



Trumpeting in the New Era of a Lean Technology-Driven Financial System

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Introduction

This is a call to President-elect Trump, an acknowledged master builder, as he ushers in the lean era of financial regulation. We encourage him to establish a new executive-level office to inform his administration on how to rebuild an essential infrastructure component of our economy - the financial system and its regulatory apparatus, on the road to lean, transparent technology driven regulation.

The Office of Financial and Regulatory Technology (the OFRT) is to be a new executive branch agency, a research and standards setting body. It would be the center of research and innovation to evaluate new technologies and build links between evolving technologies and new regulations. It would enable more effective and transparent oversight of financial institutions, amongst financial regulators, and between the two in a digitized financial and regulatory environment. It would also enable less regulators and less third-party data and infrastructure intermediaries.

The OFRT would follow in the footsteps of the U.S. Department of Defense's Advanced Research Projects Agency, the 1960's era government agency responsible for creating a packet switching time-sharing network of computers known as ARPANET, the precursor to today's Internet and World Wide Web. A similar ground breaking technology, distributed ledger technology (DLT) has entered the world of finance.¹ DLT is an outgrowth of the Blockchain. Both were developed to support the digital cryptocurrency Bitcoin. DLT works like a huge, decentralized ledger which records every transaction and stores this information on a global network to prevent tampering. It needs standards and a center of gravity², much like the ARPANET provided for the Internet.

DLT sits atop the Internet and has the potential to remove many of the inefficiencies and costs of hundreds of third-party institutions that exist to reconcile the non-standard data found in financial transactions. Savings estimates in implementing DLT range from US\$200-250 billion.³ It can also provide the trust of an instantaneous transaction so that what is being bought is what is paid for, a process that now takes two-three days to reconcile the product, price, purchaser and seller of a financial transaction. Also, financial institutions have for long kept separate ledgers that produce the data for the many regulatory reports produced, mostly duplicates of each other. This relationship of many intermediaries reinforces the many niche regulators. DLT is a single ledger that can be used by all.

After the financial crisis of 2007-2008 it became widely recognized that the data underpinning risk and transaction processing systems was not standardized even though the commercial sector of the economy operates globally with standard barcodes and the communications sector has its unique domain names and telephone numbers. It was now understood that over six decades of automation the industry had become completely digitized. There was no tangible representation in the physical world of a financial transaction. Financial data needed to be standardized so that risks could be efficiently communicated and processed by technologists and understood through the lens of the

regulator. This inconvenient truth was revealed by what was found in the digitized records of the Lehman Brothers bankruptcy.

There was no consistency in identifying Lehman as a counterparty with others; no understanding of what relationships Lehman had with others; no mechanism to associate all of Lehman's products and businesses into a total view of the exposure others had to Lehman should it fail. All who looked into the books and records of Lehman, all the regulators, the forensic accountants, the bankruptcy lawyers, the creditors and the counterparties observed a disparate deluge of data and a huge swamp of risk and no way of understanding nor measuring what they found. And it wasn't just Lehman, it was a fundamental flaw in the infrastructure of the global financial system – no universal digitized identification of counterparties, their hierarchies of business ownership, the products they own, the monies they owe, the collateral they have pledged, and how that all is used to calculate the risks they are exposed to.⁴

Financial data standardization and a standardized means to organize, aggregate and communicate this data becomes even more urgent as the promise of another generation of technology is set to be imposed on a not yet completed global regulatory reordering. Most of this technology is being embraced by individual financial regulators for segments of financial institutions they oversee. It needs oversight of a higher order to bring all these niche strategies together into a cohesive plan of action, for saving an additional \$US 250 billion estimated for standardizing and eliminating duplicate data⁵, and for coordinating hacking and cyber security initiatives that add significant risk to the financial system overall.⁶ An executive level agency is needed for the US to provide oversight of all these new financial technology developments, give guidance here to US regulators, and reach out to other governments dealing with these same issues.

Standards for 'Construction Material' Needed in Finance

President-elect Trump and all other global builders of his stature accept that the fundamental components of the building materials to be used - cement, brick, steel, glass, plumbing, electricity, heating, ventilation and air conditioning are to be specified to a standard. In similar manner, the building blocks of our financial system, principally electronically represented data arranged in different groupings by financial engineers and communicated between computers, must also be set to a standard.

These data components are the financial material that are used in different configurations to represent different products, and aligned to represent different market participants acting in different capacities across the financial supply chain. These financial construction materials are comprised of numbers and alphabetic characters. They are represented to a computerized processing application as the unique identity of financial products and contracts (stocks, bonds, options, foreign exchange, derivatives, futures, et al) and the unique identity of supply chain participants (trading counterparties, banks, brokers, dealers, custodians, clearing houses and stock, commodity, futures, swaps exchanges, et al). Further definitions in numbers and/or characters are

then required to be presented to the processing application for each data component: dates, rates, ratios, prices, quantities, counts, and values; action codes for buying vs. selling, receiving vs. paying, expiring vs. opening; event triggers for periodic corporate actions and reorganization events; date triggers for reset, maturity, expiration, call, record and payment dates; and data tags for each category.

Financial transactions can thus be thought of as an assemblage of these identifiers and data elements to uniquely identify the transaction as a specific product bought by a specific business entity. It is analogous to assembling specific component items of a manufactured product. Also necessary, as with manufactured products are: periodic or event driven actions that defines the product's changing specifications (mergers, acquisitions, reorganizations et al); occasional changes to subcomponents (calendar data, credit ratings, historical prices, et al); and seasonal incentives or promotions (dividends, capital distributions and interest payments).⁷

Computerized programmed applications – programs written to a logic as described by financial engineers - are directed to operate on these product and participant codes and some subset of these data components, each stored by the computer or transmitted between computers over communication networks. This determines the characteristic of the resulting financial transaction.

Unfortunately, each financial engineer has been given the leeway to describe a vast array of different identifiers and data components differently, requiring an immense number of intermediary infrastructure data vendors, software companies and market infrastructure entities to match one to many, and interpret them as the same or nearly so, so that they can understand them as the same. This is essential as what is transacted must be paid for and stored, and each side of the transaction (the buyer and seller or the payer and collector) must be matched both at the inception of the transaction and at the final payment and delivery point. These transaction are also arranged differently throughout their processing life cycle to conform to the many computers each leg of the transaction needs to be communicated to.

While groupings of interrelated market-specific interactors, usually grouped by trading market, country or product, have been standardized to some extent by settling on a minimum set of identifiers, data variations and communications protocols they would collectively accept, there are no global standards to operate within a global financial system. This limitation inhibits the timely flow of financial transactions via computerized means between financial counterparties, across the financial supply chain, and to regulators.

Recognizing this data limitation would also impede the advance of DLT, a concept of Smart Contracts has been devised. A Smart Contract is an amalgam of standardized data and standard transaction processing that a purchaser and seller and their agents agree on in advance as the representation of the data components of the financial transaction. This representation is described as the Smart Contract Taxonomy, a means to tag standard data so that a computer can recognize and process the data. The Smart Contract is then exchanged on the secure immutable Blockchain

for transfer of ownership and value exchange. Thus, the prerequisite for Smart Contracts and the use of the new technology of DLT is the same as in the current environment, standardization of communication protocols and the data that is transmitted and stored.⁸

Why No Global Standards Exist

That such data standards have not been set, even after nearly six decades of automating financial processes, is a testament to the inability of financial executives to keep up with the infrastructure rebuild required in increasingly interconnected financial markets.⁹ This has led to excessive infrastructure costs, higher operational risk, and multiple regulators in niche segments of finance analyzing manual reports and sending in hordes of examiners to fill out questionnaires.¹⁰ This even though the commercial sector operates globally with standard barcodes¹¹ and the communications sector has its unique domain names, telephone numbers, machine addresses and communication protocols.¹²

The primary driver of this disconnect was a performance culture in financial institutions that drove the self-interests of silo-organized business managers, an organizational structure prevalent in the management of behemoth financial enterprises.¹³ These behemoths of finance, thirty of the largest banks¹⁴ and nine insurance companies¹⁵, are now labeled by the Group of 20's (G-20's) Financial Stability Board as systemically important global financial institutions (G-SIFIs).

Within these thirty-nine G-SIFIs was self-contained business units incented to chase revenues from which a bonus pool of half its own generated revenue was allocated to its own management team. This, in turn, incentivized silo-based front office revenue-generating automation while leaving back and middle-office processes to languish in risk prone and costly legacy applications. Innovative minds were put to the task of making it work even though funding was limited.

The result was hastily conceived point-in-time unintegrated technology implementations that supported the creation of each business unit's own business function on its own non-standard data sets. This resulted in inelegant, costly and risk prone mapping exercises for accommodating enterprise-wide solutions, more in the likeness of a Rube Goldberg or Heath Robinson contraption than anything resembling rational efficient systems design.

Differently defined data sets, even though purporting to represent the same product, counterparty or financial transaction, proliferated, and still do, throughout the many separately defined data systems across the many business units of these G-SIFIs. Similarly, proprietary and specific financial transaction standards, hundreds, exist at both data intermediaries (market data vendors, business registries, numbering agencies, credit and insurance rating agencies, et al) and market place utilities (exchanges and other trading venues, clearing houses, securities depositories, trade repositories, payment and netting systems, reinsurance facilities, et al). Trying to interact amongst these supply chain participants has also created an almost unfathomable interconnection plumbing

problem within the global financial system. This too looks like a Rube Goldberg/Heath Robinson contraption.

Our Next Generation of Technology Needs Standards

The OFRT will follow the precedents already established in the US in naming both a Chief Technology Officer and a Chief Information Officer and in establishing the Office of Financial Research.¹⁶ It will follow other governments around the world and multiple regulators here in the US setting up separate centers for advancing Data Offices such as at the SEC¹⁷; sponsoring financial technology (FinTech) projects such as that at the OCC^{18 19}, in Singapore and Hong Kong,²⁰ and at the UK Treasury²¹; and setting up innovation centers for regulatory technology (RegTech) such as that at the UK's Financial Conduct Authority.^{22 23} It is estimated financial institution spending for regulatory compliance for just the six largest US banks was \$70.2 billion in 2013, twice the US\$34.7 billion spent in 2007. In 2015, the Financial Times estimated that some of the world's largest banks each spent an additional \$4 billion a year on compliance since the financial crisis.²⁴

In the US, the Office of the Comptroller of the Currency (OCC) is preparing to offer Special Purpose Bank Charters for FinTech startups for retail payment, lending and deposit taking.²⁵ The Federal Reserve has offered up its own research on FinTech exploring uses in payments, securities clearance and settlement.²⁶ However, unlike these automation initiatives, each focused on business and regulatory processes, the OFRT would look to first establish fundamental standards for financial transaction data components and communication protocols.

This is a very basic need not successfully addressed by these initiatives and left unaddressed over the preceding six decades of financial industry automation. Already pervasive is cloud computing, speed-of-light communication and the anytime, always on, anywhere reach of the Internet. Now, with another generation of technologies being actively pursued by financial institutions and their regulators (distributed ledgers,^{27 28 29 30} Blockchain,^{31 32 33 34 35} and artificially intelligent software^{36 37} to name but a few) it becomes an urgent need to address financial transaction standards locally in the US and globally as the pillars of new RegTech and FinTech initiatives.^{38 39}

Regulations Stressing Legacy Systems

Financial institutions are burdened with older 'legacy' systems, some going back in design to the early 1960's when electronic computers were installed to deal with the growing volumes of transactions and participants in financial markets. Later, modifications were placed on top of these multiple, non-integrated legacy processing and communications systems to accommodate new regulations. Much manual contrivance was necessary to mold the output from these systems to conform to the legislative language of the regulations.⁴⁰ The recent torrent of regulations now imposed on these systems never considered the technological consequences of reinforcing risk prone 'work-around' solutions to meet regulators' artificially contrived implementation deadlines.

The result has been continuous postponements of regulatory deadlines, no action letters on already passed regulations, and after-the-fact consultation papers issued by regulators for furthering industry comments. The current Chairman of the CFTC, charged with overseeing the newly regulated OTC Derivatives markets in the US, declared that many of the regulations passed by his predecessor were done without a thorough understanding of how the industry worked.⁴¹

These regulatory work-arounds require multiple data mapping and data transformation processes to aggregate disparate data sets into a single set for enterprise-wide regulatory reporting purposes for each regulator. Furthermore, these data sets world-wide must be aggregated for reporting the overall enterprise's exposure to systemic risk, a fundamental and still unfulfilled objective.

Even more of a concern in a nearly fully digitized financial system is that transactions are increasingly occurring in real-time while regulators are observing potentially destabilizing events after the fact - weeks, months even a year after events occur. Transparency in near real-time would be the OFRT's end objective so that regulators charged with overseeing financial institutions can, in fact, see what's going on.

Lean Regulation

Regulatory oversight would take on new meaning as computers in financial institutions would be posting financial transactions as they occur through a secure virtual private network (VPN) to a network of computers organized as a secure virtual database in the 'cloud'. Posting transactions to this network would replace the multiple and duplicated data collection now done by multiple regulatory agencies. Analysis of transaction data in real-time would be done by smart algorithms, getting smarter each day as Big Data patterns emerge from the accumulated data within an immutable, distributed but virtually centralized database overseen by the OFRT in partnership with industry and its technology advisors.

Thereafter, computer scientists, at academic research institutions and at the OFRT, would be engaged to develop continuous learning-based programs to operate on these standardized data sets. The objective would be to find anomalies in the data to detect fraud, insider trading, emerging risk exposures and the contagion of systemic risk. Data analysts at the OFRT, alerted by these triggers, would conduct further analysis on the financial transaction flows against a virtual data store of historical data across multiple segments of finance. This comprehensive data collection and automated analysis would reduce the number of regulators that maintain hordes of examiners, clerical staffs, administrators and managers operating in regulatory-niched segments of finance.

Immediate benefits would come from the interplay of regulators and technologists setting more implementable and more cost-effective goals for new regulations. Today's hurry-up-and-get-the-regulations-passed mindset must be tempered with the understanding that almost all regulation is implemented through computer code in the digital factory that underpins most of finance. Risk management and data management, the two pillars of a digitized financial system must be

understood through the technologists' lens or we will forever be creating more of the same – meaningless data collected by yet more layers of intermediary institutions for yet another regulatory purpose.

Standard Regulatory Reporting

The earliest breakthrough in regulatory data representation was a data tagging system adopted from the mark-up language used by printers. The tags preceded each word in its digitized electronic representation to direct the printer to set type size and color. These tags found their way into the display of browser based displays of documents on the Internet. From that humble beginning, data tagging became a way of representing data using an eXtensible Markup Language (XML) so that its content is discernible within an electronically coded document (XBRL - eXtensible Business Reporting Language) or XML transmitted message.

In 2008 the then SEC chairman called the development of XBRL something that would significantly transform the SEC's business model for delivering and reading financial statement reporting.⁴² He compared XBRL's importance to that of the first personal computers and the requirement that financial statements be published online in the Edgar database. It would take six years of pilot reporting and refinements of financial statement filings in XBRL formats to be useful as computer readable datasets.⁴³

Unlike earlier financial reporting standards that primarily transported unstructured data, this standard embeds the data's intent, or content, and structure into the message through using meaningful English language tags. A computer program searches for the beginning tag in a computer record, then finds the data, and then ends the search when the same tag is again found immediately following the data. Today over three-quarters of the financial reporting to regulators globally is done in XBRL formatted reports.

This method of tagging and retrieving data parallels the laser devices used to read the barcodes found on physical items. Lasers are positioned to read the area in which the bar widths are delineated and then to discern the content within it by interpreting the widths of each bar into its distinct number. The complete set of numbers so deciphered is the code that contains the manufacturer (company prefix), the same code for all its products, followed by a unique code, one each for each of its products.

Standard Financial Transaction Reporting

The early attempts at improving financial statement data reporting was then followed in the immediate aftermath of the financial crisis by an initiative to organize financial transaction data for reporting to regulators. This was necessary to observe systemic risk building up across financial institutions in the US and, ultimately, throughout the globally interconnected financial system. To fulfill this requirement more granular data than found on financial statements was needed -

component parts of financial transactions and common labels for financial products and financial market participants, to carry out this analysis. This initiative found its way into the Dodd-Frank legislation in the form of a new agency, the Office of Financial Research (OFR).⁴⁴ Originally intended as an independent agency it wound up under the Treasury as political issues intervened. Its mandate was to research and report on the stability of the US financial system.

To carry out the OFR's mission the data components of the legislation required the OFR to establish a 'catalogue' (database) of financial entities and financial products. Its definition of financial entities left out an important third group of financial market participants, non-financial entities like corporate, government, government agency and municipal issuers and owners of securities; companies listed on exchanges; sole proprietors acting as business entities in financial markets; corporate pension and profit sharing plans; and eleemosynary institutions in their capacity as asset holders - all major participants in the financial supply chain. This was later remedied when the OFR passed the responsibility to develop this broadened financial market participant catalogue, now referred to as the Global Legal Entity Identifier (LEI) System (GLEIS) to the G20, the group of the heads of state of the world's twenty largest economies. The G20, in turn, passed it to its newly established Financial Stability Board (FSB).⁴⁵ In its original conceptualization, the LEI was to be part of the Dodd-Frank legislation but political issues again intervened and it was not included in the final legislation.

The FSB, in turn, established the Regulatory Oversight Committee (ROC), a group of 70 individuals representing 40 global regulators.⁴⁶ The ROC's first Chairman was the chief counsel to the OFR. It took on the task of developing the LEI catalogue, engaged with industry 'experts' and added additional categories of financial market participants to be assigned LEIs. The ROC established a sixteen-member industry/academic board constituted as the Global Legal Entity Identity Foundation (GLEIF)⁴⁷ to oversee the implementation of the GLEIS.

Progressing from Financial Statement Reporting to Financial Transaction Reporting

Unlike financial statement reporting, which had benefited from over a century of refinements to global accounting standards, global financial transaction standards are, in the main, non-existent. Specific instances of proprietary standards exist, hundreds of them, necessitating mapping of these 'standards' by each financial institution. Regulators are also engaged in similar mapping exercises, a costly and risk prone process. Codes change daily necessitated, in part, by corporate actions associated with corporate reorganizations (such as mergers and acquisitions)⁴⁸; securities issuances, expirations and reassignments; and changes to financial contracts' terms and conditions.

Complicating these changes is the synchronization issues associated with change data being received from different secondary sources at different times. In some instances different interpretations of the changes occur due to the largely manual processes associated with deciphering such change notifications from originating sources - press releases, faxes, word

processed documents and other manual means. This causes additional risks and imposes costly error handling and reconciliation processes to be performed.

A myriad of standards projects and well-intentioned financial reforms are being pursued globally in the immediate aftermath of the financial crisis. Unfortunately, they are not being pursued with any master plan - no blue prints to guide the project to its end objective, that being regulators able to see the contagion of systemic risk building up across the interconnected global financial system.

In getting the OFR's data initiative into the Dodd-Frank legislation, and getting industry members' acquiescence, legislators accepted that setting financial transaction standards would remove huge infrastructure costs for individual industry members and, most importantly, for the industry overall. That there is no plan to do this is yet another failing. Nor is there any thought on how data standards and common reporting would allow regulators' budgets to be reduced through eliminating redundant data gathering and analysis, even reducing the number of regulators.

In fact, the OFR has followed an approach that perpetuates multiple regulators' continuation of non-standard data acquisition. The OFR is in the process of contracting with each US financial regulator to obtain their data, such data separately requested, received and processed from each financial institution. The OFR would then attempt to aggregate the disparate data sets. Requesting a common standardized data set from financial institutions for multiple regulatory purposes, as is being done in a number of sovereign countries, would be more efficient and would eliminate aggregation issues such as mismatches, duplication of data, and reconciliation of non-standard identification of both reporting parties and their financial products, and the changes to each. Unfortunately, with the many US regulators, each protecting its own turf, this approach would be untenable except for the fact that we now have a new president-elect who is expected to entertain new ideas for bringing financial regulation under control.⁴⁹

Current regulators' own disinterest in standardization, described below, could prove fatal in maintaining industry support for standardizing data. Individual industry members are, in fact, adding huge additional costs while the industry overall is adding a completely new layer of infrastructure intermediaries and regulators to comply with what is dysfunctional implementations by regulators. Some of these regulator-sponsored projects are described in the next section.

Regulatory Initiatives Falling Short

Derivatives Standardization

The global rethink of regulating derivatives is mired in billions of non-standard transactions already sent to regulators that are neither accessible nor readable by computerized means. Nearly one hundred new data intermediaries and market utilities have arisen to originate, process, store, aggregate and provide access to this dysfunctional data for global regulators. It is no wonder that regulators are failing to perform their local oversight function and not even approaching analysis of global systemic risk in any timely fashion.

Standardizing the basic data elements of financial transactions, from creation through to their processing in middle and back office systems, to reporting to regulators and other stakeholders is noticeably absent in finance. Such standards, for identifying and describing products, parts and supply chain participants, exists in most other transaction flows in global commerce. Toward this end there is a global initiative currently underway driven by financial regulators to do just this, starting with standardizing contracts⁵⁰ and participants⁵¹ in newly regulated OTC Derivatives markets.

OTC Derivatives standardization projects have been progressing, albeit slowly, amongst regulators with input by industry members, arguably within one of the more complex areas of finance, swaps contracts.⁵² The projects have names like ‘harmonization of data elements’, ‘data aggregation’, the ‘legal entity identifier’, the ‘unique product identifier’ and the ‘unique transaction identifier’.^{53 54 55 56} All of these projects have to be successfully concluded to allow regulators to observe swaps transactions consistently and to aggregate them for systemic risk analysis. Afterward other financial products and their associated market participants will be subjected to unique identification, data harmonization and the means to aggregate the financial transactions represented by this data.

Unfortunately, and not surprisingly, regulators’ vision for swaps regulation is to have this data flow to yet another legacy construct, a new layer of data intermediaries and market place utilities atop of all existing ones, and this just for one market product, swaps contracts. This is not entirely regulators fault as they are being guided by narrowly focused industry input which itself is permeated by silo-based legacy thinking. This is understandable given that industry ‘experts’ became so by knowing how the ‘system’ works in their own silos of expertise, in this case swaps markets. They are not sought out as having a vision for how an integrated enterprise-wide system should work and how it should be interconnected across multiple financial institutions. Similarly regulators, in their own narrow silos of regulation, lack comprehensive understandings of regulations affecting the whole of large, multi-product multi-market financial institutions nor how such regulations affect mitigating (or increasing) systemic risk.⁵⁷ That is the vision gap that the OFRT would fill.

In its first instance of OTC derivatives reform, the regulators wisely chose three projects to begin the standardization of swaps contracts, what we refer to as the Barcodes of Finance⁵⁸, an ambitious attempt to identify uniquely and in a standard way all financial transactions, their counterparties and financial supply chain participants, and their contracts.^{59 60 61}

Global Legal Entity Identifier (LEI) Initiative

This data project, the global identification of financial market participants, is a first attempt at identifying all supply chain participants in just one market, the swaps market.⁶² Its ultimate objective is to uniquely identify all participants in all financial markets. In creating

this capability regulators mandated the formation of financial data intermediaries (there are now twenty-nine (29) of them) to assign codes and keep name and address information.

Globally Unique Product Identifier (UPI)

This project is concerned with the unique identification of swaps contracts. It arose out of the need for regulators to oversee the OTC Derivatives markets. Its objective is to provide a standard identifier for swaps contracts, one of three missing components inhibiting reporting of these contracts to regulators, the other two being the LEI noted above and the UTI (Unique Transaction Identifier) noted below.

Unique Transaction Identifier (UTI)

This project was a result of new OTC Derivatives regulation that required all participants in swaps markets to send their transaction-level details to trade repositories, a newly mandated financial data intermediary. There are now twenty-five (25) of them, along with regional trade depositories to collect the data from the other twenty-five.

The SEC's CAT System

A Computer Assisted Transaction (CAT) audit trail for stocks and options that is supposed to prevent flash crashes has just been approved by the SEC, with the SEC estimating the cost at \$ 2.1 billion to implement and \$1.7 billion annually to maintain.⁶³ Its outcome, at best, is data analysis a week late after an adverse event had occurred. It will be missing critical data from futures markets even though there is universal agreement that these markets are interrelated, react to each other in real-time and collectively caused the first flash crash in 2010. Most significantly the SEC declined to use the LEI as the identifier of trade counterparties and other supply chain participants, instead opting for accepting existing proprietary identifiers.

Volker Rule

The onerous Volker rule, part of the Dodd-Frank legislation, was conceived so that banks would not abuse the capital of federally insured depository institutions to make big bets for their own trading businesses. However, it seems to have not affected trading profits. All the major banks reported huge trading profits in the third quarter of 2016. The proper implementation of the Volker rule is heavily dependent on automation. For example, it requires predicting annual intermediation activities by trading counterparty and then setting trading limits for these counterparties. Further, financial firms need to differentiate issuer pre-IPO activities for stabilizing the offering price so as not to break the no-proprietary trading prohibition; or defend profits earned from Credit Default Swaps as not proprietary trading profits when protecting loans to clients from default that do not default. The Volker rule requires legacy trading systems to be adapted to perform technology miracles they were never intended to do.

Basel's Risk Data Aggregation Initiative

The Basel Committee on Banking Supervision (BCBS) in its “Principles for effective risk data aggregation and risk reporting” observed that banks lacked the ability to aggregate risk exposures and identify concentrations quickly and accurately. Banks were unable to manage their risks properly because of weak risk data aggregation capabilities and risk reporting practices. The principal areas of concern related to data architecture and IT infrastructure and the complexity of large-scale, ongoing, multi-year IT infrastructure projects and other data-related projects.⁶⁴

The BCBS prescribes a framework in which, initially, the 30 G-SIFI banks would implement changes to their technology infrastructure to permit data aggregation across the enterprise to facilitate risk analysis. Later all banks would be required to do the same. Initial and follow up self-evaluation surveys indicate progress is slow. This is yet another area of focus for the OFRT as the savings for each of these G-SIFIs is estimated to range from \$US 1.3 billion - \$US 2.3 billion.⁶⁵

XBRL Initiatives

Regulators world-wide are supporting standards initiatives by XBRL International, a private sector non-profit standards consortium that oversees the XBRL standard and certifies XBRL taxonomies (a dictionary of data elements) for each taxonomy. These taxonomies are computer readable. Regulators from over forty countries and regional compacts either encourage or make XBRL reporting mandatory. Amongst the reports being subjected to XBRL reporting formats are financial statements, tax reports, capital and other risk calculations for banking regulations, and balance sheet and income statement reporting to business registries. However, as with financial transaction data standards, there are many XBRL ‘standard’ taxonomies.⁶⁶

XBRL International has now ventured into financial transaction standards, taking over the work previously done by one of its regional entities, XBRL US to create standard data elements and XBRL tags for corporate actions. The objective is to have issuers of securities and other financial instruments who declare to its shareholders periodic disbursements and reorganization events (referred to as corporate actions)⁶⁷ be described in an XBRL taxonomy. Another project has a goal to include the LEI in XBRL GAAP and IFRS formatted financial statement reporting taxonomies.⁶⁸

Both projects are attempts to eliminate manual intermediary processes that are error prone and subject to misinterpretations of manual inputs such as press releases, word processed documents and faxes. Timely updates and higher quality data would result by moving the process to its original data source, standardizing and automating the taxonomies, and having auditors provide at-source confirmation of the data. Both these projects already suffer from apathy of corporate executives in the case of the corporate actions project and disinterest amongst swaps market participants in renewing LEIs. An OFRT focused on motivating interest among these constituent groups would surely solve this problem.

Too-Big-To-Fail

Then there is the Too-Big-To-Fail issue where the technology blueprints of how these giant systemically important financial institutions were assembled and interoperate are missing. This leads many to ponder how they will be broken up if required to. Regulators are trying to deconstruct these complex financial institutions through the “living wills” process – to plan how a bank could be resolved in the event of a failure. A living will requires the drafter to have a full inventory of assets and liabilities and organizational components. In addition, it must contain an inventory of internal systems and interconnections, as well as external entanglements with all outside facilities operators and infrastructure organizations.⁶⁹

Without such a technology blueprint for breaking up these financial behemoths regulators may inadvertently pull the wrong brick or tug the wrong pipe and topple the whole edifice. The OFRT, focused on the technological aspects of regulation, should be able to do a better job of understanding the systems interoperating within and across these financial institutions, even motivating them through incentives of capital reduction to create technology blueprints.

Regulatory Turf Wars

Finally the turf wars of regulators – in the US at the FDIC, OCC, Federal Reserve, SEC, CFTC, et al, in the EU and the UK and across the globe that causes financial institutions to send huge, ever increasing volumes of financial transactions, including much duplication, to too many financial regulators in an immense data deluge. One study in the EU found 40% of the data requirements of multiple regulations are related and describe the same facts.⁷⁰ No regulator is able to process and analyze this data in any timely manner for risk, compliance, fraud and other regulatory oversight mandates. Lots of valuable insights are being missed as there is no regulator yet able to look for patterns of global misbehavior and appearances of systemic risk enabled by this data deluge. Only through standardization will this be possible leading to the elimination of redundant data. That too is to be one of the missions of the OFRT.

Rising to the Challenge

Early objectives for the OFRT would be the setting of uniform standards for financial transactions and uniform protocols for financial networks; overseeing the development of technology blueprints of financial institutions; embedding links between internal financial systems and external regulatory systems; removing huge and duplicative infrastructure costs of multiple regulatory agencies’ data and technology budgets; and, most importantly, setting the vision and timetable for use of distributed ledger technologies for these agencies and the financial institutions they oversee.

Starting with a Global LEI

The setting of standard data components for financial transactions must be accomplished first if financial regulation is to succeed and the OFRT is to gain traction. To this end it must start with a reassessment of the legal entity identifier (LEI) project, an ambitious global undertaking by yet another regulator, the Regulatory Oversight Committee of the Financial Stability Board. Its aim is to allow for data aggregation of risk exposures of the ultimate parent of any organization participating in financial market transactions. It is expected that regulators can then aggregate each enterprises risk exposure to understand the potential risks these entities collectively and individually represent to the stability of the overall financial system.

The LEI implementation began prematurely in the US in 2012 with a standard and unique computer-readable code issued to financial market participant involved in newly regulated swaps markets under CFTC jurisdiction.⁷¹ Name and address data accompanies the code. Later, the ROC modified the code construction and, to date, have issued approximately 475,000 codes of which only 355,000 (71%) have been renewed annually as required, which constitutes a major obstacle to data quality.⁷²

Further, the LEI has failed to take hold amongst US regulatory agencies, principally the Federal Reserve⁷³, the CFTC⁷⁴, SEC and the US. Treasury. While each embraces use of the LEI, they rely on their own proprietary codes to manage their own oversight activities. Most recently the US. Treasury, which houses the OFR, failed to make the LEI mandatory for reporting ownership of financial contracts for resolution reporting.⁷⁵ Also the SEC rejected the use of the LEI to identify financial market participants in the CAT initiative⁷⁶, the CAT itself needing a reassessment as mentioned earlier.

One of the most significant uses for the LEI is to aggregate financial transactions to the ultimate parent entity so that regulators can understand the potential risks these entities represent to the stability of the financial system. While this was always the objective, LEIs were issued without the plan to get to this objective, again the missing blue print that builders like President-elect Trump should require before starting construction.

Incremental fixes are being made to the LEI project to solve problems that were known at the start - solutions which were proposed and rejected as the politically expedient going-along-to-get-along mindsets prevailed amongst the regulators that dominated the choices in the design of the system. Admittedly, few had financial technology experience. This false start was compounded by industry 'expert' opinion that reinforced existing market utilities own agendas to dominate the issuance of LEIs.

Other issues have arisen, especially how to expand the project beyond swaps markets to the required assignment of LEIs to all financial participants in all financial markets. However, the most significant near-term issue is how to incent original LEI registrants to renew nearly 30% of the already issued codes that have lapsed. Lapsed LEIs remain active in the financial system

presenting a vulnerability to fraud. This will be an impediment to plans by the GLEIF to have existing legal entities add immediate parent and ultimate parent relationship data when there is no incentive to renew LEIs. The intent here is to have existing legal entities request LEIs for their immediate and ultimate parents on the way to eventually having LEIs for the entire hierarchy of relationship data. Thereafter, these LEIs will be connected to the parent entity based upon accountants' ownership and control principles as defined for consolidating entities for financial statement reporting. It is thought that all this identification and connectivity will enable regulators to aggregate risk exposures for each ultimate parent entity and, eventually, for systemic risk exposures.

Global Systemically Important Financial Institutions

The logical place to start is with the OFRT engaging with G-SIFIs, initially the eleven headquartered here in the US. Like Walmart that does business with most manufacturers worldwide, G-SIFIs likewise can influence their corporate and financial institution clients. Much of what Walmart demands of its supply chain to get and supply its merchandise depends on a barcode - G-SIFIs too can demand their financial supply chain to adopt standard codes in order to do business with them. Incentives can be offered to G-SIFIs to lower operational risk capital charges as such risk would be diminished from standardized data making possible the aggregation of risk data by regulators for viewing risk exposures in real-time.

These G-SIFIs have had the most onerous regulations imposed upon them as a category of financial institution. There are thirty-nine of these Too-Big-To-Fail G-SIFIs, eleven headquartered in the US, twenty-eight others having substantial operations here. They already transcend sovereign regulatory boundaries. US regulators and the OFRT have no option but to deal with them as globally interconnected enterprises as there are no 'firewalls' that block globally digitized capital flows.⁷⁷

Within these financial institutions a rethinking is already apparent – using common data sets and unique identifiers, albeit their own proprietary identifiers and data sets, to drive change as legacy systems are decommissioned and collaborative undertakings proliferate. Certainly, technology is not restraining change. Data can now be decentralized but organized for a single view as a virtual database.

Financial Industry Standards Initiatives

Many attempts by industry consortia and industry data vendors have been made to pursue data standardization. In the identification space of the Legal Entity Identifier (LEI), the Unique Product Identifier (UPI) and the Unique Transaction Identifier (UTI) these efforts all have a single goal of transforming legally drafted definitions of products, business entities, contractual relationships, notices of corporate reorganizations, etc. from paper or word-processed documents into digital form. The originating source of this information is documents – offering memorandum, prospectuses, corporate resolutions, master agreements, collateral agreements, trust agreements,

articles of incorporation, word processed documents, etc. It would, therefore, seem reasonable that the preferred method to transform this information into computer readable form is to use the standard of XBRL, the eXtensible Markup Language (XML) for Reports for this transformation. Three quarters of the globe's regulators already use XBRL to transform other regulatory information reported to them in this way.

In the transactional space, data is not created from paper documents. Data is simply pasted into or retrieved from a computer already in an existing data format. Information such as a price or notional; or a buy or sell indicator; or a reset date, tenor or interest rate; and many other codes and input items are placed into existing computer generated templates. Here such standards as the SWIFT 15022 and the later SWIFT 20022 message formats (used for communicating messages over the Society for Worldwide Interbank Financial Telecommunication network); FpML (Financial Product Markup Language used for communication of OTC Derivatives trades); and FixML (Financial Information Exchange Markup Language used for communication of securities and futures trades) are in broad use in the financial industry. Each can be incorporated into XBRL as well as stand apart, depending upon the application.⁷⁸

The biggest challenge is to conform to a common nomenclature, a set of nouns that describe in the smallest possible number of characters what industry members conclude is the best description of the data element the tags describe. This is a task yet to be carried out. It would seem logical to do so under OFRT oversight and, where necessary, regulatory mandates to assure conformity. To this end the FIBO (Financial Industry Business Object) language, the most recent attempt at standard tagging nomenclature overseen by the Enterprise Data Management Council, has shown promise.

Already ongoing is an effort undertaken by IOSCO-CPMI (International Organization of Securities Commissions-Committee on Payments and Markets Infrastructures) to harmonize data elements for defining the components of swaps transactions. While this is a first test for such standardization efforts it should form the basis for harmonizing data elements and data tags for all financial transactions. The principles developed for swaps standardization needs to be first tested for other asset classes to assure that the framework is extensible and comprehensive.

[Product, Participant and Reference Data Catalogues](#)

The need for standardization goes beyond standardizing product and participant identities, and harmonized data elements and data tags. While a necessary first step, a financial transaction that contains such identifying data must also be associated with standard reference data. Reference data that further describes transactions should be the same no matter whether used by a financial institution or a regulator. This data includes: financial market participant's name and address information; hierarchical ownership information; country of domicile and tax jurisdictions; etc. Also, financial product information: end-of-day prices; credit ratings; call, reset, maturity and expiration dates; etc.; information particular to describing a merger, acquisitions, or spin-off;

calendar data for triggering events; and specific details of dividend, capital distribution and interest payments.

Reference data is used by transaction processing systems to maintain data definitions of financial market participants, financial instruments and tradeable financial contracts. Also, to value the financial transaction for financial and regulatory reporting and for risk management purposes. However, multiple versions of identification and reference data is pervasive, owing to the way the data is originated, acquired and processed.

Data intermediaries are imposed between the originating corporate sources that describe securities offerings in prospectuses and offering documents, and announce corporate event notifications. They are also interposed with exchanges and financial institutions that create new financial instruments and contracts. These intermediaries both interpret legal documents into discreet data components and consolidate data to make it convenient for others to buy packages of information.

There are, therefore, multiple versions of identification and reference data, whether in central data warehouses of financial market utilities, at each financial firm, or available from multiple data sourcing facilities. This adds a variation to the data when, in fact, the data needs to be identical if trades are to match, payments are to be made and valuations for risk management are to be comparable. This duplicates activities and costs for each firm or regulator as they perform the same tasks on the assumption that the same data is being used which is not the case. The industry cost savings from eliminating these duplicate activities is estimated at \$US250 billion.⁷⁹ For just one data component, the LEI, estimates of cost savings range from \$US300 million for a single firm to \$US10 billion for the industry.⁸⁰

There are now a number of collaborations amongst financial market utilities and amongst financial institutions, many in fact, to bring some order to this diversity of data sources and variations in what should be identical reference data. What is needed, however, is one financial market utility, not many, using the new distributed technologies to solve this problem. Leadership from the OFRT is all that is needed.

Next Generation Technologies

Next generation technologies are being actively pursued by financial institutions and their regulators, led by distributed ledgers, an outgrowth of the technology underpinning Bitcoins. It has tremendous promise to remove many of the hundreds of financial intermediaries that exist to reconcile non-standard data in these separate ledgers. Financial institutions have long kept separate databases that store the ledgers for producing data for the many paper-based forms and regulatory reports, each containing much duplicate data that perpetuates the many niche regulators.

Distributed ledger technology (DLT) promises an immutable secure encrypted single ledger used by all, eliminating the many intermediaries that reconcile non-standard data and that sustains the multiple regulatory regime. DLT systems establish a tamper-proof digital record of who owns

what. To date it is these financial intermediaries and their regulators that are studying this new technology. Self-interest in sustaining these entities will most certainly cloud their decisions to usher in the lean digital age of financial regulation as it means doing more with less. Regulatory prohibitions built for another legal, operational and technology era is preventing DLT from flourishing.⁸¹ The OFRT is needed to provide oversight of all these new financial technology developments, give guidance to US regulators, and reach out to other governments dealing with these same issues. The technology of tomorrow is here today, we only need to have the political will to drive the change needed by embracing this technology.⁸²

Conclusion

Like the requirements found in an architect's blue print for both the dimensioning of and the selection of materials for constructing a building - from the cement of its foundation, to its plumbing and its electrical wiring, to its height - so must the architectural drawings of the financial system be in place before the cement for its foundation is poured and the first brick laid. This was the mistake of the hurry-up-and-get-the-regulations-passed crowd that dominated the first wave of financial regulation in the aftermath of the financial crisis.

Legislators and regulators did not fully understand the dominant role technology is playing in the financial system in implementing regulations. Nor did they understand how deep the foundation was to be dug, nor how secure it needed to be to support the tall 'technology' building that would house the future risk-adjusted financial system.

Finally, there are too many federal and state financial regulators, each with narrowly focused knowledge and scope, each making demands of the same financial institutions for preparing data and making their personnel available for intrusive audits and examinations. With the collection of a single, expanded common data set, and the political will to consolidate regulators, the number of lobbyists and niched-based trade associations would proportionately decrease and a more efficient, less costly financial system would result. Transparency and light touch oversight in a more automated regulatory environment with less regulators would be enabled.

The Office of Financial and Regulatory Technology could be organized by refocusing two existing agencies newly created after the financial crisis. The first, the OFR, an economic research agency of the US under the US Treasury with a secondary mission to standardize data for their own purposes. The other is the GLEIF, a global data standards agency of the Group of 20 (the President-elect is a member of this group) whose mission it is to standardize data for identifying all financial market participants. In partnership with financial institutions^{83 84} and technology companies⁸⁵ the OFRT can lay the foundation and vision for our new FinTech and RegTech risk-adjusted financial system in this digital age.

About Us

Financial InterGroup

Financial InterGroup is a financial industry consulting firm. We are veterans of the financial services industry having concluded successful careers at top-tier banks and diversified finance companies, Big 4 consulting firms and academia. We have also formed joint ventures with exchanges, clearing houses, depositories and technology suppliers that support financial services. We partner with leading academic institutions in groundbreaking research. From the earliest approaches to managing financial institutions to the latest theories of systemic risk we can claim confidently we have "been there, done that" whether on the inside as managers or on the outside as advisors to management and regulators.

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References

- ¹ Forbes, How Blockchain Technology Could Change The World, <http://www.forbes.com/sites/bernardmarr/2016/05/27/how-blockchain-technology-could-change-the-world/print/>, May 27, 2016
- ² CFTC's Giancarlo: How US Regulators Can Boost Blockchain in 2017, http://tabbforum.com/news/cftcs-giancarlo-how-us-regulators-can-boost-blockchain-in-2017?utm_campaign=ba2d3ac177-UA-12160392-1&utm_medium=email&utm_source=TabbFORUM%20Alerts&utm_term=0_29f4b8f8f1-ba2d3ac177-268937717,
- ³ Euroclear, Oliver Wyman, Blockchain in Capital Markets - The Prize and the Journey, <http://www.oliverwyman.com/content/dam/oliver-wyman/global/en/2016/feb/BlockChain-In-Capital-Markets.pdf>, at page 20, February, 2016
- ⁴ Grody, Allan D., Hughes, Peter J., Reininger, Daniel, Final Report on Global Identification Standards for Counterparties and Other Financial Market Participants, Journal of Risk Management in Financial Institutions - Special Issue on Counterparty Risk, Vol. 5, No. 2, <https://ssrn.com/abstract=2016874> at page 14, March 10, 2015
- ⁵ Ka Kei Chan, Alistair Milne, The Global Legal Entity Identifier System: Will It Deliver? https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2325889 at page 32-33, Aug. 12, 2013
- ⁶ Reuters, SWIFT confirms new cyber thefts, hacking tactics, <http://www.reuters.com/article/us-usa-cyber-swift-exclusive-idUSKBN1412NT>, December 12, 2016
- ⁷ Grody, Allan D., Infrastructure Issues in the Financial Services Industry: A Case for a Central Counterparty for Data Management, Journal of Securities Operations & Custody, Vol. 2, No. 3, pp. 202-224, <https://ssrn.com/abstract=1393022> at page 5, October 2009
- ⁸ CNBC, Barclays used blockchain tech to trade derivatives, <http://www.cnbc.com/2016/04/19/barclays-used-blockchain-tech-to-trade-derivatives.html>, April 19, 2016
- ⁹ Daniel K. Tarullo, Federal Reserve Board member, testimony at the U.S. Senate Committee on Banking, Housing and Urban Affairs, Subcommittee's Hearings on Security and International Trade and Finance, http://banking.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=c29ad867-c523-4a5c-8d0f-30757eeda312, February 12, 2010
- ¹⁰ Office of Financial Research, Developing Best Practices for Regulatory Data Collections, https://www.financialresearch.gov/viewpoint-papers/files/OFRvp-2016-01_Best-Practices-Data-Collection.pdf at page 9, May, 2016
- ¹¹ Inc. Magazine, 6 Lessons on Innovation From the History of the Barcode, Jan 3, 2014 <http://www.inc.com/the-build-network/6-lessons-on-innovation-from-the-history-of-the-barcode.html>
- ¹² Ali, R D, Haldane, A G and Nahai-Williamson, P, Bank of England, "Towards a common financial language", <http://www.bankofengland.co.uk/archive/Documents/historicpubs/news/2012/029.pdf>, March 14, 2012
- ¹³ Gillian Tett, Author, Financial Times Financial Industry reporter, The Silo Effect - The Peril of Expertise and the Promise of Breaking Down Barriers, Simon & Schuster, 2015 review at <http://inthebooks.800ceoread.com/jack-covert-selects/articles/the-silo-effect>
- ¹⁴ FSB, 2016 list of global systemically important banks (G-SIBs), <http://www.fsb.org/wp-content/uploads/2016-list-of-global-systemically-important-banks-G-SIBs.pdf>, at Annex, Nov. 21, 2016

-
- ¹⁵ FSB publishes 2016 G-SII list, <http://www.fsb.org/wp-content/uploads/FSB-publishes-2016-G-SII-list.pdf>, reference to unchanged 2015 list at <http://www.fsb.org/wp-content/uploads/FSB-communication-G-SIIs-Final-version.pdf>, Nov. 21, 2016
- ¹⁶ Dodd-Frank Wall Street Reform and Consumer Protection Act - H.R. 4173 (111th), <https://www.govtrack.us/congress/bills/111/hr4173/text/enr>, at Subtitle B—Office of Financial Research, July 21, 2010
- ¹⁷ SEC, Commissioner Kara M. Stein, A Vision for Data at the SEC, Keynote address to Big Data in Finance Conference, <https://www.sec.gov/news/speech/speech-stein-10-28-2016.html>, Oct. 28, 2016
- ¹⁸ Office of the Comptroller of the Currency Washington, D.C., Supporting Responsible Innovation in the Federal Banking System: An OCC Perspective, <https://www.occ.gov/publications/publications-by-type/other-publications-reports/pub-responsible-innovation-banking-system-occ-perspective.pdf>, March, 2016
- ¹⁹ Office of the Comptroller of the Currency Washington, D.C., Recommendations and Decisions for Implementing a Responsible Innovation Framework, <https://morningconsult.com/wp-content/uploads/2016/10/2016-135a.pdf>, October, 2016
- ²⁰ Bloomberg, Singapore Is Beating Hong Kong in Asia's Fintech Race, <https://www.bloomberg.com/news/articles/2016-12-07/with-fintech-rising-hong-kong-singapore-rivalry-gets-new-twist>, Dec. 7, 2016
- ²¹ Ernest & Young, UK HM Treasury, UK FinTech: On the cutting edge An evaluation of the international FinTech sector, <http://www.ey.com/Publication/vwLUAssets/EY-UK-FinTech-On-the-cutting-edge-Executive-summary/%24FILE/EY-UK-FinTech-On-the-cutting-edge-exec-summary.pdf>, 2016
- ²² Financial Conduct Authority Thematic Review TR15/1 Call for Input: Supporting the development and adoption of RegTech, <https://www.fca.org.uk/publication/call-for-input/regtech-call-for-input.pdf>, November 2015
- ²³ Financial Conduct Authority, Feedback Statement FS16/4 - Call for input on supporting the development and adopters of RegTech, <https://www.fca.org.uk/publication/feedback/fs-16-04.pdf>, July, 2016
- ²⁴ White & Case, Regtech rising: automating regulation for financial institutions, <http://www.whitecase.com/sites/whitecase/files/files/download/publications/regtech-thought-leadership.pdf>, at page 1, 2016
- ²⁵ Office of the Comptroller of the Currency, Washington, D.C., <https://www.occ.treas.gov/topics/bank-operations/innovation/special-purpose-national-bank-charters-for-fintech.pdf>, December 2016
- ²⁶ Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series 2016-095. Washington, DC, “Distributed ledger technology in payments, clearing, and settlement,” <https://www.federalreserve.gov/econresdata/feds/2016/files/2016095pap.pdf>, 2016
- ²⁷ Federal Reserve, Governor Lael Brainard, The Use of Distributed Ledger Technologies in Payment, Clearing, and Settlement, <https://www.federalreserve.gov/newsevents/speech/brainard20160414a.htm>, at the Institute of International Finance Blockchain Roundtable, Washington, D.C., April 14, 2016
- ²⁸ European Central Bank, Yves Mersch, Member of the Executive Board, Distributed ledger technology – panacea or flash in the pan? https://www.ecb.europa.eu/press/key/date/2016/html/sp160425_2.en.html, at Deutsche Bank Transaction Bankers' Forum 2016, Frankfurt am Main, April 25, 2016

-
- ²⁹ European Central Bank, Occasional Paper Series - No 172, Distributed ledger technologies in securities post-trading Revolution or evolution?, <https://www.ecb.europa.eu/pub/pdf/scpops/ecbop172.en.pdf>, April 2016
- ³⁰ European Central Bank, IN FOCUS Issue 1, A brave new world? What impact will distributed ledger technology have on the financial industry? https://www.ecb.europa.eu/paym/pdf/infocus/20160422_infocus_dlt.pdf, 2016
- ³¹ The Economist, Blockchains - The great chain of being sure about things, <http://www.economist.com/news/briefing/21677228-technology-behind-bitcoin-lets-people-who-do-not-know-or-trust-each-other-build-dependable>, October 31, 2015
- ³² Forbes, Why The Blockchain Is The New Website, <http://www.forbes.com/sites/valleyvoices/2015/12/21/why-the-blockchain-is-the-new-website/>, Dec 21, 2015
- ³³ Japan Exchange Group, Applicability of Distributed Ledger Technology to Capital Market Infrastructure, http://www.jpx.co.jp/english/corporate/research-study/working-paper/b5b4pj000000i468-att/E_JPX_working_paper_No15.pdf, at page 27, August 30, 2016
- ³⁴ Japan Exchange Group, Launch of Consortium and Proof of Concept Testing for Capital Market Infrastructure Utilizing Blockchain Technology, <http://www.jpx.co.jp/english/corporate/news-releases/0010/20161130-01.html>, Nov. 30, 2016
- ³⁵ American Banker, A Customer Data Bunker that Could Survive Catastrophe, <http://www.americanbanker.com/news/bank-technology/a-customer-data-bunker-that-could-survive-catastrophe-1092607-1.html>, Nov. 29, 2016
- ³⁶ Bloomberg, Should Your Employer Go Full Robo on Your Retirement Savings? <https://www.bloomberg.com/news/articles/2016-12-01/should-your-employer-go-full-robo-on-your-retirement-savings>, Dec 1, 2016
- ³⁷ American Banker, AI Is the Answer to Regulatory Uncertainty, <http://www.americanbanker.com/bankthink/ai-is-the-answer-to-regulatory-uncertainty-1092841-1.html>, December 14, 2016
- ³⁸ Douglas W. Arner, János Barberis, Ross P. Buckley, FinTech, RegTech and the Reconceptualization of Financial Regulation, Forthcoming: Northwestern Journal of International Law and Business, <http://ssrn.com/abstract=2847806>, October 2016
- ³⁹ Financial Innovation Now, Examining the Extensive Regulation of Financial Technologies, https://financialinnovationnow.org/wp-content/uploads/2016/07/Examining_the_Extensive_Regulation_of_Financial_Technologies.pdf, July, 2016
- ⁴⁰ Group of Thirty, 2006, “Global Clearing and Settlement, Final Monitoring Report”, http://group30.org/images/uploads/publications/G30_GlobalClearingSettlementFinalMonitoringReport.pdf at page ix
- ⁴¹ CFTC Press Release, Request for Comment, Draft Technical Specifications for Certain Swap Data Elements, <http://www.cftc.gov/idc/groups/public/@newsroom/documents/file/specificationsswapdata122215.pdf>, December 22, 2015
- ⁴² SEC Maps Interactive Data-filing Mandate CFO Magazine, <http://ww2.cfo.com/technology/2008/05/sec-maps-interactive-data-filing-mandate/>, May 14, 2008

-
- ⁴³ SEC Announces Program to Facilitate Analysis of Corporate Financial Data SEC Press release, <https://www.sec.gov/news/pressrelease/2014-295.html>, Dec. 30, 2014
- ⁴⁴ Office of Financial Research, <https://www.financialresearch.gov/about/>
- ⁴⁵ Financial Stability Board, A Global Legal entity Identifier for Financial Markets, http://www.financialstabilityboard.org/wp-content/uploads/r_120608.pdf?page_moved=1, June 8, 2012
- ⁴⁶ The Legal Entity Identifier Regulatory Oversight Committee - LEI ROC, <http://www.leiroc.org/>
- ⁴⁷ GLEIF – Global Legal Entity Identifier Foundation, www.gleif.org
- ⁴⁸ Thomson Reuters, Mergers & Acquisitions Review Financial Advisors First Nine Months 2016, http://share.thomsonreuters.com/general/PR/MA_3Q_2016_E.pdf, Sept. 28, 2016
- ⁴⁹ American Banker, The Time Has (Finally) Come for a Single Regulator, <http://www.americanbanker.com/bankthink/the-time-has-finally-come-for-a-single-regulator-1092722-1.html>, Dec. 7, 2016
- ⁵⁰ Futures & Options World, Battle for Future of Data ID Standards Hots Up, <http://www.financialintergroup.com/cmsAdmin/uploads/201601-Battle-for-future-of-Data-ID-Standards-hots-up.pdf>, Jan. 20, 2016
- ⁵¹ See footnote 45
- ⁵² Joint Association letter on global trade reporting and data harmonization, “Key Principles to Improve Global Trade Reporting and Data Harmonization”, <http://www2.isda.org/attachment/NzY1OA==/Joint%20Trade%20Association%20Data%20Harmonization%20letter.pdf>, June 11, 2015
- ⁵³ Committee on Payments and Market Infrastructures Board of the International Organization of Securities Commissions. Consultative report - Harmonization of the Unique Transaction Identifier, <https://www.bis.org/cpmi/publ/d131.pdf>, August 2015
- ⁵⁴ Harmonization of the Unique Product Identifier, <http://www.bis.org/cpmi/publ/d141.pdf>, December, 2015
- ⁵⁵ FinOps, OTC Derivatives Players: The ISIN Engine Emerges, <http://finops.co/technology/infrastructure/otc-derivatives-players-the-isin-engine-emerges/>, Sept. 16, 2016
- ⁵⁶ ESMA, Consultation on Transaction Reporting, Reference Data, Record-Keeping and Clock Synchronization Under MIFIR, https://www.esma.europa.eu/sites/default/files/library/2015-1909_guidelines_on_transaction_reporting_reference_data_order_record_keeping_and_clock_synchronization.pdf, at page 20, December 23, 2015
- ⁵⁷ SWIFT Institute, Working Paper No. 2013-006 A Critical and Empirical Examination of Currently-Used Financial Data Collection Processes and Standards, Dr. Suzanne Morsfield, Dr. Steve Yang Susan Yount, https://www.swiftinstitute.org/wp-content/uploads/2016/12/SIWP-No-2013-006-SWIFT-Financial-Standards_vfinal_2.pdf, at page 30, 36, November 2, 2016
- ⁵⁸ Grody, Allan D. and Hughes, Peter J., Risk, Data and the Barcodes of Finance, <https://ssrn.com/abstract=2544356>, September 28, 2015
- ⁵⁹ Financial Times, Iosco warns on data challenge to risk oversight, <http://www.ft.com/intl/cms/s/0/6f76089e-5f1a-11e4-be0b00144feabdc0.html#axzz3HdGbX4YV>, Oct. 29, 2014
- ⁶⁰ OFR, Cornelius Crowley, Setting Standards for Microdata, https://www.ecb.europa.eu/pub/conferences/shared/pdf/160705_8th_stats_conference/Crowley.pdf?63f285a1d91290c061feff4afe6aba0e, at page 13, July, 2016

-
- ⁶¹ Office of Financial Research, 2016 Financial Stability Report, https://www.financialresearch.gov/financial-stability-reports/files/OFR_2016_Financial-Stability-Report.pdf, at page 80, 2016
- ⁶² Department Of The Treasury, Office of Financial Research, Statement on Legal Entity Identification for Financial Contracts, http://www.treasury.gov/initiatives/Documents/OFR-LEI_Policy_Statement-FINAL.PDF, at pages 6-7, November, 2010
- ⁶³ SEC, SEC Approves Plan to Create Consolidated Audit Trail (CAT), <https://www.sec.gov/news/pressrelease/2016-240.html>, Nov. 15, 2016
- ⁶⁴ Grody, Hughes, GARP – BCBS 239: Heightened Standards and Operational Risk, <http://www.financialintergroup.com/cmsAdmin/uploads/201605-BCBS-239-Heightened-Standards-and-Operational-Risk.pdf>, May 11, 2016
- ⁶⁵ See footnote 4 at page 66
- ⁶⁶ Marijn Janssen, Yao-Hua Tan, Dynamic Capabilities for Information Sharing: XBRL enabling business-to-government information exchange , <http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=6758864>, at the 47th Hawaii International Conference on System Science, 2014
- ⁶⁷ XBRL International, XBRL International Calls for Global Working Group to Define Standards for Corporate Actions Reporting, <https://xbrl.us/news/xbrl-international-calls-for-global-working-group-to-define-standards-for-corporate-actions-reporting/>, May 28, 2014
- ⁶⁸ GLEIF, XBRL International Forms Joint Working Group with GLEIF to Address Legal Identity in Digital Business Reporting, <https://www.gleif.org/en/newsroom/blog/xbrl-international-forms-joint-working-group-with-gleif-to-address-legal-identity-in-digital-business-reporting>, June 20, 2016
- ⁶⁹ American Banker, A ‘Boundless Informant’ for Financial System Could End TBTF, <http://www.financialintergroup.com/cmsAdmin/uploads/201306-A-Boundless-Informant-for-Financial-System-Could-End-TBTF.pdf>, June 13, 2013
- ⁷⁰ JWG Group Ltd , Harmonized transaction reporting: probable or impossible? <https://regtechfs.com/harmonised-transaction-reporting-probable-or-impossible/>, December 15, 2016
- ⁷¹ CFTC’s Implementation of Dodd-Frank — Grading Agency Transparency Keynote Address by Commissioner Scott D. O’Malia, SIFMA Compliance and Legal Society Annual Seminar, <http://www.cftc.gov/PressRoom/SpeechesTestimony/opaomaliamalia-22>, March 19, 2013
- ⁷² Financial InterGroup, FIG Research Note "The Global LEI Initiative - Moving in the right direction but still another month of lapsed LEIs exceeding new LEIs", <http://www.financialintergroup.com/cmsAdmin/uploads/Research-Note-A-Progress-report-on-New-vs-Lapsed-LEIs-Dec-2016.pdf>, December, 2016
- ⁷³ Federal Reserve Press release, <http://www.federalreserve.gov/newsevents/press/bcreg/bcreg20150316a1.pdf> , at page 7, March 16, 2015
- ⁷⁴ CFTC, Unique Swap Identifier (USI) Data Standard, <http://www.cftc.gov/idc/groups/public/@swaps/documents/dfsubmission/usidatastandards100112.pdf>, at page 4, Oct. 1, 2012
- ⁷⁵ US Treasury, Qualified Financial Contracts Recordkeeping Related to Orderly Liquidation Authority, Final rule. Federal Register / Vol. 81, No. 210 / Monday, / Rules and Regulations <https://www.federalregister.gov/documents/2016/10/31/2016-25329/qualified-financial-contractsrecordkeeping-related-to-orderly-liquidation-authority#footnote-13-p75625>, at page 75669 , October 31, 2016

⁷⁶ SEC, Commissioner Kara M. Stein, Statement on the Joint Industry Plan on the Consolidated Audit Trail (“CAT”), <https://www.sec.gov/news/statement/stein-statement-open-meeting-111516.html>, Nov. 15, 2016

⁷⁷ Institutional Investor, Globalization Backlash is No Where to be Seen in Financial Markets, <http://www.institutionalinvestor.com/article/3598916/investors-pensions/globalization-backlash-is-nowhere-to-be-seen-in-financial-markets.html#.WEm0qbIrLcs>, Nov. 3, 2016

⁷⁸ SWIFT Institute, Working Paper No. 2013-006 A Critical and Empirical Examination of Currently-Used Financial Data Collection Processes and Standards, https://www.swiftinstitute.org/wp-content/uploads/2016/12/SIWP-No-2013-006-SWIFT-Financial-Standards_vfinal_2.pdf, November 2, 2016

⁷⁹ See footnote 5

⁸⁰ Office of Financial Research, Legal Entity Identifier - Frequently Asked Questions <https://www.financialresearch.gov/data/legal-entity-identifier-faqs/>

⁸¹ U.S. Securities and Exchange Commission, Fintech Forum - The Evolving Financial Marketplace, <https://www.sec.gov/spotlight/fintech/transcript-111416.pdf>, at lines 0121 11 – 24, Nov. 14, 2016

⁸² Finextra, ECB and Bank of Japan research DLT for market infrastructure, https://www.finextra.com/newsarticle/29872/ecb-and-bank-of-japan-research-dlt-for-market-infrastructure?utm_medium=dailynewsletter&utm_source=2016-12-8, December 7, 2016

⁸³ PWC, 2016, Market utilities in financial services: What role will you play? <http://www.strategyand.pwc.com/reports/market-utilities-in-financial-services>, at Exhibit 4, March 22

⁸⁴ ISDA, The Future of Derivatives Processing and Market Infrastructure, <https://www2.isda.org/attachment/ODcwMA==/Infrastructure%20white%20paper.pdf>, at pages 21-24, Sept. 15, 2016

⁸⁵ Financial Innovation Now, FIN calls on President-elect Trump to promote innovation in financial services, appoint senior financial technology leader, <https://financialinnovationnow.org/2016/11/fin-trump-transition-letter/>, Nov. 30, 2016