**DRAFT**

**Blockchain Position Paper**

**Current State and Recommended Approach**

# Introduction

The Emerging Technologies Team (the “Team”) identifies new technologies that are potentially relevant to the London Stock Exchange Group (“LSEG” or “Group”), assesses the technology’s viability, and if appropriate, establishes a strategic and tactical position for the Group through business-driven proofs of concept (PoC).

This paper describes our analyses and recommendations on Blockchain. The paper is organized into five sections. Section 2 describes the Team’s major work to date and certain initial conclusions regarding the Blockchain’s viability in financial services. Section 3 provides a framework for assessing potential Blockchain applications. Section 4 describes the two PoCs being pursued by LSEG, their rationale, and recommended next steps. Finally, Section 5 compiles the Team’s observations throughout this paper and recommends a Group approach to Blockchain for the next year.

1. **History and Initial Conclusions**

The Team began exploring Blockchain in 2014. During this exploratory stage, the Team reviewed most major Blockchain technologies,[[1]](#footnote-1) met with many Blockchain startups,[[2]](#footnote-2) service providers,[[3]](#footnote-3) and consortiums, and helped establish a leading open-source blockchain project, the Hyperledger Fabric.

In early 2016, the Team created several internal working groups of business, legal/regulatory, and operational experts from across LSEG. The purpose of the working groups was to identify potential blockchain business or operational applications that would give LSEG technical experience with blockchain while helping us understand the hurdles related to blockchain implementations. The working groups informed a Group-wide Steering Committee, which considered and prioritized several potential Blockchain applications.

The Steering Committee, recognizing blockchain’s potential effect on securities clearing and settlement, prioritized a Hyperledger-based trade reconciliation PoC that was completed in Winter 2016. The committee also approved two other Blockchain initiatives that are still underway.

Based on our Blockchain experiences, we have concluded that Blockchain technology serves its intended purpose- namely of providing an ever-expanding ledger of cryptographically signed, irrevocable records that are shared by network participants. Each time-stamped record refers back to a previous record so that those with access rights can trace a transaction to its inception.

However, despite rapid and intense development fueled by considerable investment, Blockchain is not yet mature enough to meet the enterprise-grade requirements of most organizations.[[4]](#footnote-4) Significant gaps remain in technology performance, scalability, latency, integration, and analytics. While many firms are working on these shortcomings, Blockchain’s functional scope, its interoperability with other Blockchains, and the technology’s operational manageability remain huge hurdles.

During the next couple of years, we expect sufficient technological progress to be made on several leading Blockchains so that they will be able to meet the enterprise requirements of LSEG.[[5]](#footnote-5) We have also concluded that blockchain is likely to play an important role in the digital transformation of the financial services industry. Blockchain’s ability to digitally represent assets, enable new forms of value exchange, eliminate intermediaries, and ensure that transaction records are immutable and traceable make Blockchain particularly attractive to financial service offerings. While we expect that new and existing FMI participants will be introducing innovative Blockchain-enabled business models, most of these offerings will be of little immediate significance. However, once business models demonstrate “success,” we believe that the number of Blockchain-enabled offerings will rapidly accelerate. These new business models will render obsolete certain other existing financial service business and operating models.

Despite this tremendous potential, it is too early for the Group to invest heavily in Blockchain. LSEG’s immediate challenge is determining the right amount of investment today to plan for the possibility that our competitive landscape will change quickly and radically once Blockchain technology reaches its tipping point. As we discuss further below, we recommend keeping a dedicated Group-level technology team focused on monitoring Blockchain’s technical advances and business model developments, both of which should be objectively reported back to senior business leaders on a periodic basis. Additionally, we recommend that LSEG’s businesses formally scenario play to understand the effect that Blockchain adoption may have on their business and operating models, and conceptualize Blockchain-enabled business and operating models that allow the Group to compete.

# Blockchain- What Should We Do With It?

Blockchain’s hype reached a crescendo in February 2018. Throughout 2017, supply-side technology vendors (IBM, DAH, SETL) and consortia (R3), who are the primary beneficiaries of Blockchain’s hype, tended to overstate the technical readiness of their particular Blockchain platforms while understating the business, operational, legal and regulatory hurdles of a successful Blockchain implementation. Additionally, almost always, vendors and start-ups failed to consider the side-effects of a Blockchain implementation, especially as it related to upstream consequences on market structure or business model.[[6]](#footnote-6) Various communications between these parties and parts of the Group has led to confusion about what Blockchain is,[[7]](#footnote-7) what it is best suited for, and Blockchain’s actual readiness to support business.[[8]](#footnote-8)

## Blockchain Applications

As early Blockchain thought-leaders, we were presented with many opportunities to engage in Blockchain PoCs. The majority of these early PoCs involved operational or business process improvements that enhanced record keeping between market participants. To help us determine which Blockchain PoCs to pursue, we formulated a checklist of the technology’s core attributes, which gave us a better understanding of what Blockchain is and what it might be best suited for.

We broke Blockchain into five core attributes: (1) digital tokenization; (2) multiple actors “invoking” transactions; (3) consensus; (4) immutability; and (5) cryptographic security. Even among Blockchain experts, we found a lack of common understanding of these core attributes. Thus, we found it useful to focus on what each attribute means to us:

* **Digital tokenization**: participants are exchanging among themselves something of value, or ‘assets’ that exist digitally. The term “asset” is defined very broadly to include things like data.
* **Multiple transactors**: multiple, distributed actors create transactions that modify data on the ledger.
  + **Untrusted transactors**: participants’ actions are untrusted. *Untrusted* does not necessarily mean malicious. It includes many sorts of failure within the system, including bad actors along with failures of the infrastructure itself– network delays, partitioning, corrupted data, etc.
* **Trust in consensus:** the consensus mechanism is the final arbiter of truth that brings trust to the system. There is no single central ‘golden’ copy of the ledger. Any decentralized copy of the ledger is authoritative.
* **Immutability**: the transaction records and their order of application to the ledger have to be irrevocable. The history of changes to the ledger has to be immutable.
* **Cryptographic Security**: the integrity of *data* will require a high level of security, typically provided by strong cryptography.
  + **Privacy and Isolation:** participants must be known to those responsible for authorizing access to the ledger but may remain anonymous to each other or only known amongst application-defined groupings. It may also be important to provide isolation for transactions among any group of users. Isolation can consist of any number of constraints including limiting who might execute specific transactions, and who might view the inputs and/or outputs of a transaction.

As part of our PoC process, we assessed how many of Blockchain’s core attributes were actually present in a potential PoC. Frequently, we found that just a couple attributes were necessary, which left us wondering whether Blockchain technology was the best solution to address a potential PoC’s problem. More than once, the Team concluded that Blockchain was not the best solution because existing technologies (or a combination thereof) could solve the problem at lower cost and at lower risk.

LCH’s Trade Reconciliation PoC, which was our first completed Blockchain PoC, offers a good example. In the Trade Reconciliation PoC, the Team successfully developed a Hyperledger-based Blockchain to eliminate trade reconciliation problems that arise when a post-trade feed fails between an equity execution venue and LCH (the equity clearing house). The PoC used the Hyperledger Fabric that was filled with LSE trading data and shared between the network participants, LSE and LCH. The plan was to extend the Blockchain to include other LCH-supported trading venues so that each trading venue and LCH on a non-public Blockchain network could have a full copy of every venue’s trades (encrypted, of course). If a market feed went down between any venue and LCH, the time-consuming process of manual trade reconciliation would be avoided.

At a high level the LCH PoC seems attractive for a Blockchain application because data is cryptographically shared across a distributed network. When one market feed goes down between a trading venue and the clearing house, the other network participants capture all of the trading activity, so that when the failed connection is re-established the incomplete Blockchain ledger is replaced by the most recent Blockchain ledger. While this definitely solves a reconciliation problem, the PoC lacked an important attribute of a Blockchain- allowing multiple actors to create transactions between themselves. Thus, we don’t think that Blockchain is the best solution for trade reconciliation when each market is the sole source of the “golden record.” A shared, distributed database that algorithmically synchronized is a better solution.

Through this hands-on experience we gained an important insight, which is implied above but is worth stating explicitly: Blockchain’s core attributes, and the technologies underpinning them, are not new technologies.[[9]](#footnote-9) Blockchain’s innovation was having meshed together these several existing, tried-and-true technologies in a new and disruptive way.

This insight is a critical point of this paper: innovatively using existing technologies almost always requires the creation of new business models.

Technologies like Blockchain do not usually cause business disruption by themselves. Instead, business models enabled by Blockchain will cause the disruption. In hindsight, the oft-heard comment that “Blockchain is a technology in search of a problem” was a clue to us that we were working backwards when trying to apply Blockchain to existing business models. Blockchain requires new business models in order to achieve its disruptive potential.[[10]](#footnote-10) Arriving at disruptive business models is not easy. Thus far, the only disruptive Blockchain-enabled business model has been bitcoin.[[11]](#footnote-11)

The two insights, that Blockchain is comprised of existing technologies and that Blockchain requires innovative business models in order to achieve its potential, helps us strategically assess our current situation. Right now, we do not think that LSEG resources should be utilized trying “fit” Blockchain to improve existing business process inefficiencies and/or record keeping. Not to minimize those real problems, we believe that potential efficiency gains over our existing processes are unlikely to be offset by the cost and risks associated with LSEG developing its own Blockchain applications. Instead, LSEG should monitor competitive developments to ensure efficiency (i.e., cost) parity with its competitors and rely on vendor Blockchain products.

Conceptualizing and investing in innovative Blockchain-enabled business models presents an opportunity. The Team believes that the financial services industry is ripe for digital disruption. Blockchain, which enables digital asset creation,[[12]](#footnote-12) is likely to be an important part of this disruption. Thus, keeping technological options open while focusing on business planning seems to be the most productive path forward should we, as recommended below, or others introduce digital assets to the financial services ecosystem.

# LSEG’s Ongoing Blockchain PoCs

In this section, we describe two Blockchain PoCs that the Team has completed its work on. Innovative Blockchain-enabled business models underpin both PoCs.

**4.1 Securities Issuance**

Private Securities Issuance on Blockchain (PSIBs)

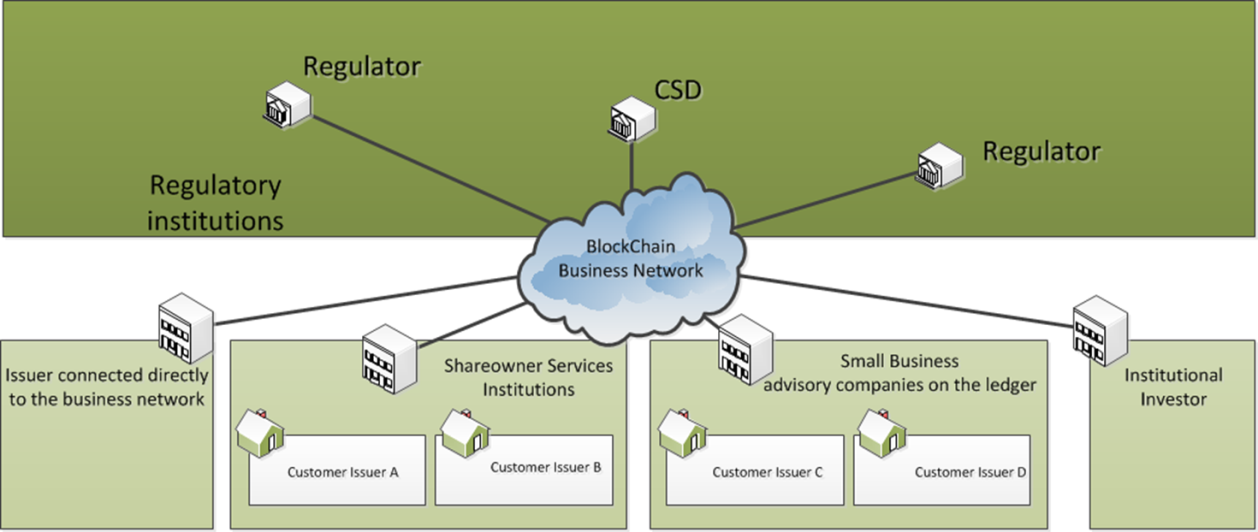
Monte Titoli’s post-trade team, led by Paolo Caniccio, completed the first PSIB use case in April 2017.

### Business Rationale

In most cases, privately-held companies may issue physical stock certificates to shareholders as part of the capital raising process. This practice is paper-intensive, highly manual and presents a number of problems like cumbersome and expensive company registration, little transparency, high cost of account maintenance and account reconciliation, and possibilities for fraud. To address these shortcomings, the PSIB use case’s limited objective was to tokenize stock certificates (i.e., create blockchain-based digital assets) in accordance with Italian law.

Technically, the POC succeeded. The Monte Titoli team demonstrated that a blockchain could successfully represent a tokenized security, allowed multiple relevant parties access to a Blockchain, and offered some additional functionality such as security transfers.

**Diagram of PSIB Environment**



Moving forward, we recommend building on this work with Elite and LSE listings to develop offerings tailored for small and mid-sized enterprises. PSIB selling points are the following:

1. PSIBs might reduce the time it takes to register a business because the process would be standardized and automated.[[13]](#footnote-13)
2. PSIBs offer fraud-resistant, real-time shareholder information to issuers, shareholders, and regulators.
3. Because PSIBs reside on a Blockchain, document maintenance costs should be drastically reduced and account reconciliations eliminated.
4. Blockchain-enabled securities issuance structures should be the beginning of customer-centric offerings that could lead to much more sophisticated functionality (i.e., “smart assets”), like automated transfer restrictions, dividend payments, and other issuer or investor-driven functionality.
5. PSIB Blockchain-enabled markets could be developed offering peer-to-peer interactions between issuers, shareholders, and other investors.

### Group Applicability/Strategic Importance

PSIBs are tokenized securities.

Tokenization is the process of converting the rights associated with an asset into a digital token on a Blockchain. In our context the asset, a security, either currently exists in the real world (like a share of Google or a block of gold), and thus must be rendered immobile before being tokenized, or a security is conceived on a Blockchain, like PSIBs. LSEG does not have the legal authority to “physically” hold assets like a bank. Thus, the PSIB use case gave us experience with creating digital assets in the first instance.

As a facilitator of capital formation, LSEG is well positioned to develop solutions for small and mid-sized companies seeking next-generation ways of raising capital and interacting directly with shareholders. In later stages, other services could be developed, including services around trading and settlement. In any event, experience with digital asset creation might prove useful should digital securities enter into the financial services industry through other distribution channels.

LSEG would not be the first exchange to consider such an offering. In 2015, Nasdaq announced a partnership with a Blockchain company, Chain, to build a Blockchain platform “to facilitate the secure issuance and transfer of shares of privately-held companies.” Nasdaq rebranded the partnership “Nasdaq Linq.” More recently, the Delaware Board of Trade launched as the “only SEC-registered exchange using blockchain.” The founders hope to give small companies “new ways to raise capital.” To our knowledge, neither effort has attracted many privately-held companies.

As we will discuss below, Initial Coin Offerings (ICOs), represent a new Blockchain-enabled method of raising capital. ICOs captivated investors in 2017, and regardless of how hard issuers try to avoid regulation, ICOs will eventually be regulated as securities. ICOs offer an interesting (and risky) opportunity for LSEG because, like PSIBs, ICOs are tokenized securities that may play a role in the digitization of the equity markets.

## LCH Internal Settlement Facility

The LCH Internal Settlement Facility (ISF) PoC, led by Gerard Smith from LCH, relates to securities settlement on a Blockchain. In July 2017, the Team successfully built a private, permissioned Blockchain on the Hyperledger Fabric that allows pre-settlement netting of trades between participating custodian banks. The netted outcome creates a settlement instruction to an existing non-LSEG affiliated Central Securities Depository (i.e., an (I)CSD, like Euroclear), where participating custodians will continue to retain their account structure and funding arrangements until later phases of the project.

### Business Rationale

LCH seeks to create a Blockchain-enabled securities settlement ecosystem that might one day operate as an (I)CSD.[[14]](#footnote-14) Working confidentially with a group of global custodians, LCH reimagines a Blockchain-enabled securities settlement ecosystem, which, at a minimum, offers participants an infrastructure co-existing with established (I)CSDs with much reduced the costs for global custodians and their sub-custodians.[[15]](#footnote-15)

For LCH, ISF offers new revenue streams, and could potentially radically disrupt the (I)CSD space by offering existing and new functionality that is unburdened by legacy cost structures of the incumbent (I)CSDs.

Because creating a securities settlement ecosystem is complex, LCH and its partners elected to take a phased approach, with the technology functionality requirements outlined below:

## Phase 1 (partially completed)

* Validation and matching of settlement instructions sent to the ISF for equity and fixed income settlements;
* Netting of instructions between a defined set of participants with one or more specific settlement locations;
* Onward instruction of the net settlement to the relevant CSD under Power of Attorney arrangement with a Settlement Agent; and
* Real time standardised reporting of the above.

## Phase 2

* Expansion on the provision of asset classes and settlement locations;
* Enhanced transaction types (repo, stock loans, etc.); and
* Regulatory participation – regulators provided with direct access to the ledger.

## Phase 3

* Further expansion of asset classes and settlement locations; and
* Risk management enhancements – provision of uncleared margining functionality.

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## Phase 4

* Critical mass – migration from external settlement to settlement on the ISF, depending upon availability of access to DvP in central bank money.
  + - 1. **Group Applicability/Strategic Importance**

LCH’s ISF project is an example of an LSEG entity contributing its operational and regulatory experience along with its trusted market neutral position as an administrator to provide services to a community of users. The users become decentralized in business dealings but require a central authority. Among other things, the “central authority” permissions network users, provides the regulatory licenses to allow network users to engage in what otherwise might be a regulated function (like operating a Securities Settlement System), audits the network to ensure compliant behavior (even if the behavior is governed by smart contracts), and provides a single point of contact for governmental oversight.

# Recommended Approach to Blockchain

*“Blockchain concepts are extremely hyped given their embryonic status, but ignorance is dangerous. Maturity will usher in dramatic and sudden changes, radically reshaping economic systems, institutions and societal models that have existed for hundreds of years. Scenario planning is essential.”*

-Gartner Hype Cycle for Blockchain Business, 2017

The Team has completed its active development work on the aforementioned PoCs. As the Group determines next steps, we are taking this opportunity to offer some recommendations for discussion in an effort to focus the Group’s efforts for the next year. To help organize our thoughts, we break up our recommendations into three sections: (1) Technology, (2) Business, and (3) Revisiting Past Decisions.

**Technology**

As noted above, while Blockchain technology is rapidly developing, we do not believe that widespread business disruption is imminent. We believe LSEG should continue to support a core GTS Blockchain Team, which is currently comprised of four full-time staff, that focuses on:

1. Continuing to gain hands-on experience with the leading Blockchains, notably Etherium, the open-source Blockchain technology that is a favorite of ICOs;
2. Monitoring the development of other Blockchain technologies generally, standards development, advancements in Blockchain interoperability and smart contract development;
3. Continue to migrate away from directly contributing to open-source Blockchain platforms, and instead focus on appropriate Blockchain applications;
4. Educating business leaders and senior management on technical advancements and other material developments, especially as it relates to business model development;
5. Coordinating a strategic framework that ensures that LSEG’s various business units act consistently with Blockchain technology strategies (if desired);
6. Defining enterprise requirements in preparation for Blockchain adoption; and
7. Developing a knowledge transfer and a staffing plan.[[16]](#footnote-16)

**Business-side**

The most challenging portion of our Blockchain strategy comes from the business side. As a starting point, business must do some honest, strategic soul-searching to accept (or not) the disruption that a decentralized, tokenized ecosystem may bring to our decades-old business and operating models. So far, it seems clear that most publicized efforts of financial service firms have “fitted” Blockchain into existing models without disturbing the delicate, status quo balance of control and economics. For entities willing to invest in Blockchain-enabled business to disrupt that balance, a lot of time and money will be needed to conceptualize a successful digital business and re-engineer functions so that they conform to existing legal and regulatory frameworks. We do not know who will launch a disruptive digital business or how long it will take. However, based on the facts currently before us, we are confident that radical disruption to LSEG’s business will occur at some point.

In the meantime, the business-side should set an appropriate level of business and technical investment today. So far, we have been successful in fending off vendors and start-ups that want to lock us into a significant consulting or technology contract. Additionally, we have not spent any money joining consortia. Generally, we suggest staying the course in this regard.

More specifically, we recommend the following for LSEG businesses:

1. Each business line should go through a formal exercise of conceptualizing how Blockchain might disrupt their business or operating model and identify existing impediments (primarily legal and regulatory) that will aid in recognizing a tipping point. The results of the exercise should be recorded and periodically reviewed;
2. Each business line should identify potential business/operating models that will be needed to compete in a Blockchain-enabled, digital environment. In this regard, we suggest two areas for initial focus:
   1. digital asset creation as part of capital formation; and
   2. leveraging existing regulatory licenses and regulatory and administrative expertise that add value to a Blockchain-enabled community;
3. At this early stage, business must avoid vendor or partner lock-in. Assuming that material business disruption is at least 5 years away, it is currently unknowable what the financial services industry will look like in terms of scope and focus and Blockchain’s role in it. Individually, business lines need the flexibility to work with multiple vendors. Collectively the Group need to leverage relationships and ensure a coordinated, efficient approach to Blockchain adoption; and
4. Business should consider their medium-term platform strategy to determine whether future platform vendors have a Blockchain strategy.

**Revisiting Past Decisions**

During the past two years, we (i.e., business leaders with our input) have decided not to pursue several potential opportunities in the crypto-space. Following our own advice that we should periodically reassess earlier decisions, below are some areas for discussion:

Crypto-Exchange Operation/ Technology and Services Provision

*Cryptocurrencies*

During the past two years, cryptocurrency markets have grown grow, fueled by new levels of institutional and retail interest in the new asset class. Cryptocurrency exchanges were adding over 100,000 new customers per day during the early part of 2018. Goldman Sachs announced in April 2018 that the firm was dedicating staff to crypto-currency trading. Robinhood, a smartphone-based application focused on equities, attracted 1 million new users when it announced that it was adding cryptocurrencies to its offering. Lastly (for the purpose of this paragraph), a recent Thomson Reuters poll found that 20 percent of surveyed financial institutions plan to trade cryptocurrencies in the next 12 months. It appears to us that cryptocurrency trading is here to stay.

Based upon discussions with exchange operators and regulators, many cryptocurrency exchanges lack an understanding of market structure, exchange operations and regulation. Exchanges are desperate for talent. We think some cryptocurrency exchanges might be operating in unsafe ways and an industry shakeout is inevitable. Thus, established exchanges, like Nasdaq, are sensing an opportunity to enter the cryptocurrency exchange space as an exchange operator.

LSEG Technology, which is separate from Emerging Technologies, is in discussions with several cryptocurrency exchanges to provide matching engines and related exchange technology to them. LSEG Technology views the growth of crypto exchanges as presenting new market for their services, as does the rise of formal trading venues for other alternative asset types (emissions, real estate, media). This seems to be a reasonable way to gain experience in supporting new crypto-markets, which could provide the Group insights into market operations and commercial considerations for these new asset classes.

LSEG should reconsider entering into cryptocurrency market operation or are cryptocurrencies still too risky and immature an asset class for us to participate in? As an interim step, should LSEG offer services (operational, regulatory, consulting) to fledgling cryptocurrency exchanges or is the regulatory and brand risk too high?

*ICO’s/Tokens*

In 2017, the only thing that garnered more attention in the Blockchain space than Blockchain itself was Initial Coin Offerings (ICOs). ICOs come in many different flavors, most commonly as a form of crowdfunding. In these transactions, a token associated with some sort of future project is sold to “investors” in exchange for cryptocurrency (e.g., bitcoin, Ethereum, etc.). The initial ICOs involved funding the development of new cryptocurrencies. For example, both Ripple and Ethereum sold tokens that represented their embryonic currency in exchange for bitcoin. As Ripple and Ethereum became more successful, the value of their tokens increased relative to bitcoin. Early investors became very wealthy.

Other projects generally followed this model. This early momentum was blunted by regulatory and investor protection hurdles. Alarmed by several fraudulent projects that sought funding through ICOs, the SEC dedicated enforcement resources to this emerging market and halted unregistered ICOs. It also issued a report to market professionals on the legal and regulatory risks associated with ICOs, including the possibility that an ICO may need to be registered. In addition, the SEC has urged investors to exercise caution when considering potential ICO investments. It even went so far as to publish a mock ICO website – dryly named Howeycoins.com – to highlight the risks of investor fraud in this market. In any event, ICOs uncovered a significant appetite for alternative capital raising methods that seem to cross crowdfunding with traditional capital raising and secondary market trading.

A question is whether the business should devote resources to developing models to bring these ICOs to market. On the one hand, ICOs, or a variation of them, probably represent the future of digital equity asset issuance. On the other hand, we believe that the regulatory hammer is about to fall hard on market participants in this space. Additionally, the view in the US seems much less friendly to ICOs than regulatory authorities in Europe. Is it too early to devote resources? Considering the regulatory and brand risk that ICOs bring, is there still an opportunity for LSEG to apply its regulatory experience to nurture this market?

Crypto-based Assets

Periodically, questions have arisen about creating securities products based in crypto-based assets. We note that CME and CBOE have launched bitcoin futures contracts and a number of crypto-based indices have been introduced or are in the process of being created. Should FTSE or Capital Markets reconsider this opportunity?

1. The Blockchains that the Team analyzed included Hyperledger, Ethereum, Corda, Ripple, and the bitcoin blockchain. [↑](#footnote-ref-1)
2. The Team met with over 50 Blockchain startups. [↑](#footnote-ref-2)
3. While the line between a “start-up” and a “service provider” can be blurry, we met or worked with such established service providers such as IBM, Accenture and PWC as well as new entrants like R3, Digital Asset Holdings (“DAH”), SETL and Paxos. [↑](#footnote-ref-3)
4. The Gartner 2018 CIO Survey shows that while 66 percent of CIOs have an interest in Blockchain, *only 1 percent* have implemented, or invested in, Blockchain. Only 22 percent of CIOs surveyed are in the short/medium-term planning or experimenting stage. To us, this demonstrates the gap between what is really being done and what is being reported in media and sales pitches. [↑](#footnote-ref-4)
5. Many significant technology companies, such as IBM, Intel, Google, SAP, Oracle and Microsoft, are developing enterprise-grade Blockchains, which we expect to be productized during the next year. [↑](#footnote-ref-5)
6. For example, we frequently hear about the benefits of immediate settlement of equity trades. While benefits probably exist, we almost never hear about the potential consequences to liquidity provision in markets where “a trade is the settlement.” [↑](#footnote-ref-6)
7. For example, R3’s Corda is not a Blockchain though many consider R3 a Blockchain company. [↑](#footnote-ref-7)
8. “[M]ost of the business partners that enterprise architects, innovation leaders and CIOs support assume that blockchain is already being actively deployed across enterprises, and a larger transformation is underway. These assumptions are based in large part on the commentary in the media and information being received from solution providers. Unfortunately, rumor has erroneously been equated with fact. This is a dangerous situation and can lead to significant problems of failed innovation, wasted investment, rash decisions and ultimately, perhaps, rejection of one of the most important set of technology capabilities the world has ever seen.” Blockchain Status 2018: Market Adoption Reality, Gartner Report (March 27, 2018). [↑](#footnote-ref-8)
9. The newest technology, the Secure Hash Algorithm (SHA)-256, was developed in 2001. Distributed communication networks, the oldest of these technologies, dates back to 1964. It took until 2008 for someone to put the technologies together to launch a long-talked about product- digital currency. [↑](#footnote-ref-9)
10. See also, Gartner, Market Guide for Blockchain Platforms, page 7, (March 2018) (“Many proposed uses of blockchain technology seem like ‘hammers in search of a nail.’ Most enterprises’ blockchain projects actually do not need blockchain technology to meet their requirements. In fact these projects would be better done without Blockchain technology…..technology innovation leaders must also consider whether they really need to develop and deploy blockchain by performing a careful analysis of existing technology solutions and fitting them to the specific business case or challenge.”) [↑](#footnote-ref-10)
11. Instructively, when bitcoin was launched, its founders did not look at the bitcoin blockchain as a solution extendable to other offerings. Instead, the original block and chain application very narrowly focused on a “peer-to-peer electronic version of cash” and nothing more. See Nakamoto, S., Bitcoin: A Peer-to-Peer Electronic Cash System (2008) [↑](#footnote-ref-11)
12. We use the term “digital asset” to mean the representation of a thing as a unique, digital token. This should be contrasted with our current state, where assets are represented in a non-unique way on electronic ledgers. Digital assets enable the individual, unique transfer of an asset for value. Bitcoin is an example of a digital asset. Equity securities, held in street name, are not digital assets. [↑](#footnote-ref-12)
13. Other costs, such as legal costs, could be reduced by offering standardized smart contracts. [↑](#footnote-ref-13)
14. During early 2016, the team worked with GlobeSettle to determine whether it could operate as a Blockchain-enabled (I)CSD, with an offering similar to that being contemplated by LCH. Because of Blockchain’s technical immaturity and significant legal and regulatory hurdles (not to mention the regulatory community’s general ignorance of Blockchain), the effort was not pursued. [↑](#footnote-ref-14)
15. The very early business case shows significant settlement netting benefit with ISF for participants. Analysing Fixed Income settlements of Citi in 15 markets across Europe, the expected netting ratio was at 51% against the top 5 counterparties. This could translate in c€1m savings per annum in Citi’s top 5 markets alone. [↑](#footnote-ref-15)
16. All six of LSEG’s original Blockchain team have left the firm during in the last two years. [↑](#footnote-ref-16)