INTERVIEW
The EC's Jennifer Robertson on post-trade regulations

DODD-FRANK
The SEC's Hester Peirce on security-based swap rules

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Developing a voluntary carbon market

IQ
ISDA® Quarterly
Vol 7, Issue 2: July 2021 | www.isda.org

* DIGITAL TARGET

A number of initiatives are under way to digitise derivatives documentation, enabling the industry to move towards a fully automated operating environment

* Looking to the Future

From artificial intelligence to distributed ledger and smart contracts, there is no doubt that technology will drive major changes in the derivatives market in the coming years. **IQ** *asked a variety of market participants and observers for their perspective*

Akber Datoo
Chief executive and founder, D2 Legal Technology

The over-the-counter derivatives market has always greatly benefitted from technology, from trading platforms to pre- and post-trade analytics and processing, including pricing and discovery tools, settlement systems and collateral management. This technology has helped the market manage the ever-increasing pace of innovation and change.

However, legal agreements and opinions continue to be dealt with manually and with limited use of technology, despite the fact that financial instruments are simply a series of contractual obligations. Technology such as clause libraries, document generation tools, artificial intelligence (AI) and machine learning, when properly applied and built on legal data taxonomies and standards, can rise to meet the latest challenges of this increasingly complicated regulatory and business landscape, assisting with safe and efficient markets.

Recent work on the digitisation of legal agreements has evolved from initiatives such as Financial products Markup Language to today, where the ISDA Clause Library and ISDA Legal Agreement Taxonomy are key to enabling business benefits to be unlocked through document generation and negotiation platforms, data extraction and analytical tools, especially when supported by ISDA's Common Domain Model (CDM). These new enablers will drive resource optimisation across capital, liquidity and collateral, while assisting with regulatory reporting and operational management. It will be through the medium of data that we truly see the business benefits – combining legal agreement data with market, trade and party information to provide actionable and automatable insights. In the future, this will be possible through smart derivatives contracts.

Although agreement standardisation and automation have received a lot of attention recently, we will increasingly obtain business value through the digitisation of legal advice, which is often provided today through formal written legal opinions. Technology is now being

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used to create close-out netting or cross-border compliance engines that apply the legal advice in these opinions in an automated manner – providing the controls and audit trails required by regulation such as the European Central Bank's netting reporting requirements and the Basel Committee on Banking Supervision's principles for effective risk data aggregation and risk reporting. These smart legal opinions have the potential to streamline and better manage legal risk while optimising the use of derivatives in a safe and efficient manner.

Maroun Eddé
Chief executive, Murex

Derivatives took off in the 1990s thanks to technology – and fundamental improvements in the derivatives markets can still be spurred by technology.

There are many very specific challenges where technology will obviously have impressive market impacts, such as dealing with an instant burst of calculation capacity to compute counterparty risk exposure in real time. However, its most spectacular impact will be measured by the way the end-to-end derivatives lifecycle can still be transformed.

Each institution active in selling derivatives must build and operate an IT factory capable of structuring, pricing, distributing, hedging, risk managing and settling those products. All such institutions must be connected within an effective network, with each of them connected with their clients.

This global web can massively improve in speed, efficiency and security with the concurrent emergence of new technologies. Software platforms capable of handling the full IT factory within each institution exist today and can bring the consistency and simplicity that is so desperately needed. Development and operations principles and corresponding techniques will inject agility in IT factories that end clients have been craving to get the right products at the right time. The cloud, along with the massive infrastructure being built on top of it, will connect all the value chain dots with the right level of security and almost infinite scaling capabilities. Those dots include all key actors (sell side, buy side, corporates and regulators) and providers (data, exchanges and other execution platforms, business process outsourcing, software as a service and system integrators).

We have never experienced such a convergence of powerful technologies in the capital markets world. I strongly believe their application will slowly but relentlessly transform the value chain into something so efficient that the cost of managing derivatives in the future will be a small fraction of what it is today, with a massively improved capacity for risk management.

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Scott Farrell
Partner, King & Wood Mallesons

Smart contracts can mean different things to different people, from a theoretical term for self-executing computer code to legal contracts that use automated processes to ensure performance. Whichever of these meanings you take, smart contracts →

will drive technological change in derivatives markets.

From master agreements to transaction definitions and from clearing houses to trade reporting, the derivatives markets are no newcomer to standardisation and automation. They have been used to improve productivity, efficiency and risk management over many years, particularly as transactions and regulatory obligations have become more complex. While much of this role has been performed by financial market infrastructure over the past decade, the next decade should see smart contracts contribute as well.

Fundamental to the development of smart contracts is a shared representation of derivatives transactions understood by all the knowledge disciplines that manage productivity, efficiency and risk in the derivatives markets. This permits a collective understanding of critical concepts in derivatives and the risks related to them, and more effective collaboration between technologists, valuation experts, risk managers, compliance officers and lawyers. In reducing duplication between them, it allows experts to focus on what they bring to the derivatives markets. This is important because, like financial market infrastructure, smart contracts must not only be technologically efficient, but must also effectively deliver the range of outcomes needed by their users.

It seems inevitable that the derivatives market will continue its journey from analogue to digital. Smart contracts are the next step, pushing the transition beyond the application of operational processes into legal meaning and effect. The pursuit of ever safer and more efficient markets leads their way.

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Scott Farrell, King & Wood Mallesons

Haytham Kaddoura
Chief executive, SmartStream

Harnessing the potential of new technologies plays an increasingly vital role for financial institutions seeking to enhance the efficiency and cost effectiveness of their derivatives processing operations. While a lack of standardisation has prevented greater automation in the past, initiatives such as the CDM and ISDA Create are driving change, enabling firms to benefit from current advances in IT.

The ongoing drive towards greater digitisation has also increased the willingness of the industry to exploit newer technologies, including AI. Advances in the use of AI in reconciliations have driven efficiencies in processing and costs of up to 20% for some of our clients. Our most recent AI innovation, Affinity, uses observational learning to pick up on what business users do and, just as importantly, what they don't do. It uses this knowledge to improve matching algorithms and drive down exception processing time and costs.

The need for more flexible access to data and associated processing technologies is also rising up the executive agenda. In response, we've ensured our services and solutions are accessible in a variety of ways, including through application programming interfaces (APIs), as microservices or through the cloud. In parallel, we have also seen a significant uptake in managed services from several of our clients.

Institutions now require systems that are easier to use, and don't demand constant reliance on IT departments.

Lalana Kagal
Principal research scientist, Massachusetts Institute of Technology (MIT)

Ravi Rahman
Graduate research assistant, MIT

Decentralised ledger technologies introduce a new approach to managing the collateralisation of derivatives. Blockchain offers more than speculative cryptocurrencies: they are secure, low-cost decentralised ledgers capable of

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executing custom-rules-based logic for processing complex financial transactions at low cost.

The Ethereum blockchain, the second largest to Bitcoin by market capitalisation, provides an API to create digital tokens that represent real assets. Tokens exist for an ever-expanding array of financial instruments, including US dollar, sterling, euro and, recently, US equities. Holders of digital tokens benefit from the same security and accountability guarantees of the underlying blockchain, while also being shielded from the price volatility of traditional cryptocurrencies. Through blockchain programmes known as smart contracts, developers can build applications around digital tokens to manage complex financial transactions. These programmes can store digital tokens in escrow and release the tokens only when predefined conditions are met. This deterministic execution, independent of any entity in the transaction, can significantly reduce costs by eliminating the need for trusted counterparties.

There are several innovations that will enable the derivatives market to realise the benefits of digital tokens. New blockchain protocols, such as Compound, will enable collateral stored in a smart contract to earn interest while still being secured against counterparty default. Proof-of-stake blockchain consensus protocols and transaction side channels, known as lightning networks, will increase transaction volume and lower costs.

Our research group at MIT, the decentralised information group, is investigating how institutions can leverage zero-knowledge cryptographic proofs to demonstrate their collateralisation without revealing the underlying blockchain addresses and account balances. These innovations in blockchain applications, scalability and privacy will enable the derivatives market to take advantage of digital tokens and allow low-cost, accountable and privacy-preserving financial transactions at scale.

Declan McKeever
Executive director and assistant general counsel, JP Morgan

On paper, the proposition that smart contracts have the potential to revolutionise how financial institutions deliver services to their clients is a compelling one, and their beneficial use case for the derivatives markets is no exception. Leading financial institutions will continue to invest heavily to remain at the forefront of technological innovation. The integration of smart contract technology to support firms' various business applications, particularly those deploying distributed ledger technology (DLT) and AI, may sensibly be viewed as a logical extension of that investment. There are, however, various challenges.

Much has been written about how embedding code or conditional logic in contracts risks unintended or absurd outcomes in performance, which were not contemplated by the parties when the contract was formed. That may be true, but the use of algorithmic trading strategies among institutions is merely one example of where conditional logic is already used on a daily basis, and firms are required to have the means to manage those outcomes effectively.

A key issue for financial institutions is obtaining appropriate certainty on the legal and regulatory treatment of smart contracts, including cross-border recognition and enforceability, without which there can be little appetite to progress beyond the use of traditional natural language contract terms. Increased standardisation of terms (including ISDA's considerable efforts in this area) is central to promoting such certainty and the ability of financial institutions to integrate smart contracts across interoperable DLT platforms and their risk, reporting and data analytics systems.

It does not follow that because a contract may be automated, it should be automated. Financial institutions will continue to focus on the specific needs of clients and regulators, and this will continue to drive innovation in a →

way that is inherently useful and appropriate from a risk management perspective. This will undoubtedly extend to novel applications of smart contracts, but what is equally clear is that natural language contract terms, which rely on traditional rules of legal interpretation, shall for many purposes remain the most appropriate and useful way to form and enforce legal obligations.

John Montgomery
Senior specialist, global derivatives and collateral, Vanguard

One of the main challenges facing collateral operations today is managing the vast amount of data throughout the collateral ecosystem. Not only do we need to manage static data from a variety of systems, but we also need to deal with information that, for the most part, is not standardised.

This issue is compounded by the complexity of contracts and the associated data, such as haircuts, eligibility criteria and settlement instructions. Challenges with managing this data result in increased onboarding times and operational risk. The solution is standardisation, and ISDA is leading the way with the CDM. By creating a common model for data, we can avoid both costly IT development and high-risk manual processes and move towards API-driven data communication. Additionally, the CDM lowers the barriers to entry for new technologies that will change the face of operations as we know it, such as smart contracts and machine-learning exception management.

Technology will also remedy some of the pain points related to settlement. Thanks to industry standards like the MT527 message and utilities like the Depository Trust & Clearing Corporation's margin transit utility, we will soon be rid of fax machines and will be able to manage collateral settlement in real time. Improving settlement instruction standardisation via the CDM will allow us to avoid future settlement issues, as well as reduce the time to onboard new contracts.

In the end, these new tools will enable operations to shift their attention to more value-add functions, such as data aggregation and analytics, which will allow us to better support our investment managers in the endeavour to increase the returns for clients.

Beatrix Pole
Director, managing legal counsel, Natwest Markets

Although technology innovation has affected the banking sector as a whole for many years, the scale of regulatory change within the derivatives market since the financial crisis has fostered the development of numerous compliance-related technology solutions. For example, the introduction of mandatory posting of variation margin (VM) and initial margin (IM) as a risk mitigation tool has led to significant changes in collateral management processes, infrastructure and documentation that have been supported by technology enhancements. More recently, the COVID-19 pandemic has accelerated existing trends in technology change as legal teams adapt to the new normal – for example, through the increased use of electronic signatures. ISDA's e-contract opinions have proven to be an incredibly valuable resource in this context.

Mandatory margining required market participants to agree new sets of ISDA VM and IM collateral documentation, as well as custodian-related documentation. This exercise highlighted that a lack of standardisation results in increased legal and operational risk and inefficiencies. Greater standardisation of documentation is also needed to meet the cost challenges the industry is facing. The ISDA Clause Library initiative has started to address this issue. A set of common variations to selected ISDA clauses is now available, so tailoring can be streamlined, efficient and cost effective.

One major benefit of greater standardisation in legal documentation is the opportunity to automate and digitise agreement production, review and amendment. For example, the ability to produce an agreement or ascertain its terms quickly and accurately with limited or no human interaction can facilitate an efficient and cost-effective implementation of future regulatory change, as well as enable a swift reaction to changing market conditions – in particular, in a default scenario.

Nevertheless, any technology solution seeking broad adoption across the market will still need to cater to legacy documentation and non-standard terms. While opportunities to harmonise and streamline will continue to be sought, the need to tailor derivatives documentation will remain. Technology solutions offering market participants a flexible and scalable solution to address this effectively will greatly impact the derivatives markets in the future.

Chris Walsh
Chief executive, Acadia

Derivatives markets are being transformed by global regulations. Together, the non-cleared margin rules, IM implementation, benchmark reform and the standardised approach to counterparty credit risk have created a new framework where risk is quantified using industry standard measures and mitigated using industry standard processes. While the impact of this shift differs across dealers, clearers and the end-user

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> **Sir Geoffrey Vos, Master of the Rolls**

segment of the market, there are some common impacts driving technology priorities across the industry.

The most significant impact we see is that all market participants must calculate risk. September marks phase five of the non-cleared margin rules, with phase six next year, which will require many of our buy-side clients to calculate IM based on the ISDA Standard Initial Margin Model. This will necessitate new quantitative capabilities and tools that are no longer siloed within quant teams but are instead embedded across entire organisations, including trading, post-trade and client-facing functions. Risk calculations will be performed in real time thanks to cloud computing, new quantitative tools and open-source risk services. Information will become widely accessible thanks to self-service analytics and visualisation platforms.

To achieve this, the industry must solve a big data challenge. Massive amounts of information need to be exchanged and reconciled across and between financial institutions. Data and domain models must be much more standard than today. This standardisation will require cross-industry collaboration and will involve leveraging data management technologies, including advanced AI-driven normalisation and reconciliation capabilities.

Clients must be prepared for sharp increases in operational and compliance activities that accompany their new risk responsibilities. With this move, workflow will focus on exceptions only and client experiences will become fully digitised. Websites will be replaced with APIs, trading relationships will be codified through intelligent contracting, and workflows will be automated and controlled, all enabled by machine-based learning, AI and explained analytics.

All this change being thrust upon existing businesses will pressure clients to focus on what is most important. This, along with standardisation, will give rise to shared services to perform calculations, manage, normalise and reconcile data, and manage key workflows between parties.

Sir Geoffrey Vos
Master of the Rolls

We are on the verge of a digital revolution. Soon, almost all derivatives and much other business will be undertaken by the use of electronic documentation, electronic signatures, smart legal contracts and on-chain records.

There have been, however, four impediments to the inevitable eventual and ubiquitous use of on-chain smart contracts.

The first impediment was the lack of a clear understanding of the legal status of cryptoassets and smart contracts, something that the UK Jurisdiction Taskforce, as part of Lawtech UK, took forward in respect of English law with its legal statement on the subject published at the end of 2019.

The second impediment is the absence of dependable central bank digital currencies (CBDCs) to allow smart contracts to execute automatically. Several central banks have trialled them, but there is not yet a CBDC that commands international business confidence.

The third impediment is the absence, so far, of a universally accepted method of digitising commercial and legal documentation. The options available are not currently uniform.

The fourth impediment is the absence of a universal dispute resolution process for smart contracts and cryptoassets. However, the UK Jurisdiction Taskforce recently published a set of digital dispute resolution rules, providing for arbitral or expert dispute resolution in very short periods, arbitrators or experts to implement decisions directly on-chain using a private key, and optional anonymity of the parties.

Overcoming these four impediments will transform trading on derivatives and other financial markets globally.