clearmatics

30 Great Guildford Street
London, SE1 0HS
United Kingdom

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Mr. Chris Kirkpatrick
Secretary
Commodity Futures Trading Commission
1151 21st St NW
Washington, DC 20581

Dear Mr. Kirkpatrick:

On behalf of Clearmatics, I would like to thank the Commissioner for inviting me to participate in the Commodity Futures Trading Commission's Technology Advisory Committee meeting on February 23, 2016.

Clearmatics is a London-based technology company working with financial institutions to develop "Programmable Distributed Ledger" technology that will dramatically improve post-trade transparency and also enable what we describe as "Automation without Intermediation". Specifically, our technology enables the consortium members of a market utility to jointly maintain a golden record of financial ledgers and, most importantly, to *collectively* perform the computations involved in amending that ledger.

In terms of markets, we are focused on Fixed Income, Currency and Commodities ("FICC") asset classes, with a particular emphasis on their OTC derivatives.

Some comments about terminology

It is popular today to speak of "blockchain" technology in the context of financial markets, in particular its applicability to post-trade. This is often qualified as "permissioned blockchain" technology to make clear that the consensus model is based on authenticated and legally-accountable validating nodes, and to to distinguish it from blockchains like Bitcoin or Ethereum, which are based on a model of permissionless consensus.

I will instead use the phrase "Distributed Ledger Technology", or "DLT" in place of "permissioned blockchain". There is nothing wrong with the phrase "permissioned blockchain", it is just that neither the property of collating transactions into blocks, nor the property of chaining those blocks together via cryptographic hash are essential to creating an immutable and distributed ledger, so the terminology is a little question-begging about implementation details.

I also think it helps to demystify the technology by making clear that we are finding powerful new applications by combining technologies that are actually well-established and well-understood, namely:

- public key signature;
- cryptographic hash functions;
- virtualisation;
- distributed consensus algorithms;
- and peer-to-peer networking protocols.

Some observations about the technology

DLT is a network where every node on the network has a *local copy* of the *global state* of the ledger, and a consensus algorithm insures that each node's local copy is the same as every other node's local copy, which is why we can refer to the collection of separate ledgers as a *single, shared ledger*.

Today every financial institution maintains its own system of ledgers, so in today's financial system it is fair to say that ledgers of ownership and obligations are already distributed. But in today's system, consensus on the global state who-owns-what and who-owes-what-to-whom is obtained by many iterations of *reconciliation*, which is usually labour intensive, expensive, and slow.

DLT works differently. Each node on the network:

1. takes a set of settlement instructions, applies them to the current state of the ledger and returns a new ledger state;
2. then the nodes follow a consensus algorithm to come to agreement with each other on the new ledger state that each node computed independently.

There has been much talk about how this second aspect of DLT can improve post-trade. If you replace reconciliation with a consensus algorithm, you can obtain substantial operational efficiencies through automation, whilst reducing the time interval between trade and settlement, which releases capital and reduces counterparty risk.

However, this narrative around the benefits of replacing reconciliation with consensus algorithm is silent on the the first aspect of DLT, which raises an important question: at what point in the post-trade lifecycle is an instruction generated and passed to DLT?

The post-trade life-cycle is complicated. It differs from market-to-market, and there are many process in between the *contractual event* represented by a trade confirmation and the *proprietary event* of a trade's settlement.

If DLT comes only at the end of the lifecycle, then some other technology or technologies are automating the post-trade process up until that point. But given that the legal validity of a ledger entry makes reference to every step in the lifecycle, DLT could end up turning a distributed, industry-wide "golden record" into in an intermediated technology service, even if the DLT itself is a technology commons. This could have the rather paradoxical consequence of actually concentrating rather than decentralizing post-trade intermediation.

On the other hand, if DLT is introduced at the beginning and encompasses the entire post-trade lifecycle, then there is a very different implication. Post-trade automation can be achieved through what we describe as *Decentralized Clearing Networks*, or *DCN's*. DCN's are light-weight consortium entities whose members are the nodes on the network and consist of the main participants in the market that the DCN clears. In principle, this model can eliminate third-party intermediation entirely, replacing it with a platform model, one that enables third-party service provision, but the platform itself is governed by DCN members rather than a third-party intermediary. The market "owns" the post-trade plumbing.

Some DLT architectures, like those derived from the Ethereum codebase, lend themselves to this second scenario because they are based on a model where ledger state transition is general purpose computation and are capable of expressing the complex business logic involved in post-trade lifecycle. These architectures are "Programmable Distributed Ledgers", or PDL's.

Other architectures, like those adapting Bitcoin's UTXO model, are much more likely to fit in the first scenario for the simple reason that these architectures cannot by themselves implement the complexities of post-trade processes in their model of limited-purpose ledger state transition.

The OTC Derivatives Market

One domain where the DCN model is most compelling is the OTC derivatives market, where we believe that PDL's are not only a transformative new infrastructure for the bi-lateral, uncleared OTC market, but also perhaps an alternative to Central Counter Parties (CCP's) themselves.

One of the most interesting aspects of PDL's is that it challenges our background assumptions about what functions can only be performed through centralized intermediation. Consider the following functions performed by a CCP:

- performing contract valuation
- settling variation margin payments
- calculating initial margin

- custody of initial margin and other loss-absorbing capital
- novation and netting
- managing close-out on default

Clearmatics is currently working on proving how all of these functions can be performed on a DCN, that is, by a membership-governed network instead of a CCP.

At their core, derivatives contracts are legal agreements with fully computable terms. They are, quite literally, algorithms disguised in the legalese of IMA's, CSA's and contract specifications. Ignoring for the moment the role that CCP's play in assuming the performance of a derivatives contract to both sides of a trade, what CCP's in effect do is standardize and automate the aforementioned clearing functions by centralizing the computations in the CCP's technology silo.

This solution is sensible when the alternative is that the counterparts to a trade perform the computations independently. This is because, until recently, there has been no obvious means of definitively reconciling complicated computations performed independently by two or more parties. Valuation disputes in the bi-lateral market are but one example of this difficulty.

But we now have a model for performing computations collectively and coming to consensus on the correct results. With a PDL there is not only a golden record of collateral and variation margin movements, but also a golden record of all the computations involved in those movements. Everything is available on the ledger, with machine-readable auditability.

We believe that one of the more profound implications of this technology will be the transformation and revival of OTC market places that are more transparent alternatives to markets that centralize post-trade intermediation.

Clearing without the Central Counterpart

The one function that a CCP performs that cannot be replicated by a DCN is that of guaranteeing both sides of a trade. It remains an unanswered question whether this impressive concentration of counterparty risk at CCP's mitigates or amplifies systemic risk. But now that technology is providing practical means of un-bundling the many functions performed by a CCP, it is perhaps worth re-visiting the question.

Another potential systemic risk factor in the OTC derivatives market is the legal nature of the contractual agreements themselves, which are agreements that provide legal recourse against a defaulting counterpart's balance sheet. This is arguably a statutory innovation by the Commodities Futures Modernization Act of 2000 (CFMA), which does run contrary to a long-standing Anglo Saxon common law principle that Contracts-for-Difference are not enforceable in a court of law.

Therefore, another question that we believe is worth exploring is whether there should be an alternative legal wrapper around a DCN's computational contracts, one that is not based on ISDA documentation at all. Instead, it could be based on documentation that binds the counterparts of the trade to the output of the program implementing the derivatives deal on the DCN's PDL, with recourse against a defaulting counterpart limited to collateral posted. In the "long-tail" scenario where loss absorbing capital is exhausted, it amounts to variation margin haircutting. Such a scheme in many ways resembles the membership model of a 19th Century exchange.

We at Clearmatics are committed to developing PDL solutions that decentralize financial intermediation and would welcome the opportunity to open a dialogue with regulators to explore how this might be accomplished. In particular, we would very much like to explore how Title VII of Dodd-Frank might accommodate DCN model of clearing.

Thank you again for providing Clearmatics with the opportunity to make this statement. We are always available to discuss any of the points above with you or any member of your staff; I would be delighted

to handle any queries personally and can be reached at rs@clearmatics.com.

Kind regards,

Robert Sams
Founder and CEO