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Old & New Up North

Souheil Badran looks to revolutionize Northwestern Mutual's technology

It's the People

A little over a year ago, the path was cleared for Ion Group to acquire Fidessa, after the UK's Competition and Markets Association and the Financial Conduct Authority gave the deal their blessings. The rest is history … as are the Fidessa careers of 400 to 500 now-former employees. Time will tell if this ends up being a successful acquisition or not, but since my colleague Rebecca Natale broke the news on August 7 of the mass exodus (*see page 4*), the feedback we've received from current and former Fidessa employees, employees of other Ion-acquired companies, as well as clients of Ion-acquired companies, has not been glowing, to say the least.

Before you label me a "snowflake" or call me a naïve 40-year-old Millennial, I recognize that in business, layoffs are a necessary evil. Additionally, an acquisition is a great time to bring in fresh eyes, fire the poor performers, and breathe new life (and hopefully investment) into an organization. But the goal for any personnel decision should be to improve the acquired product—not find profit by scaling everything back just because it's profitable. For the time being, though, I'll take Ion out of the equation. Regardless of acquirer, here's where acquisitions almost always go sour: disrupting a successful culture. As I said in last month's column, it's the people who make the tech run.

Terms like "redundancies" and "attrition" and "voluntary resignations" have always bothered me. They're corporate words thrown around by C-level execs used to disguise the fact that they are firing people—or forcing people out—and now those people have to figure out how to pick up the pieces and get on with their lives. When you start looking at people as numbers on a revenue sheet, problems always arise.

The idea of people is also weighing heavily on my mind for another—much more important—reason. As many of you may know, *WatersTechnology*'s publisher, known as Risk Waters Group in 2001, lost 16 staff members and an additional 65 delegates who were either attending or speaking at the inaugural Waters Financial Technology Congress at the World Trade Center on September 11, 2001. As this is the September issue, it's important that we remember those we lost—we are still thinking of you all and you are missed. **wt**

We remember our friends and colleagues who lost their lives in the World Trade Center on September 11, 2001.

Sarah Ali Escarcega Freelance Marketing Consultant
Oliver Bennett Staff Writer, Risk
Paul Bristow Senior Conference Producer
Neil Cudmore Sales Director, *Waters*
Melanie de Vere Publisher, *Waters* Reference Products
Michele du Berry Director of Conferences
Elisa Ferraina Senior Conference Sponsorship Coordinator
Amy Lamonsoff Conference Coordinator, North America

Sarah Prothero Conference Operations Manager
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Laura Rockefeller Freelance Delegate Coordinator
Karlie Rogers Divisional Sponsorship Manager
Simon Turner Board Director
Celeste Victoria Conference Telesales Executive
Joanna Vidal Events Coordinator
Dinah Webster Head of North American Sales

We also remember our 65 colleagues from the industry who attended the Waters conference in the World Trade Center as delegates, speakers, sponsors and exhibitors.

Anthony Malakian
Editor-in-Chief

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Souheil Badran,
Northwestern Mutual
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Hundreds Leave Fidessa Following Ion Acquisition

Current and former employees of the London-based software provider say around 400 employees have left in the last year. By Rebecca Natale

At least 400 employees have left Fidessa in the 12 months since it was acquired by Ion Group, according to six employees of the British financial software company, five of whom left recently. These sources—all of which held managerial positions and are still in contact with former colleagues—agreed that 400 is likely the minimum, with one former manager putting the figure as high as 500.

On July 25, 2018, when the Financial Conduct Authority (FCA) approved the deal, Fidessa's staffing level was roughly 1,750–1,800, according to three senior executives who worked at the company at the time (several outside websites peg the total

> "While a lot of people have worked very hard to meet the February pay run target, I regret to inform you that this will not be possible and it now looks likely that … the 2018 variable compensation will be paid in April."
> **Email to Ion staff on Feb. 13**

employee count at 1,700–1,750). Since then, *WatersTechnology* has learned there have been around 300 voluntary resignations at Fidessa, and around 100 redundancies, although three sources said those numbers could be higher.

Each source interviewed for this article says that a major contributing factor for many of the resignations was the late payment of bonuses.

July saw the most recent round of redundancies within the company, which affected around 70 people in the London office. One source said there were roughly 30 to 40 layoffs in the US office. One senior employee, who managed an entire department, believes that Ion plans to reduce headcount at Fidessa to around 1,200.

In an internal note obtained by *WatersTechnology*, Ion management said it was using company performance reviews and rankings to select employees for redundancy, and a maximum of 20 years' service would be taken into

account. According to the note, more than 200 positions were reviewed in London, and of that, 23 positions—or about 10%—were earmarked as "possible redundancies." The source says they are not sure if those 23 positions were included in the 70 London redundancies, which were scheduled to be completed by mid-August.

At the senior level, sources say that most—if not all—of Fidessa's operating board, which reports into the board of directors, have left, as have a significant number of senior managers at the level below the board. John Hamer, Fidessa's former chairman, and Andy Skelton, its former chief financial officer, have left the company, according to LinkedIn profiles and sources, while Chris Aspinwall, the former CEO, is no longer with the company, according to sources. Hamer, Skelton and Aspinwall were also members of the board of directors.

As part of the terms of the Ion offer, the five non-Fidessa executives on the board—Richard Longdon, Ron Mackintosh, John Worby, Ken Archer and Ishbel Macpherson—resigned as directors of Fidessa as of August 3, 2018.

A spokesperson for Ion Group declined to comment for this story. A spokesperson for an agency that represents Fidessa said the vendor declined to comment for this story.

A Winding Path

Fidessa earned its reputation thanks to its extensive trading network, analytics and compliance tools, and its order management system, which helped it to create the proverbial front-to-back trading environment through its Fidessa Investment Management System (IMS). As a result, at the beginning of 2018, several suitors came calling.

On Feb. 21, 2018, the boards of both Fidessa and Geneva-based software company Temenos announced in a joint statement that an agreement had been reached to sell Fidessa to Temenos for £1.4 billion ($1.71 billion) in cash. On April 5, 2018, Fidessa

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TIMELINE: FIDESSA'S RISE

When looking at Fidessa's timeline, the two things that jump out are stability and organic growth. Outside of a few name changes, the company has quietly expanded its Fidessa Workstation and subsequent suite of solutions largely through organic growth, with the lone exception being the LatentZero acquisition.

- **1981**: Fidessa is founded in the UK as Intercom Data Systems (IDS), later renamed royalblue.

- **1996**: Launches in the US, opens NYC office.

- **2000**: First hosted US clients go live.

- **2003**: Launches Fidessa Workstation as entry-level market data and trading product.

- **2006**: Launches multi-asset trading platform.

- **2007**: royalblue announces acquisition of LatentZero, provider of front-office solutions for the buy side, which is later renamed Fidessa Buy-Side Limited.

- **2007**: royalblue rebrands as Fidessa due to the recognizable name of its core trading platform.

- **2008**: Fidessa Fragmentation Index, which measures fragmentation liquidity across order-driven European markets, goes live.

- **2009**: Fidessa launches its Fragulator, an aggregator of European trade records.

- **2011**: Fidessa launches its Tradalyzer tool for performance comparison and European trading analysis.

- **Feb. 21, 2018**: The boards of Temenos and Fidessa announce in a joint statement that

Temenos has agreed to buy Fidessa for £1.4 billion in cash.

- **April 3, 2018**: Reuters reports Fidessa postponed its shareholder vote following talks of potential rival bids from Ion Group and SS&C Technologies.

- **April 20, 2018**: Ion submits its £1.5 billion proposal hours before the deadline set by the UK Takeover Panel, and the offer is accepted by Fidessa shareholders. SS&C did not submit an official bid.

- **April 20, 2018**: Temenos issues a statement saying the group did not revise its offer, nor would it, and the proposed acquisition would lapse on April 28, 2018, in accordance with terms.

- **June 18, 2018**: The UK's Competition and Markets Association launches an investigation into the deal, citing competition concerns.

- **July 25, 2018**: The Financial Conduct Authority approves the deal.

- **Aug. 1, 2018**: ION receives valid acceptances of more than 90% of Fidessa's ordinary share capital.

- **Aug. 3, 2018**: The CMA clears the merger.

- **Aug. 14, 2018**: Ion announces dispatch of formal compulsory acquisition notices to Fidessa shareholders who have not yet accepted the offer. The transfer of remaining Fidessa shares is set to take place on Sept. 26, 2018.

Source: Media Reports and Fidessa's website.

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confirmed that there were two potential competing bidders: Ion and SS&C Technologies, the latter of which never materialized as an official bid.

On April 20, 2018, it was announced that the Temenos deal had been scrapped due to a competing offer from Ion of £1.5 billion. In a same-day statement, Temenos said the group did not revise its offer, nor would it, and the proposed acquisition would lapse on April 28, 2018, in accordance with terms. About three months later, the FCA approved Ion's acquisition of Fidessa.

Multiple reasons were cited for the resignations, but one that everyone interviewed for this article pointed to was Ion's handling of bonuses, which

were slated to be paid on Feb. 15. *WatersTechnology* has seen an email, dated Feb. 13, in which Ion's European head of human resources, Jill Powell, told staff they would have to wait to receive their bonuses until April.

"Unfortunately, while a lot of people have worked very hard to meet the February pay run target, I regret to inform you that this will not be possible and it now looks likely that where applicable, and subject to individual performance considerations, the 2018 variable compensation will be paid in April," the email said.

Ultimately, compensations were not paid until May, by which time, sources say, employees eligible for bonuses had already left. **wt**

Scotiabank Turns to Cloud GPUs for Risk Calculations

The Canadian bank has significantly improved the time it takes to run XVA calculations, and has big plans to further expand its XVA cloud GPU program. By Anthony Malakian

At the end of 2016 into 2017, Scotiabank initiated a project that would allow it to use cloud GPUs (graphics processing units) to run its derivatives valuation adjustments (XVA) program. With the project gaining traction, the results have been impressive.

According to the bank, the runtime for risk calculations and derivatives pricing using cloud GPUs is 30 times faster, allowing brokers to deliver more accurate derivatives pricing in 20 seconds, which would previously have taken 10 minutes. It also allows for more nuanced risk analysis thanks to more detailed risk scenario modeling that can assess more than 10 times the number of previous scenarios.

"The scale of XVA means that we need to lean on the scalability of public cloud for compute power and couple that with data at scale from our internal global data platform," Stella Yeung, chief information officer at Scotiabank Global Banking & Markets, tells *WatersTechnology*. "This combination lets us deliver, in real time, to the traders the information that they require to serve our global clients."

Andrew Green, managing director and lead XVA quant at Scotiabank, who joined the bank at the end of May 2016, believes that a GPU is the best type of platform for running XVA calculations. Additionally, Scotia already had a cloud-first policy in place, even before it started this particular over-

> "So [CVA] is a very onerous numerical calculation that needs to benefit from some accelerations, which is why you get GPU cards and GPU compute capability."
> **Andrew Green, Scotiabank**

haul. When combined with a public cloud infrastructure—for valuation adjustments, Scotiabank is using the Microsoft Azure cloud and their NC24 virtual machines—GPUs are better equipped to handle these type of computationally-intensive calculations than traditional CPU cores. And finally, the bank's XVA program is a Microsoft Windows-only system, and as you'd expect, Microsoft Azure has the capability to use GPUs with the Windows operating system.

Combined, the greatest tech change over the last four years is the ready availability of GPU machines via the cloud, Green says. This trend is being driven by firms looking to experiment with deep learning, but that demand has allowed risk managers to take advantage of the same hardware.

Turn the Page

Since the financial crisis, XVAs have grown, both in size and in complexity. This has been an ongoing challenge for banks, but at the same time, the ability to store massive amounts of data in the cloud relatively cheaply, combined with vast improvements to compute power and the continued evolution of GPUs, has allowed firms to more efficiently crunch massive datasets and run risk calculations.

It also hasn't hurt that new regulations—from credit valuation adjustment (CVA) accounting standards, and the new Fundamental Review of the Trading Book (FRTB) stemming from Basel III, to new rules around initial margin requirements, and BCBS/Iosco requirements—have helped to push banks toward newer technologies in search of help.

"There's been significant growth in the number of valuation adjustments that are applied in common practice in the derivatives industry since 2008 and the financial crisis," Green says.

When it comes to valuation adjustments, it's an acronym minefield. Beyond CVAs, which account for counterparty credit risk, there are

> "We did a release where we optimized the calculations significantly and we got a big performance boost and that means we can dial down the compute requirement. And then later on in the year, we'll be expecting to add more calculations … and then we'll need to dial it up again. So it gives us a degree of flexibility that we wouldn't otherwise have."
> **Andrew Green, Scotiabank**

funding valuation adjustments (FVAs), which account for funding costs for derivatives; margin valuation adjustments (MVAs), which relate to the funding costs associated with initial margin; and, among others, capital valuation adjustments (KVAs), which is something banks look at to assess the impact of new derivatives transactions on their balance sheet and return on capital.

"Those things have been growing over the last 10 years, so it's now common practice to include them whenever you do a new transaction with a client—you want to assess the impact of all those things on your accounting valuations and on your balance sheet,"

he says. "So you need a system that is capable of being able to price those into new derivative trades, and because they're a part of your accounting practice, you need to also include them in your books-and-records valuations, and you also need to calculate sensitivities because they impact your derivatives risk and sensitivities, as well. As a result, you need to have an end-of-day process where you generate sensitivities to those numbers, and you have a trading desk that is responsible for managing them and hedging them, as well."

Better, Faster, Stronger

The standard approach to calculating XVAs is to use large-scale Monte Carlo simulations, Green says.

"Typically you'll use a Monte Carlo simulation because of the high number of risk factors that are involved in the calculation. Monte Carlo is a relatively slow numerical technique, but the only one that's really capable of dealing with this high dimensionality in the nature of the problem," he says.

What you end up with is a very large number of calculations that are required to conduct a basic valuation adjustment. By Green's estimates, this equates to a possible 10,000 Monte Carlo paths, hundreds of time steps, and a typical trade portfolio of hundreds of thousands of derivatives transactions.

"So you very quickly, even for the baseline calculations, get into 10^{11} or 10^{12}—in the order of a trillion valuations—just to get your nightly, basic CVA number without any sensitivities," Green says. "So it's a very onerous numerical calculation that needs to benefit from some accelerations, which is why you get GPU cards and GPU compute capability provided by Nvidia,"—the bank's preferred brand of compute cards for all of these calculations.

Scotia started with a Kepler series GPU but will upgrade to the Volta (V100) series "fairly soon" to take advantage of the newer cards. A V100 card has more than 5,000 compute

cores on it, so is better suited to performing these types of Monte Carlo calculations, where you're essentially doing the same calculation on each part, but with different data inputs, he says.

"A couple of months ago, we did a release where we optimized the calculations significantly and we got a big performance boost, and that means we can dial down the compute requirement," Green says. "And then later on in the year, we'll be expecting to add more calculations to it as we start to do second-order sensitivities, and then we'll need to dial it up again. So it gives us a degree of flexibility that we wouldn't otherwise have."

During the release, the bank reduced the runtime for calculating risk sensitivities by about 50%, he says. Looking ahead, Scotia will add more sensitivity calculations to provide a richer set of metrics, particularly around second-order sensitivities, or gammas, and will also add more types of derivative transactions.

Additionally, he says, by switching from Kepler to Volta, the bank will be able to do more because of card improvements. For example, the K80 series that Scotia currently uses has two GPUs and 24 Gigabytes (GB) of RAM, whereas, the Volta cards have only one GPU but 32GB of RAM. That extra memory will allow them to do more high-intensity computations on a single card. Volta also allows atomic operations—the ability to run concurrent programming independent of other processes—whereas Kepler's K80 does not have this feature.

This is also another example of how the cloud—in this case, they're using a grid of GPU machines on the cloud, and a piece of software called Origami to distribute their calculations to the various GPU cards and the various CPU cores on the cloud within the same calculation—can boost a bank's performance, as it allows the firm to choose the card it wants to use, thus allowing for flexibility.

" **"Finite difference approximation for derivative sensitivities is enormously computationally intensive... So it's very slow. Algorithmic differentiation... allows you to do the same thing—or calculate the sensitivity directly by differentiating the computer program automatically."**
Andrew Green, Scotiabank

Prior to using Azure, Scotia would have needed to perform the same processes as it would have done five years ago—go through a purchase cycle, buy the GPUs, install them in its multiple datacenters, and then deal with the multitude of business continuity issues that will inevitably arise. Now, the bank can access GPU cards on the cloud fairly easily, and the cloud also gives it the ability to tune the scale and size of the grid needed to directly suit the calculations it wants to perform, and change that over time.

Not to NAG

Beyond speed, Scotia is also incorporating algorithmic differentiation and data from vendor Numerical Algorithms Group (NAG), which allows brokers to see how different changes to factors within the model might impact risk. NAG helps them to do these calculations through three tools: DCO, DCO Map, and the NAG library.

The traditional way that derivative sensitivities are calculated is by using what's known as finite difference approximation, which is essentially a bump-and-revalue technique, Green says. So, for example, to calculate first-order sensitivity, you take your inputs—such as a volatility or an interest rate swap price that is part of the market data that your model is calibrated to—and then you shift it up a bit, re-run the entire calculation, and then shift it down a bit, re-run the entire calculation, and then take the difference to approximate the sensitivity.

"Finite difference approximation for derivative sensitivities is enormously computationally intensive, as you can imagine, because we have thousands and thousands of inputs, particularly to the XVA calculation, because it depends on so much market data. So it's very slow," he says. "Algorithmic differentiation... allows you to do the same thing—or calculate the sensitivity directly by differentiating the computer program automatically."

At its core, algorithmic differentiation is a numerical technique for calculating sensitivities by differentiating the computer program automatically. It uses two modes: forward (tangent) mode, and backward (adjoint) mode. They have different efficiencies, Green says, depending on the format of your computer program. For XVA calculations, the adjoint is the more efficient one, he says, but it is harder to use than the tangent one.

Currently, Scotia is using the forward mode to calculate the first-order sensitivities, particularly for vega calculations. Within the next few months, the bank plans to switch to the adjoint mode of calculation because it's much more efficient, Green says. **wt**

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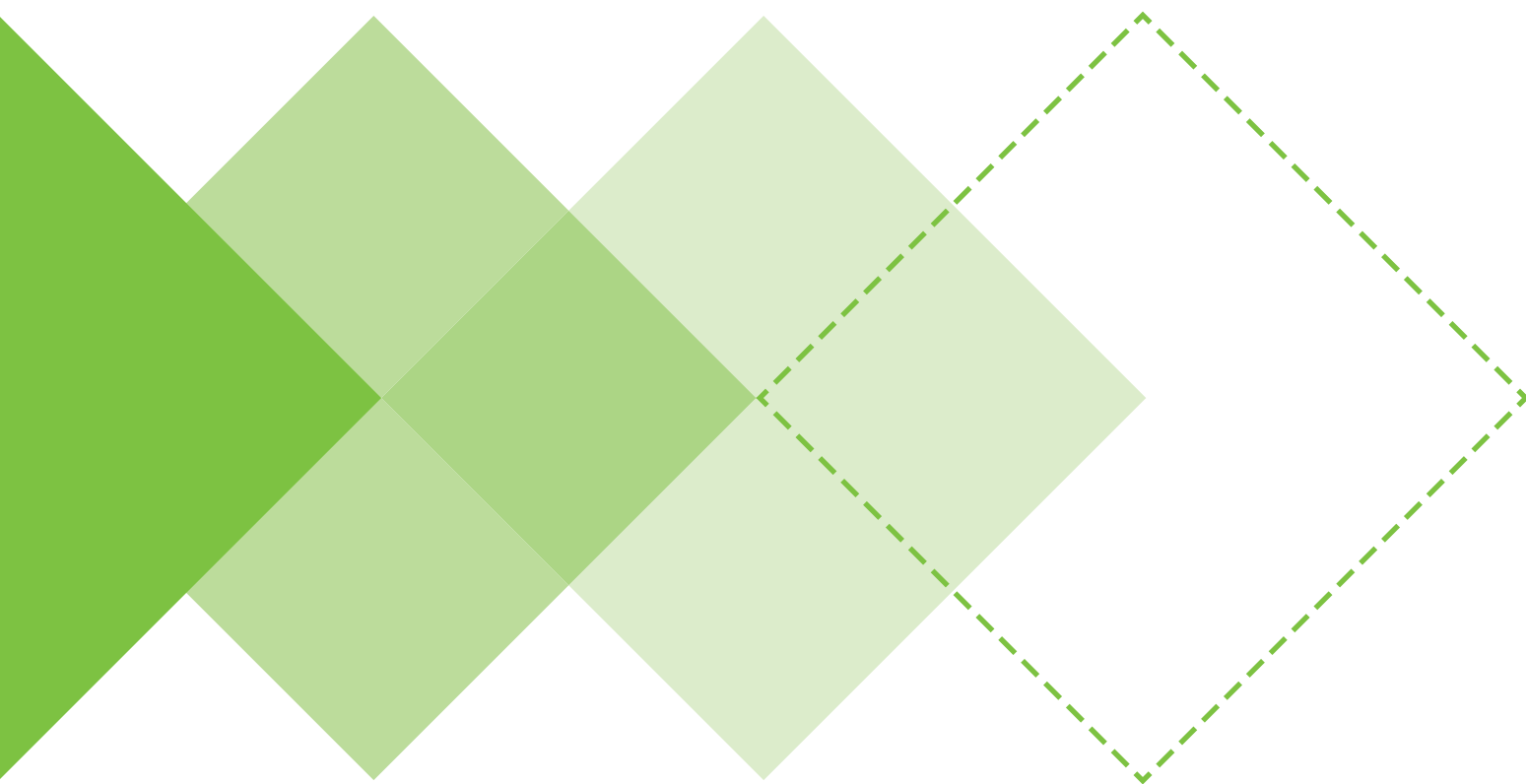
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World Bank: Blockchain Could Reduce Settlement Time to Seconds

A year after issuing the first blockchain-traded bond, the lender says blockchain technology could drastically cut settlement times and costs. By Hamad Ali

Blockchain technology could cut trade settlement time from days to seconds, a World Bank official says.

"I think practical transactions allow you to see that the potential benefits [of blockchain], such as the reduction in settlement time," says Paul Snaith, the multilateral lender's head of operations for capital markets, speaking to *WatersTechnology* ahead of the one-year anniversary of the bank's issuance of the first blockchain bond, Bond-i.

"You could have near simultaneous settlements if you have tokens of appropriate value. That would change some of the mechanics of how liquidity is positioned for a transaction and—this is one of the things we said about Bond-i—instead of a settlement times being T+X measured in days, it could be T+X measured in seconds," he says.

The World Bank partnered with the Commonwealth Bank of Australia (CBA) to build a platform on the Ethereum blockchain, and issued Bond-i in August 2018. The partners announced in May that they had successfully enabled secondary market trading of the bond, making this the first bond whose issuance and trading are recorded using distributed ledger technologies.

Snaith says the technology behind Bond-i clearly enables individual participants to directly trade securely, and that the potential for costs savings and efficiency is huge. Settlement, which usually takes two days, could be finalized much more quickly in the future, reducing settlement risk.

"It [blockchain] is worth exploring because it could potentially drive down risk, it could drive down cost,

and it could increase speed. I think it is easier now to conceive of trading and settlement mechanisms that have an overlay of information systems illustrating pricing information, liquidity, all of those things, and are likely to be available with much simpler and more rapid exchange behind it," he says. "That is the future."

Snaith says that although the current market infrastructure works very well, there is potential for cutting costs in the long run—though he also cautions that market infrastructure is very complex, and wholesale change will not happen in the short term. "If things like capital formation can be done more cheaply, we think that could have a significant development impact, and we are really interested in that. There are so many different dimensions of it," he says.

Legal Challenge

Bond-i faced some legal considerations during its development, Snaith says, often related to the fact that current regulations that are designed to protect investors reflect the technological structure of markets as they are today.

For example, he says, "The creation of an asset or bond on a blockchain is the straightforward part, but it implies that investors are able to hold these assets directly and, potentially, trade them directly. But if that were to occur, then the platform itself would become an exchange with regulatory and licensing implications under current law."

With Bond-i, only the security registration is on the blockchain. The parties considered using digital tokens for settlement, but decided against it

Blockchain could offer "near simultaneous" settlements

because of regulatory constraints and tax complexity. Bond-i issuances are settled using Swift's payment network. CBA acts as the issuing, paying and calculating agent.

The platform was built on a private version of the Ethereum blockchain. It was independently validated by a blockchain engineering team from Microsoft to ensure it was fit for purpose. The validation was then presented to investors to make sure they were comfortable with it. The World Bank runs two nodes on Microsoft's Azure Cloud, while CBA runs on the Google Cloud. There is also potential for regulators to run a node in the future, allowing them to have a real-time view of the transactions on the ledger.

CBA was the sole arranger for the bond and developed the platform, with the World Bank conducting technical observations of the development. Snaith says the World Bank does not plan to become a technology company, and will remain focused on its core business of funding economic development.

But the bank will consider other partnerships on blockchain projects, he says. "If we find a [blockchain] project with other partners that has a real learning benefit, we will consider it. Because we are a frequent issuer and because we make payments around the globe, we are in a position to do this. We come to market quite regularly, we are well known in the capital markets, and we have a serious purpose."

In such projects, most of the development will be done by others, with the World Bank being the issuer and engaging on understanding and sharing any technological benefits it derives. **wt**

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Banks Embrace Use of Synthetic Data

Banks have long been using synthetic data to validate solutions, but tech advancements and regulatory pressure have established this practice as a crucial step in the development and testing of technologies. By Josephine Gallagher

Synthetic data is playing an increasingly important part in testing solutions, particularly as pressure mounts on banks to harness newer, more sophisticated technologies while complying with a raft of regulation.

Although auto-generated data is not a new tool for many banks, it has proven particularly useful in recent cases where firms look to adopt new capabilities, similar to those of Netflix, Amazon or Google, that require vast amounts of data.

According to Giuseppe Nuti, head of algorithmic trading at UBS investment bank, replicating functionality that can, for example, recommend investment products to clients and understand user preferences involves the processing of huge volumes of data, a capability that big tech firms have in orders of magnitude more than investment banks.

In these cases, the synthetic data is used to compensate for the lack of testing data required to validate the technology to a comparable standard as that of Silicon Valley applications.

"We are talking tens if not hundreds of millions of users actively buying stuff or watching movies, versus a few hundred clients for a bank," Nuti says. "Even in the biggest of investment banks and for the most successful of its desks, we are talking 200 to 300 active clients. The statistical difference is substantial—hence the need for synthetic data."

Synthetic datasets are often based on vast amounts of reproduced historical data that includes insights or patterns that have already been identified. It is used to validate algorithms and AI-driven models, but only tests

Synthetic datasets based on huge amounts of historical data can be used to validate algorithms and AI models

against predictable outcomes or previously determined answers. Yet, Nuti says, the data is a crucial component in evaluating a broad set of functionality and sits at the core of UBS's development process.

"It is a necessary step that you need to take," he says. "It doesn't guarantee a solution because the world may not behave the way you thought it would, but it certainly ensures that if it does, you are able to pick that up,"

As one example, synthetic data has been incorporated into the development and testing of UBS's recommendations engine, which is used to suggest trades to its asset managers and hedge funds and to identify potential clients. Algorithms are trained to analyze user behavior and provide automated suggestions based on their activity. Synthetic data comes into play when the technologies are used to test patterns and offer analysis before using the algorithms on real client data.

Data Protection

In many cases, the reason for using synthetic data is tied to compliance and the need to avoid using client data for

testing solutions. As financial institutions are under increasing pressure to comply with global data protection and privacy laws, such as the General Data Protection Regulation (GDPR), they are having to take specific measures to adhere to cross-border data sharing and prevent client data getting into the hands of unauthorized users.

"When you have large reams of corporate client information such as we do, we have an obligation to respect the client around cross-border data sharing and there are very strict controls around that," a senior data executive at a tier-one bank says. "Instead, we are exploring how we can use synthetic data. So we can generate artificial data such as credit payments or whatever it may be and then use that for development use cases."

The bank is currently in the early stages of research and development on testing synthetic data compliance use cases. According to the executive, the adoption of cloud technology or cloud environments will prove extremely useful in generating and storing vast amounts of synthetic data in a more on-demand and efficient way in the future.

However, they add, while synthetic data can be very effective in testing technologies, it is not applicable everywhere. They say that for unpredictable anomaly detection, for instance, synthetic data can create its own issues.

"It doesn't work for all types of use cases," the data executive says. "It does help us when we are looking at historical pattern analysis, time series analysis and that sort of thing. If you are trying to do anomaly detection, you don't necessarily want to artificially generate data [for that use case] because it is almost as if you are planting an anomaly." wt

Battle Bots

Charting AI's Next Phase in the Back Office

Financial services firms are deeply entranced with artificial intelligence (AI), yet the revolution is under pressure as the industry continues to become more educated and selective about it. Recent research data from *WatersTechnology* and SmartStream seeks to separate the reality from the magic, presenting new perspectives on the extent of AI's adoption, its potential benefits, and its prevailing direction in the back office.
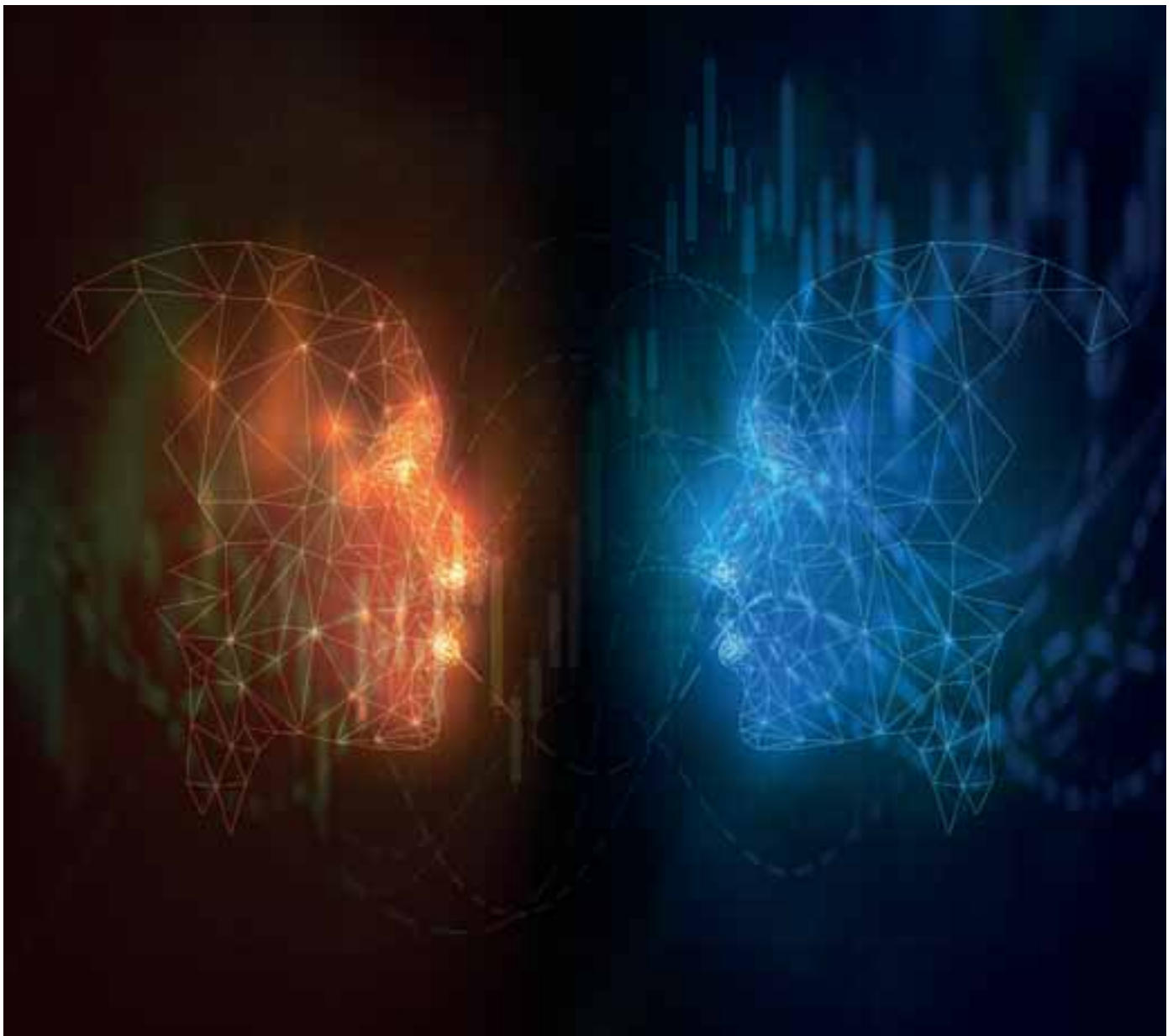
Every technological innovation has its time, when perceptions move from initial awe onto questions about how it actually works. Sometimes these little moments can be trivial—think of a virtual assistant misinterpreting a common idiom. Other times they are born of irritation, as when your GPS tries to reroute you—and everyone else—around a traffic jam, causing another one in the process. Often we come to these questions well after the fact. We have all posted to social media only to be bewildered by an ad derived from it immediately afterwards, with the realization that these networks were designed more for oversharing and data monetization than anything else. These inflection points aren't innately negative; on the contrary, they help us understand technology and frame users' relationships with it.

"

AI surrounds us now more than ever. Asking more questions of AI will raise its profile among financial institutions for the better, and though the back office lacks flash, it is the most logical space for investment banks and asset managers to begin the journey

In 2019, we are approaching a similar moment with artificial intelligence (AI). From curing disease to combating climate change and solving conundrums around driverless cars, there is a limitless allure to AI. It encompasses a broad umbrella of different techniques and applications, and many among them—from deep learning to robotic processing automation (RPA) bots—are attractive to financial services, where proponents point to cost and head count reduction as well as computational and efficiency gains. Now, several years into AI adoption and with the development of evermore sophisticated AI, firms are asking new questions: "How much competitive advantage does it really offer?", "Is it suitable?" and "Can its methods, biases and use

of data be explained under scrutiny?" Measuring these risks is no longer optional, as clients, board members and regulators become more familiar with the flavors of AI, and concepts such as explainability.

Partnering with SmartStream, *Waters Technology* gauged the industry on a range of important questions related to AI, with several salient findings about AI's growing presence in the back office. The study sought to determine the extent to which perspective on AI has changed, why financial services companies are ramping up its adoption, and what kinds of help—and in which areas—it can provide. Above all, the results found that both interest and expectations are on the rise. Whereas caution was once afforded because of AI's ineffability, today's decision-making turns upon almost the opposite approach: whether it can measure up.

Room for Growth
Ideas and concerns about social networks, geospatial services or virtual assistants generally grow out of market penetration. In 2019, these things are either indisputably ubiquitous, or seemingly so, and they are steadily doing the same for AI. Still, there are a couple of critical distinctions to draw.

First and most obvious, digitally native industries have far less work to do in integrating AI into core business processes. Global banks aspire to that description. But, being hundreds of years old, with tangles of legacy systems and employing hundreds of thousands of people makes AI adoption harder. Second, and equally important, tech firms are not nearly as tightly regulated as financial services—and rightly so. Relying on AI to surface your next Netflix suggestion invites far less risk than relying on it to rebalance a multi-billion-dollar institutional portfolio or initiate an exchange circuit-breaker after trading aberrations. The stakes are undeniably higher. Even if the enthusiasm for AI is spilling over, those stakes demand that financial services undertake more development and testing, ongoing monitoring and organizational transition—all of which require time and investment.

For those reasons, it is not shocking that finance's most vocal, all-in adopters of AI are small-shop hedge funds, while the story for banks and investment managers with far larger back-office operations is more mixed. Industry respondents were neatly split when answering a basic query about AI adoption in the back office: just over one-quarter (26.3%) said AI is live in their operations, and a slightly higher number (27.6%) said they are trialing AI at a proof-of-concept (POC) stage. Another one in five (19.7%) are considering a POC, while the final 26.3% said they have no plans to use AI at all.

Much can be read into those numbers. That 46% of respondents—nearly half overall—are only in early-stage considerations or forgoing AI altogether is telling. Whatever the genuine opportunity to benefit from AI, many firms are holding back. Meanwhile, the live environment result broadly aligns with previous research. For instance, a wider study by consultants McKinsey & Company in late 2018 found that AI adoption is around 21% across industries, though the study also noted growing traction in financial services—along with high tech and telecoms. Indeed, that strikes at the most important result: the highest overall share of respondents took up AI more recently, and are currently in POC. Many firms did their homework on AI, instead of jumping in for a first-mover advantage, meaning live environment AI will likely spike significantly by 2021.

Thirsting for Performance
Next, given adoption splits, it is reasonable to ask how AI can potentially impact the back office. Will it be truly transformative, broadly upending the back-office concept altogether? Will it drive toward back-office optimization as we currently know it? Or will it take on a lesser role, simply doing the "dirty work" incrementally faster and cheaper? These expectations matter. They not only define firms' engagement with AI, but could also explain why such a sizable minority of institutions aren't yet actively engaged at all. One of the

most common challenges with implementing AI adoption is selecting the right technique or application for its given purpose. It might therefore be less about a categorical, "up or down" question on AI, and more a matter of the options available and what they can and cannot specifically achieve.

Survey respondents made clear that they are thirsting for stronger performance, as nearly two-thirds (65.8%) noted more accurate processing, fewer errors and greater transparency as top-line impacts for AI. A smaller though still significant number (57.9%) expected reduced processing times, while exactly half believed AI will help redeploy personnel to higher-value tasks. The lowest responses, meanwhile, were more transformative in nature: greater straight-through processing (STP) at 46.1% and stronger support for AI-based applications elsewhere in the enterprise, only 19.7%.

What does this say about expectations, and what kinds of AI are most in demand? Both answers take on a Goldilocks quality. Above all, respondents want AI to be smarter, executing tasks with a lower error rate and greater process insight than legacy tech or human eyes. To a slightly lesser extent, they expect AI to do these tasks faster and with added organizational benefits. But they also view back-office AI as separate and contained, with fewer aspirations at broad STP initiatives—despite STP essentially being a back-office Holy Grail—or linkages to AI being deployed in the front office or by risk managers.

Instead, firms today appear to view AI as doing better as a "black box" at a solution level, rather than revolutionizing the enterprise in a structural way—which introduces more explainability questions and liability—or merely replacing older methods for rudimentary task completion. This reflects the fact that it is still early days for many firms' AI posture. Accordingly, most back-office AI implementations often target a middle technological ground as well, with RPA (bots) and machine learning—such as natural language processing—in the mix, if not a synthetic combination of both.

Two Sure Places to Invest

After having answered questions of "whether" and "why", the final piece of the puzzle is figuring out the "where". The back office hosts a rich stew of functions that are notoriously inefficient or just plain hard to solve, such as corporate actions. But that does not make all of them good candidates for AI—at least not yet. So many in financial services are picking their battles, with survey responses showing that two areas in particular are leading the way: reconciliations and compliance.

Both of these share a commonality of scale, with firms justifying the cost of the AI investment rather than going after the most historically sticky problems. When asked for areas of potential AI benefit, reconciliations led the way with a survey response rate of 75%, and compliance wasn't far behind at 73.7%. While each of these garnered an impressive majority at around three-quarters of participants' responses, the next pair—accounting (51.3%) and cost and expense management (50%) functions—landed only roughly half, while the final sets were still further behind: corporate actions with 39.5%, and collateral management at 36.8%.

In this instance, neither top-voted option is surprising. Reconciliations represent a multifaceted challenge of data volume and processing strength, and legacy systems in this area are often siloed, fickle and inflexible. Much needs to be done *post hoc* to scrub data or map reconciliation output to other internal platforms, and ultimately to report it. Furthermore, firms today are increasingly looking to incorporate unstructured data from off-exchange illiquid instruments, such as securities finance or collateralized debt, onto their master ledgers. AI can reasonably sit at any—or all—of these pain points, and generate significant improvement.

Much the same can be said for compliance, the breadth of which has exploded in recent years. Here the question is not only around interpreting unstructured data such as names and legal entities, and aligning these to lists or analyzing their activities for patterns, but to do so at speed and while documenting the process. It is an old

tale that great compliance provides little competitive advantage. But deploying AI to run these checks faster may do just that. For similar business benefit reasons, collateral management is certainly a favorite to rise from its spot at the bottom in the coming years, while corporate actions is less so.

> "
> From curing disease to combating climate change and solving conundrums around self-driving cars, there is a limitless allure to AI. It encompasses a broad umbrella of different techniques and applications, and many among them ... are attractive to financial services

Going into Battle

AI surrounds us now more than ever. Asking more questions of AI will raise its profile among financial institutions for the better, and though the back office lacks flash, it is the most logical space for investment banks and asset managers to begin the journey. As *Waters Technology*'s research has shown, significant opportunities remain for chief technologists and technology providers to convince the uninitiated of AI's benefits. Many institutions, likewise, are more carefully calibrating AI projects according to practical purposes—reaching beyond small efficiency gains toward greater impact while still exerting proper institutional governance and control. Finally, they have overwhelmingly identified areas ripe for AI progress that currently cost the industry billions of dollars in operational spend every year.

As AI continues to proliferate and financial services face new sources of potential disruption, firms will ultimately look for AI that can help them win in battle: tools that are cost-reductive, right-sized, armed with the apropriate techniques and capable of generating value where human eyes and toiling cannot. **wt**

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"It's deemed an alternative market because there is no real public market, and there is very little data. There is private market data… but you can't necessarily rely on that. It's an industry that is still relatively data-poor, even though it is better than it was five years ago."
Anthony Gahan, IPSX

» *see page 34 for full feature…*

"Believing that our data scientists will eventually be able to generate values through AI using our data without any access to open source is a lie."
Elvie Lahournere, Natixis Bank

» *see page 56 for full feature…*

"As chief innovation officer, anytime you're going through a transformation, you have to look at what assets you have in place today and what exists across the organization. Part of the formula is understanding what your customers and key stakeholders are looking for."
Souheil Badran, Northwestern Mutual

» *see page 22 for full feature…*

"[The machine] knows the payoffs from derivatives. But it knows nothing about Black-Scholes, it knows nothing about the deltas, gammas, vegas, and so on. It just does trial and error." **John Hull, University of Toronto**

Photo: Kristina Ruddick

» *see page 18 for full feature…*

"The industry is at a critical juncture in its efforts to define and adopt improved data and process standards. There is no commercial advantage to organizations developing and maintaining standards separately."
James Carlyle, R3

» *see page 64 for full feature…*

"So now you are adding Refinitiv, which has another three or four major businesses that themselves are relatively independent, because again they were bought together by acquisition. So there are an awful lot of moving pieces in this new entity that are in different businesses, in different markets; they are on different technology-specific management teams." **Mack Gill, Torstone Technology**

» *see page 52 for full feature…*

"We've synthesized the brain of a data scientist and built an AI algorithm that can choose between AI algorithms."
Darko Matovski, causaLens

» *see page 28 for full feature…*

"I think at some stage for buying and selling property, and especially for registering the title, blockchain would be very helpful. If you want to establish a 'real truth' or a distributed ledger, it's very good for that." **Annerie Vreugdenhi, ING**

» *see page 34 for full feature…*

"It would very much be a last resort on the part of the regulators. They wouldn't want to get to a position where they felt they had to directly [oversee] service providers because there would be massive resistance from the cloud providers, and it would be costly for the regulator to do so."
Paul O'Hare, Kemp Little

» *see page 68 for full feature…*

NEWSDESK

WatersTechnology's roundup of headlines that hit the wire this month from around the industry

Northern Trust Looks to Google for Pricing Engine

Google technology inspires project

Northern Trust has developed a pricing engine that uses machine learning and statistical analysis techniques to forecast loan rates for the securities lending market.

"For this project, our data scientists applied a time series algorithm to the problem of securities lending. Specifically, we have used some techniques inspired by Google technologies," says Chris Price, a specialist enterprise architect at Northern Trust.

Time series analysis harnesses machine learning and statistical tools for predicting future conditions based on past data. Northern Trust's algorithm uses market data from various asset classes and regions to project the demand for equities in the securities lending market. The firm's global securities lending traders can combine these projections with their own market intelligence to automatically broadcast lending rates for 34 markets to borrowers.

China Industrial Taps Bloomberg for Buy-Side

Integrated solution aids compliance

China Industrial Securities International Financial Group (CISI) has opted to use several of Bloomberg's buy-side solutions, including AIM, its buy-side order management system, Bloomberg Transaction Cost Analysis, Liquidity Assessment, and Bloomberg Vault, a cloud-based service for information governance, surveillance, and trade reconstruction.

Prior to using Bloomberg's buy-side solutions, CISI was mostly conducting its operations and risk practices manually. Eric Yip, head of trading for CISI's asset management business, says this included using spreadsheets and hours of laborious data checking.

"Since we were growing so fast in terms of our team, assets under management, and the types of asset classes we were investing in, we had to introduce advanced technology to streamline the process," Yip says.

In under two years, CISI has grown its team of four to more than 20.

"Compliance regulations for asset managers—especially those like us who invest in many types of assets around the world—have gotten so complex, it made little sense not to automate our processes," he adds. This is why CISI needed an integrated software solution.

Swift Develops API to Automate KYC Registry Data Consumption

API helps reduce manual KYC tasks

Swift has developed an API to automate its KYC Registry, with the aim of creating time efficiencies, particularly for large institutions.

Marie-Charlotte Henseval, head of KYC compliance services at Swift, says the API enables banks who consume information from the platform to automate and integrate that data directly into their back-office systems.

"Customers can use the API to automatically schedule the download of a correspondent bank's KYC profile. The data can then be stored directly into the customer's database and used to populate any data fields in the customer's client management applications," Henseval says. "The API eliminates the manual effort of logging into the KYC Registry, searching for a correspondent's KYC profile, opening it, downloading it and then storing it in a central place for further processing."

ICE Acquires Fixed Income Volatility Index from BAML

Intercontinental Exchange plans to increase the frequency of updates—from end-of-day to continuous intraday values—for a set of fixed income volatility indices that the exchange and data services provider has agreed to acquire from Bank of America Merrill Lynch. Officials say the more timely updates will be useful to investors who are watching the indices as an indicator of market sentiment.

Steele Buys Osprey to Build One-Stop Compliance Shop

Compliance software provider Steele Compliance Solutions has acquired Osprey Compliance Software to create a one-stop-shop for both external and internal compliance and risk management needs to better meet the increasing compliance demands of clients. Steele will now offer Osprey's array of technology that tracks conflicts of interest, policy management, whistleblowing and incident management, in addition to its anti-money laundering monitoring and third-party risk management platforms.

Bloomberg Expands Regulatory Reporting Suite with RegTek Buy

Bloomberg has acquired regulatory reporting software provider RegTek.Solutions to expand its services to multiple jurisdictions and cover more regulatory requirements. With the purchase, Bloomberg aims to offer more regulatory reporting around EMIR, Mifid II and Dodd-Frank, as well as for regimes of the Monetary Authority of Singapore and the Australian Securities and Investments Commission, by Q1 of next year.

Machine Learning Takes Aim at Black–Scholes

Quants are embracing the idea of 'model-free' pricing and deep hedging. By Nazneen Sherif

In 2008, a team of quants at JP Morgan set out to automate the hedging of one of the firm's derivatives portfolios. The effort was quickly abandoned. The hedging strategy—which relied on computing risk sensitivities, known as Greeks—required constant manual adjustments to account for transaction costs and other market frictions, which are not captured in classical quantitative models.

Some years later, they tried again, this time using machine learning. The new system eschews conventional modeling techniques such as Black–Scholes and replication—what quants have been doing for the past 45 years—in favor of a purely data-driven approach.

The results will surprise no one familiar with recent advances in the field of artificial intelligence (AI). The machine-learning algorithm far outperformed hedging strategies derived from existing models.

JP Morgan began using the new technology to hedge its vanilla index options books last year and plans to roll it out for single stocks, baskets and light exotics next year. Bank of America, Societe Generale and Standard Chartered are exploring similar applications of the technology.

Hans Buehler, global head of equities analytics, automation and optimization at JP Morgan, was one of the co-authors of a recently published paper on deep hedging. The research is part of an ambitious project at the bank aimed at using machine learning to hedge positions multiple time-steps ahead. Buehler has discussed the research in a series of talks, and in a podcast with *Risk.net*, which have captured the imagination of quants.

"I listened to [a talk by Buehler] … and I got pretty excited about it," says Mark Higgins, COO and co-founder of Beacon Platform, a New York-based financial technology vendor. "The right way to think about it is that it's addressing some of the weaknesses in the current way people approach derivatives pricing. Rethinking it from first principles, really."

Higgins was co-head of JP Morgan's quantitative research team until 2014.

Deep hedging is already being heralded by some as a breakthrough in quantitative finance, one that could mark the end of the Black–Scholes era and usher in a future of "model-free pricing."

"This is something I have argued for several years now," says Alexei Kondratyev, head of the data analytics group at

> "Once the network is trained, any subsequent pricing function call is almost instant. So instead of building a model, calibrating the model, and then using the model for pricing, we can spend some time learning the approximation, but then we have pricing effectively for free."
> **Alexei Kondratyev, Standard Chartered**

Alexei Kondratyev
Standard Chartered

Standard Chartered. "The future is working with data directly, with empirical distributions directly, rather than trying to invent a new parametric model every time and fit it to historical data."

At JP Morgan, that future has already arrived. Several other financial firms, including Bank of America and Societe Generale, are getting there.

"We are growing in this direction," says Daniel Giamouridis, global head of scientific implementation in the data and innovation group at Bank of America. "The plan is to engage as much as possible within the business with these techniques."

The bank began testing the application of machine-learning techniques for hedging complex, cross-asset portfolios a few years ago. The benefits were

deemed to be "economically material enough" to justify its use. "The trade-off between complexity and advanced modeling, and the benefit obtained, makes it worth pursuing this methodology versus something that is more linear," Giamouridis says.

Societe Generale is already using machine learning to pick stocks for its quantitative investment strategies. "Machine learning is a big topic for us," says Sandrine Ungari, the bank's head of cross-asset quantitative research. "We have looked at it quite a lot from an underlying perspective. We do have a machine-learning algorithm that runs for picking stocks. We are looking at a wide range of fundamental data on corporates, like balance sheet data, earnings data and analyst sentiment data."

Hans Buehler
JP Morgan

"The next step is in applying machine learning for having a better hedging strategy when selling options systematically," she says.

Technology firms both old and new are also getting involved. IBM is working with a group of banks, hedge funds and pension funds to test a machine-learning system for hedging equity portfolios using options. Donna Dillenberger, a fellow at IBM in New York, says clients involved in the project saw accuracy improvements of 25% to 30% compared to classical models, while the reduction in hedging costs was in the double digits.

Beacon Platform is trying to apply deep hedging to commodities and variable annuities. The company estimates the technique could reduce the cost of hedging some commodity exposures by as much as 80%.

The use of machine learning for pricing and hedging has big implications for the way markets and traders operate. A senior structurer at a European bank says the concept of a mid-price—the average of the bids and offers in the market—is "dead" if banks adopt data-driven pricing. Each bank would quote its own price, based on the information available to it. And that price could vary considerably if banks use proprietary or alternative data sources.

Traders will also need to learn new skills. "People who today spend their time adjusting for the deficiencies in classical Greek-type models now need to understand how the statistics work," Buehler said in the *Risk.net* podcast. "If the machine proposes a trade that may not be intuitive, the question is why? The traders need to be able to

understand how the machine comes up with a particular answer, and if they believe the answer is wrong, how do they adjust this?"

JP Morgan is training its staff to use Python and has made Jupyter notebooks—a web application that is used to create and share data analysis—available to trading desks.

How Deep Is Your Hedge?

The Black–Scholes model—developed in 1973—has been the de facto standard for pricing options and other financial derivatives for nearly half a century. Traders value their puts and calls by entering five variables—the price and volatility of the underlying stock, the strike and expiry of the option, and the risk-free rate—into the model.

The formula can be used to calculate the so-called Greeks, an option's sensitivities to various risk factors. With this information, it is theoretically possible to create a perfect hedging strategy that eliminates all risk in a portfolio of options.

For all its elegance, Black–Scholes is far from perfect. It assumes price moves are random and normally distributed, and that volatility remains constant over the life of an option. Market frictions such as transaction costs are ignored.

These simplifying assumptions, which are inherent in classical models like Black–Scholes and the Heston model—

another popular stochastic volatility model—have long troubled quants.

"As a quant for investments, I really care about the real dynamics of prices," says Societe Generale's Ungari. "We have seen in the past these classical models being challenged by market participants. There have been cases where you had huge market disruptions, huge volatility in the market, and classical models failed to provide accurate hedging of books of options. We have seen environments where classical models such as Black–Scholes and Heston failed

> "We have seen environments where classical models such as Black–Scholes and Heston failed to prescribe the right hedging strategy. This is something as a quant investor you are very much aware of."
> **Sandrine Ungari, Societe Generale**

to prescribe the right hedging strategy. This is something as a quant investor you are very much aware of."

The failure of classical models to fully explain the behavior of asset prices has inspired a huge body of academic literature on "incomplete markets," which explicitly accounts for market frictions and other real-world constraints.

However, the sheer amount of data required, and the number of competing explanations for empirical asset price moves, made it difficult to put these theories into practice in a standard way.

Buehler has described deep hedging as an application of the theoretical understanding of incomplete markets with machine learning. The idea is that by relying exclusively on empirical, data-driven analysis, rather than simplified assumptions and approximations, it is possible to create more robust and realistic simulations of markets that evolve over time.

"Machine learning allows us to, first of all, consider a broader set of possible risks or possible factors that can formulate the overall risk of these portfolios," says Bank of America's Giamouridis. "It allows for the modeling of more complex interactions, and enables us to generalize better, resulting in potentially better accuracy on unseen data, out of sample. They are also more robust against situations where the factors happen to be closely related."

In their paper, Buehler and his colleagues modeled hedging strategies using neural networks, a type of artificial intelligence that can learn to perform complex tasks by identifying patterns and relationships in large volumes of data.

The system is first programmed to recognize information relevant to hedging. These so-called feature sets include not only the prices of hedging instruments but also trading signals, news analytics and past hedging decisions—the sort of information a human trader might use to formulate a hedging strategy.

The algorithm teaches itself to hedge by studying this information. It runs statistical regressions to find patterns and relationships between different variables, and extracts rules and strategies from these observations.

"The respective algorithms are entirely model-free," the authors write. "This means we can include market frictions such as transaction costs, liquidity constraints, bid/ask spreads, market impact, etc."

Finally, a technique called reinforcement learning is used to train the machine, through a large number of

simulated trades, to find the best possible hedge in any given scenario or market environment.

"If you have something you want to hedge, you give the machine a lot of data and it learns," says John Hull, professor of derivatives and risk management at the University of Toronto's Rotman School of Management. "It knows the payoffs from derivatives. But it knows nothing about Black–Scholes, it knows nothing about the deltas, gammas, vegas, and so on. It just does trial and error. The way this learning works is, you develop a strategy and then you improve on it and improve on it."

Beacon Platform is applying these techniques to find optimal hedges for commodities and variable annuities. For instance, a company that uses natural gas storage facilities could hedge its exposure to commodity prices at the storage location, where costs might be high, or take some basis risk and hedge at a more liquid location. Deep hedging could be used to figure out the optimal distribution of hedges between these locations.

The research is still at an early stage, but Higgins says it is already attracting interest from commodity firms. He estimates that for natural gas storage, deep hedging could lower transaction costs by 50% to 80%, depending on the market structure, while reducing hedging errors by 50% to 90%.

Higgins says the same techniques could also be used to more accurately hedge variable annuities sold by insurance companies, which carry hard-to-hedge risks such as mortality and early redemption.

Monte Carlo, Fast

Deep hedging is one of several applications of machine learning in derivatives markets. Another promising use-case is pricing more complex instruments that typically require cumbersome Monte Carlo simulations, where a product is valued thousands of times under various scenarios to arrive at an average price.

Standard Chartered's Kodratyev gives American options as an example. Unlike European options, which have a fixed expiry and can be priced using Black–Scholes, an American option can be exercised early. This means its value is dependent on a number of factors that evolve over time, such as the price and volatility of the underlying, and when the option gets exercised. To price these options, a bank would run thousands of scenarios in a Monte Carlo simulation, which can be time-consuming and computationally intensive.

With machine learning, a neural network can be trained to do most of this work ahead of time. It can then be used to price derivatives in real time when the products are being traded or risk-managed.

"Normally, when we run a Monte Carlo simulation, we need to first generate new scenarios and then we would need to revalue payoffs on these scenarios [which] can be quite time-consuming," says Kondratyev. "[With machine learning], once the network is trained, any subsequent pricing function call is almost instant. So instead of building a model, calibrating the model, and then using the model for pricing, we can spend some time learning the approximation, but then we have pricing effectively for free."

The University of Toronto's Hull says machine learning may be able to approximate Monte Carlo results one to 5,000 times faster than current methods. Standard Chartered is currently researching the use of machine learning for this purpose.

Kondratyev says machine learning could also be used to improve value-at-risk (VaR) calculations, which provide an estimate of how much a portfolio might lose with a given confidence level over a certain period of time. VaR modeling is hampered by sparse data. At a 99% confidence level, only 1% of losses over an observation period should exceed VaR—so in a year with 250 trading days, there will only be 2.5 relevant observations, which is not enough for an accurate reading.

"When the 99th percentile of the portfolio value change is calculated, the error in VaR numbers can be huge," Kondratyev says. "It can easily be 20% higher, or 30% lower because there is only one particular realization of history and really a small number of data points."

He says machine learning can solve for this problem by generating "synthetic" data. An algorithm could be trained to study the available data and then create new distributions with similar features. This way, there would be more data points to model VaR.

"If a machine can learn an empirical distribution and generate more samples from this distribution, then you can have as many samples as you wish," says Kondratyev.

The same principle can be applied to approximate sensitive client data. If the synthetic dataset cannot be linked to a particular client or portfolio, it will no longer be considered sensitive, and can be used by quant teams for modeling purposes.

"We can't share client data at all, even if we try to anonymize it," says Kondratyev. "But if we can generate synthetic data—data that comes from the same distribution, but is not real—then this becomes a dataset we can share. We can perform analysis on this data without breaching any restrictions or compromising on privacy." wt

Editor's Note: This article has been condensed for print. To read the full story, go to waterstechnology.com/4488371

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"[The machine] knows the payoffs from derivatives. But it knows nothing about Black–Scholes, it knows nothing about the deltas, gammas, vegas, and so on. It just does trial and error."
John Hull, University of Toronto

Souheil Badran has found his way from Alibaba's unicorn startup Ant Financial to Northwestern Mutual, which was founded in the 1800s. His experience in a more agile environment is an asset to the buy-side shop, which is currently undergoing a digital transformation. By Emilia David with photos by Timothy Fadek

Here's how it all started

for Northwestern Mutual: As the story goes, on the morning of November 1, 1859, a train traveling from Fond du Lac, Wisconsin, to Chicago collided with an "ornery white steer" outside of Johnson Creek. The train derailed, falling into a ditch, killing 14 passengers and injuring dozens more. Two of those killed were policy owners with the Mutual Life Insurance Company of the State of Wisconsin, the precursor to Northwestern Mutual.

The claims totaled $3,500, which was $1,500 more than the two-year-old, Milwaukee-based company held. Samuel Daggett, then-president of the firm, and his fellow trustees borrowed money to make up for the shortfall.

This is all to say that Northwestern Mutual is an old institution, with old traditions, and old—or legacy, to use the polite term—systems. That's where Souheil Badran comes in. Badran, who moved to Milwaukee in the 1980s from Lebanon, received his MBA in 1997 from Cardinal Stritch University, which is about a 15-minute drive north from Northwestern Mutual's headquarters on East Wisconsin Avenue.

He joined the insurance company in January 2019 after two years at Ant Financial, which originated from Alipay, an Alibaba affiliate based in Hangzhou, China. Ant Financial, which serves as the payments arm of internet juggernaut Alibaba in America, could not be more different than the 162-year-old Northwestern Mutual—the startup raised $14 billion in a 2018 funding round, and its valuation was once larger than Goldman Sachs. Badran, who served as president for the Americas, helped launch the firm in the US.

But Northwestern Mutual offered an intriguing opportunity for Badran—a chance to revolutionize a respected-yet-aged institution as its chief innovation officer.

In this role, he is now working toward a full digital transformation of the insurance and asset management company by leveraging his experience in the fintech startup world. His extensive technology and innovation experience brings a fresh perspective to a traditionally staid market.
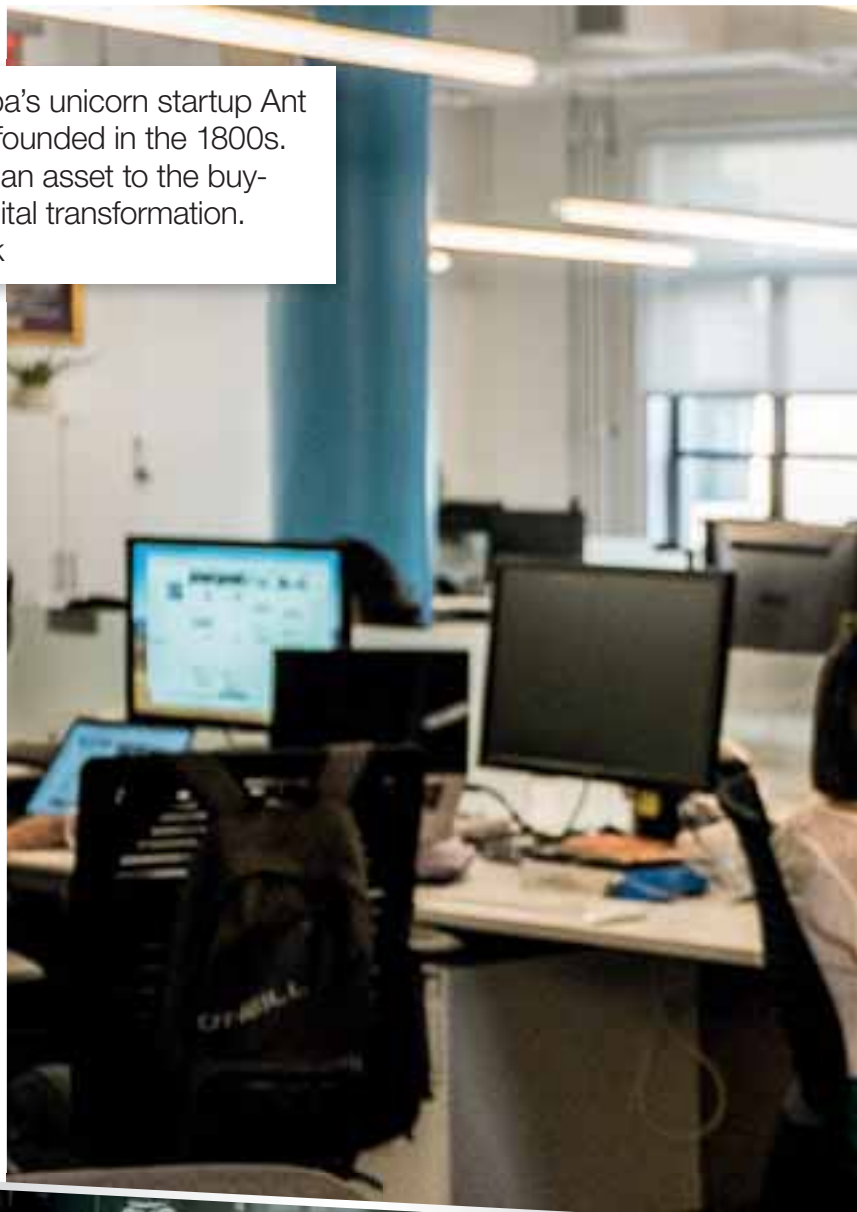
Old & New Up North

Souheil Badran

Before the innovating could begin, though, Badran says he first had to take stock of the legacy systems at Northwestern Mutual and figure out how to best approach digital transformation.

"As chief innovation officer, anytime you're going through a transformation, you have to look at what assets you have in place today and what exists across the organization. Part of the formula is understanding what your customers and key stakeholders are looking for," Badran says. "For example, we want to provide easy access to services for our clients and our Northwestern Mutual financial advisors. As companies decide how to modernize and transform, they need to consider what components of legacy systems need to stay in place. It could be easy sometimes to say, 'let's move everything to the cloud,' but you need to again assess [whether or not] that's the best decision to achieve your goals."

Northwestern Mutual, which reported $128 billion in assets under management in 2018, is now changing its legacy infrastructure to support new systems. It is focusing on two different aspects of technological change. First, it is leaning more heavily on cloud-based tools and platforms. Second, it is investing in startups through a $150 million venture fund that is part of its larger plan around technology.

Badran is no stranger to new technologies. As president of Ant's US operations, Badran gained a peek into a unicorn startup environment where innovation was *de rigueur*. And it allowed him to blend his interest in finance with that of technological innovation.

"What got me interested [in finance] was that I was always interested in how to make money—how people make money and how companies make money. I started my career as a developer many years ago in financial services around cash management," he says.

He adds that he was more of a techie when he was younger, but with the years he spent in the industry, he's learned to balance the needs of both technology and the business.

After beginning his career in fin-tech, he decided to explore another technology sector and moved to security firm Verisign in 2000, where he was vice president and a general manager, before leaving in 2007. Badran says working at Verisign showed how important privacy is to clients and to financial services, so he wanted to marry both in his work. After his stint at Verisign, he moved back to the world of financial technology in senior roles at First Data Corp an Digital River, before joining credit card platform provider Edo Interactive as president and CEO, then moving to lead Ant Financial and eventually to Northwestern Mutual.

Fail Fast

Badran admits that what he brings to the table is a more agile perspective when it comes to tech development. With his background in a fail-fast company, his

experience in a less constrained environment goes a long way towards his support of cloud. Beyond that, his team is also looking at how artificial intelligence (AI) can help improve customer service.

Since Northwestern Mutual is primarily an insurance company, with wealth and asset management components, a lot of its innovations are geared toward insurance clients. As such, it has begun implementing AI in its call centers for personalized services, but has also used the technology for improved underwriting, claims processing, fraud detection, and lead generation. The company is also developing APIs to easier integrate with other partners.

"We're driving collaboration between the business, technology, and innovation teams to ensure that we are aligned about where we need to be 18 to 24 months from now. Over the last five years, Northwestern Mutual has been on a path to transform the way people experience financial security," Badran says. "Now I'm able to introduce the kind of expertise I bring, which is a more agile mentality. We need to be able to try fast, fail fast and keep on going—nothing can slow us down. I think of it as techfin versus fintech. That's the kind of mentality I'm bringing into the Northwestern Mutual teams across both innovation and technology, and really across the enterprise."

Much of the focus for Badran and his team is on figuring out how technology can help their next generation of clients feel more connected to the firm. It is not just about bringing the company to the modern era, but also ensuring its clients interact with the organization in the manner they most feel comfortable with. Badran notes that many wealth and asset management clients feel like they don't need constant handholding from a portfolio manager, so Northwestern Mutual is developing tools to help guide more DIY-oriented clients to manage their own investments and use AI to better detect when a manager can step in.

Separate but Together

Northwestern Mutual differentiates between its technology and innovation teams, with both working together but not under the same umbrella. This was one of the distinctions Badran found very attractive in the company and one he will continue to foster.

"One of the things I'm really proud of with the team is that we never do things in a vacuum, and there is constant interaction between the clients, our financial advisors, and our teams internally. It's an ongoing process, so when we're developing a new set of solutions, we get input directly from

our users," Badran says. "We also do roundtables with our clients to make sure that what we're developing can meet our needs and is satisfactory to what they would be looking for from Northwestern Mutual."

By separating the tech and innovation units, it lets the innovation team remain focused on actually innovating, rather than worrying about the day-to-day nuts and bolts of the organization. And since they still work closely together, feedback coming from different departments to understand what needs to be added or fixed becomes integral to the process.

Though he believes technology is now driving finance, what he doesn't forget is that institutional knowledge is an important part of being successful. This institutional knowledge brings with it an understanding of the technology's users and how they will react to the user experience.

Developing Talent

While the company is in the process of transformation, Badran says his ultimate goal is to get this change culture ingrained into the firm.

"You can only transform for so long—at some point, it must be part of your business. Northwestern Mutual's transformation is now a part of the business, and part of that is the collaboration between technology and the business," he says.

One of the biggest projects of Northwestern Mutual is one Badran is deeply passionate about—investing into the technology talent of Milwaukee.

Northwestern Mutual is not just about trying new technology for itself; it is also aiming to invest in startups in the hope that it will be a customer of them, or even a partner. Most of all, it wants to create an environment where it can pull not just technology

but talent as well. With its venture fund, it invests in startups developing technology for Northwestern Mutual's different business lines. Badran says the fund has already invested $35 million for 15 initiatives. This is the second venture round for Northwestern Mutual—in 2017, it backed 14 companies and invested $43 million.

The firm also helped to create the first data science institute in Wisconsin, which is shared by the University of Wisconsin–Milwaukee and Marquette University. Northwestern Mutual pumped $40 million into the institute, and the first class will begin in the fall of this year.

Badran says the investment is not just to put money back into the community that has hosted the firm for years, but also to develop a larger talent pool it can tap as data becomes a larger and larger part of all functions of Northwestern Mutual.

"We're excited because we're helping grow that next generation in terms of innovation and education around these services, [and] within the community as well," Badran says. "In our business, everything is about data. Understanding the data you have is critical, and what additional data you can complement it with gives you the ability to drive analytical tools and outcomes that can help shape the business and drive it forward. You're not just looking to outsource—it's really building the talent within the organization."

The company also partnered with other Milwaukee-based firms including Foxconn Technology Group, Aurora Health, and Johnson Controls for the Wisconn Valley Venture Fund, which aims to invest in and attract technology companies to open offices in Wisconsin. Northwestern Mutual put $25 million into the venture. The

> **"In our business, everything is about data. Understanding the data you have is critical, and what additional data you can complement it with gives you the ability to drive analytical tools and outcomes that can help shape the business and drive it forward."**

goal of the fund is to make Wisconsin into a global technology hub.

For Badran, this means he can bring some of the fast-paced nature of New York and Silicon Valley that he misses to the city he loves. He says the hustle and bustle of the more traditional centers of finance and technology gets him inspired and he'd like to see a lot of that talent grow in Milwaukee. After all, one of the reasons that tipped his decision to join Northwestern Mutual was the fact that it's based in

Milwaukee, where he and his family have lived for years. He's excited about the possibility of bringing some of the excitement of technology and financial hubs to his hometown, and coming from a person who is at the office at 7:30 am after a workout, it seems his go-getter personality fits very well into the environment he's trying to create.

"I'd love to see the investment in Milwaukee boosted even more and that's why we're spending time, money, effort and resources on our innovation labs and data science," he says.

Badran may have come from a more agile background, working for one of the hottest fintech firms in recent years, but it is his passion for innovation and transformation that's kept him moving. His innate interest in understanding how change can filter through a firm lets him remain plugged into the needs of Northwestern Mutual's customers. wt

The Rise of the Robot Quant

The latest big idea in machine learning is to automate the drudge work in model-building for quants. By Rob Mannix

It was always a matter of time before machine learning experts designed algorithms to do their work for them.

Called automated machine learning, the latest breakout in artificial intelligence (AI) has already made inroads in investment management. At its most spectacular, the new tool can spin out hundreds of thousands of models in minutes—a celerity that has intrigued experts. Buy-siders like Allianz Global Investors and Franklin are already using the technology, while others, RAM Active Investments among them, have built their own autonomous systems in-house. One vendor pushing the software says it's like "a data scientist in a can."

In broad terms, the systems "wrangle" data—that is, fill in gaps in the data in the most apt way—pick out the variables of greatest influence on what's being modeled, select from a "recipe book" of algorithms to build a suite of models, test these on out-of-sample data, then rank them by effectiveness. Some platforms will even keep an eye on live models and alert users to any changes that call for an upgrade.

"We've synthesized the brain of a data scientist and built an AI algorithm that can choose between AI algorithms," says Darko Matovski, a co-founder of causaLens, a start-up that began selling its product last year.

But many quants are skeptical, mostly because the usual flaws of machine learning could be amplified by software that does such immense amounts of work and moves at a blur. Yet it's the very speed of the approach that few can afford to ignore.

A Trillion Choices

The robot quants are being set loose on complex tasks. Wrangling data might mean, for example, choosing whether to replace missing information about a company with the industry average or a sectoral average—or removing the field entirely.

Then there is plucking variables from the data and turning them into trading signals—so-called feature engineering—which would usually be done by data scientists through "exploratory analysis," or testing things to see if they work. It's more conjecture than science.

Matovski says the robot quants can do a better job.

"If you have a hundred inputs to choose from, selecting five already means you have billions of permutations. A thousand inputs means you're in the trillions," he says. Humans are at a distinct disadvantage. "Testing one combination can take a few weeks. What data scientists do is make a selection and hope for the best," he adds.

When it comes to building a model, quants choose from a dozen families of machine learning algorithms, each with a dozen more hyper-parameters to be "tuned," such as the number of layers in a neural network, or the number of branches on decision trees in a random-forest algorithm. And that's before considering the possibility of combining models.

Getting More Out of the Quants

At Franklin Templeton, the fixed-income team has been using machine learning vendor H2O.ai's "Driverless AI." The product builds machine learning models that estimate the default risk of underlying loans in fixed-income assets, like mortgage-backed securities.

Franklin's conversion came about following an acquisition. In early 2018, Franklin bought a machine learning credit investment firm that was using H2O to analyze credit risk on small loans, explains Tony Pecore, a senior data science expert at Franklin. "We really appreciated how they combined machine learning methods into their investment process," he says.

Now Franklin wants to use the tool to predict bond defaults and model cash-flows on other types of loans, he says.

H2O and other established vendors like DataRobot are prepping to expand their sales on the buy side.

And in June, Mind Foundry, a company launched by Stephen Roberts and Michael Osborne of the University of

> "How many asset managers are thinking about automated machine learning? All of them." Ayan Bhattacharya, Deloitte

Oxford, started selling an automated machine learning product targeted at non-experts that requires little guidance.

At its extreme, the idea is to build a product that requires no guidance whatsoever. CausaLens compares its system to a "virtual army of data scientists" and claims it can process data, and build and test "thousands" of machine-learning models to find the optimal model "at the press of a button."

A survey across industries by Deloitte Consulting found that nearly half of companies that were early-adopters of AI were already employing automated machine learning tools. As for firms in investment: "How many asset managers are thinking about automated machine learning?" asks Ayan Bhattacharya, an advanced analytics specialist at Deloitte. "All of them."

Elsewhere, buy-side firms are building their own autonomous systems.

Swiss investment manager RAM Active Investments has opened a fund that uses a proprietary automated process to build hundreds of thousands of possible models across asset classes. From those, it selects the best ones

using "genetic" algorithms that mimic biological evolution.

"Out of hundreds of millions of possible strategies, 99% are bad strategies, noisy strategies, lucky strategies," says Maxime Botti, the firm's systematic equity fund manager. "But there are some that are good. Our job is to filter out the noise." He adds, "That was not possible five years ago."

RAM's genetic algorithms rank an initial set of models based on known investment approaches like trend following, combine the features of the best ones to create a new generation of models, but with a controlled level of random mutation in the individual features, and repeat the process through hundreds or thousands of iterations. The fund is seeded with $60 million of the company's own money and is on the road being showcased to possible investors.

Doing More, Faster

Data-driven strategies, as well as more mundane model-building, involve an ample amount of computational grunt work. Next to it, the logic of automated machine learning is plain.

Jeremy Achin and Tom de Godoy came to launch DataRobot in 2012 after tiring of rebuilding machine learning models over and over when the two ran the data science division at Travelers Insurance in the US.

Roberts and Osborne came up with the idea for Mind Foundry after having

Darko Matovski
causaLens

The model that 'reincarnates' itself

Quants who cut their teeth at the Man Group and Edgestream Partners have used the principle behind automated machine learning to create a model that refashions itself to changing markets—by constantly destroying and rebuilding itself.

Darko Matovski and Maksim Sipos's machine—the causaLens Predictive Unit—operates as a virtual quant, constructing models to predict anything from the price of oil to the outlook for inflation. Users have only to load the data and "press a button," says Matovski.

The system—a machine learning model that has learned to build machine learning models—has been trained over two years using proprietary data, running "billions" of possibilities. "We don't count how many," Matovski says.

Its creators say the causaLens machine solves one of quants' biggest headaches: how to build models fast enough to keep up with markets that are in constant flux. The machine eliminates the unending routine of revamping or replacing models, which can leave buy- and sell-side traders operating "blind" for months as they await the next upgrade, Matovski says.

"It's a live model," he states, while conventional, static models "drift" out of date as markets fluctuate. The causaLens machine "reincarnates itself" continuously, he says, rechecking whether the model it has built is the most optimal in light of new data coming in. Matovski compares it to a watch that keeps on ticking once it's wound.

To protect against the pitfalls of over-fitting and data-mining in automated machine learning, the causaLens machine delivers a prediction with a "certainty score" and shows clients the

algorithms used and how any data inconsistencies were handled, Matovski says.

An additional feature lets users try out new datasets in order to find the most valuable. The machine creates two "armies" of virtual data scientists, Matovski says, and gives one data with a new element—satellite data of natural gas shipments, for instance—but not the other.

Both armies build "thousands, even millions" of models "and you see whether the one with the additional data did a better job of predicting than the one without," he says. "It's similar to a double-blind randomized clinical trial where you give one group a placebo."

The company, whose advisory board includes the former head of trading at Bridgewater Associates, started selling the technology late last year. Clients include a $20 billion US hedge fund and a $100 billion investment manager, though Matovski declines to name them or disclose how much the technology costs. Allianz Global Investors, with €535 billion under management, has said it uses the platform.

Matovski's very first venture was arbitraging foreign exchange rates by pedalling his bike between currency exchange bureaux to cash up money in hyperinflation-wracked Macedonia in the 1990s. He was seven.

Now, he and his partners see big money to be made in licensing the technology, more than in running a fund that uses it. The amount of assets causaLens could manage in a given strategy would be limited, Matovski says, unlike sales of the technology, which could be put to work in a myriad of other industries.

"The richest man in New York City is Michael Bloomberg," Matovski says. "Not the hedge fund managers."

to repeatedly bone up on domain expertise when they worked on machine learning jobs in fields they knew little about. Their idea was to build a tool to "democratize machine learning" to help laymen use it themselves, says Charles Brecque, part of the firm's leadership team.

In other industries, automated machine learning is already being used to predict things as varied as the demand for taxis or bad drug reactions. Retail financial services have found uses for it: H2O gets half its revenue from predominantly retail banks like Capital One, Citi and Wells Fargo.

And in investment, automated machine learning promises to help quants do things they couldn't before, and things they could—faster.

"The day-to-day life of a data scientist is poring through datasets trying to augment them with additional data and to find the best model possible," Franklin's Pecore says. The auto machine learning super-charges that. "We can build more models faster and get more lift out of the current models we're using."

He adds that "tackling the problems we're studying now wouldn't have been feasible without it," noting that for discretionary managers the approach could increase the number of investment decisions an analyst can make in a day.

At RAM, the firm's quants took a year to build its first model; today, its platform builds and tests 250,000 models in under two minutes. That means the firm can do a "grid search" of 15 strategies applied across 100 assets with different hyper-parameters to select about 100 that perform best in back tests, Botti says.

Because the platform is trying many more models than a human quant could, it can find trading patterns that diversify the well-worn strategies common at other firms, says Botti. RAM sees this as its competitive edge.

"There is really no magic in the signal—the magic is in the process," he says. Some think automation could solve a longstanding problem facing quants—how to build models fast enough to keep pace with changing markets. At causaLens, Matovski's model rewrites itself automatically as new data arrives in the system (*see box on p. 29*).

Elsewhere, robot quants are whirring through tasks just a step removed from making investment decisions. Mind Foundry has several quant-fund clients that use its product for what Brecque calls "machine assisted idea generation."

"They can prototype ideas quickly," he says. "They can validate their thesis about whether a strategy works, then refine it, then take it outside the platform and implement it in their own production environment."

Even discretionary investor clients are using the tool to select subsets of companies to focus their fundamental analysis on, he adds.

Don't Try This at Home

With all their flash, these tools could look like easy money-spinners to the untutored. But used improperly, the software could be a trap, concocting models that are vulnerable and leaving a manager unaware of their exposure, some warn.

"Many of the tools are so easy to use that individuals might not make the right decisions about how to tune them," says Andrew Chin, chief risk officer and head of quantitative research at AllianceBernstein.

those assets, the methods have to be different. We haven't lived through enough market cycles, and we don't have enough datasets to say which parameters are the right ones."

Amateur data scientists armed with an automated tool could also be naïve to the weak spots of their own creations, critics warn. Only by carefully going over data do scientists become aware of the gaps that could send a model flying in the wrong direction. The outliers in a dataset, for example, might be errors, or they might reflect the sorts of rare but extreme market events that can punish systematic strategies.

One quant puts it bluntly: "Research cannot be automated. Insights come through careful analysis of data. There is no royal path to discovery."

Drivers Needed

But automation's supporters say the skeptics are missing the point: The robot data-scientists won't replace their human counterparts. Demand for quants is too great at present for there to be any threat to their livelihoods. And even as the machines chew Pac-Man-like through the computing work, they need minders.

"

> **"Out of hundreds of millions of possible strategies, 99% are bad strategies, noisy strategies, lucky strategies. But there are some that are good. Our job is to filter out the noise."**
> **Maxime Botti, RAM Active Investments**

For instance, in a deep learning neural network, quants have to judge how many layers of neurons to include. Out-of-the-box tools will likely include default settings, but the choice should depend on the problem in hand. A model too complex for the data it feeds on could extrapolate general rules from what might be no more than random patterns.

"Stocks are different from credit or currencies. There are fewer currencies, a lot more stocks, a huge number of bonds," says Chin. "Depending on the problem and the correlation structures and the performance patterns of each of

Vendors underscore that their products will help quants, not sideline them. H2O says it has a quarter of a million data scientists using its products, including many open-sourced machine learning algorithms.

In the best instances, domain specialists are fully in charge of the way automated machine learning is applied, says H2O CEO Sri Ambati.

"If you have an airplane, you still need to know where to go. You can fly to New York or you can drive to New York," he says. "Flying's faster. But you'll still need a pilot."

Pecore agrees on the need for domain-experts to avoid coming up with "phantom conclusions." At Franklin that works fine, he says.

"We've got younger data scientists building models shoulder-to-shoulder with asset managers who've been around for 20 years," Pecore says. "The data scientists gain domain expertise, and the veterans see their wisdom leveraged."

Despite his reservations on algorithm mistakes in cleaning up data, Chin at AllianceBernstein concedes they also see problems a person could miss. That happened at AB recently when it took weeks to realize some UK prices in a large dataset had been inadvertently quoted in pence rather than pounds, sending its research skidding off track.

At the same time, many of the problems auto machine learning can tackle are simple enough that the risks are small, its supporters argue.

Early asset management use cases are often similar to problems already being solved in other businesses, like forecasting next quarter's sales. In investment, that process would be used to create a trading signal; in another industry, it could go to planning production or warehousing.

DataRobot is working with an asset manager to forecast fund flows so as to stay fully invested and avoid excessive cash balances that dilute returns. In another project, DataRobot worked with a buy-side firm to forecast international cash transfers. Non-investment teams often face these simpler problems, but don't have the expert staff to build models to address them.

"We are not saying we have a magic box that can predict returns on stock prices. That frankly isn't where the return on investment in automated machine learning is," says Rob Hegarty, DataRobot's general manager for financial markets and fintech. "That's not how our platform is being used."

Just in case, though, vendors have built safety mechanisms into their tools. All the providers *Risk.net* spoke to enable users to explore how their auto-generated models are reaching conclusions: Which variables are the biggest drivers of a given output and how those variables influence results, including in some cases explaining non-linear relationships.

> **"Many of the tools are so easy to use that individuals might not make the right decisions about how to tune them."**
> **Andrew Chin, AllianceBernstein**

Firms building and using these tools say that quants are alive to the risks of data-mining and over-fitting. The fear is that multiplying the datasets quants can analyze increases the risk of betting on patterns that turn out to mean nothing, or that through trying many versions of models, quants inevitably end up with one that works well in backtests, but fails out-of-sample.

The solution? Automate the tests human quants use to guard against these same dangers.

H2O's Driverless AI checks whether training and testing datasets are similar and warns the user if not, Ambati says. The platforms covered in this article automatically run out-of-sample testing and other processes like cross-validation—testing variations of hyper-parameters using different cuts of the dataset.

The genetic algorithms in RAM's in-house system favor strategies that sit within clusters of similar strategies that all work, making it less likely they are a fluke of the historical data.

Plenty of Runway

Mark Roomans, an angel investor in causaLens, expects "significant adoption" of automated machine learning within the next two years, and a tipping point when firms will scramble to latch onto these approaches sometime within five years.

The snowballing of useful data that buy-siders will want access to will add to the pressure, he says, citing the Internet of things as one cause.

"The data throughput rate is going to be slower than the information arrival rate," says Roomans, who is also head of EMEA at Morningstar. Companies will have no choice but to find ways to automatically summarize or process that information; otherwise they will have to ignore it.

Many firms, quant funds especially, will prefer to build their own tools in-house rather than rely on third parties.

But the vendors have grand ambitions. Mind Foundry hopes to create a thousand "citizen data scientists"—that is, anyone in business who has data and might benefit from machine learning—by 2020. Brecque talks of its platform becoming "the Excel for data science."

CausaLens, which has more than 10 clients so far, sees Google-scale growth potential in providing a service, or as Matovski puts it, building and selling "the bread maker" rather than baking the bread.

Deloitte's Bhattacharya thinks established sellers of data analytics are likely to scoop up automated machine learning providers; Standard & Poor's made the biggest acquisition of an AI company to date when it bought Kensho for $550 million last year, he points out.

At H2O, Ambati says the application of automated machine learning in capital markets will be a "tectonic change" for providers. His company is hiring, and is working to tailor its platforms over the next six months to better match buy-side demand, he says. At DataRobot, financial services is the biggest sector for the company, Hegarty says.

What's clear, though, is that no one expects automated machine learning to put human data scientists and quants out of a job. The truth is, Ambati's Driverless AI needs drivers. And he invoked the name of a Formula One legend to make the point: "The best car won't make a [Michael] Schumacher." **wt**

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BIG BETS 2019
The best of times, the worst of times....

WatersTechnology's sister brand Chartis Research is the leading provider of research and analysis on the global market for risk technology. This feature is dedicated to showcasing Chartis' latest insights. Below we provide a taster of our 'Big Bets': the factors that Chartis analysts believe will shape risk technology markets for financial institutions (FIs) and vendors in the coming months. Overleaf we focus on the emerging issues in one key area for FIs: cyber risk management and quantification. For more on our five Big Bets for 2019, and to join the discussion, visit us at www.chartis-research.com.

For risk technology users and providers, this might seem the best of times: new technologies, new ways of doing business, new opportunities. But below the surface threats and risks, old and new, fester and rankle.

The wave of cutting-edge statistical techniques sweeping finance, crested by AI and machine learning, threatens to leave a storm of costly confusion and misapplication in its wake. As new business structures appear, companies are regrouping and consolidating.

And the perennial caveat with technology is that no matter how sophisticated your tools, mechanisms and defences, they are available to everyone – good and bad.

The future, we believe, is about three vital issues: awareness, understanding and familiarity. Knowledge and experience will make up the vital glue holding this all together, and they can only come from proper engagement and a sober realization that understanding how things work is more important than rushing to have them in the first place.

DIGITAL IDENTITIES

See both sides: coping with the duality of digital identity

Automation and beyond: firm data foundations are vital

OPSTECH AND DATA MANAGEMENT
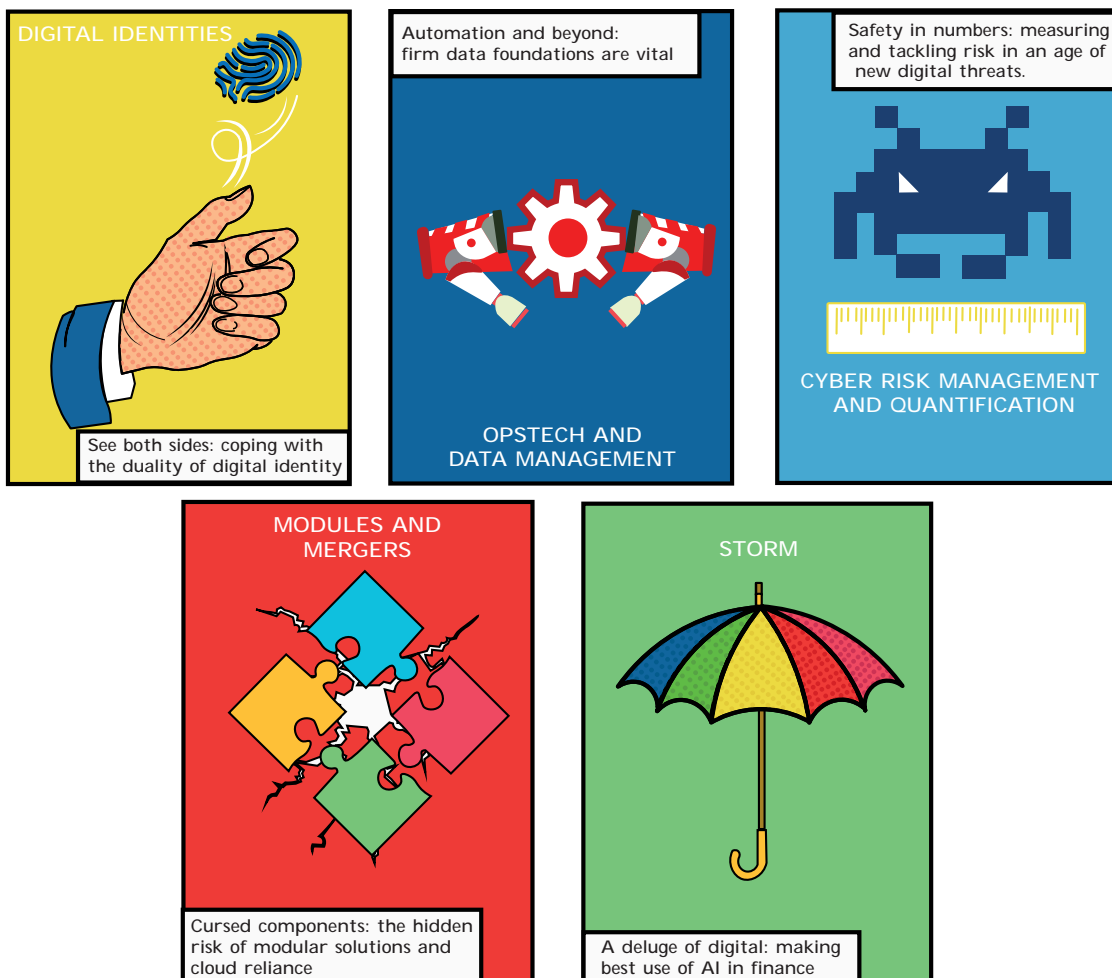
Safety in numbers: measuring and tackling risk in an age of new digital threats.

CYBER RISK MANAGEMENT AND QUANTIFICATION

MODULES AND MERGERS

Cursed components: the hidden risk of modular solutions and cloud reliance

STORM

A deluge of digital: making best use of AI in finance

Flip or Flop? 'Building' a Tradeable Asset Class

The value of real estate markets dwarfs other asset classes. Historically, the capital required to participate in this market has made investing in this space prohibitive. New datasets and technologies, though, are opening up opportunities to trade property in a more liquid manner and to gain wider investor participation. Max Bowie investigates, with additional reporting by Josephine Gallagher

It's easy to assume that the financial markets have already exhausted all major asset classes, and the markets with the most valuable assets already trade daily on exchanges around the world. And it's true that foreign exchange trading has a turnover of around $5 trillion per day, while over-the-counter derivatives have a gross market value of about $10 trillion, though their notional outstanding is much higher.

But there's a market with an even higher value that has yet to be fully exploited: property. Nareit, the industry body representing real estate investment trusts (REITs), estimates the value of commercial real estate in the US in 2018 was as high as $17 trillion.

Until now, this market has been the exclusive domain of real estate moguls and large prop-erty firms, or banks spending millions on buildings that they might own for decades, collecting rent and waiting for the value to double. The participation of retail and institutional investors alike has largely been limited to exposure through buying shares in REITs and property companies.

"Obviously, it's easier to get data on a company that issues debt, than on a building itself," says Elisabeth Kashner, director of exchange-traded fund (ETF) research at FactSet. "Real estate ETFs don't fully represent the US real estate market because most of the market is privately held. … And most indexes—and the ETFs that track them—have a liquidity screen, so most penny stocks get screened out … and the underlying securities need to be accessible on public markets." She adds that the similarity between securitized real estate assets and microcap stocks presents "real hurdles" to the inclusion of real estate in invest-ment funds.

Now, though, with the evolution of technology and data, some market participants are setting their sights on disrupting this exclusivity and opening up this market to new audiences and trading practices.

"The real estate market dwarfs equi-ties, for example, but has been very illiquid as an asset class because of

the lack of transparency around pricing," says Phillip Silitschanu, director of strategic relationships at securities token issuance platform Token IQ, and former industry research analyst. "In the next few years, I don't really see real estate being traded with the liquidity of equities or debt—I don't think people will be day-trading real estate. But I do see people adding it to a portfolio or long-term investment plan where they can commit those assets for the extent of the development … and it takes on a stabilizing role within a portfolio of investments."

The appetite for exposure to real estate among asset managers, alternative investment firms, and family offices is so great that traders are looking to gain participation through any and all avenues, including REITs, publicly traded companies operating in property markets, developers, and any related company in the supply chain, such as developers and supply stores such as Home Depot, says Erez Katz, CEO of big data analytics platform vendor Lucena Research.

While these types of investors may be driving change, traditional investors in the space are also contributing to increased transparency and data availability, driving service providers to offer more information around their investments.

Targeting Transparency

"We are seeing more money flowing into real estate … and we are getting into being a full-service real estate client data provider for our clients," says Melanie Cohen, global head of private equity real estate at fund administrator Apex Group. Apex's clients include multi-billion dollar funds with multiple real estate assets, ranging from shopping malls to railways, with up to 100 institutional investors such as pension funds, as well as closed-end funds with a horizon of between 10 and 15 years.

"It may be a 10- to 15-year investment, but they're not going to wait 10 to 15 years to see how their investment is doing—and quarterly reports are not frequent enough anymore. Investors want to know more, and as a service

> "It's deemed an alternative market because there is no real public market, and there is very little data. There is private market data … but you can't necessarily rely on that. It's an industry that is still relatively data-poor, even though it is better than it was five years ago." Anthony Gahan, IPSX

provider, you have to be ready, willing and able to answer them," Cohen says.

To do this, Apex has created a portal that fund clients can use to share more frequent and granular information about performance and a fund's assets (for example, statistics relating to a building owned by a fund) with their investors, and is looking at implementing a system in-house—similar to that operated by real estate management software and data provider Yardi—to give its clients access to data inputs to perform their own valuations.

Others see even greater opportunities on the horizon.

"Real estate, I think, is a sector that is ready for disruption," says Annerie Vreugdenhil, head of innovation in ING's wholesale banking business. "For starters, there is a lot of data, and a lot of data in registers that are relatively easily accessible. It also has a lot of middlemen who charge quite high fees. These are signs that a market can be disrupted."

One of the protagonists looking to disrupt the space is the International Property Securities Exchange (IPSX), a London-based and Financial Conduct Authority-regulated exchange for trading securitized property assets in an equities-style format, by securitizing individual commercial buildings with values ranging from tens of millions to hundreds of millions of dollars, and listing them via an IPO.

"The idea of securitizing real estate has been around for decades, but has not been successfully done," says Anthony Gahan, founder and chairman of IPSX. "It's deemed an alternative market because there is no real public market, and there is very little data. There is private market data … but you can't necessarily rely on that. It's an industry that is still

relatively data-poor, even though it is better than it was five years ago."

Half of the UK market is owned by institutions, and trades infrequently, Gahan says. But half of the market is owner–occupier, where properties sit inefficiently on a company's balance sheet as an expense, instead of becoming an asset that can be exploited.

However, you can bring a horse to water, but you can't make it drink: While there is an appetite to gain exposure to real estate's profits, some investors are still reluctant. The percentage of UK-based institutional investors' portfolios invested in real estate assets is between 2% and 5%, whereas a balanced portfolio should be between 10% and 20%, Gahan says. "But there's no liquidity, so they don't want to hold it as an investment," he adds. "That's why, early on, we took the view that we needed to create a fully regulated market—because real estate is renowned for a lack of transparency."

An IPO process for real estate assets would force owners to disclose more data about their buildings, he adds.

To provide transparent information in a manner that investors are familiar with, IPSX—which is currently signing up trading participants, and envisages expanding to other markets in the US, Europe and Asia in the future—has divided its information offering into market data, indexes, and benchmarks and derived data. It will make the data available through traditional channels, including low-latency data and trading infrastructure provider QuantHouse, which will provide IPSX's data in the same format as the data it already carries, so clients can easily incorporate it into existing strategies.

"For us, IPSX is another interesting source of data. Our clients want more business opportunities than those being provided by equities, options, and other

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> "The challenge is that at the end of the day, you have to underwrite a building, and there is no such thing as a continuously updated underwriting for buildings. With REITs, the investor is buying part of assets that someone else has underwritten. But to invest directly in a building, you need a daily or intraday update for the value of that building." **Jeffrey Adler, Yardi**

asset classes," says Stephane Leroy, co-founder and chief revenue officer of QuantHouse, who believes property will prove to be a huge opportunity for asset managers and hedge funds.

"All those technology-driven clients have a solid appetite for anything new. They want first-mover advantage. So all our clients are curious, and now we have connection to the market … it's very easy for them to test," Leroy says. But because real estate is a different beast from other asset classes, it requires additional data for traders to make the best use of it. "A property is a physical location, and you have a lot of attributes that describe that property

and location. So we are working on other datasets that can enrich the IPSX feeds—for example, satellite imagery, or geographical coordinates—to provide additional information on the area around a property," he adds.

The idea of listing real estate on an exchange isn't entirely new: In 2012, Jesse Stein started a company called Etre Financial, which aimed to list real estate assets on exchanges. Retail investors loved the idea, but institutions were hesitant to get involved early.

"The institutional market is still investing the same way they did 10 years ago—through private investment, private equity funds, and REITs," says Stein,

who is now chief investment officer at Compound Asset Management, which has created a real estate investment product called the City Fund, which will create city-specific investment vehicles that will behave similarly to REITs, and which the firm plans to list on the New York Stock Exchange.

What's interesting about Compound's approach is that the firm will own the properties within the City Funds that it launches. It has seeded its Manhattan fund with four buildings, and is raising capital in the private markets to add more assets to the portfolio before IPOing the fund around year-end or early next year, and launching similar funds for other

cities. This fragmented approach reveals the fragmented nature of the "market data" that exists in this space, and how data that's useful for valuing assets in one city may not be applicable to other cities.

Protecting Value

However, not everyone believes that the exchange-driven model will lend itself to real estate. "I think it's very unlikely that people will list a building on a stock exchange," says Jeffrey Adler, vice president of the Matrix suite of data products at Yardi. "Large institutional investors believe they provide value to their clients by offering access to markets that they can't other-

Data will also differ depending on the client and use case. "If you're a 30-year investor, you may have different data requirements from a retail investor with a three-month timeline," says Jeff Ramson, founder and CEO of strategic advisory and investor relations firm PCG Advisory, which is providing investor outreach services to institutional investors, family offices, and high-net-worth individuals on behalf of several companies looking to trade real estate as a digital asset.

PCG's role is helping those companies tell the story of the potential new asset class. "Digital security issuers still need to communicate with investors," Ramson says, adding that real estate is "probably the most easily digestible type of digital asset to understand … even if [everyone is] not sure yet how it would be traded."

And before it can be traded beyond niche vehicles, real estate data needs to establish a common bond that ties the information together, in the same way that a Legal Entity Identifier (LEI) or an exchange's Market Information Code (MIC) unites data about a stock or bond—perhaps, in the case of physical real estate, a new breed of identifiers based on GPS coordinates.

"If you want to trade properties themselves in a more liquid manner, you need more data, and especially a data master so you know what building both sides of a trade are talking about," says Ely Razin, CEO of commercial real estate finance data provider CrediFi, which provides the reference data and identifiers—covering physical real estate as well as related equities and bonds—to link data to specific buildings, using machine-learning techniques to capture data from 3,000 counties and municipalities relating to property type and the shell companies that own them, to be able to reliably connect owners and buildings, and paint an accurate picture of property ownership.

CrediFi's identifier includes basic identifying information such as address, how big a building is, and geo code, while its price evaluations take into account discounted cash flow analysis and uses nearby comparable sales.

wise reach … so they want to keep this off exchanges," and are spending millions of dollars to assemble warehouses of proprietary and third-party data to create automatic valuations for every property in their investible universe to deliver competitive advantage, he adds.

According to Adler, just as in the fixed-income markets, valuations are the key data point to real estate being traded in a more liquid manner. "We offer a proprietary data service for institutional investors. But the challenge is that at the end of the day, you have to underwrite a building, and there is no such thing as a continuously updated underwriting for buildings," he says. "With REITs, the investor is buying part of assets that someone else has underwritten. But to invest directly in a building, you need a daily or intraday update for the value of that building."

The datasets that contribute to property values can be as diverse as location, the number of units in a building, square footage, occupancy ratio and delinquency (and the same metrics for nearby buildings), local payroll data, mortgage applications, loan and interest rate data, demographic information (such as how people are spending money in different zip codes), Yelp scores of nearby businesses, social media scores

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> **I think at some stage for buying and selling property, and especially for registering the title, blockchain would be very helpful. If you want to establish a 'real truth' or a distributed ledger, it's very good for that."**
> Annerie Vreugdenhil, ING

of tenants, and hard-to-define metrics such as how a neighborhood and its infrastructure is changing.

"If you think about the factors that coincide in predictive signals, it's a combination of multiple, independent datasets. So if you think about what really makes the value of real estate go up or down, it's a compilation of all of these things," says Lucena's Katz. In fact, Lucena is building a product that combines many of these predictive datasets specifically to meet demand for predictive valuations of the real estate markets. "This will be specifically for the real estate market, but the information we gather has much larger ramifications because real estate is such an important part of the economy."

"For there to be a tradeable universe of unique real estate stocks, you need a database of unique identifiers around them. … The real estate and financial markets have not yet organized themselves around one ID system—and we've done the hard work to master that," Razin says. "From the beginning, we knew we were building the future, and we knew that real estate is a huge asset class that would move in the direction of other asset classes, to become more transparent, liquid, and open … to new classes of investors."

Blockchain Chicken and Egg

Real estate markets face a chicken-or-egg predicament: The markets need liquidity to generate timely market data, but need market data as an input to foster liquidity. And data accessibility isn't the biggest challenge to creating a more transparent and efficient market-place, according to ING's Vreugdenhil, who says there are more fundamental, property-specific impediments to trading real estate as an asset class—especially outside the largest markets.

"In many countries, land registries have existed forever, so everything has been recorded—on paper, but in a very solid ledger. But there are many countries in the world where that's not the case, so if you are buying property, finding out whether the seller actually has the title to sell to you is very hard," Vreugdenhil says.

Here, she says, blockchain could solve some of the inherent issues. "I think at some stage … for buying and selling property, and especially for registering the title, blockchain would be very helpful. … If you want to establish a 'real truth' or a distributed ledger, it's very good for that," she adds. In fact, blockchain and related technologies such as digital assets and tokenization may yet play a bigger role in democratizing access to new asset classes such as real estate.

The current quality and availability of real estate "market data" reflects the way property is still bought and sold by large property companies and investment firms, says Token IQ's Silitschanu, whereas being able to divide an asset into digital tokens would open it up to a broader investor base. For example,

instead of trying to raise $2 million each from 10 investors to fund a $20 million development project, a developer could lower the entry amount to $50,000, exposing more investors, and making it easier for investors to trade in or out of those positions.

"As we see the tokenization of these assets, you'll see that data adapt to be more granular," Silitschanu says.

New York City Real Estate Coin (NYCREC) is one such company pioneering the tokenization of New York-based properties, and far from the perception of many crypto entrepreneurs, has a management team with more than 170 years of combined experience. NYCREC co-founder Barry Cohen says many players are approaching the same challenge—democratizing real estate investing and increasing liquidity—in different ways.

"Some are trying to tokenize fractional ownership in single buildings. We've seen some tokenize shares in a portfolio of real estate assets, other people operating ownership structures that have community governance models, and others creating models where they act as a platform where buyers and sellers can meet," Cohen says. "Lots of people are trying to do this in different ways. … Once you tokenize something, you have the ability to do many different things with it."

Worth the Risk?

Another example of a company already operating in this space is Relex, a cryptocurrency crowdfunding platform focused on real estate developments, which recently announced a crowdfunding campaign to raise investment for additional development of the My Thuy International Port in Vietnam, sees the potential for blockchain- and cryptocurrency-based crowdfunding to speed up and streamline the fundraising process for real estate projects, says Relex founder Keith Hilden.

"Investment for these projects usually comes in over a 12-month window. When you take a crowdfunding model, and blockchain technology, which allows you to monitor those investments more efficiently, that reduces the time taken to raise investment and perform due diligence, so a fund can disperse

capital quickly," he says. "When you get investors involved earlier, developers don't have to be so reliant on debt and occupancy rates, and investors can exploit the difference between wholesale and retail returns, so they can make three times the returns."

Hilden says a combination of a culture of "proxy developers" rather than passive investors, and a distributed ledger that takes any guesswork out of when money gets dispersed to investors, creates the kind of transparency that raises the investment score of an asset, and makes projects that utilize this approach more attractive to potential investors.

> "Is it really necessary to trade a piece of property on a second-by-second basis? I'm not sure if it's in the long-term interest of the capital markets, in general."
> **Gerry Frigon, Taylor Frigon Capital Management**

But will the speculative and unsecured nature of cryptocurrencies simply add greater risk to an asset class known for bubbles and crashes?

NYCREC's Cohen warns that the new world of tokens and blockchain may still deter institutional investors with fiduciary obligations, leaving high-net-worth individuals and other accredited investors such as family offices that are able to absorb those discrete risks when others cannot. Though appealing to a different client base, IPSX's Gahan says the exchange "took the view early on

that we needed to create a fully regulated market … because the real estate world is renowned for a lack of transparency."

But even with improved technology, challenges are likely to remain. Gerry Frigon, founder and chief investment officer of San Luis Obispo, Calif.-based investment advisor Taylor Frigon Capital Management, says blockchain can be a useful tool for building out this market, but notes that there are still market-structure concerns that will need to be addressed before it can move into the mainstream.

"We're believers in distributed-ledger technologies, regardless of whether it's for digital assets, equities, or other asset classes. We believe that's the future. It's an important trend in terms of how things will be brought to market and democratized in the future," Frigon says. "That said, we get concerned about trying to create liquidity where it doesn't exist … which distorts the market," where increased frequency of

Jesse Stein
Compound Asset
Management

trading may only benefit a few traders, rather than the listed company or security, or the markets as a whole, when a more fundamental approach may be more suitable for a particular asset, he adds.

Frigon says the majority of the firms' high-net-worth individual clients—which comprise roughly 60% of its business, with institutional investors accounting for the other 40%—already have exposure to real estate through business ventures as developers or as professional real estate investors, and notes that the firm is currently generating better returns from REITs than it would expect from investing in physical real estate assets. "Is it really necessary to trade a piece of property on a second-by-second basis? … I'm not sure if it's in the long-term interest of the capital markets, in general," he says.

But one of the big advantages of trading real estate in a more liquid manner is that the market will become

more transparent and fungible, and that data will become more accurate and timely. IPSX's Gahan says the "shares" of real estate assets and their underlying attributes will behave similarly to corporate bonds. "We're talking about institutional-grade real estate assets, not low-value development projects. We're talking about yielding predictable—boring, if you like—returns … that make you willing, on a risk-adjusted basis, to buy an asset," he says.

As the real estate market opens up, these new investors gain exposure to the asset class—but also share in its risks. The credit crunch and financial crisis exposed the inefficiencies and lack of transparent pricing and valuation around corporate debt and other credit instruments. With the evolution of technology and data availability that has taken place since that time, for the sake of those new investors, it shouldn't take a bubble to create an efficient and transparent marketplace for property investing. **wt**

AI Use-Cases Emerge Across the Back Office

waterstechnology

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Introduction

For as long as anyone working in the capital markets can remember, the front office has generally fared better than the middle and back offices when technology budgets are planned and allocated. This is with good reason: the front office has traditionally been the part of the business focused on revenue generation and ensuring that the company coffers remain healthy. However, in recent years, the back office has started to reap rewards as the operational heart of the business, as both sides of the industry look to manage their fixed operating costs, increase automation and improve transparency across a range of back-office functions. For many, artificial intelligence (AI) technology holds the key to achieving those goals.

This whitepaper, based on a survey carried out by *WatersTechnology* on behalf of SmartStream, explores increased interest from firms on both sides of the industry around the development and deployment of AI technology across their back offices, specific use-cases for the technology and how capital markets firms can go about making the business case for its adoption.

When it comes to AI, if you asked 10 capital markets technologists what it is and what it means to them and their organizations, you would likely receive 10 different answers. The reasons for this are twofold. First, AI as a catch-all phrase that typically includes natural language processing, robotic process automation, machine learning and smart algorithms, and the use of artificial neural networks is a necessarily broad and relatively poorly defined domain that has been in and around the industry for a number of decades—depending on one's definition of what constitutes AI. This semantic fuzziness has led some practitioners to argue that relatively rudimentary tools—such as Excel—are early instances of AI

Key Findings

- Just under 50% of respondents are familiar with artificial intelligence (AI) technology, although their professional roles do not currently benefit from its use.

- Fifty-five percent of respondents would opt for a hybrid model/partnership with a third-party specialist for their AI technology provision and would look to share the development/implementation work.

- Just under three-quarters of respondents either already have AI in a live environment, are trialing the technology by way of a proof of concept (POC), or are considering a POC with the view to introducing it in the foreseeable future.

- More accurate processing, fewer mistakes, greater transparency and significantly reduced processing times were cited by respondents as the two most significant benefits of implementing AI technology across the back office.

- Seventy-five percent of respondents believe reconciliations to be the business process most likely to benefit from AI adoption, followed by compliance functions (73.7%).

- The biggest obstacle to AI adoption is a lack of knowledge about the technology and its specific use-cases, with 31.6% of respondents believing this to be the case.

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technology. Judging by off-the-record conversations during AI-focused workshops at a number of recent *WatersTechnology* events, there seems to be a large amount of confusion and ignorance—not willful ignorance, but ignorance nonetheless—about what exactly AI is and its industry-specific use-cases, although what is generally accepted now is the significant potential it holds for the capital markets. Second, AI has emerged in recent years as the convenient default label under which many new technologies are amassed, given its attractiveness to technology providers and consumers alike and its general embodiment of the zeitgeist across a large number of industries.

Questions 1 and 2 of the survey dealt with respondents' demographics, with a shade less than 40% representing corporate investment banks and not quite 20% hailing from the buy side—asset managers and hedge funds. In terms of location, North America and Asia-Pacific accounted for two-thirds of respondents (32.4% each), while 28% of respondents were based in the UK and Europe.

Question 3 kicked off the survey, gauging respondents' familiarity with AI technology in a back-office context. Surprisingly, just shy of 50% indicated that they are familiar with the technology, even though it has not yet been deployed to support their current roles. This possibly indicates that they are struggling to identify use-cases for its application—an issue that cropped up later in the survey in question 8, where almost one-third of respondents (31.6%) reported a lack of knowledge about the technology and its specific use-cases. "What I see is that many people think they are familiar with AI because they read a lot about it in the newspapers, but everyone repeats what everyone else is already saying," explains Andreas Burner, head of SmartStream Innovation Lab in Vienna and chief innovation officer for blockchain and AI at the firm. "What does familiar actually mean? It means you've heard a bit about AI, but I'm not sure whether respondents fully understand what is possible with AI, which might be the reason why it is difficult for them to find use-cases even though there are so many. What I find astonishing is that 50% of respondents, many of whom come from corporate investment banks, cannot see the benefits of implementing AI technology across the back office."

> "Understanding AI and its potential use-cases is not just about reading press articles—which is often media hype. It's a bit like Facebook, where everyone is smiling and their lives appear idyllic, but the real information about those people is deeper than that.

Andreas Burner, SmartStream Innovation Lab

1 What type of organization do you represent?

- 37.6%
- 17.2%
- 15.1%
- 11.8%
- 6.5%
- 11.8%

- ▉ A corporate investment bank
- ▉ An asset manager/hedge fund
- ▉ A broker/market-maker
- ▉ Other bank
- ▉ A pension fund/mutual fund
- ▉ Other

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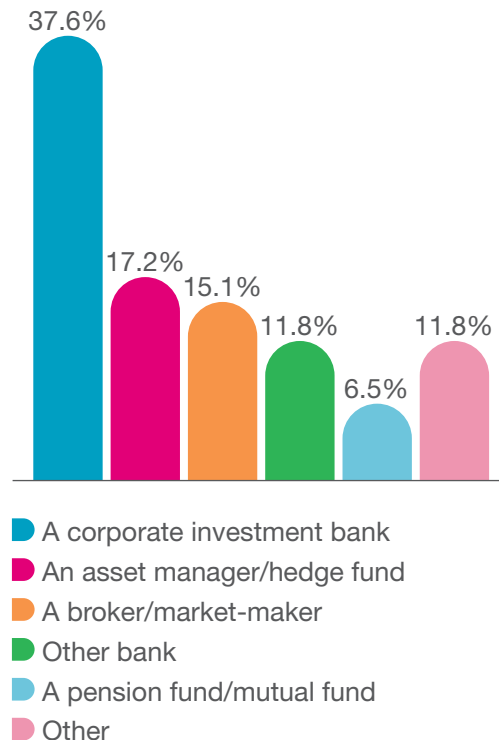
Partnerships

Question 4 sought to gauge the extent to which user-firms are looking to partner with third-party technologists when it comes to developing and implementing AI technology within their respective organizations. These results were significant, given that almost 55% of respondents confirmed that they would opt for a hybrid model where they would partner with a third-party provider for their AI technology, indicating their acceptance that there is probably no benefit to be gained by developing AI technology in-house, especially when it is already available on the market, which in turn means reduced development and implementation timeframes and arguably greater levels of sophistication and maturity. In short, users can leave the technical engineering piece to the specialists, and focus on making the business case for adopting the technology and applying it to enhance existing business processes across the back office. "That finding correlates with responses to question 8 about the biggest challenge standing in the way of firms adopting AI technology across the back office," Burner explains. "It comes down to know-how and so having a third-party vendor in the project helps them specifically to address that challenge."
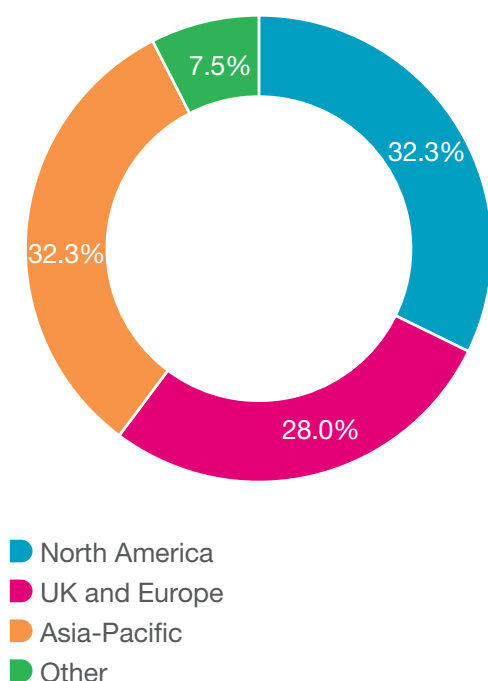
Responses to question 5 regarding the extent to which firms had already implemented AI technology to support back-office functions showed that just over one-quarter already have such functionality in a live environment, while marginally more (27.6%) are already trialing the technology by way of a POC project. Therefore, in the foreseeable future, well over half of all respondents to the survey will have some form of AI technology in a live environment supporting various back-office functions, assuming that all the POCs currently running are deemed successful and

2 Where are you based?

- North America — 32.3%
- UK and Europe — 28.0%
- Asia-Pacific — 32.3%
- Other — 7.5%

3 How familiar are you with AI technology in your domain?

- Intimately familiar, and I benefit from its use on a daily basis (14.0%)
- Familiar, although my professional role does not currently benefit from its use (49.5%)
- Aware, but am unsure of its use-cases within my professional domain (28.0%)
- Vaguely familiar, but it needs to mature before it can be implemented (8.6%)
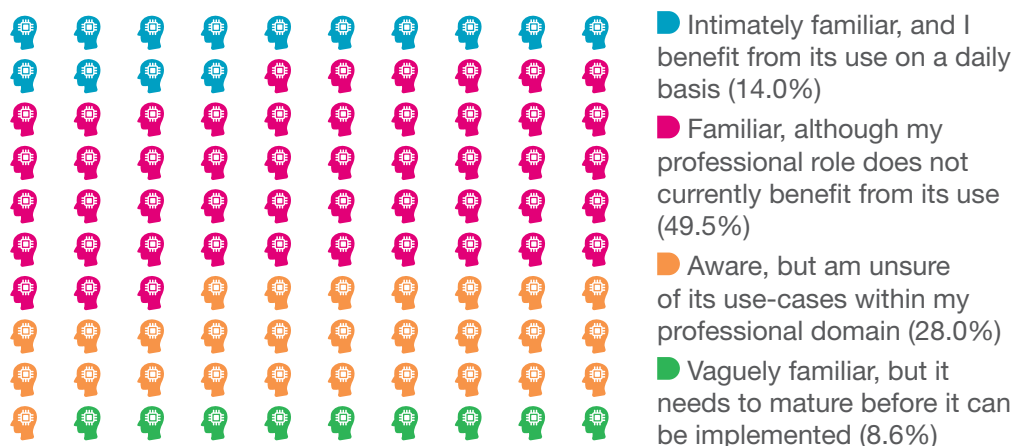
lead to live implementations. Clearly there is significant demand for the technology across the back office, and capital markets firms have either already identified use-cases for its deployment or are trialing the technology to support existing business processes. "What was interesting to me was that a further 19.7% are considering a POC, which means almost 75% of all respondents believe the technology is useful to their business," Burner says.

> **"**
>
> Users can leave the technical engineering piece to the specialists, while they can focus on making the business case for adopting the technology and applying it to enhance existing business processes across the back office.

While the responses to question 5 are encouraging and illustrate the extent to which AI has struck a chord with respondents from a back-office perspective, they do somewhat contradict the results from a similar question in SmartStream's previous AI survey published in the third quarter of 2018, *AI Adoption Across the Capital Markets— Opportunities, Challenges and Use-Cases*, where one-third of respondents indicated that they already had live implementations of AI technology. That anomaly, however, is likely a result of the previous study being more of a generic AI survey and not focused exclusively on the back office, which has traditionally lagged behind the front and middle offices in the implementation of new technologies.

4 To what extent can a third-party vendor successfully introduce AI technology to your organization?

- 11.8%
- 54.8%
- 12.9%
- 20.4%
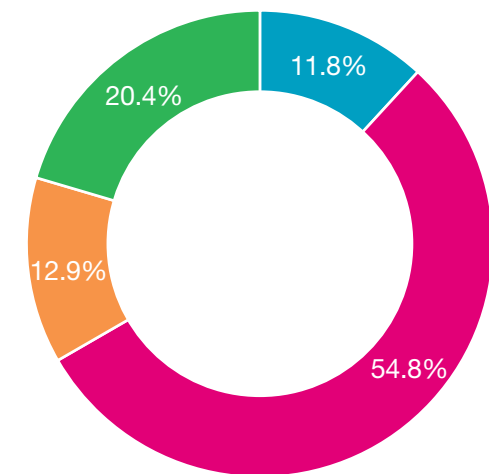
- ● Minimal
- ● Moderate
- ● Significant
- ● Significant, but the success of any project depends on the quality of the partnership rather than a third party's technology and expertise

5 Do you currently have any AI technology supporting back-office functions within your organization?

- 26.3%
- 26.3%
- 27.6%
- 19.7%
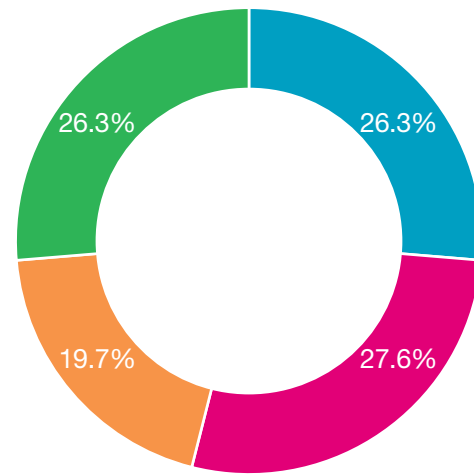
- ● Yes
- ● No, but we are trialing AI technology by way of a POC
- ● No, but we are considering a POC with the view to introducing AI technology
- ● No, and we have no plans at this stage to introduce AI technology

Processes

Question 6 examined the impact AI technology is expected to have on back-office processes, with two-thirds of respondents believing that it will allow more accurate processing with fewer mistakes and greater transparency, while the second most popular option—significantly reduced processing times—received 57.9% of the vote. The reduction of processing times—not only across the back office but the front and middle offices too—has emerged in recent years as an area on which large numbers of capital markets firms are focusing, given that the faster they can administer often manually intensive, error-prone and laborious processes, the more accurately and efficiently they can manage pretty much every aspect of the trade life cycle. The consequence of this driver—especially in certain aspects of the reconciliation process—is one of the key attributes of SmartStream Air, the firm's cloud-native reconciliation platform designed to massively reduce processing times.

Question 7 dovetailed neatly with its predecessor, drilling down into the specific business functions and processes that respondents anticipate will benefit the most through the development and implementation of AI technology. Unsurprisingly, 75% of respondents believe reconciliations to be the most suitable function to be enhanced by AI technology, followed closely by compliance (73.7%) and accounting (51.3%).

> "What I find astonishing is that 50% of respondents, many of whom come from corporate investment banks, cannot see the benefits of implementing AI technology across the back office.
>
> Andeas Burner, SmartStream Innovation Lab

6 What impact will AI technology have on back-office processes?

65.8% — More accurate processing/fewer mistakes/greater transparency

57.9% — Significantly reduced processing times

50.0% — Redeployment of personnel allowing them to focus on higher-value tasks

46.1% — Greater levels of straight-through processing

19.7% — Faster deployment and configuration of AI-based applications

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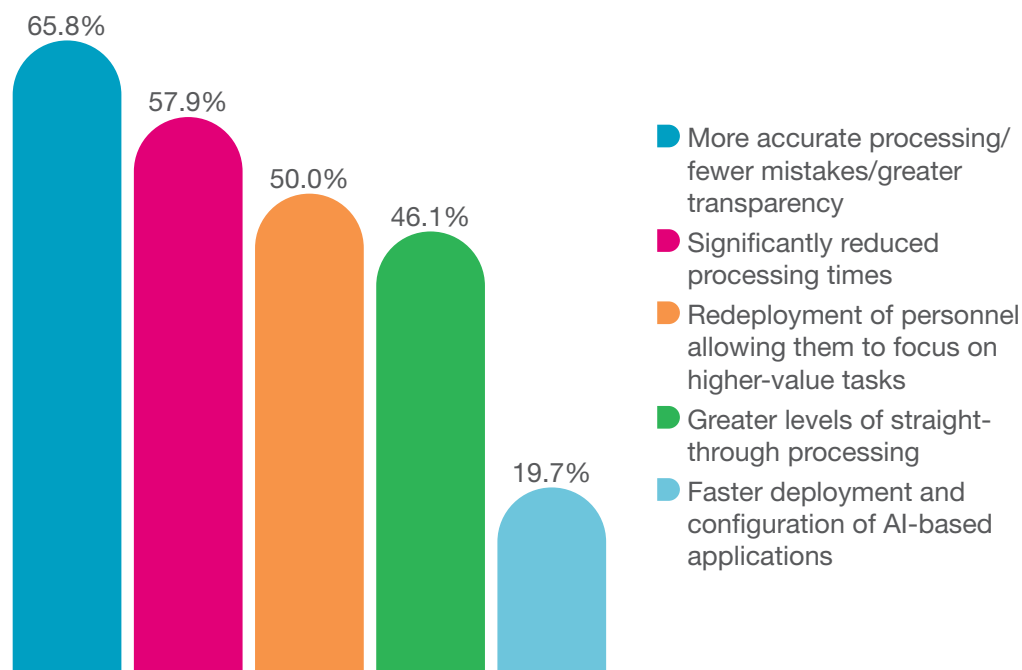
7 Which processes will benefit from the implementation of AI technology?

- 🟦 Reconciliations — 75.0%
- 🟥 Compliance — 73.7%
- 🟧 Accounting — 51.3%
- 🟩 Cost and expense management — 50.0%
- 🟦 Corporate actions processing — 39.5%
- 🟪 Collateral management — 36.8%
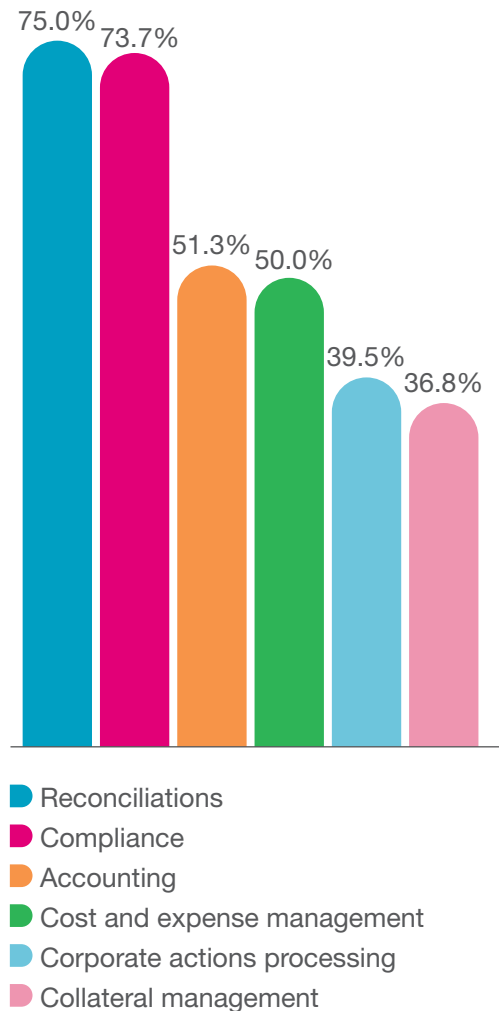
Hurdles

And so to the all-important question 8, which addressed the challenges facing capital markets firms in adopting AI technology across the back office. Just shy of one-third of respondents (31.6%) cited a lack of knowledge about AI and its specific use-cases as the primary challenge, while one-fifth believed there was no business case for developing and deploying AI, which makes it difficult for them to convince a sponsor that AI technology is crucial for the business. "I see that at all levels, with my SmartStream hat on when I'm visiting banks, and I see it when I'm at industry conferences," Burner explains, with reference to the apparent lack of knowledge about how the technology can be deployed to underpin and enhance existing business processes. "Many people don't understand the technology because all the financial technology influencers at the conferences just repeat themselves. Everyone shows the same 10 slides, and so attendees believe they've seen everything. But they don't really understand how the technology is being used and its day-to-day applications. Understanding AI and its potential use-cases is not just about reading press articles—which is often media hype. It's a bit like Facebook, where everyone is smiling and their lives appear idyllic, but the real information about those people is deeper than that."

8 What is the biggest challenge to your organization's adoption of AI technology across the back office?

- 🟦 A lack of knowledge about the technology and its use-cases (31.6%)
- 🟥 A lack of internal technology skill/competence (22.4%)
- 🟧 No business case (21.1%)
- 🟩 Managing and locating data in a single repository so AI can be successfully applied (14.5%)
- 🟦 Knowing how and where to start (10.5%)

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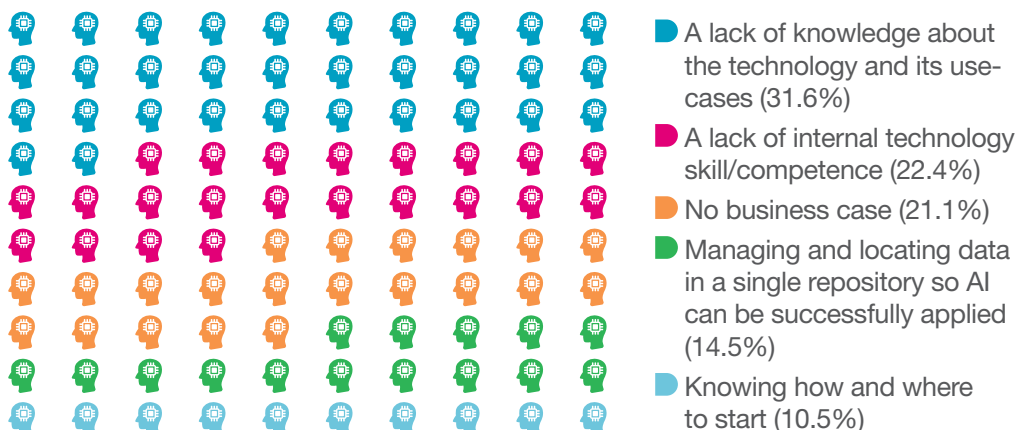
Business Case

Arguably the two most critical questions of the entire study—not just in terms of the issues addressed but also in terms of responses to those questions—were questions 8 and 9. While 8 looked at the challenges facing capital markets firms in their adoption of AI, question 9 outlined how firms might go about making the business case for deploying the technology. It goes without saying that capital markets firms cannot afford to sponsor speculative IT projects in the same way they might have done a decade ago, and rightly so. If business and technology teams cannot make a solid, clear and demonstrable business case for adopting any new technology—not just AI—funding for it is unlikely to be approved by the executive committee. No business case means no funding, and no funding means no project. Firms, therefore, need a clear understanding of the problems the technology is intended to solve and whether it is fit for purpose to actually solve them and, by so doing, deliver a measurable business benefit. More than half of responses (53.5%) to question 9 indicate an assumption that AI technology will deliver cost reductions and general efficiencies by way of reduced processing times across the back office, while a further 28.2% of respondents see it as a means of delivering improved reconciliations efficiency and accuracy.

"This is really important," Burner says. "If you look at where to apply AI technology, it is all about big data—you need lots of data. Second, users should only be working on data that is stored within the business. And third, the business process or functions must offer the potential for scalability. If it is a business process where you only have a few users working on it each day, that is a nice AI use-case, but it is not a business case. So scalability is the key. If you can identify these three instances, you have a use-case, and the business case is based on the use-case."

> Firms need a clear understanding of the problems the technology is intended to solve and whether it is fit for purpose to actually solve those problems and, by so doing, deliver a measurable business benefit.

9 **How do you make the business case for adopting AI technology?**

- **Cost reduction and general efficiencies/reduction in processing times across the back office** — 53.5%
- **Improved reconciliations efficiency and accuracy** — 28.2%
- **More accurate intraday risk/collateral/cash management** — 7.0%
- **Improved cost and expense management functions** — 1.4%
- **It is difficult to make the business case for adopting AI technology** — 9.9%

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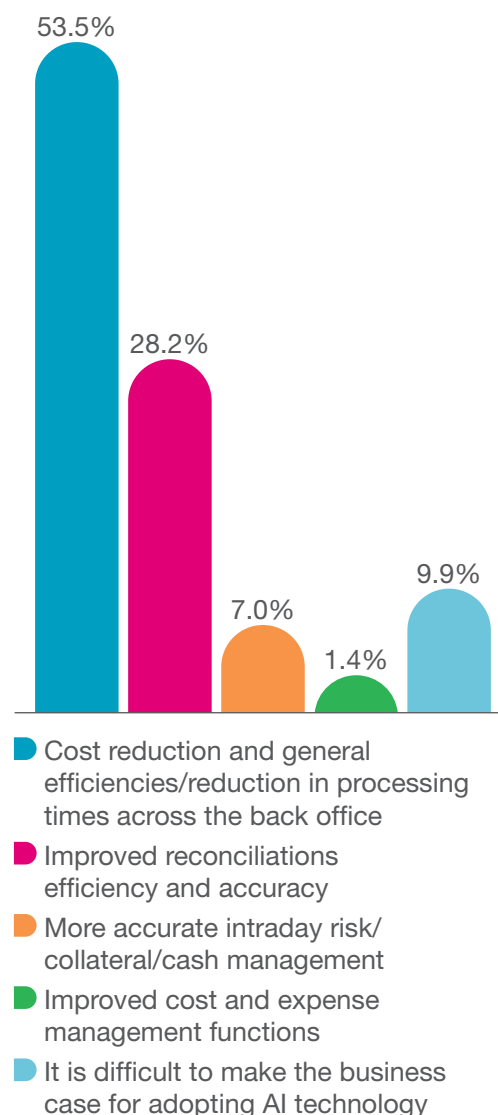
Sourcing

Question 10 reintroduced the theme of partnerships and the extent to which capital markets firms are seeking help from a specialist AI provider rather than forging ahead alone, while question 11 dealt with the perennially thorny issue of data sharing and the extent to which firms are happy to share potentially sensitive data with a third party. Responses to the former question—where respondents are most likely to source their AI technology from—showed few firms (17%) are looking to develop it internally without any external assistance. "It shows that the business has matured," Burner continues. "At the beginning [of the AI boom], everyone was trying to do it themselves, but now they understand they need help. Also, it provides users with better quality in the end. Many companies have a problem with recruiting the appropriate specialists. If you don't have the skills, how can you recruit the right skills and screen applicants when you don't know which questions to ask?"

Responses to question 11—the extent to which firms feel comfortable sharing their data with a third-party AI provider—were significant in that just under 55% indicated that they would be willing to do so, with the proviso that the necessary checks and balances are in place to ensure that it remains secure, illustrating just how far the industry has come in recent times in terms of increased comfort levels associated with data sharing. That said, just under 40% indicated that they were not comfortable sharing their data with an external organization. Clearly, the industry is moving in the right direction, but third-party providers still have their work cut out when it comes to convincing prospective and existing clients to relinquish control of their data.

10 Where are you most likely to source AI technology from?

49.3%
33.8%
16.9%

- ● Internally/proprietary technology
- ● From a third-party technology provider
- ● A mix of internal and external providers

11 To what extent would you feel comfortable sharing your data with a third-party AI provider?

54.9%
38.0%
7.0%

- ● Comfortable sharing data with providers
- ● Willing to share data with providers, with necessary checks and balances to ensure it remains secure
- ● Not comfortable sharing data with a third-party provider

SmartStream

Timeframe

The final question of the survey dealt with the expected timeframe for the deployment of AI technology across respondents' back offices. Responses indicate that AI is already being used to support certain functions across 17% of firms' back offices, while almost one-third believe that they will deploy AI technology across their back office in the next one to two years. While broadly encouraging, these results also somewhat contradict those from question 5 where 26.3% of respondents indicated that they currently have AI technology in a live environment, while 27.6% are currently trialing the technology. Also, in last year's SmartStream AI survey, just shy of 40% of respondents reported that AI is already being used within their domain. These anomalies, however, are almost certainly down to the fact that the 2018 survey was not limited to AI adoption across the back office, instead focusing on AI adoption across all parts of the business.

Reconciliation Has Met its Match

As previously mentioned in this whitepaper, SmartStream is gearing up to unveil a new product, SmartStream Air, at the Sibos event in London in late September. The cloud-native platform, which Burner explains is available to users immediately after they have signed a contract with SmartStream and have created a user profile, is infinitely scalable and is multi-tenanted. "It's available within seconds," he confirms.

SmartStream has been beta testing the product with a number of large, long-term clients and the results to date have been promising, which Burner says is encouraging, given that he and his team have been working on the offering for more than a year now with little user-specific feedback. "We have been looking at specific areas around *ad hoc* reconciliation demands," he says. "We are not looking at the large cash domains that need to be computed for two weeks—we are looking at simple reconciliation needs where someone like a broker has two files and wants to find out within seconds whether there are any disputes within those files. We have tested a number of those types of files on Air and it works nicely. You drop in two files of any structure or format and SmartStream Air will do the mapping and find out how the reconciliation matches, and will immediately produce results, statistics and disputes within seconds."

To put SmartStream Air's performance into context, it helps to compare it to incumbent processing times for similar tasks. So, for example, if one had to manage the above workload on a non-AI-enabled reconciliations platform, how much longer would it take? "With TLM Reconciliations Premium and with our competitors' products, that would typically take two or three days and sometimes even a week," Burner explains. "And it has to be done by IT people. But the good thing is that we can implement the same technology that underpins Air into TLM Reconciliations Premium, offering all the power and checks [of SmartStream Air] if a user wants to set up a stable, day-to-day reconciliation system," he confirms.

SmartStream

Conclusion

Last year's SmartStream AI survey concluded that the findings were cause for "qualified optimism" in terms of AI adoption across the capital markets and the significant potential the technology holds for the industry in allowing users to perform previously impossible tasks while also transforming existing ones. The 2019 survey builds on much of that optimism, although it goes a step further and investigates the practical implications of developing and adopting the technology and applying it to back-office process.

While large numbers of capital markets firms are already well on their AI journeys—75% of all respondents to this survey either already have AI in a live environment, are conducting a POC with the view to implementing the technology in a live environment, or are considering a POC—there are still appreciable numbers of firms unsure of exactly what the technology entails and, crucially, its potential use-cases, especially across the back office. That the technology is here to stay and that it can provide significant business value is no longer a moot point. More pertinent is the issue of how long it will take for the industry's laggards to at least conduct feasibility studies, followed—ideally—by a POC. Granted, some may conclude that the business case simply doesn't stack up, and that is their prerogative. But the fact remains that the technology is simply too transformative to ignore.

Methodology

The AI and the Back Office survey was conducted by *WatersTechnology* and comissioned by SmartStream, receiving 93 valid responses. The survey was conducted between June and July 2019, and respondents were drawn from people working at banks, brokerages, funds and asset management firms. Percentages are rounded to the nearest 0.1% and, as such, some figures may not total 100%. For Questions 6 and 7, respondents were invited to provide multiple answers.

About SmartStream

SmartStream is a recognized leader in financial transaction management solutions that enable firms to improve operational control, reduce costs, build new revenue streams, mitigate risk and comply accurately with regulation.

By helping its customers through their transformative digital strategies, SmartStream provides a range of solutions for the transaction life cycle with AI and machine learning technologies embedded—which can be deployed in the cloud or as managed services.

As a result, more than 2,000 clients—including 70 of the world's top 100 banks, rely on SmartStream Transaction Lifecycle Management (TLM®) solutions to deliver greater efficiency to their operations.

For additional information:

Web: www.smartstream.com
Email: info@smartstream-stp.com

SmartStream

LSEG–Refinitiv: More Than Market Data

What does the bourse's planned purchase of the data giant mean for clients and the industry going forward? By Joanna Wright, Hamad Ali and Josephine Gallagher

As revenues derived from traditional businesses are declining, and regulators and consumers are increasingly push-ing back against market data fees, exchanges are looking for tie-ins that will diversify their businesses. As a result, exchanges have been increasingly turning to the traditional vendor community to round out their offerings, through acquisition and partnerships.

In July, the *Financial Times* broke the news that another blockbuster deal might soon be in the books: The London Stock Exchange Group (LSEG) is in talks to buy Refinitiv in a deal valued at $27 billion (£22.1 billion). A merger of the massive bourse and the data giant would form one of the largest technology companies in Europe—if regulators allow it.

Currently, funds managed by Blackstone own 55% of Refinitiv, while Thomson Reuters owns 45%. Prior to its buyout by Blackstone and affiliates, Refinitiv was the Financial & Risk business of Thomson Reuters. Refinitiv share-holders would own 37% of the enlarged group. Combined, the firms would be the largest listed global financial mar-kets infrastructure provider by revenue, with a joint annual revenue of over £6 billion ($7.3 billion) in 2018, according to a press release that had to be cobbled together following the initial reports.

It is far from guaranteed that this deal will be approved by the regulators—for example, there's the tricky question of whether an exchange can offer services that connect to competitors' data—but for the time being, this deal points toward broader market trends and raises major questions for the LSEG and Refinitiv. It is clearly a major play by LSEG to build out its market data offering, but there are other tech and personnel aspects of the deal that can't be ignored.

For instance, while there are clearly complementary products between the two, Refinitiv has a wide array of services that will not easily fit in with LSEG's offering. Furthermore, if you're a talented developer on the Refinitiv team, will you be willing to go through another acquisition so soon after the last one? Also, with any acquisition, there's usually some cost-cutting involved, as well as the need to identify areas of organic growth that meet publicly announced expectations—where will all of that happen?

There are many questions that will arise from this deal over the coming months, not least of which is whether it will actually get approved—lest we forget the failed merger between Deutsche Börse and LSEG. *WatersTechnology* spoke with several industry participants to get a preview of what might come.

'Herculean' Task

"The core of Refinitiv's business is selling trading platforms, data, data management [services] and data analytics [platforms] to the sell side," says Mack Gill, COO of Torstone Technology, and previously CEO of the LSEG's technology subsidiary MillenniumIT from 2013 to April 2017. "So it is interesting to see a financial market infrastructure provider like the LSEG extend its platform and ... portfolio out of core exchanges into the sell side. That is another part of the strategic logic that you are seeing here with this deal."

While the market data component is the major piece of this deal, Virginie O'Shea, research director at Aite Group, says Refinitiv's compliance assets—including its sanctions database World Check—will also fit in nicely with LSEG's services.

"They tend to focus on reconciliation and regulatory reporting; something like the [LSEG's] UnaVista business might fit with the compliance aspects of Refinitiv," she says.

The deal could also benefit Refinitiv's tax and risk offerings, O'Shea adds. "World Check is a hugely important part of the business that the LSEG will want to get its hands on, and could expand it by adding it to the regulatory reporting stuff LSEG is doing," she says, especially considering Nasdaq's 2010 acquisition of Smarts and its work building out its KYC/AML offerings.

While there are obvious synergies, should the deal be approved, the firms will have to do a lot of work fitting multiple businesses together. The LSEG is siloed, analysts say, with many different departments and independent platforms that don't necessarily communicate seamlessly.

The big challenges for the LSEG will be convincing the market that it isn't simply increasing prices—more services means heftier price tags—to drive growth, and will not stifle investment in innovation and services to support profits, say sources at competing firms. Additionally, even if this deal is approved, there will be numerous regulatory hurdles that will have to be overcome—which usually means concessions—and a reorganizing of the workforce and integration of platforms before the benefits of a combined entity can truly be felt. That can be challenging enough under normal circumstances, but it becomes even more complex when you consider that a similar effort was already underway at

Refinitiv following the Blackstone-led consortium acquisition.

Refinitiv declined to comment for this story. The LSEG said the exchange had nothing to add to its initial public comment.

Gill notes that while it's great to have a robust data offering, it's also key for those platforms to be able to talk to one another and be streamlined across the organization to deliver that data to customers. Without that ability to share data, you lose the economies of scale.

"So now you are adding Refinitiv, which has another three or four major businesses that themselves are relatively independent, because again they were brought together by acquisition. So there are an awful lot of moving pieces in this new entity that are in different businesses, in different markets; they are on different technology-specific management teams," Gill says.

The integration challenge will be "Herculean," Gill says. "They have signed up to some pretty big numbers—$350 million I saw as a cost-saving target. That is a big number to hit. That is a long, multi-year challenge to look for those opportunities."

And, again, it can't be overlooked that the trickiest part of the merger will be gaining regulatory approval around Refinitiv's Enterprise Platform, its data management and market data distribution business, Aite's O'Shea says.

"The Financial Conduct Authority and European Commission have to make a decision on whether an exchange can offer services that connect to competitors' data. This is going to be a bit of an awkward thing to deal with. The LSEG would have to [put a] Chinese wall [around] the enterprise platform business as a separate unit," she says.

> "World Check is a hugely important part of the business that the LSEG will want to get its hands on."
> **Virginie O'Shea, Aite Group**

Dollars and Sense

While the deal came out of nowhere—leaving sources at competing tech companies "trying to get their heads around it right now"—it also makes sense.

With this deal, the LSEG is announcing its bid to become a definitive player in the data provision and distribution world, but the acquisition would also see the bourse take over other functions in trading, risk management and regulatory reporting.

The deal would bring together under one roof a set of world-class platforms for trading different asset classes, Gill says.

"What we are seeing in financial markets is much more of a need and an appetite for integrated cross-asset trading and with technology that can manage cross-asset trading much more efficiently," he says. "What I mean by that is being able to share margins, share collateral and manage your risk across all your trading operations, so not just equi-

ties but fixed income and derivatives and foreign exchange. That is increasingly what market participants want to see."

The industry is consolidating as companies—exchanges, vendors, financial institutions and other players—seek to offer one-stop-shop services. On the exchange front, one only needs to look at the Intercontinental Exchange's acquisition of Interactive Data, Nasdaq's purchase of eSpeed, and the CME Group's deal for NEX, to name a few, as examples. One could also look at LSEG's acquisition of fixed-income platform MTS as an example, and sources say that Refinitiv's FXall platform and its links to Tradeweb are major attractions in this deal for LSEG as it tries to expand its offering.

In the past, the old competition was between the data stalwarts—Bloomberg vs. then-Thomson Reuters, IHS Markit, FactSet and others—but meanwhile, exchanges have been involved in an intensifying arms race centered

around building value through over-the-counter execution and proprietary data (especially indexes) and distribution channels.

Additionally, the fact that it was the LSEG making this move should not come as a surprise, Gill says, as CEO David Schwimmer, who was brought on in 2018 after a 20-year career at Goldman Sachs, has made a living in the M&A space.

"When the LSEG brought in David Schwimmer, I think there was an expectation that his main focus was going to be deal-making," Gill says. "When you bring in a Goldman M&A banker to be CEO, that is clearly part of the game plan. He was very clear in public statements earlier in the summer that doing M&A in the exchange space was challenging—so, in hindsight, this ... is logical in the sense that the LSEG has been diversifying out of its core exchange business for some time."

Another question raised after the deal was announced was why Blackstone would flip Refinitiv so soon—the spinoff from Thomson Reuters only closed in October 2018. Dan Connell, managing director of market structure and technology at Greenwich Associates, says the deal looks like easy money for Blackstone.

"I remember Blackstone valued Refinitiv at $20 billion at the time of their acquisition. Since then, Tradeweb has gone public, so that was positive for Blackstone. Blackstone's business is not market data—it's financial transactions. If you look at the valuation here—$27 billion—plus the Tradeweb activity, that seems to be a good financial position for Blackstone," Connell says.

Ultimately, though, what often gets forgotten after these types of big acquisitions is the people. Yes, there are new technologies, services, integrations and tools to be offered, but

David Schwimmer
LSEG

managing culture and making sure to both retain talent and create an environment that will be inviting for new prospects will ultimately decide if the acquisition is a success or not.

Connell believes that on this front, Blackstone has had a positive influence on Refinitiv that can carry forward.

"Refinitiv itself has undergone a bit of a cultural evolution ever since the Blackstone deal," he says. "We have seen them become a bit more entrepreneurial, there has been more of a call to action within Refinitiv that I think both employees and the market have found to be exciting. Can that continue in what will now be a much bigger and broader organization within the combined entity? When you have a lot of pieces up in the air and teams are being required to fit together, that can spark more innovation among new organizations." wt

With additional reporting by Max Bowie and Anthony Malakian.

The Secret Source

The open-source framework has transformed the way software is created and delivered. One area that has seen advancements thanks to the sheer number of open-source tools available is in the field of AI. Wei-Shen Wong finds out what this means for financial institutions.

There was a time when banks and asset managers would dare not talk about their use of AI—and, specifically, machine learning—in public forums, as they either viewed it as taboo, or they wanted to hide its power from competitors. The secret, though, is out of the black box.

The advent of the public cloud (*see page 68*) has made it easier to store huge amounts of data, which is necessary to run many forms of machine learning. Additionally, vast improvements in computing power has made it exponentially quicker to crunch these massive datasets. However, there is another reason why companies are increasingly experimenting with machine learning: open-source tools and libraries.

The availability of software and code through the open-source framework has meant firms can take the source code, for free, and then add their own lines of code on top, rather than having to write the entire code from scratch. It allows for easier building and experimentation.

But in the past, banks often viewed the rise of open source as a scourge. Goldman Sachs famously took one of its former programmers, Sergey Aleynikov, to court, claiming he stole high-frequency trading code. Aleynikov said he was simply trying to strip out open-source code that he had added and return it to the community, which is what is expected from the open-source community. Aleynikov was eventually exonerated, but not before spending a year in prison.

Attitudes have since changed—even Goldman Sachs has opened its Java library, GS Collections. The reason for this shift is because as firms are finding cloud services vital, they need to also embrace open-source tools to better extract the full power of the cloud. As firms have become more comfortable with open source, they've realized it's also an efficient way for experimenting with machine-learning techniques, while failing fast and (relatively) cheaply.

Tony Warren, vice president and head of strategy and solutions management at FIS, says before open-source libraries and frameworks like scikit-learn, Keras, TensorFlow, Theano, PyTorch, among others, data scientists needed to research and build the models from scratch.

These libraries and frameworks make it possible to create, train, and test machine-

learning models in a shorter timeframe. "In addition to cheaper computing power, also open source ML platforms like MLflow and Kubeflow are making it easy for the institutions to manage the ML lifecycle, including experimentations, reproducibility, and deployment," he adds.

Meanwhile, Viral Shah, co-founder and CEO at Julia Computing and a co-creator of the open-source Julia programming language, says quantitative analysts often look for the fastest path for converting their insights and intuition into trading strategies.

"They write something in Python, R or Matlab and then hand it over to a team of Java programmers. This translation can often take months and be error-prone," he says. "If I'm an algorithmic trader, the thing that matters to me is what open-source packages are available that make it easy for me to do my job efficiently. At Julia, we have many data-processing libraries, signal-processing libraries, time-series capabilities, machine-learning capabilities, and more. All of these make it very easy to prototype a new algorithm. If not for these libraries, one would have to write all these fundamental capabilities from scratch. The Julia ecosystem provides 2,500 open-source packages, and many of those are directly relevant for algorithmic trading."

Other useful libraries, according to sources, include the Natural Language Toolkit (NLTK) and spaCy, which allow for classification and tokenization of text, alongside scikit-learn during model training.

DIGging Deep

Nick Reid, DIG architect for global research at Deutsche Bank, says DB DIG, which stands for Deutsche Bank Data Innovation Group, works with DB's technology team to generate new infrastructure and models, which they're building up and working alongside the business too.

"It's still early days, and we're still ironing out details," he says. "The other challenge is potentially where we need to work on redesigning and building application environments that support the training requirements for a lot of the data science work. To build much

larger models, we use microservices on Kubernetes. There are other options on cloud, but we already have the environment to scale on Kubernetes."

DB DIG was set up roughly 18 months ago and focused on hiring "non-typical roles" to be part of the research team, according to Pamela Finelli, global COO for global research at Deutsche Bank. The aim was to bring together a diverse team to find new ways to harness data using, among other techniques, machine learning to help analysts and investors make better-informed decisions. The other side of DIG is its natural-language processing (NLP) team, which created the group's first product, α-DIG (pronounced "Alpha-DIG"), a web-based platform that uses ML techniques and NLP to quantify the value of non-financial information.

"We slice and dice different information sets from news flows and assign a value to company intangibles, rather than the typical accounting metrics," says Finelli. "This is done for roughly 5,000 global stocks and based on signals created from news flows. We create scores from different sentiments and metrics to help investors determine what stocks they want—and which are risky—to hold in portfolios."

α-DIG collects data from patent news, product announcements, litigation, and regulatory documents to quantify intangible information such as brand value, corporate culture, management quality, innovation, and sustainability issues, as well as regulatory and litigation risks.

She says clients also want this data represented in different ways, including visualization from DIG's NLP program. "Our quant research team also uses different types of machine-learning techniques to create investment signals. We've enhanced our traditional quant product using machine learning to benefit stock selection models," she says.

> **"There's a subtle divide between the technologies used by the data scientists—all the libraries and models, for example, and the tools and utilities used by the tech teams for deployment."**
> Shirin Hine, Deutsche Bank

This product would not have been able to make it to market in that time frame if not for the help of open-source libraries and tools. Shirin Hine, head of technology for global research at Deutsche Bank, says that in the past year, the firm built a new technology team within research to specifically support the data scientists in DIG.

"There's a subtle divide between the technologies used by the data scientists—all the libraries and models, for example, and the tools and utilities used by the tech teams for deployment," she says. "We are participating in a bank-wide agenda to hire diverse talents into technology to work on data ingestion, scheduling, storage, and compute to support the work of the data scientists."

Driven by Data

Different needs require different tools. What firms are learning is that AI cannot serve as a panacea—whether vector machines, linear regressions, neural networks or NLP, each technique has its strengths and weaknesses. Hence, why open source can help in

Pamela Finelli
Deutsche Bank

the experimentation process, because a firm can build on what already exists.

When Google released TensorFlow as an open-source platform, that was when deep learning—a subset of machine learning—became much more accessible to the industry, according to Tosha Ellison, director of member success at Finos, the Fintech Open Source Foundation. Although Facebook and others released their ML tools as open source later on, she says, TensorFlow still has the largest brand recognition.

But deep learning can be resource-intensive, so for many instances, other forms of machine learning are more effective, and libraries such as scikit-learn are better, says FIS's Warren. "This is one of the most popular libraries/

> "Believing that our data scientists will eventually be able to generate values through AI using our data without any access to open source is a lie."
> **Elvie Lahournère, Natixis Bank**

frameworks which has [the] implementation of many ML algorithms for both supervised and unsupervised machine learning," he says.

Meanwhile, open-source frameworks like Rasa help with natural-language understanding and interactive communication. These techniques help companies wanting to host the solutions

instead of using cloud-based solutions, for privacy or compliance reasons. This framework could be used for chatbots and other cases requiring information extraction, says Ellison.

One of the greatest challenges firms face is that because there is more data available and because it's easier to store that data, firms want to use different AI techniques to find insights, but it is not always so easy to know which technique to use—it can't be a hammer-looking-for-a-nail situation. The Catch-22, however, is that as you try to handle more data, you need to incorporate AI, or risk drowning in a sea of inputs.

This is where open source has helped firms to manage their data-corralling needs. "MLflow from Databricks is

> "Even if you had that army of data scientists, would you assign 80 data scientists to build that one model? No. The cost of any experiment would become so expensive that you will only use it if the ROI is very big."
> **Sanjna Parasrampuria, Refinitiv Labs**

a recognized open-source project to address that. Some other popular tools are Python, Jupyter, sklearn, numpy, and Pandas," Ellison says.

The other reason why open-source tools are becoming increasingly en vogue is because the likes of Google and other tech giants have spent years building out these platforms and libraries, so they're robust enough to handle a multitude of needs.

TensorFlow, for example, has spent a decade boosting its libraries, pumping data into its platform, and bringing in top-tier data scientists, engineers and programmers. This kind of investment is not available to most—if any—financial services firms.

"You would need 10 times the people because the data is just exploding unless you had an army of data scientists, which perhaps only the largest asset managers and hedge funds can afford," says Sanjna Parasrampuria, head of applied innovation at Refinitiv Labs in Asia. "Even if you had that army of data scientists, would you assign 80 data scientists to build that one model? No. The cost of any experiment would become so expensive that you will only use it if the return on investment is very big."

Giving Back

At the Asia-Pacific Financial Information Conference held on June 12 in Hong Kong, speakers on a panel centered on using artificial intelligence (AI) and analytics to improve business efficiency, agreed that open source is one of the main reasons AI and ML are used more.

Sanjna Parasrampuria, Refinitiv Labs

Elvie Lahournère, digital and innovation director for Asia-Pacific at Natixis Bank, said: "Believing that our data scientists will eventually be able to generate values through AI using our data without any access to open source is a lie. Let's face it, the whole point of this technology [being] there is thanks to the open-source way."

Refinitiv's Sanjna says the financial industry has experienced the pitfalls of working alone, often involving significant amounts of time or money. Pre-financial crisis, firms were more likely to go it alone, but banks and asset managers have realized there is no glory in solitude.

"Once you are in a position to find connecting spots to collaborate, not only will you benefit from increased speed and agility, but you will save on costs as well," she says. "All our data scientists would love it if I could just publish all the code and make it open so that it can help the whole community at large. It's free, and that's empowering. Of the advanced machine-learning use cases that there are today, 80% of data scientists would be tinkering within TensorFlow, for example."

Somewhat ironically, much like how open source was used to help firms to better handle a glacier of data, the challenge going forward for data scientists, notes Sanjna, is developing the experience to pick and choose from the sea of libraries that are now available.

"That's going to be your secret sauce—how you have combined the various pieces available and applied it to the problem you're trying to solve," she says. **w͡t**

Plato's Potential Play for the Consolidated Tape

Industry experts say the not-for-profit organization is building a post-trade market data platform that could be a precursor to a European consolidated tape. By Josephine Gallagher

When European regulators includ-ed measures for a consolidated tape (CT) in their 2018 review of the trading rulebook, it was largely met with applause. The hope was that it would bring much-needed transparency into the market, help reduce market data costs, and allow firms to better comply with new mandates rolled out after the financial crisis. Almost two years later, though, the effort has gotten stuck in the mud as nobody wants to be the one responsible for it.

That might be about to change.

In June, the Plato Partnership—a non-profit organization comprised of buy-side and sell-side institutions, including Barclays, BlackRock, JP Morgan, and Schroders—announced it was collaborating with BMLL Technologies, which provides a research service designed to recognize patterns in exchange limit order books, to develop a platform that will provide market quality metrics on European equities and equity-like instruments, free of charge.

However, according to sources familiar with Plato, who spoke to *Waters Technology* on condition of anonymity, this recent initiative could function as a precursor to a European consolidated tape.

Several of these sources attended the Imperial Plato Market Innovator (MI3) Conference on July 25, where BMLL Technologies presented on how it will design and help build a platform

that will provide a consolidated view of market data metrics on European equities from all relevant venues. The service comprises 12 daily T+1 analytics on indicators such as liquidity, the European Best Bid and Offer (EBBO), closing auction analytics, intraday volatility, and trade-quote ratios.

Sources say achieving some of these benchmarks, especially the EBBO, would involve or require the construction of a consolidated tape—since Plato and BMLL are building this, they say this would logically serve as a precursor to the official CT.

"[The platform] would have to say the best bid price among all those venues, the best offer among all those venues, and by doing that, you are effectively consolidating the touch price," says a senior executive at a market structure firm familiar with the proposed platform.

As part of the Plato Partnership project with BMLL Technologies, they are also aiming to create industry standards and definitions to help with the classification of addressable and non-addressable liquidity across venues.

The Plato Partnership declined to comment for this article,. However, sources familiar with the organization have said it is still discussing the wider direction

> "For the moment, the focus is on the delivery of the portal, which will obviously have a concept of creating a European CT, because in order to be able to provide an EBBO price, we need to have the European CT."
>
> **Ben Collins, BMLL Technologies**

of the project with BMLL Technologies and expects to make announcements in the coming months.

According to a Plato press release published in June, the platform will be available to market participants by the end of this year.

Ben Collins, head of sales and client relationship management at BMLL Technologies, says the vendor is not sponsoring a CT itself but would work with the Plato Partnership to help develop the official European CT if this becomes the end objective. However, like the other sources, he says the way the project is designed may require or involve the building of something akin to a European consolidated tape.

"For the moment, the focus is on the delivery of the portal, which will obviously have a concept of creating a European CT, because in order to be able to provide an EBBO price, we need to have the European CT," Collins says.

The Definitional Challenge

The industry is still exploring what a European CT could look like. While there is a general idea, until there is an actual plan submitted, questions will remain. And sources say Plato will have to consider whether it would even want to come forward as an official consolidated tape provider (CTP) and be subject to added regulatory scrutiny on data quality, resilience and performance.

"Consolidating data is not the same as meeting the regulatory requirements to be a consolidated tape provider, and that is actually one of the reasons in my view no consolidated tape provider has come forward because in effect, you have to submit yourself to a lot of regulatory requirements that make it more onerous and less cost effective to provide consolidated data," says David Cook, head of regulatory affairs for EMEA and Asia at IHS Markit.

Under Mifid II/Mifir provisions, the European Securities and Markets

Cheaper? Maybe Not

Even if a European consolidated tape is built, trading participants will still have to buy market data feeds from the data vendors, says Matthew Coupe, co-chair of the EMEA regional committee and EMEA regulatory subcommittee at industry body FIX Trading Community.

A consultation paper from the European Securities and Markets Authority (Esma) released in July covers how the consolidated tape (CT) should function. And, since the cost of market data could render the tape commercially unviable, the Esma paper also asks a number of questions around the cost and charging model of pre- and post-trade transparency data.

The consultation is part of a review of the CT under Mifid II. The CT collects post-trade data published by venues and consolidates them into a continuous live data stream before making them available to the public, both for equity and non-equity products. Mifid II went live in January 2018. As part of the rule, the tape is supposed to be developed within two years of its implementation. If no private company steps forward to provide the tape, Esma has to review the situation.

Users of market data think the CT will bring down costs for them, says Coupe, who is also market structure director at Barclays.

"The question of commercialization is relevant [to the consolidated tape consultation] because there is the view that if the consolidated tape were to be delivered, that would solve the market data pricing discussion that is happening in the industry," Coupe tells *WatersTechnology*.

"That view is as follows: If you have the consolidated tape, everyone can use it and it would also be made available on a low-cost basis; therefore, market participants would no longer require data direct from the sources."

The problem, he adds, is that most trading participants would still need to buy the feeds directly from the market data providers, due to latency issues and the ability to see the depth of book, among other challenges. It is not feasible or desirable to put everything on to the tape, he says, so there are still many services for which market participants will have to shell out.

Equities Developing First

The consultation paper looks only at equities. A debate is ongoing among FIX's membership, and in the industry at large, as to whether consolidated tape for equities should be developed simultaneously with fixed income, or whether the simpler problem (equities) should be solved first.

However a consolidated tape for bonds is developed, it must take into account that this is a very different asset class to equities, with a different market structure, Coupe says. Whatever happens in equities can't simply be "cut and pasted into another asset class."

Even on the equities side, there are difficulties that need to be addressed, he says, and notes that FIX will highlight those in its response to the consultation. For example, addressable and non-addressable liquidity is a very important part of the consolidated tape that needs to be defined in equities.

In Mifid II reports, a lot of activity (most of which is technical trades) is non-addressable and does not contribute to price formation. Market participants will want to be able to see at a point in time which liquidity they can engage with and which they can not, so the question is, if this kind of activity is included in the consolidated tape, will it really help the investor understand what is going on in the market?

"If I were to do a trade between two Barclays entities as an affiliate to another one, that would potentially get trade reported, but that is just a risk transfer of position and not addressable liquidity. Should that really be trade reported or not? Is it really addressable liquidity? Does it really help inform the market?" Coupe says. "The industry needs to understand that there are a number of complex trading methodologies for how trades are managed, and how trading works between various entities, and to publish all that information into a tape would be misleading." —*Joanna Wright*

Steven Maijoor
Esma

Authority (Esma) aims to reduce the cost of data for the industry and help to provide a service where market data is published on "a reasonable commercial basis," "in a disaggregated format," and also make it "available 15 minutes after publication free of charge."

On July 12, the EU regulator issued a consultation paper that reviewed these Mifid II/Mifir provisions and set out a variety of ways for establishing a CT. Some of the considerations looked at including the type of data that should be available on the CT (e.g. equities and non-equity instruments) and the frequency at which data should be provided, such as in real-time, 15 minutes after publication, or on a T+1 basis. Additionally, the consultation paper assessed market costs and the issues that have arisen in delivering a consolidated tape, which was expected, under Mifid II, to be developed within two years of its implementation in January 2018.

When asked for additional information, Esma pointed to the July consultation paper.

A press release that accompanied the consultation paper notes: "Esma has identified several clear benefits a CT could provide. In particular, a CT would provide post-trade information on the trading activity for any equity and equity-like instrument in a single place and format. Finally, the consultation sets out different ways of establishing a CT should the EC and co-legislators decide to do so."

Additionally, in the statement, Esma chair Steven Maijoor said: "Establishing a consolidated tape in the EU has been discussed for many years. I believe it is time to decide if and how we want to go ahead with this ambitious project and ESMA is ready to provide support to the co-legislators on the right way forward."

The Regulatory Push

According to a market structure analyst at a brokerage firm, in recent months Esma has become more active in trying to establish a suitable candidate to run the CT. It is anticipated that the first and simplest iteration of a tape would offer post-trade equities data.

"I think [Esma] is focusing on the post-trade data first," the market analyst says. "I think they want to try and move quickly so it seems that achieving [a] post-trade [feed] would be the easier option before moving to pre-trade data and then non-equity instruments."

Additionally, the European Commission (EC) published a paper titled *Study on the Creation of an EU Consolidated Tape* on June 25. The study is set out to provide a comprehensive analysis on the feasibility and conditions for the creation of a CT and included an open invitation to tender where candidates can submit a proposal of how they would conduct the study. The receipt of the tender closed on July 31. According to one source, the study will offer a holistic view of the next steps to be taken by the EU legislator in deciding the appropriate CT model or outcome for the EU marketplace. He says some of the remaining challenges to solve for involve data quality, producing a viable and cost-effective service, latency, the type of data, standards, and whether there should be one or more CTP.

An over-arching concern that impacts the CT is also the role that trading venues and approved publication arrangements (APAs) play. In the US, all trading venues and APAs are mandated to report their data to the CT, yet Mifid II only requires them to make the information public on a reasonable commercial basis.

"The tape is fed by exchanges through an SEC mandate, and they are compelled to report their trades to the consolidated tape. In my opinion, until that is required and until that is done, we are unlikely to see a solution that is viable based upon just collecting all of the various exchange and venue feeds that are available today in the market," the source says.

Some of the options considered by Esma in its consultation paper looked at even changing parts of Mifid II to improve the conditions for a CTP to come forward. One example was making trading venues and APAs' contribution to the establishment of a CT mandatory under the regulation, similar to the US model.

Industry participants are expected to submit their responses on the consultation paper and the future of a CT by Sept. 6, and Esma intends to submit its final report to the EC by December 2019.

As the industry tentatively awaits the outcome of the EC's report, most sources spoken to for this piece say the main objective is to have clarity on what an EU CT will look like and how it will function as a commercially viable source of valuable data. As to when that will be locked down—if ever—is anyone's guess. **wt**

Timeline

January 3, 2018—Mifid II outlined the proposal of a European consolidated tape and the organizational requirements of a consolidated tape provider in Article 65.

July 12, 2019—Esma releases a consultation paper on the development of market data costs and the assessment of Mifid II/Mifir provisions, including the development of a European consolidated tape.

June 25, 2019—The European Commission publishes an open call for tender and launches study on the creation of a consolidated tape. The receipt of tenders closed on July 31.

September 3, 2019—European Commission to release a report on the functioning of the consolidated tape for equity instruments, according to Esma's consultation paper.

September 6, 2019—The deadline for the consultation period where market participants can provide feedback.

December 2019—Esma is to submit a final review report to the European Commission.
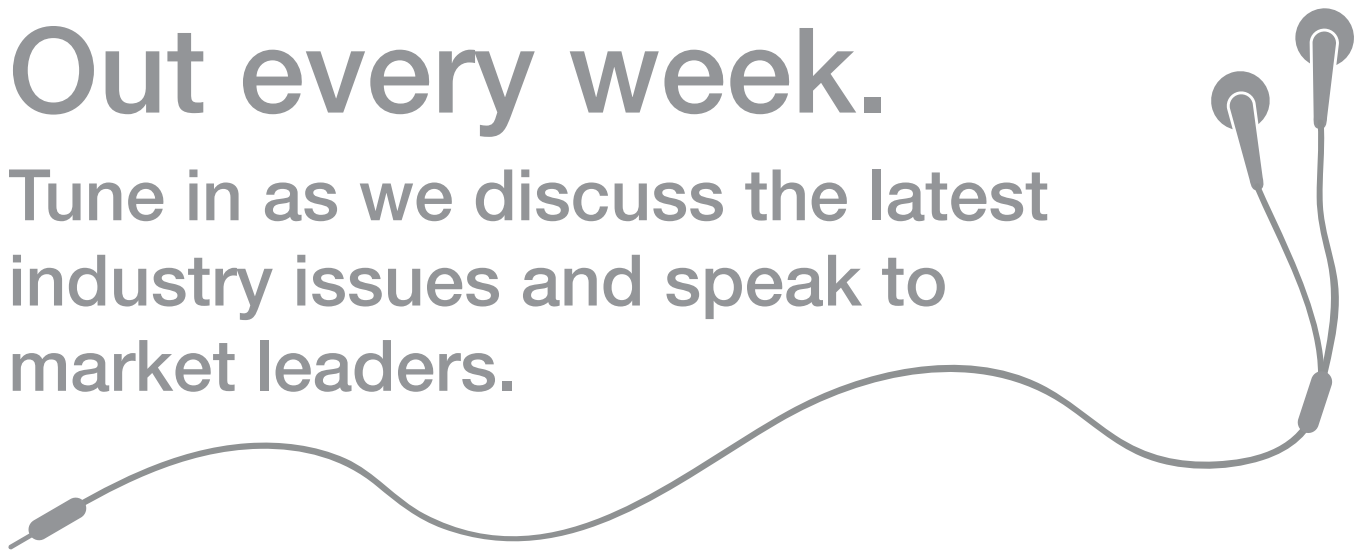
Blockchain's Standards Dilemma

While hyped as a revolution just a few years ago, blockchain's development in the capital markets has been slow. One potential reason for its stunted growth is the lack of standards when it comes to how these platforms are built and how they operate with one another and with legacy banking systems. By Hamad Ali

When you build a piece of heavy machinery—for example, a bull-dozer—standards are of immediate and obvious importance. Without standards, the same nuts and bolts could not be used to build different machines, which leads to cost overruns and compliance issues.

The matter is a lot less clear, though, when it comes to emerging technologies such as distributed-ledger technology (DLT). The industry can't even standardize around the technology's name—is it DLT or blockchain, which is technically a type of DLT, but is now used interchangeably with the acronym.

James Carlyle knows a lot about standards. He not only actually built bulldozers—in Japan, at the beginning of his career—but also worked inside banks, where standards like the ISO 20022 for payments are the rails on which crucial functions run.

Today as chief engineer at enterprise blockchain technology company R3, Carlyle's passion for standards hasn't diminished, especially as companies such as his look for ways to make blockchain systems interoperable.

"The industry is at a critical juncture in its efforts to define and adopt improved data and process standards," Carlyle says. "There is no commercial advantage to organizations developing and maintaining standards separately."

Without industry data standards, two blockchain systems, even if connected, could not exchange information in a meaningful way. And many different areas of blockchain technology still need standardizing, such as data taxonomies and smart contracts. But standards in blockchain are in something of a chicken-and-egg situation: Which comes first, the standards or the technology? How complicated is it to make chains interoperable?

Why Standards Are Needed

Standards for blockchain have been necessary for the past four or five years, ever since it became clear that chains would need to operate between firms doing, for example, swaps transactions, says

Hans Huber, project manager at Main Incubator, a subsidiary of Commerzbank.

Taking blockchain out of the equation, Huber notes that banks already run miles of cable and spend a fair amount of money and time connecting systems so that the data can flow seamlessly across the organization. While information can flow across a single distributed ledger easily, problems occur when trying to connect a blockchain with a legacy system or another distributed ledger.

"This has been, and is still, a tremendous effort—it is costly, it is time-consuming for all participants in the business, it reduces time-to-market and excludes especially smaller companies," he says. "If we are not coming up with standards that make the exchange of data some orders of magnitude easier, we will only gain a fraction of the digitization dividends that DLT promises to bring."

Michael Spitz, CEO at Main Incubator, lays out the problem of blockchains that cannot interoperate, using a trade financing project as an example. If you wanted to deploy the project from one framework to the other, you would be out of luck—it cannot just be copied over.

"You cannot use [the open-source Hyperledger] Fabric and then right-click, see how it works, and then deploy it to [a different framework]," he says. "There is a different framework, a different language, and a different consensus mechanism. So there needs to be adjustments."

Interoperability means one transaction can run on two different frameworks, Spitz says, which is very complicated. It took his team six weeks to move from the Hyperledger Fabric into Corda, another open-source blockchain-specific tool. But that doesn't mean they can get Fabric and Corda to interoperate.

It's important that they figure out how to do this, in order to avoid the trap of vendor lock-in, Spitz says. "But we need to understand how we can actually build on different frameworks," he says.

If two blockchain systems have standardized the control processes they work on, they can talk to each other, says R3's Carlyle. The nodes in a blockchain system "talk" using semantics, communicating constantly in an ongoing discussion.

> "If we are not coming up with standards that make the exchange of data some orders of magnitude easier, we will only gain a fraction of the digitization dividends that DLT promises to bring."
> **Hans Huber, Main Incubator**

"If a different system has a completely different model about how finality is achieved, or how data gets propagated, then there has to be a mapping between those conversation semantics. They can't understand each other at a native level," he says.

For example, a system that has a concept of strong finality, like Fabric or Corda, finds it hard to work with a system like crypto networks Ethereum or Bitcoin, which have a probabilistic finality. The first system doesn't know when the second system is reaching execution, Carlyle says. "It doesn't give clarity as to whether the data on the other system will ever change in the future. So, standardization around the way these blockchain systems communicate must be modeled on trust; it becomes very important."

To ensure two different blockchain systems are able to effectively interoperate, trust between the platforms must be determined. Trust must also be able to be verified through data provenance and the ability to trace all the way back to the transaction that created the data in the first place, Carlyle says.

Be Specific

What does interoperability actually mean in practice? It turns out, that might be a difficult question to answer.

Caroline Malcolm, who heads up the Organization for Economic Co-operation and Development's Blockchain Policy Center, says standards should create an environment in which different blockchains can talk to each other. The OECD is among the organizations liaising with ISO/TC 307.

"We don't want to get locked into one particular blockchain protocol or another, it is quite important from that perspective of competition," Malcolm says.

It might help even to come to an agreement of what blockchain is in

Caroline Malcolm
OECD Blockchain Policy Centre

James Carlyle
R3

the first place, she says. "People use the word blockchain like they use the word Kleenex for tissues, but it does in fact have a specific meaning. Many things that get termed blockchain might actually be part of a broader group of what we would call distributed-ledger technology."

There isn't a single definition of what interoperability is, says Marta Piekarska, director of ecosystem for Hyperledger, a project started by the Linux Foundation to develop open-source distributed ledgers.

"We don't have an idea of what we mean by interoperability," she says. "You can see it as doing atomic swaps—so basically moving assets or data from one blockchain to another."

Atomic swaps are smart contracts that allow the exchange of one cryptocurrency with another, without an exchange.

She continues: "Interoperability, as it is defined by some of the companies that are building a [functionality] layer on top of blockchains, allows for a kind of translation between [blockchain systems], so not moving assets but rather translating between different blockchains. And then another [definition of] interoperability would be standardizing the messaging between blockchains. And then you have side chains, which is yet another thing where you basically freeze assets on one blockchain, move it to a side chain, and then move it back because the main blockchain is [where] the core of the transactions [take place]," says Piekarska.

Indeed, it might even be too early to define interoperability standards at all, says John Whelan, head of digital investment banking at Santander.

"Certain standards, however, could have immediate use," he says. "Standards for cross-chain interoperability will come later and, from a technical standpoint, we are just beginning to understand how

this level of interoperability might be implemented."

Down Under

Another challenge facing the sector is that there are a lot of entities looking to create standards around the globe. As an example, the International Organization for Standardization (ISO) has set up a technical committee, ISO/TC 307, for this purpose. Committee chair Craig Dunn used to be chair of a Sydney fin-tech start-up hub and has a background in banking as CEO at financial services company AMP and a board member of Australian bank Westpac.

Dunn is well aware of the dilemma about choosing the right timing for the standards.

"On the one hand there is a call for standards to help develop a technology and do it in a standardized way, in order to improve the rate of innovation, lower the cost of innovation, and those sorts of things," he says. "On the other hand, you can't rush the process, because if the work is only in its infancy, or there isn't

> "Anyone smart is designing applications that will be, going forward, blockchain-agnostic and be able to operate over a number of different blockchains."
> **Hirander Misra, GMEX Group**

John Mizzi
Bond.One

yet a consensus on which particular area of the technology to develop, you are not in any position to publish a standard."

The working groups within the technical committee include a broad spectrum of people, including representatives from larger technology groups working on blockchain, start-ups, lawyers, research scientists and representatives from standards bodies around the world.

"Generally, we believe the more involvement we have from people that are actually developing the technology, using the technology, the more likely we are to develop standards that are useful and impactful," Dunn says.

ISO/TC 307 plans to first release a technical report on smart contracts and standards of terminology within the next 12 months. The committee is also looking at themes like reference architecture and system interoperability.

Setting the Pace

Some believe, however, that it will be the market and not international bodies that will determine which standards come to define blockchain operations.

Tom Grogan is a lawyer at law firm Mishcon de Reya, where he co-leads the firm's blockchain group. He says the key blockchain platforms are competing in the area of standards. "To a certain extent, I think it would likely be a market decision as to which of those wins the day," he says.

"Obviously, R3 Corda has probably got the biggest foothold in the financial sector, and benefits from a number of consortium members being big financial players themselves. So it may well be that ends up being the entity that wins the day, but it depends on whether or not we

are saying those standards have got to be set by the platforms themselves or some sort of external body."

Conor Svensson, chair of the Technical Specification Standards Working Group of the Ethereum Enterprise Alliance (EEA), which is working with ISO/TC 307, believes there will be more flexibility around finalizing standards. "We are collaborating with everyone we see as relevant. We are not trying to lock anyone out of the ecosystem," says Svensson, who is also founder and CEO of Web3 Labs, which provides analytics around smart contract applications and blockchains.

Certainly, firms just want to engage with a technology that works across as many platforms as possible. Hirander Misra, chairman and CEO at GMEX Group, which is looking to launch a derivatives exchange, says when his firm developed applications on blockchain, they looked at a range of blockchains, including Corda, IBM, Hyperledger, MultiChain and Ethereum. Given there is a lot of development overhead, resources have to be devoted to one over the other in the near term.

"Anyone smart is designing applications that will be, going forward, blockchain-agnostic and be able to operate over a number of different blockchains," he says. "And you can use them as a form of message bus as well."

John Mizzi, chief strategy officer at Bond.One, a platform for tokenized debt securities, says six months ago he would have predicted that one blockchain protocol would win out among financial services organizations and everyone would transport their data over to work on that one consistent protocol.

His views have changed a bit since, he says: Now, instead of requiring all of these applications to be transitioned to one single protocol over time, there are organizations coming up with interoperability solutions.

"Microsoft is focused on this as well," he says. "We can develop our application on [open-source blockchain platform] Quorum, we can work with a counterparty or a partner who can provide a complementary service, who has built their solution on Hyperledger or R3's Corda, and Microsoft is providing

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> **Greg Schvey, Axoni**

technical tools that allow us to process transactions across different protocols somewhat seamlessly. I think what ultimately is going to be the case is there will be tools that enable this seamless cross-protocol processing of transactions, and that allows all of the development that has taken place on one protocol or another protocol to remain the way they are."

Limited Success

Perhaps the greatest hurdle facing this global standards push is that only a handful of truly successful, live blockchain-based platforms are currently being used on a wide scale in finance. Greg Schvey, CEO at Axoni, a capital markets technology firm that specializes in distributed-ledger infrastructures, says that until there are more real deployments, the standards push will be slow to unfold.

"There is so much work to get one of these networks or systems setup, that trying to accommodate some other project, some other network that has all of its own risks of execution [means that it] is generally not the top priority, at least at this point," he says. "Five years from now it might be different when there are some more established networks out there, but for the time being, getting these things over the line for their own business case tends to be the top priority."

Consensus around standards is hard to get even in established areas, says Sam Chadwick, head of blockchain research at UBS. For example, there has been a lot of difficulty in getting to a standard for know-your-customer information, as each regulator in each country has different requirements.

But there is value in the exercise of trying to get to standards, Chadwick says.

Even if financial firms don't end up using a distributed ledger, through the discussions on standards it will have created a common understanding of how the data might be represented, and that is valuable. He gives the example of messaging standards for Internet of Things (IoT) devices, which, like mobile phones, each have their own protocols.

"As we think about platforms for IoT interfacing with the financial services industry, those very same discussions around the standards carry over, even without a blockchain underneath it," he says.

ISO's Dunn concedes that it's still early days for interoperability among distributed ledgers, and says the technical committee needs to study the issue more.

"We don't believe the world is ready for a standard yet. The technology just hasn't developed sufficiently to warrant a

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> **"We don't believe the world is ready for a standard yet. The technology just hasn't developed sufficiently to warrant a standard at this point."**
> **Craig Dunn, ISO**

standard at this point. That is one of the challenges of working with a very new technology," he says. "Depending on how the technology matures and develops, it will influence how quickly a standard [for interoperability] becomes available." **wt**

The Future of Cloud Regulation

As authorities begin to worry about the dominance of the major public cloud providers, Joanna Wright takes a look at how regulators could approach supervising these companies in the future.

On February 28, 2017, Amazon Web Services (AWS) suffered a massive outage due to high error rates with its Simple Storage Service (S3) in the US-EAST-1 corridor. The disruption took down websites and platforms across the US. At the time, a bank CTO told *WatersTechnology* that their team was "sitting around twiddling our thumbs" because the outage knocked out its main analytics platform and there was nothing they could do, even though the platform was mission-critical. A few weeks later, on March 21, Microsoft's Azure cloud suffered an outage, knocking US East Coast users of Office 365, Outlook.com, and Skype—among other services—offline. These were just the latest in a long list of examples as to how disruptive outages at these major public cloud providers can be.

According to analysis by industry website Network World, from the beginning of 2018 through May 3, 2019, AWS experienced 338 hours of reported downtime, Google Cloud Platform (GCP) followed with 361 hours, and Microsoft Azure experienced "a whopping total of 1,934 hours of self-reported downtime," though the outlet noted that "this is an aggregation of the self-reported data from the vendors' websites, which isn't the 'true' number, as regional information or service granularity is sometimes obscured." But these numbers do help show that service disruptions happen.

Governments are starting to worry seriously about the fact that much of the technology that finance relies on is underpinned by the big three cloud service providers: AWS, Azure and GCP. Currently, financial markets regulators don't have direct supervision over these cloud providers the way they do over banks, asset managers and exchanges, but they could seek to change that as trading houses shift more critical functions off-premise.

As they do so, though, financial firms worry that migration to the cloud—which is something they increasingly desire—could be hindered.

"It is important to be mindful that we are still at an early stage for cloud adoption in financial services," says Brad Carr, senior director of digital finance at the Washington, DC-based Institute of International Finance. "Regulators are absolutely right to be forward-looking, but as we try and weigh up the management of future risk profiles with enabling (not deterring or constraining) innovation, we need to be conscious of our current placement, which is that we are still at a very early stage."

As cloud has become increasingly enticing to financial firms—according

to a February 2019 report published by consultancy Tabb Group, "the majority of entities across the buy side, sell side and exchange/trading venues plan to increase spending on [public] cloud in 2019"—regulators have started considering concentration risk. The Bank of England (BoE) is among them: its June *Future of Finance* report quotes figures saying AWS and Azure command more than half of all cloud revenues, which "brings scale and efficiency, but also concerns about dependence on a small number of critical suppliers," the report says.

While the BoE acknowledges the cloud is becoming a strategic necessity, it says the risks of reliance on third parties "could heighten the risk of disruption to essential financial services in the event of operational outages or cyber-attacks."

The report says the central bank should continue to keep a close watch on the changing use of cloud technology and what this means for financial stability, before adding ominously: "Eventually, this may necessitate changing the boundaries of financial regulation to include aspects of cloud service providers' operations in the Bank's direct oversight."

The report also talks of expanding the powers of the Prudential Regulation Authority, saying that the PRA "should also consider whether it needs new powers such as giving supervisors sufficient access to cloud service providers to monitor risks appropriately."

Regulation of cloud providers would be an unprecedented major shift: In the US and Europe, regulators do have some authority to scrutinize these companies, but only in limited contexts, such as when a provider is performing a regulated activity on behalf of a bank and would have to get authorization. Mostly, however, regulatory guidelines have focused on ensuring the contracting firms themselves conduct their third-party due diligence and vendor look-through properly.

And cloud providers say they have business continuity plans in place. Frank Fallon, vice president of global financial services at AWS, says the company's infrastructure is architected to minimize the impact of potential events in a number of ways. "For example, we build our cloud infrastructure in diverse geographic

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> **Paul O'Hare, Kemp Little**

regions with multiple availability zones per region. This diffuses the potential for systemic risk for any particular industry or location."

The AWS cloud spans 69 availability zones in 22 regions across the world, he adds; the company plans to add nine more zones in three more regions.

European Standards

In the EU, the primary high-level regulation on outsourcing is found in Mifid II, which lays out the requirements with which financial institutions have to comply regarding their outsourcing arrangements, including those for cloud.

In the UK, the Financial Conduct Authority (FCA) handbook sets out rules and guidance that mirror the language of Mifid II, in its Senior Management Arrangements, Systems and Controls (SYSC) chapters. The outsourcing rules are known as "SYSC 8" in the handbook and are concerned with operational functions that are critical or important to a firm.

The European Banking Authority also has its own guidance on outsourcing for payment and credit institutions, as well as investment firms, which it is about to update. At the end of September, the new guidelines will replace not only the existing ones on outsourcing—which have been in place since 2006—but also the EBA's recommendations on cloud outsourcing specifically, which have been in place since July 2018.

The new guidelines require firms to assess if the functions they are outsourcing are "critical or important" and would impair the firms' regulatory compliance, financial performance or business continuity if the service provider should fail in some way. The

guidance also says outsourcing contracts must set out the rights to audit providers' premises, including devices, systems and networks, for banks and regulators.

This guidance is very detailed in contrast to Mifid II and SYSC 8, which are relatively high level, says Paul O'Hare, a partner and head of outsourcing at law firm Kemp Little in London.

"The 2019 EBA guidelines on outsourcing run to 70 pages, so they are much more detailed and cover a range of things that financial institutions need to do at all stages of the outsourcing lifecycle, from the pre-contract due diligence phase through to termination and exit of outsourcing cloud contracts. The guidance also identifies a number of issues that the financial institutions should ensure are adequately addressed in their outsourcing and cloud contracts," O'Hare says.

The EBA will also require firms to maintain a register of their outsourcing contracts, in part to help the regulators monitor potential concentration risks, he adds.

"So the regulators will be monitoring any potential risk, either at a micro level within a particular financial institution—is it putting all its eggs in one basket—or at a macro level, where you have over-reliance by large parts of the industry as a whole on one or two or a small handful of cloud providers," O'Hare says.

The EBA document also provides guidance of "chain outsourcing," which deals with how financial firms can look through to their service provider's service provider, which is often referred to as fourth-party risk. The firm will need to know who these parties are and have a degree of control over these relationships.

The FCA or PRA having direct control over the cloud providers, as the *Future of Finance* paper envisages it, would be a different direction for regulators, O'Hare says—and not one they want to take, at least not right now.

"It would very much be a last resort on the part of the regulators," he says. "They wouldn't want to get to a position where they felt they had to directly [oversee] service providers because there would be massive resistance from the cloud providers, and it would be costly for the regulator to do so."

That's not to say there isn't dialog and engagement between the cloud providers and government, "but that is very different to moving to a scenario where they have direct powers over the service providers," O'Hare says.

US Standards

In the US, similarly, the banking regulators have little direct power over cloud service providers, although the federal agencies can examine non-bank third parties if they have a large role in providing services to banks.

The law on outsourcing is laid out in the Bank Service Company Act. Washington, DC-based lawyers say this act is implemented in the US via the framework of the Federal Financial Institutions Examination Council (FFIEC), an interagency body that can prescribe standards for the federal examination of financial institutions. The FFIEC's members include the main banking regulators: the Federal Reserve, the Federal Deposit Insurance Corporation (FDIC) and the Office of the Comptroller of the Currency (OCC).

The FFIEC has a risk-based supervisory framework for what it calls Technology Service Providers (TSPs). The regula-

tory agencies can go on-site to review the largest TSPs and give them ratings in various categories, which are communicated to US financial firms. But the ultimate responsibility for the TSP lies with the contracting firm, which must have a risk management process in place that addresses vendor management for their relationship with TSPs.

US authorities are also clearly worried about concentration risk. *The Wall Street Journal* reported in August that the Federal Reserve formally examined an Amazon facility in Virginia, signaling concern about cloud providers that store sensitive financial information.

The Fed declined to comment for this article.

Regulated Cloud

There are a number of different scenarios of how one might manage concentration risk in the cloud, says the IIF's Carr.

Firstly, authorities could consider a cloud service provider as critical for banking, and focus on just that part of the provider's business that deals with financial firms. In this way, the cloud provider could be considered a bit like what are known in the UK as financial markets utilities (FMUs) or in the US as

systemically important FMUs—critically important pieces of infrastructure whose failure could threaten the stability of the entire financial system. Central counterparties (CCPs) for derivatives clearing are considered FMUs, for example.

Because tech firms and financial firms operate globally, this would most likely be driven on the level of the Financial Stability Board or the Group of 20, as is the case with CCPs.

"So at an FSB or G20 level, we end up saying, right, we are going to designate just the financial services bit of the cloud services provider (CSP) as a critical infrastructure. … But that then throws up some key questions: If you are doing that, are you trying to ringfence the finance bit of the CSP? Is it even possible or practical to ringfence the finance bit of the CSP away from the rest of it?" Carr says.

He says CSPs are emphatic in feedback to the IIF that this is not practical.

"And even if you could do that ringfencing, what does it mean for the business case of the CSPs? Would they be deterred from investing in the finance bit of the CSP, where they can't leverage or integrate with the rest of their business, in a field where the economics are heavily about scale?" he adds.

Another approach would be to designate a cloud provider as a critical national infrastructure across a range of different sectors, not just finance. Governments already designate utilities for water supply, telecommunications and electricity as critical infrastructure. Could cloud providers be considered as crucial?

"In this case, you aren't trying to ringfence the industry, but you still have the territorial issue: could the UK, for instance, designate an American CSP as a critical national infrastructure? How would the legalities and supervisory mandates around this work? Is the pragmatic reality that we instead need a US-led approach that other countries can harmonize to, or replicate?" Carr says.

The designation of critical infrastructure would also have to be informed by a clear formulation of the problem the regulators are trying to solve, Carr says, and ask what the risk actually is. Is the worry that the whole industry is reliant on three providers, and that more entrants should be encouraged into the market? Or is the problem one of resilience: that if one of the three fails and a third of the financial industry goes down with it, how do those firms get on to another provider and back up and running as quickly as possible?

If it's the former—authorities want there to be multiple providers—designation as critical infrastructure of AWS, Azure and Google might actually further entrench the incumbents.

Risk-averse procurement officers inside the banks will always hire one of the already-known and highly regulated three dominant players. No one gets fired for hiring IBM, the old adage goes; surely in 2019, no one gets fired for hiring AWS. (Indeed, even IBM has changed its strategy and now allows its Watson AI, which was previously only available on the IBM Cloud, to run on AWS, GCP and Azure.)

Additionally, other tech companies that might have wanted to start offering cloud services to banks would be deterred by requirements, Carr says.

"You might want to see Oracle and IBM and Apple or others enter the market and have something like six providers instead of just the current three leaders. But you … could have a scenario where the

> ## "There could be a piece where regulators say CSPs must demonstrate that if the CSP is down, the bank could readily shift its critical functions within a certain timeframe, either on to a different CSP or at least on to another cloud instance."
> **Brad Carr, IIF**

level of overhead required to satisfy that designation and oversight is just a barrier to entry. Those other candidate providers might say, we don't want to do that, it is too big a leap, we will just focus on other industries and let AWS and Microsoft and Google serve the regulated banking and insurance sector," Carr says.

Ironically, as a regulatory solution, that would end up running exactly counter to the objective and make the industry even more concentrated.

If the regulatory focus is on resiliency, on the other hand, the question becomes more about portability: how cloud providers can make it technically easy for firms to migrate their properties to other providers.

Carr says the three cloud incumbents are heavily focused on portability right now, partly because of their own sales objectives: They want customers to be able to move on to their platforms. But regulators too are starting to look at this.

"There could be a piece where regulators say CSPs must demonstrate that if the CSP is down, the bank could readily shift its critical functions within a certain timeframe, either on to a different CSP or at least onto another cloud instance. If you do that, you have issues with latency and redundancy; it might not be an optimally efficient solution, but it can help to mitigate the resilience concern."

Kemp Little's O'Hare agrees that regulators are thinking about portability: "There is a lot of emphasis on the steps that banks should be taking to ensure that they have an effective route to exiting their cloud contracts if they want to switch from one provider to the other without causing significant risk or disruption to the bank if the cloud provider is underperforming or gets into financial difficulty," he says.

Brad Carr
IIF

The providers themselves say vendor lock-in is a myth. AWS says on its website that it's easier to move information from cloud to cloud than within legacy systems.

AWS's Fallon says vendor lock-in is not a cloud-specific issue: "If you look at how companies have historically been locked into multi-year contractual relationships with their database providers, you can understand the trepidation. These proprietary offerings are expensive with punitive licensing and auditing terms."

He says AWS's services are usage-based, and customers can stop using them at any time, for any reason. "The mindset AWS has is that we need to earn our customers' business every hour, every day, every month, every year. We've been very fortunate that in more than 13 years of business, customers rarely choose to move off AWS."

Fallon says AWS's services are built on a lot of open standards, like SQL, Linux and Xen, and AWS provides migration tools that allow customers to not only move resources from on-premises to AWS, but also to move them back again.

"Additionally, AWS customers only pay for the services they use," Fallon adds.

Nevertheless, portability is likely to be a regulatory focal point, whether in updates to existing guidance or in a situation of direct regulation. The EBA has published warnings of "vendor lock-in" where firms may find it difficult to exit and migrate to a new cloud provider.

Whatever the concerns are, Carr says regulatory agencies around the world are realizing that the risks of moving to cloud are far less than the risks of not moving to cloud. Few institutions will want to eschew the flexibility and advanced analytics capabilities of cloud technology for clunky old mainframe computers and finding people who still program in Cobol.

Over the past year or so, more understanding and a much sharper focus on specific problems, portability and resiliency among them, has emerged, he says.

"These are probably the right issues, the right part of the risk profile for supervisors to be concerned with," Carr concludes. **wt**

Max Bowie

The 'Art' of Using Token Tech

Max Bowie says that while tokenization and blockchain offer benefits for investing in esoteric and illiquid assets, it won't make them safer or more profitable investments.

When I started writing under the *WatersTechnology* umbrella almost 19 years ago, it was under the auspices of then-owner Risk Waters Group (which sold to Incisive Media, and later to Infopro Digital). The owner and editor-in-chief of RWG was a publisher and entrepreneur by the name of Peter Field, who I have little doubt would be excited by the current developments around blockchain and digital assets—not because he was a fintech investor, but because he had a love of art, which influenced the artful cover designs of *Risk* magazine, and continues to do so. And I'm certain he would be excited by the prospect of tokenizing physical assets, ranging from real estate to fine art, and turning them into tradeable investments.

At the peak of its hype, blockchain evangelists promised that DLT technology would do everything from cook your breakfast to babysit your toddlers.

Now, as the technology becomes more mature and understood, the industry is spending less time on blue-sky, multi-year visions for "blockchaining" entire organizations, and is instead focusing attention on specific areas that can serve as a proving-ground for the technology and become a solid foundation for broader adoption, such as stock registries, KYC data repositories, and aggregated golden copies of price data.

Likewise, tokenization efforts that depend on blockchain are also becoming more targeted to investments—especially alternative assets—that offer potential exposure to high returns but have traditionally been cut off from investors for various reasons.

One example is fine art, which is a market that hedge funds and alternative asset managers have frequently tried to exploit. Fine art is a good example because not only can it offer stable investments and potentially high returns, it also captures investors' imaginations in a way that asset-backed securities or municipal bonds never

> **Tokenization and blockchain can't guarantee that you won't lose money, but they can aid in creating greater transparency.**

will—just as how tokenizing real estate assets potentially allows investors to take stakes in iconic buildings, or just buildings that they pass every day (*see page 34*).

Phillip Silitschanu, director of strategic relationships at Token IQ, believes that tokenizing any illiquid asset makes it more tradeable, and increases transparency, ultimately giving a better idea of its true value. This not only makes an asset more liquid, but also means investors can more accurately price the asset as part of their portfolio.

"Smaller stakes [in a painting] may trade more frequently, so you could see prices changing week-to-week or month-to-month, so that—even if they aren't updating in real time—you get a better idea of an asset's value than you would for a painting that sells for $20 million every 10 years," he says.

Tokenizing fine art exposes it to more funds and investors, but also allows it to be treated differently than other financial instruments created for the purpose of investment, whereas alternative assets like art and real estate were not. For example, a tokenized structure would allow art to be rotated between public museums and galleries, whereas privately owned artworks might sit unseen in a billionaire's vault.

But there are other challenges associated with taking something of value that originates outside the confines of the financial markets and trying to shoehorn it into a framework that is acceptable to investors. For example, would a tokenized consortium be subject to similar rules as equity ownership models? Would investors' ownership levels be disclosed? If one party buys up more than 50% of available tokens in an asset, would they get a bigger say in decisions affecting the underlying asset? And would the market for the free-floating remainder of that asset collapse?

When approaching tokenized alternative assets, it's worth remembering the lessons of the property bubbles (there's no such thing as "safe as houses") and that the value of any investment—especially those subject to the whims of the open markets—can go down as well as up. Therefore, these efforts still need many of the same structures, processes, rules, and tools as other financial markets. Tokenization and blockchain can't guarantee that you won't lose money, but they can aid in creating greater transparency, which means you should be able to spot a change in direction earlier, and be able to trade in or out of an asset (via its tokens) faster. **wt**

Turning Point for Cloud Trust

Jo Wright says the Capital One data breach could make cloud adoption just that much more fraught.

When I first read news reports about the massive data breach that hit Capital One back in July, my first thought was, "Oh well, another day, another leak of millions of consumers' sensitive personal data." It's unfortunate, but when it comes to cybersecurity, it's easy to become desensitized in the face of such a daunting challenge.

The breach, one of the largest ever discovered, was allegedly perpetrated by a former Amazon employee named Paige Thompson, who might have exploited something called a Server Side Request Forgery (SSRF). SSRF is the most serious vulnerability facing organizations that use public clouds, according to a blog on the hack by Cloudflare's head of product security, Evan Johnson.

The bank hadn't even been aware of the breach until it was notified by a tipster. Subsequent news reports said that Thompson may have hit other companies too, including Vodafone.

It seems that each year brings a new wave of huge data breaches at some of the world's largest financial institutions. But it struck me that this time something a bit different was going on: AWS, Capital One's main cloud services provider, was taking almost as much heat for the breach as the bank.

Storm Clouds

A rash of articles explained how Thompson had allegedly used her expertise as a former Amazon employee from 2015 to 2016 to help in the crime.

Journalists and analysts on TV debated whether the tech giant, by far the most dominant player in cloud services, was to blame. Customers of Capital One who were among the more than 100 million Americans and Canadians whose personal identifying information was exposed named AWS as a co-defendant in a class action lawsuit they are undertaking, assigning just as much culpability to Amazon as to the bank.

AWS itself said it is not to blame, saying in a statement that it "functioned as designed" and that the perpetrator "gained access through a misconfiguration of the web application and not the underlying cloud-based infrastructure." They may have a point. After all, the vast majority of cloud breaches are caused by just such misconfigurations—human error on the client side.

> **Though brands like Amazon, Apple and Facebook are still much admired, cracks are starting to show in public trust.**

I couldn't help but think back to something that Blackstone CTO Bill Murphy recently told *WatersTechnology*: "You can do the cloud wrong; it's not like you just suddenly press one button and you're in the cloud. You can misconfigure the cloud instances and create massive vulnerabilities, so you need to have proper governance when you move there and be worried about security, just as much as if it was in your own private datacenter."

On the other hand, Johnson says on his blog that "the impact of SSRF is being worsened by the offering of public clouds, and the major players like AWS are not doing anything to fix it."

But putting aside the issue of blame, public cloud was still at the heart of this particular crime. Both AWS and Capital One had punted their partnership in the media, the bank especially keen to position itself as an innovative first mover going "all in on public cloud" and taking AWS as its primary provider.

It seems the public is becoming aware how much of the technology they use every day is now hosted on the servers of a handful of big corporations, and they are starting to worry about it. This dovetails with a growing distrust of Big Tech—brands like Amazon, Apple and Facebook are still much admired, but cracks are starting to show in public trust. Presidential candidates talk of antitrust violations and breaking up the biggest firms. And in institutional finance, as I report this month on page 68, regulators are expressing concern about the concentration of cloud services among three companies.

The capital markets are heavily regulated, and firms take big financial, operational and reputational risks when outsourcing their critical functions. That's why adoption in this sector has been relatively slow. But the promises of the cloud are too great. Even as regulators show concern, they are urging adoption so that the financial services in their jurisdictions remain competitive.

But while cloud providers have improved their security to the point where they can appeal to heavily regulated banks and asset managers, the political context is getting more complicated. **wt**

Wei-Shen Wong

Passing the Sibos Torch

Wei-Shen Wong looks back at the key themes of Sibos 2018 to preview this year's London event.

Last year marked my first time covering a Sibos event, which on that occasion was held in Sydney. It was a fun, exhausting, coffee-and-cocktail-infused affair. Though I won't be there this year, I thought it would be fun to look back at Sibos 2018 to see what might be in store for this year's event in London. Please make sure you say hi to my colleagues, Jo Wright, Josephine Gallagher and Hamad Ali, if you'll be in attendance.

Blockchain

Obviously, this being a Swift-hosted conference, payments and trade finance were the biggest topics up for discussion last year, and that will not change anytime soon. *WatersTechnology* is not massively into payments and trade finance as we mainly write about trading tech for the institutional, wholesale capital markets. But when it touches on blockchain, we take notice because what's happening in payments and trade finance will likely bleed into the rest of finance—if not sooner, then later.

One of the first stories we covered there was about Voltron—the initiative eight banks (Bangkok Bank, BNP Paribas, CTBC Holding, HSBC, ING, NatWest, SEB, and Standard Chartered) undertook along with blockchain specialist R3. The project looks to make trade finance more efficient.

Since then, the Voltron initiative has completed several global trials. More than 50 banks and corporates have participated in the simulation of multiple digital letter of credit transactions across 27 countries on six continents.

Voltron uses blockchain technology to reduce the time it takes to execute the letter of credit process—traditionally a manual, paper-based affair—from between five and 10 days to less than 24 hours.

As we have said in these pages many times, blockchain often resembles a hammer in search of a nail. But when it comes to trade finance, there are true

> What I also discovered at Sibos is that many of the best discussions are had over coffee or—even better—drinks.

industry-wide (as opposed to internal) use cases unfolding at banks across the globe. I found that Sibos was good at highlighting the reality over the hype.

Crypto Crazies

You can't talk about blockchain and Sibos without a discussion of cryptocurrency. With Facebook getting into the crypto game—and, as a result, regulators turning their Eye of Sauron on its Libra offering—it stands to reason that crypto will once again find its way onto the Sibos agenda.

Last year, I spoke with Walter Verbeke about how central securities depositories (CSDs) could play a similar role in the crypto-asset infrastructure.

At the time, Verbeke worked for Euroclear, though in May of this year he was poached by BNY Mellon as senior principal for corporate strategy. Before moving to the custodian bank, he spoke with *Coindesk* about this idea

of CSDs in Europe and Asia collaborating on infrastructure to custody digital assets—an idea that really took flight at Sibos 2018.

"So BNY Mellon would be there, HSBC, Standard Chartered, those types of banks. And of course, a number of other European banks as well," Verbeke told *Coindesk*.

He told me that there are certain pieces of financial market infrastructure (FMI) and roles that CSDs play as a central body, and that these could be used in the crypto market.

"Tomorrow, those FMI roles will have to be played as well. And some of those pieces of infrastructure and FMI roles will fall more naturally into our remit for what a CSD does," he said.

Quantum Computing

Sadly, the one subject that appears to be missing from this year's agenda is quantum computing. There was keen interest in the topic at Sibos 2018, which featured no fewer than eight sessions devoted to it, including a curated quantum computing networking session.

While it's important to discuss the trends that are most crucial to today's markets—whether that be in payments and trade finance, blockchain developments, or AI and cybersecurity—which will feature prominently—it's disappointing that this year's event isn't going to help advance quantum computing's development.

But then again, what I also discovered at Sibos is that many of the best discussions are had over coffee or—even better—drinks. **wt**

Human Capital

Former NEX CEO Pivots to Baton's C-Suite

Baton Systems, a provider of distributed ledger-based post-trade and payments solutions, has hired Andres Choussy in New York as president and COO. Choussy will look to expand Baton's client base beyond major financial institutions in the payments space, while building scale around the company's products.

He was most recently president and CEO of NEX Group's Traiana (now part of CME). Prior to that, he was head of derivatives clearing for the Americas and global co-head of OTC clearing at JP Morgan.

Capitolis Makes Krug President

Technology provider Capitolis has promoted Justin Klug to the role of president. He will work closely with the vendor's development team and clients as it invests, grows and scales.

Klug has served as COO at Capitolis for the past two years. Prior to that, he was a managing director at Credit Suisse, where he led the US rates structuring team and was responsible for developing, executing

Asif Alam

Michael Pizzi

and monitoring strategic and tactical business lines. He has also worked at Bank of America Merrill Lynch, where he developed, marketed and executed cross-asset structuring and solution distribution to institutional clients.

Klug is based in New York.

Crux Names Etherington CTO

Mark Etherington joined Crux Informatics in June as CTO. He replaces Philip Brittan, Crux's CEO, who had been acting as interim CTO.

An industry veteran, Etherington has worked at several stalwarts, including his most recent post at Refinitiv, where he was global head of trading technology. He joined Thomson Reuters as global head of execution management system technologies before its rebranding. Prior to that, he was CTO at REDI Global Technology.

He is based in New York.

Crux has also hired former consultant Asif Alam in San Francisco as full-time as head of partnerships and alliances. Alam will join the firm's leadership team, and will oversee relationships and structure deals with strategic partners.

E*Trade Appoints New CEO

E★Trade Financial has announced that current COO Michael Pizzi is taking on the role of CEO, following an earlier announcement that current CEO Karl Roessner is leaving the company after 10 years' service. Pizzi took over the role, effective immediately, but Roessner will act as an adviser through the end of the year. Pizzi will also join the board of directors.

Pizzi has held several roles at E★Trade since joining in 2003, including COO, chief risk officer, CFO and corporate and bank treasurer. Prior to that, he worked in asset/liability

management at Lehman Brothers and First Maryland Bank.

Visible Alpha Hires Miller

Visible Alpha has named Samantha Miller chief product officer. She will oversee product strategy and manage the investment research technology provider's entire product suite.

Miller joins from Dun & Bradstreet, where she was vice president of global product portfolio strategy and management. Prior to that, she was general manager and vice president of product at LexisNexis.

Miller is based in New York.

Passaro to Head Capital Markets at BTIG

Brokerage firm BTIG has hired Deutsche Bank's Joe Passaro as a managing director and head of capital markets. He will advise on equity, equity-linked and equity-derived products, and take part in originating transactions, structuring offerings and improving valuations for corporations.

Passaro spent 12 years at Deutsche Bank Securities in a variety of senior roles across the equity capital markets and global equity trading units.

Based in New York, he reports to Matt Clark, head of BTIG investment banking.

Byron Swaps Fidessa for FIA

The Futures Industry Association (FIA) has hired Don Byron as head of global industry operations and execution. Byron will be responsible for developing solutions related to clearing, execution, cybersecurity, and market structure issues, and will be the principal FIA liaison with the divisions and committees representing these areas.

He joins from from Fidessa/ION

Andres Choussy

Markets in Chicago, where he was product manager for Fidessa's derivatives global trading platform.

Instinet Adds One for EMEA Execution Sales

Nomura's Instinet has named Seema Arora head of execution sales for EMEA. Arora will lead a team responsible for selling all Instinet execution products and offering related strategies for clients.

Arora previously spent 10 years at Kepler Cheuvreux, most recently in a similar sales role. She is based in London and reports to Instinet CEO Richard Parsons.

Itiviti Appoints New CFO

Trading and compliance solutions provider Itiviti has hired Peter van Tiggelen in London as CFO.

Van Tiggelen was CFO at the last three firms he has worked for, including healthcare technology provider CRF Health and AmCO, a specialty pharmaceuticals company.

CFTC's First Innovation Head Returns to Private Sector

The Commodity Futures Trading Commission (CFTC) has announced the departure of Daniel Gorfine, its first chief innovation officer and the director of LabCFTC, a platform that informs the commission's policies for new financial technologies. Gorfine is returning to the private sector in an undisclosed role.

After joining the CFTC in 2017, he created primers on virtual currencies and smart contracts, spearheaded the creation of the LabCFTC Accelerator, focused on tech innovation competitions and internal tech trials, and held the first CFTC Fintech Forward conference. He also served as the designated federal officer of the CFTC's Technology Advisory Committee.

SEC Cyber Chief Exits Agency

Robert Cohen, the first chief of the Securities and Exchange Commission's

INDUSTRY VET NADZAN JOINS TEMPLUM

Brian Nadzan has joined Templum, a provider of blockchain-based trading services for the private markets, as CTO. He will focus on building new solutions to provide connectivity and liquidity for alternative assets, such as digital and private securities, and manage the firm's technology team.

Nadzan most recently worked at AlphaPoint, where he served as the company's chief development officer. Prior to that, he spent eight years at TradingScreen in the same role, then later as chief data officer. Nadzan has also been IT director at

Brian Nadzan

Lava Trading, responsible for developing its buy-side execution and order management systems.

He will carry out his new role in New York.

Peter Sanderson

(SEC) Cyber Unit, is leaving after 15 years of service.

The division was created in 2017, and Cohen led investigations into violations involving cryptocurrencies and other digital assets, hacking and cybersecurity disclosures.

Before heading the Cyber Unit, he was co-chief of the Market Abuse Unit, where he was the point man for cases that looked into insider trading schemes, dark pools, and market manipulation. Cohen joined the SEC's Enforcement Division in 2004.

GAM Names New CEO, Chair

Swiss asset manager GAM has named former BlackRock executive Peter Sanderson CEO. Sanderson will focus on restructuring and "simplifying" GAM, and concentrate on more profitable business lines in order to put the company on a growth trajectory.

At BlackRock, he held several roles in the EMEA region, including head of financial services consulting, co-head of multi-asset investment solutions, and COO for BlackRock Solutions. He was also part of Merrill Lynch's strategic investment group prior to its merger with BlackRock.

In addition, the current chairman of GAM's board of directors, Hugh Scott-Barrett, is stepping down in October and will be replaced by interim CEO David Jacob.

Prior to joining GAM, Jacob was CEO of Rogge Global Partners, vice chairman and chief information officer for Henderson Global Investors,

EMEA head of fixed income at UBS Asset Management, and vice president of JP Morgan Asset Management.

Sanderson and Jacob are based in London.

CFTC Names Head of Clearing and Risk

Malcolm "Clark" Hutchison has been appointed director of clearing and risk at the Commodities Futures Trading Commission. Hutchison will be responsible for the CFTC's supervision of derivatives clearinghouses and their members, including oversight of clearing processes through risk assessment and surveillance.

He has a 34-year career in derivatives trading, including roles as managing director at Deutsche Bank Securities, Morgan Stanley and UBS Securities, and as executive director at Goldman Sachs.

Instinet Hires Head of Quant Trading Strategy

Instinet, the execution services arm of Nomura Group, has hired David Fellah in a new role: head of quantitative trading strategy. He will sit within Instinet's Global Trading Research (GTR) team in Hong Kong, leading quantitative trading strategy research and execution consultancy across Europe and Asia.

Fellah joins from ITG, where he was head of trading analytics.

In his new role, he reports to Richard Parsons, CEO of Instinet Europe, and David Firmin, global head of GTR. w͟t

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