Constructing Smart Contracts

Smart contracts offer the potential to bring greater automation and efficiency to the derivatives market. But can a derivatives contract ever be fully automated? Will smart contracts take the place of paper contracts? ISDA's Ciarán McGonagle explores the issues

George Bernard Shaw, in extolling the virtues of creative thinking, once declared that some men "see things; and say 'Why?' But I dream things that never were; and I say 'Why not?'" The development of new technologies such as blockchain and smart contracts and their application in the financial markets has created exciting opportunities, allowing us to reimagine the market and to ask, as Shaw did, 'why not?'

Indeed, the use of smart contracts in the derivatives market offers the potential for a fundamental reshaping of derivatives infrastructure, reducing operational risks, streamlining increasingly cumbersome and time-consuming processes, and cutting costs.

However, the efficient, practical and safe application of new technologies to existing operational processes also requires market participants to ask some searching questions. What problems are we trying to solve? What kind of trade-offs do we need to consider? Is technology the answer?

Seeing the world as it exists today and asking 'why?' would therefore seem to be a necessary, if rather more prosaic, task. In the context of smart contracts, it is a question for which lawyers are well placed to respond.

When considering the future development of smart contracts and their application to derivatives documentation, a number of legal issues must first be considered. For example, what contractual terms should be automated? Will these terms be represented in computer code? If so, how can lawyers ever be expected to validate the legal effect of any automated contractual terms?

What is a smart derivatives contract?

In 2017, ISDA and Linklaters jointly published a whitepaper entitled *Smart Contracts and Distributed Ledger – A Legal Perspective*. In exploring the concept of a smart contract, the paper identifies a number of initial semantic challenges – not least, the tendency among lawyers and computer scientists to use similar terminology to communicate distinct concepts.

For example, when lawyers speak about smart contracts, they may be referring to a 'smart legal contract', which envisages a written and legally enforceable contract where certain of the obligations may be represented or written in code. Computer scientists, on the other hand, might interpret the term more narrowly as a piece of 'smart contract code', which is designed to execute a task if a certain, pre-defined condition is met.

The paper notes that these two concepts aren't necessarily contradictory. From a

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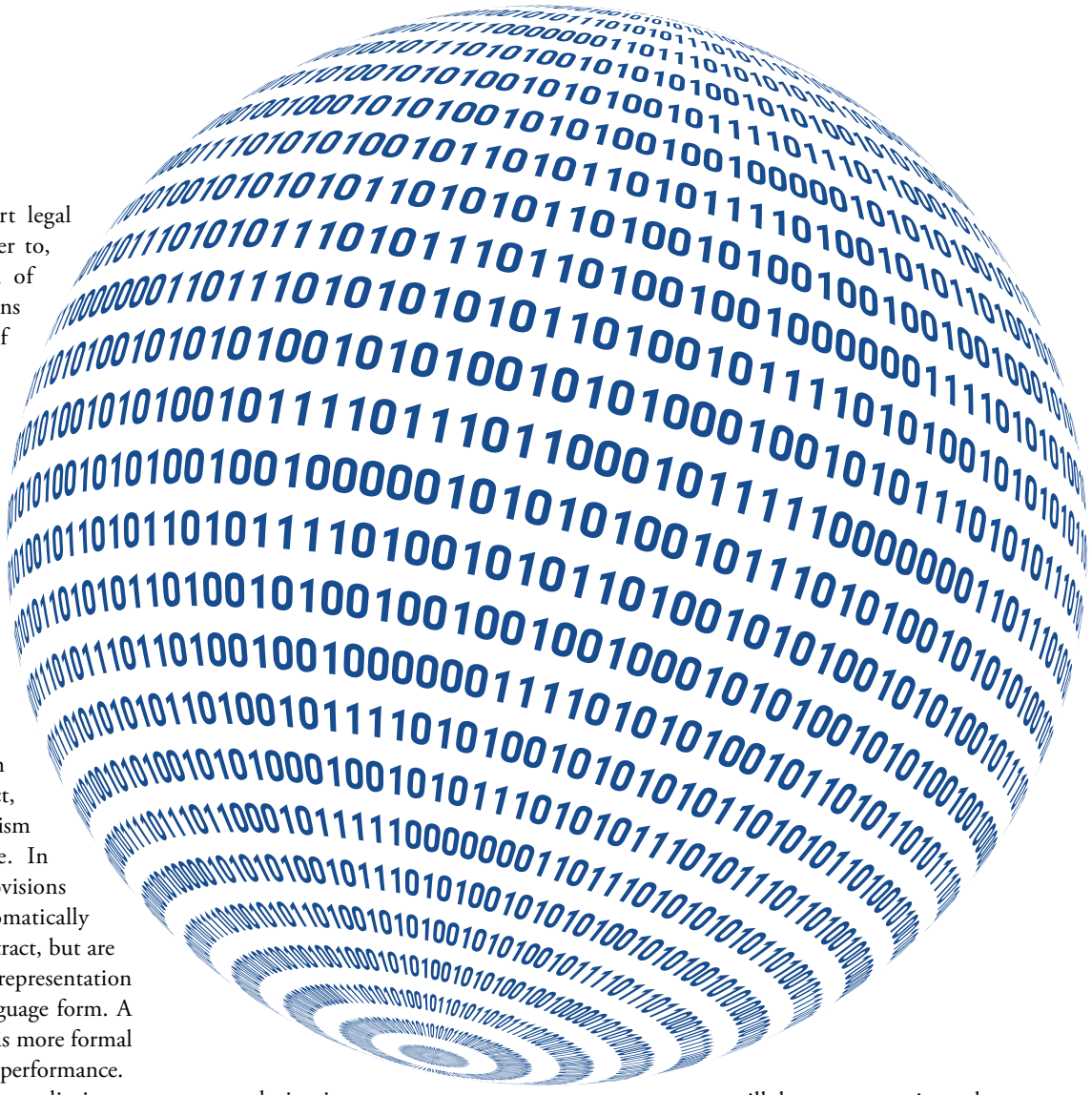

lawyer's perspective, a smart legal contract will necessarily refer to, or incorporate, some form of smart contract code as a means of effecting the automation of certain operative provisions within the contract.

Analysis of the relationship between legal contracts and computer code is helped by a further important distinction. The paper identifies two different potential smart legal contract models: the 'external model' and the 'internal model'.

In the external model, the coded provisions remain outside of the legal contract, and represent only a mechanism for automatic performance. In the internal model, the provisions that can be performed automatically are included in the legal contract, but are rewritten in a more formal representation than the current natural language form. A computer could then take this more formal representation and automate performance.

This paper offers some preliminary thinking about how these new technologies might be applied to ISDA documentation. For example, ISDA definitions could be rewritten in a more formal representation that is readable by computers. Transaction data could be stored on a distributed ledger, with the smart contract elements embedded in, and operating on, that platform. Oracles could also be used to serve as an external data source for making calculations or determinations under the contract.

This application of smart contract technology to the ISDA documentation framework could then allow for the potential development of 'smart derivatives contracts'.

Constructing a smart derivatives contract

In October 2018, ISDA and King & Wood Mallesons jointly published a new whitepaper called *Smart Derivatives Contracts: From Concept to Construction*. This paper goes beyond the initial concepts explored within the legal perspectives paper, and proposes a practical framework for the development and eventual construction of smart derivatives contracts. It does so in the context of the internal model. As the internal model will result in the replacement of natural language provisions with some form of smart contract code, the 'construction' of a new type of contractual framework is likely to be required.

The preliminary analysis identifies the need for smart derivatives contracts to be compatible with each of the various standards that apply to both derivatives and smart contracts. Indeed, the success of ISDA documentation has largely relied on the extent to which it remains consistent with and accurately reflects commercial, legal and regulatory standards that are relevant and applicable to derivatives trading.

The development of smart contract and broader technology standards and their application to derivatives trading will likely require some form of collaboration between market practitioners on how these standards are reflected within the existing ISDA documentation architecture.

Identifying and resolving potential areas of tension among these various standards will be necessary in order to ensure smart derivatives contracts are capable of achieving the same success and ubiquity as the existing suite of ISDA documentation.

Assessing where these tensions might arise is likely to help determine priorities. For example, there may be comparatively little tension between prevailing commercial standards and those that ultimately apply to smart contracts. It might be reasonably assumed that smart contracts will become widely used only where there exists some commercial imperative for that to occur. In this case, the operational efficiencies and potential cost savings associated with their use would seem to provide a sufficient commercial benefit for firms to support and promote their adoption.

From a regulatory perspective, there appears to be little immediate impediment. The regulatory response to the development and use of these new technologies is at a nascent stage, and regulators generally appear to be adopting a wait-and-see approach. This reflects the fact that there is still a lack of agreement at the →

→ industry level on precisely what role these technologies can play in the derivatives market.

It would therefore appear that initial work in this area should focus on how these technologies might supplement, adapt to or even disrupt the current legal and contractual framework underpinning derivatives trading.

This is the starting point for the smart derivatives contracts paper. The paper explores the various possible points of connection between the technological and legal representation of derivatives transactions, and examines the steps that may be required in order to determine which parts of the contract might be successfully automated in future. Here, the paper proposes two guiding principles: contractual clauses should only be considered for automation where they are both effective and efficient.

Effective automation

What do we mean by 'effective' automation? Simply put, if automation is to be considered effective, then it must be capable of achieving the desired or expected result. Automation will only be effective to the extent that automation of the provision is technically possible without disrupting or changing the underlying meaning or intent of the original natural language provision within the contract.

Where automation unexpectedly alters the legal effect of the contract, automation cannot be said to be effective. This is particularly important in the derivatives market, as contracts are often used in connection with each other. For example, one contract may be used to hedge financial exposure created by another. An inability to validate the legal effect of a smart derivatives contract may therefore introduce increased risks.

Given the precise nature of legal drafting, some lawyers might consider this to be an almost insurmountable task. However, considerable thought has been applied to how to determine which parts of a legal contract can be automated.

One approach, explored in the legal perspectives paper, might be to divide a contract into 'operational' and 'non-operational' clauses. In the context of a legal agreement, operational clauses generally embed some form of conditional logic – for example, upon the occurrence of a specified event, or at a specified time, an action is required. Non-operational clauses do not embed such conditional logic, but rather relate to the wider legal relationship between the parties. Examples of non-conditional clauses include those that require parties to exercise discretion in determining whether to take a specific action.

Given their conditional logic, clauses that are primarily operational in nature may be relatively simple to express in a form that would allow for their effective automation. Conversely, non-operational clauses may prove more resistant to automation.

Of course, it is possible that a particular clause may contain both operational and non-operational aspects. As a result, categorising individual clauses within a contract as 'operational' or 'non-operational' may not always be straightforward and will require careful legal analysis.

Once those parts of the contract that are sufficiently operational in nature are identified, automation of these provisions is likely to be effective only to the extent that lawyers are capable of validating the legal effect of the smart contract code.

This in itself may be challenging if it relies on the presumption that lawyers will at some point be required to understand programming languages or that programmers understand legal drafting.

The smart derivatives contracts paper suggests that these challenges could be overcome by following a two-step translation process, involving both lawyers and programmers. First, the legal language could be translated by a lawyer into a more formal, intermediate form. A programmer could then use this translation to convert the language into a programme that a machine could use for automation. The lawyer would be able to verify that the formalised representation is consistent with the legal drafting, while the programmer can confirm that the programme is consistent with the formalised representation.

The smart derivatives contracts paper uses the example of a calculation based on a formula, such as a fixed-rate payer amount in an interest rate swap, to illustrate how this kind of formal representation might be achieved. It is possible to distil this provision into a more formal, logical function: the calculation of a floating rate starts with observation of the rate, followed by a function for its calculation, which results in a derived observation of the floating amount.

The ISDA Common Domain Model (CDM) provides a blueprint for how this kind of shared, formal representation can promote greater efficiency in the derivatives market and create a foundation for the development of smart derivatives contracts.

While this type of logical, process-driven deconstruction of contractual language represents a departure from normal legal drafting, this example demonstrates that many of the features of the economic terms, calculations and performance in the CDM have analogies in the ISDA product-specific documentation.

There are limitations to this approach. The formal representation of the legal language would need to follow a precise

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logic, using defined variables and functions, and specific language and control structures. Many parts of a derivatives contract cannot be effectively expressed in such a manner and will likely continue to be expressed in natural language form.

Efficient automation

Not all of the provisions of the ISDA documentation that can be effectively represented in automatable form should be automated.

While smart derivatives contracts have the ability to improve the efficiency of the derivatives market by automating the performance of certain events and obligations, the vast number of complex and interdependent permutations that need to be considered in some circumstances – for example, determining when a bankruptcy event of default has occurred (and, more importantly, when it should be triggered) – may mean that it's never efficient or desirable to automate this part of the contract, even if technically possible to do so.

The smart derivatives contracts paper suggests a number of considerations are likely to feed into any determination of whether automation of a particular provision is likely to be efficient.

First, the provisions should be relatively standardised and used in common form by many parties across many contracts. Automated provisions should also not be overly complex or rely heavily on factors that are external to the contract. Finally, it would be useful if there is commonality in the functions being performed by the automated provisions – in other words, they should be capable of being utilised across different derivatives products. This would ensure consistency with the ISDA CDM, which seeks to avoid making functions product-specific where possible.

It is also important to bear in mind that those parts of a derivatives transaction that are automated will ultimately need to work with the legal provisions of the ISDA Master Agreement and associated documentation.

Indeed, one of the main challenges in developing smart derivatives contracts within the existing ISDA documentation framework is the complexity that exists both within and beyond the written legal contract.

While the calculation of a fixed-rate payer amount in an interest rate swap is a good example of the type of provision where automation is likely to be both effective and efficient, other considerations need to be taken into account – for example, the terms of the Master Agreement may impact the quantum, timing and even the obligation to make any payment resulting from the calculation process.

In response to this complexity, the smart derivatives contracts paper recommends some form of mechanism to suspend automatic performance of the contract in situations where real-world events (such as the insolvency of one of the parties) overtake the business-as-usual operation of the transaction.

The paper also identifies the development of a framework for assessing where automation is likely to be both effective and efficient as an important area of further work for ISDA and its members.

In response, ISDA has commenced work on a number of initiatives designed to address some of these legal challenges. The ISDA Clause Library project will create opportunities for efficient automation by developing standard-form clause wording across a range of commonly negotiated contractual terms. A forthcoming legal guide for smart derivatives contracts will also identify areas of complexity within ISDA documentation that should be considered in the context of smart derivatives contracts. These will eventually be supplemented by product-specific guidelines that aim to identify further opportunities for digitisation within the ISDA CDM and, ultimately, automation within a smart derivatives contract template.

Creating this new framework will inevitably require collaboration among multiple stakeholders across different businesses, products and disciplines. The temptation to limit exploration and discussion of these opportunities and their associated challenges to within existing institutional and professional silos should be resisted. Failing to do so risks exacerbating the operational fragmentation and inefficiencies that these technologies are designed to solve.

To quote Shaw once more: "The single biggest problem in communication is the illusion that it has taken place."

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Read the Smart Derivatives Contracts: From Concept to Construction white paper at bit.ly/2QsHnDv