, pre-agreed application of mandatory insolvency rules, such as suspension of payments) and on the approach that the courts would be likely to adopt to the smart contract.

6. **Low-risk alternatives:** Industry participants should seek opportunities to develop a parallel market solution, for example, to issue a new asset class or provide an alternative trading mechanism, which may be done in a low risk, optional, sophisticated investor environment to build regulatory confidence in the DLT solution.

7. **Linking to the real value:** The industry will need to collaborate to ensure that DLT solutions can effect a transfer of the ultimate underlying value by linking to cash without creating a need for additional liquidity. Various industry solutions are reported to be in development based on a tokenised approach as well as the initiatives underway at central banks, including the Bank of England's work on central bank issued digital currencies.

APPENDIX
LEGAL REQUIREMENTS

What are the regulatory regimes governing the current market infrastructure involved in the trading, clearing and settlement of listed securities? We have assumed that MiFID II and CSDR will be relevant here because we are considering the implications for blockchain and DLT solutions that will be introduced in the future.

TRADING VENUES

The establishment and operation of trading venues will be governed by the requirements of the MiFID II package of regulatory measures.[3] MiFID II provides for the regulation of different types of trading venues: regulated markets, multilateral trading facilities and organised trading facilities. It does not prescribe that trading venues must appoint a CCP. However, it requires that member states have operators of MTFs and OTFs put arrangements in place to facilitate the efficient settlement of the transactions concluded on their systems.[4] Member states are required to ensure that the operators of regulated markets have effective arrangements to facilitate the efficient and timely finalisation of transactions executed under their systems.[5]

We should also note that, in the UK, regulated markets are regulated as "Recognised Investment Exchanges" under the Financial Services and Markets Act 2000 (Recognition Requirements for Investment Exchanges and Clearing Houses) Regulations 2001 (Recognition Regulations). Persons recognised under the Recognition Regulations (Recognised Bodies) are exempt from requiring authorisation under the Financial Services and Markets Act 2000 (FSMA).

The Recognition Regulations provide that an exchange must ensure that business conducted by means of its facilities is conducted in an orderly manner and affords proper protection to investors.[6] Furthermore, the exchange must ensure that satisfactory arrangements are made for securing the timely discharge of the rights and liabilities of the parties to transactions effected on the exchange.[7]

Unlike with certain derivatives, there is no requirement that transactions in securities should be cleared through a CCP. However, on the basis of the current market infrastructure, CCP involvement is often a necessary or prudent means of ensuring that the relevant market can operate effectively and in an orderly manner.

CENTRAL COUNTERPARTIES

Central counterparties (CCPs) are regulated under the European Market Infrastructure Regulation (EMIR), which defines a CCP as: The definition requires a CCP to be a legal person.

"A legal person that interposes itself between the counterparties to the contracts traded on one or more financial markets, becoming the buyer to every seller and the seller to every buyer." [8]

EMIR requires that CCPs are authorised by their home state regulator, and that they comply with extensive organisational and legal requirements. The purpose of these requirements is to ensure that CCPs are properly governed, with robust risk management arrangements, so that they can fulfil their main purpose of managing the risks of a default by a clearing member, thereby mitigating the impact of such defaults on the wider market.

UK CCPs are also regulated as Recognised Bodies under the Recognition Regulations. As "Recognised Central Counterparties," they are subject to regulatory requirements set out in the Recognition Regulations. These are in addition to those in EMIR, including requirements to maintain rules on losses that exceed the CCP's standard default resources.

Whilst, as we have noted above, a CCP is not a mandated feature of the market infrastructure supporting the trading and settlement of securities, the absence of a CCP has potential impacts upon financial institutions trading in such instruments.

3 The MiFID II legislative package consists of a directive (the MiFID II Directive) and a regulation, the Markets in Financial Instruments Regulation (MiFIR), together with delegated legislation.
4 MIFID II Directive, Article 18(6)
5 MiFID II Directive, Article 47(1)(e)
6 Recognition Regulations, Schedule, Part I, para 4(1)
7 Recognition Regulations, Schedule, Part I, para 4(2)(d)

CENTRAL SECURITIES DEPOSITORIES

Central Securities Depositories (CSDs) are currently regulated in the UK under the Uncertificated Securities Regulations 2001 (USRs). The USRs govern the approval, by the Bank of England, of the operator of a relevant system, being a computer-based system for evidencing and transferring title to units in securities. There is currently only one UK-incorporated CSD (Euroclear UK & Ireland), which operates the CREST system. CREST is also a Recognised Body and is regulated as a "Recognised Clearing House" under the Recognition Regulations.

When the EU adopts certain technical measures, CSDs will be regulated under the Central Securities Depositories Regulation (CSDR), which defines a CSD as:

"A legal person that operates a securities settlement system … and provides at least one other core service." [9]

For the purposes of this definition:

- A "core service" may include the initial recording of securities in a book-entry system (notary service) or provide and maintain securities at the top tier level (central maintenance service).[10]
- A "securities settlement system" is a system as defined by the Settlement Finality Directive (SFD) that is not operated by a CCP, whose activity consists of the execution of transfer orders.[11] A system will fall within the SFD if it comprises a formal arrangement between three or more participants (excluding the operator of the system, a possible settlement agent, CCP, or indirect participant), with common rules and standardised arrangements for clearing, whether or not through a central counterparty, or execution of transfer orders between the participants; that is governed by the law and regulation of a Member State chosen by the participants; and designated as a system by the relevant regulators for the purposes of the SFD. The SFD has been implemented in the UK by the Financial Markets and Insolvency (Settlement Finality) Regulations 1999 (the SFRs).

In order to be authorised under the CSDR, a CSD will need to maintain organisational and technical arrangements that satisfy extensive and detailed requirements set out in CSDR.

The CSDR requires that, where a transaction in transferrable securities takes place on a trading venue (that is, a regulated market, MTF or OTF), the relevant securities shall be recorded in book entry form in a CSD. [12]

Consequently, for transactions occurring on a trading venue, the law will require the transfer to be recorded at a CSD.

SPECIAL INSOLVENCY PROTECTIONS

UK and EU law and regulation provides for the protection of the rules and default arrangements of the current types of market infrastructure bodies.

- In the UK, Part VII of the Companies Act 1989 provides extensive protection for Recognised Investment Exchanges, Recognised Central Counterparties and other Recognised Clearing Houses against their arrangements and, in particular, their default rules, being challenged under UK insolvency law.
- The SFD (and the SFRs) also provides protection for the default rules maintained by operators of systems designated under the SFD. Furthermore, it provides protection of "transfer orders" against being disclaimed following their becoming irrevocable under the rules of the system. Transfer orders include orders to transfer securities or cash between participants in the system.

These measures recognise the importance of the market infrastructure in maintaining order and stability within the financial system, particularly in times of distress (such as when a participant in the system becomes insolvent and unable to perform the obligations that it has undertaken pursuant to transactions that it has executed prior to its insolvency). These measures allow the market infrastructure operators to manage the impact of the insolvency in order to minimise the adverse consequences for other market participants.

8 EMIR, Article 2(1)
9 CSDR, Article 2(1)(1)
10 CSDR, Article 2(1)(1)
11 CSDR, Article 2(1)(1)
12 CSDR, Article 3(2)

CONTRIBUTORS

INNOVATE/FINANCE

Innovate Finance is an independent not-for-profit membership association representing the UK's global FinTech community. Founded in 2014 with the support of the City of London and Canary Wharf Group, Innovate Finance aims to accelerate the UK's leading position in the global financial services sector by directly supporting the next era of technology-led financial services innovators, from start-ups to institutions.

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