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Introducing the TabbFORUM 40 Top Innovators in Financial Markets

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Who are the top tech executives in the capital markets -- leaders who possess that special blend of vision, strategy and execution? Look no further than the inaugural TabbFORUM 40. Here is a list of the top 40 technology-driven innovators, those disruptors and difference-makers who are having the greatest impact on financial markets. Plus, a list of the 10 To Watch.

Through economic cycles, uncertainties, crises and volatility, the financial markets consistently prove to be not only reliable and resilient, but also engines of growth and innovation. Facing a constant and ever-more challenging barrage of risks and stresses, capital markets have repeatedly demonstrated their operational strengths as well as those of their underlying infrastructures, while supporting and nurturing cultures of experimentation and entrepreneurship.

How does it happen? Start with leadership and management, and in this industry, a special blend of vision, strategy and execution. The TabbFORUM 40 spotlights those technology-driven innovators, disruptors and difference-makers who are having the greatest impact on financial markets, on how far they have advanced, and on where they are headed.

This inaugural selection is the result of TabbFORUM research, with consideration given to nominations and recommendations from the community, and is based on qualities of the individual executives including leadership, results and reputation; impact on domestic and/or global markets; achievements both recent and over the course of a career; and pure technology advances, implementations and R&D.

The honorees – in addition to the TabbFORUM 40 profiles, 10 others are recognized who are working on leading-edge developments – come from all across market and transaction lifecycles, multiple asset classes, and are at the cutting edge of such areas as operational efficiency and resiliency, trading systems, and market structure, data and analytics.

Among the 40 are top exchange company CEOs (Intercontinental Exchange's Jeffrey Sprecher and Nasdaq's Adena Friedman); chief technology officers at organizations managing petabyte-scale databases (Bloomberg's Shawn Edwards and Two Sigma's Jeffrey Wecker); serial product and technology inventors who are still going strong after five decades (Thomas Peterffy and Richard Sandor); former regulators now making waves in the crypto world (Brian Brooks and J. Christopher Giancarlo); and the distinctive, thought-provoking voices of a current regulator (SEC Commissioner Hester Peirce) and disruptive-tech-focused asset manager (Cathie Wood).

The TabbFORUM 40 2022

- Michael C. Bodson, President and Chief Executive Officer, Depository Trust & Clearing Corp.
- Brian P. Brooks, Chief Executive Officer, Bitfury Group
- Charles Cascarilla, Chief Executive Officer, Paxos
- Sebastian Ceria, Chief Executive Officer, Qontigo (Deutsche Börse Group)
- Nadine Chakar, Executive Vice President, Head of State Street Digital
- Martin Chavez, Vice Chairman, Sixth Street Partners, Director, Santander Group
- Peter B. Cherecwich, President of Asset Servicing, Northern Trust Corp.
- Mazy Dar, Chief Executive Officer, OpenFin
- Terrence A. Duffy, Chairman and Chief Executive Officer, CME Group
- Shawn Edwards, Chief Technology Officer, and Vlad Kliatchko, Chief Product Officer and Vice Chairman, Bloomberg LP
- Bridget E. Engle, Chief Operations and Technology Officer, BNY Mellon
- Henry A. Fernandez, Chairman and Chief Executive Officer, MSCI
- Patrick Flannery, Chief Executive Officer, MayStreet
- Adena T. Friedman, President and Chief Executive Officer, Nasdaq
- Thomas P. Gallagher, Chairman and Chief Executive Officer, Miami International Holdings
- J. Christopher Giancarlo, Senior Counsel, Willkie Farr & Gallagher
- Robert Gutmann, Chief Executive Officer, NYDIG
- Alasdair Haynes, Chief Executive Officer, Aquis Exchange
- Jeanine Hightower-Sellitto, Chief Executive Officer, Atomyze LLC
- Paul Humphrey, Chief Executive Officer, BMLL
- Chris Isaacson, Executive Vice President and Chief Operating Officer, Cboe Global Markets
- Brad Levy, Chief Executive Officer, Symphony Communication Services
- Ronnie Mateo, Co-Chief Executive Officer, Trumid
- Richard M. McVey, Chairman and Chief Executive Officer, MarketAxess Holdngs
- David Mercer, Chief Executive Officer, LMAX Group
- Michael Novogratz, Founder and Chief Executive Officer, Galaxy Digital Holdings
- Lee Olesky, Chairman and Chief Executive Officer, Tradeweb Markets
- Hester Peirce, Commissioner, Securities and Exchange Commission

- Thomas Peterffy, Chairman, Interactive Brokers
- Yuval Rooz, Chief Executive Officer, Digital Asset Holdings
- Richard L. Sandor, Chairman and Chief Executive Officer, American Financial Exchange
- Travis Schwab, Chief Executive Officer, Eventus
- Nick Solinger, Chief Executive Officer, FIA Tech
- Jeffrey C. Sprecher, Chairman and Chief Executive Officer, Intercontinental Exchange
- Andrea Remyn Stone, Group Head, Data & Analytics, London Stock Exchange Group
- Stacie Swanstrom, Chief Product Officer, Pico
- Mona M. Vernon, Head of Fidelity Labs
- Jeffrey Wecker, Chief Technology Officer, Two Sigma Investments
- Cathie Wood, Chief Executive Officer, ARK Investment Management
- Peng Zhao, Chief Executive Officer, Citadel Securities

Michael C. Bodson, President and Chief Executive Officer, Depository Trust & Clearing Corp.

Processing well over $2 quadrillion in securities transactions annually, providing custody and asset services for $73.5 trillion worth of issues, serving 6,300 client firms in 70 countries, DTCC is an essential cog in the machinery of finance. As an industry-owned utility, it ensures global markets' safety and stability "by seamlessly clearing and settling transactions every day," says Michael Bodson, president and CEO of DTCC and three principal operating subsidiaries. Since becoming CEO in 2012 – he had joined DTCC in 2007 after 20 years in senior operations positions at Morgan Stanley, and is retiring in August – Bodson has flawlessly maintained the post-trade plumbing while also cultivating an edgier, more innovation-driven culture belying the firm's staid "legacy" reputation. It sponsors a fintech incubator and has undertaken artificial intelligence and cloud computing transformation initiatives.

Intent on understanding the implications of potentially disruptive blockchain, or distributed ledger technology, DTCC bought a minority stake in Digital Asset Holdings, Bodson took a seat on its board, and the two organizations jointly tested the waters. "We intend to use our more than 40 years of experience and expertise to help shape the future and lead the development and implementation of this technology," the CEO said at a 2016 DTCC symposium. In 2021, DTCC hired Brian Oliver, formerly of Citadel Securities and IHS Markit, as head of business development – digital securities management, based in London and reporting to head of strategy and business development Jennifer Peve, a former CME Group executive who joined DTCC in 2015.

DTCC has mapped a path to implementing central clearing in the U.S. Treasuries market, and it will be ushering the securities industry toward T+1, or one-day, settlement, from T+2, over the next two years.

Following a 2021 distributed-ledger proof of concept, DTCC has begun implementing Project Ion, "modeled around a netted T+0 settlement cycle but capable of supporting T+2, T+1, T+0 or extended settlement cycles."

Brian P. Brooks, Chief Executive Officer, Bitfury Group

"Disruptive regulator" may be an oxymoron, but Brian Brooks made the idea plausible. As acting Comptroller of the Currency from May 2020 to January 2021, heading the U.S. national bank regulatory agency, Brooks called himself "the first fintech Comptroller" and encouraged cryptocurrency experimentation and innovation. For example, a July 2020 interpretive letter told national banks and federal savings associations that they had authority to provide cryptocurrency custody services. "From safe deposit boxes to virtual vaults," Brooks stated, "we must ensure banks can meet the financial services needs of their customers today. This opinion clarifies that banks can continue satisfying their customers' needs for safeguarding their most valuable assets, which today for tens of millions of Americans includes cryptocurrency."

The letter was signed by senior deputy Comptroller and chief counsel Jonathan Gould, who in February 2022 was appointed chief legal officer of Bitfury Group, where Brooks became CEO last October. Gould, a former Senate Banking Committee chief counsel, was "sitting at the table for some of the most important policy conversations impacting the crypto industry in the United States," Brooks said, which "will be extremely valuable as Bitfury endeavors to play a larger role in these conversations around the world. We are thrilled to have Jonathan on board as we seek to leverage our best-in-class technology and team to bring blockchain into the mainstream."

Based in Amsterdam and founded in 2011 by Valery Vavilov, now chairman and chief vision officer, Bitfury grew from a bitcoin mining operation into a "Web 3" infrastructure company with an array of hardware, security and software technologies – in Brooks' words, "a diversified portfolio [that] has immense opportunity and is well positioned for long-term success."

A University of Chicago law graduate, Brooks spent 17 years with the O'Melveny & Myers firm. He was its managing partner in Washington before becoming vice chairman of OneWest Bank in 2011, where the previous Comptroller of the Currency, Joseph Otting, was also a top executive (as was Trump administration Treasury Secretary Steven Mnuchin). Brooks was executive vice president, general counsel and corporate secretary of Fannie Mae from 2014 to 2018, then chief legal officer of crypto exchange company Coinbase, until Otting brought him into the Comptroller's office as first deputy and chief operating officer in April 2020.

Returning to the Capitol last December to address a House Financial Services Committee hearing, Brooks spelled out as a "threshold issue . . . whether it makes more sense to continue to keep crypto activities largely out of the regulated financial system, or to bring them inside the system precisely so they can be supervised and operated with appropriate levels of risk management."

Charles Cascarilla, Chief Executive Officer, Paxos

"The U.S. financial system is exceedingly slow," Charles "Chad" Cascarilla declared in House Financial Services Committee testimony last December. He co-founded Paxos in 2012 convinced that blockchain held the key to speeding things up, so that it doesn't take five days to transfer funds internationally, and settlement risk – "trillions of dollars worth of capital held up in transactions that have not yet settled" – can be minimized. Cascarilla earned that moment in the limelight as a prominent "crypto native" alongside leaders of Circle Internet Financial, Coinbase and FTX.

Operating as a New York State-chartered trust company, with a national charter application approved last year, Paxos introduced itBit as the first regulated cryptocurrency exchange, as well as the USDP stablecoin. Cascarilla argued that "regulation should establish a level playing field and safeguard consumers, while still encouraging the innovation that helps ordinary people, especially those disadvantaged by the status quo," and that blockchain technology can "replatform" and "revolutionize" financial services by making them more efficient, accessible and economical.

With ABN AMRO, Bank of America, Societe Generale and Wedbush Securities among its institutional customers, Paxos got Securities and Exchange Commission approval in 2019 to pilot settlement of stock trades on the blockchain. It applied last October for a full equities clearing agency registration. In February, Paxos congratulated the SEC for formally proposing to reduce the U.S. equities settlement timetable to T+1 (one day after the trade date) from T+2.

A former analyst and portfolio manager and co-founder of Liberty City Ventures, a Paxos backer, Cascarilla believes reform won't stop there: "U.S. equities settlement is opaque and relies on outdated technology. The Paxos Settlement Service reduces risk, enables greater trading liquidity and provides ownership transparency, which will revolutionize securities markets." As asserted in a Paxos blog, "T+1 and T+0 are possible today if the SEC opens the market to competition."

Sebastian Ceria, Chief Executive Officer, Qontigo (Deutsche Börse Group)

Deutsche Börse's Roadmap 2020 strategic plan targeted "programmatic M&A and new technologies." In 2020 and 2021, respectively, the parent of Frankfurt Stock Exchange, Eurex and Clearstream purchased majority stakes in U.S. trading algorithm and analytics developer Quantitative Brokers and Swiss-regulated digital asset venture Crypto Finance. Preceding those transactions, in 2019, was the $850 million acquisition of New York-based analytics software innovator Axioma, which Deutsche Börse CEO Theodor Weimer termed "a step change for our pre-trading business." Axioma was combined with its German parent's STOXX and DAX index businesses. Axioma CEO Sebastian Ceria, now leading the larger enterprise dubbed Qontigo, described it as "a growth company that is uniquely equipped to help clients capitalize on the critical trends now reshaping the investment management landscape." The indexing expertise plus "Axioma's best-of-breed analytical capabilities in risk management, portfolio construction and performance attribution is expected to result in strong near-term revenue synergies and creation of a platform for future growth." (Their EBITDA through nine months last year jumped 69%, to €137 million.)

A Carnegie Mellon University (Tepper School of Business) operations research PhD, and a member of the National Academy of Engineering, Ceria was teaching at Columbia University in New York before he founded Axioma in 1998 as a mathematical modeling consultancy. In 2001 he began selling portfolio optimization software, eventually leveraging cloud computing and other high-performance capabilities to offer an array of solutions, data and services for a global, multi-asset customer base. Qontigo has reported a significant expansion over the past year in the Axioma equity risk model suite as well as enhancements to its granular and factor-based fixed income models.

Ceria is emphatic about the role and importance of technology. He recruited as Qontigo's chief operating officer Neal Pawar, who was previously group chief information officer at Deutsche Bank and before that held comparably senior positions at AQR Capital Management, UBS Wealth Management and D.E. Shaw Group.

Tech is "the best friend of investment managers," Ceria said in an online Q&A. Whether active or passive, firms "have to raise their game . . . either by delivering competitively superior risk-adjusted returns, by being more efficient – i.e., achieving the advantages and economies of scale – or some combination of the two. And the deployment of modern technology is an essential element in that overall mix."

Nadine Chakar, Executive Vice President, Head of State Street Digital

It is a measure of the importance attached to digitization that State Street Corp. called on Nadine Chakar, executive vice president of State Street Global Markets, to head the State Street Digital division when it launched last June. The asset servicing giant – it had $43.7 trillion in assets under custody and/or administration and $4.1 trillion under management at yearend 2021 – put the initiative in the context of a "long history of innovation and strong foundation within the digital servicing space," citing its Alpha open and interoperable data and deals already in place to serve as administrator of bitcoin exchange-traded funds. The GlobaLink technology platform was to be "an integral component of State Street Digital and will be enhanced into a digital multi-asset platform," anticipating creation of "new liquidity venues for our clients and investors worldwide."

"We have been developing a number of digital capabilities and other solutions as well as partnering and investing in the infrastructure that forms the foundation of State Street Digital," said Chakar, who reports to chief operating officer Lou Maiuri. "State Street has a major role to play in the evolution of digital market infrastructure, and this new division will help us bring our expertise and resources to the conversation. As digital currencies and tokenization not only gain momentum, but transform financial infrastructure and operating models, we can help our clients bridge the gap between the industry of today and the one of tomorrow."

Chakar was previously global head of operations for the Manulife Global Wealth and Asset Management Division, and before that was at BNY Mellon as the global head of Financial Institutions and head of eCommerce Strategy and Research and Financial Markets Infrastructure.

In December, State Street collaborated with Vanguard and distributed ledger technology (DLT) developer Symbiont on completion of the first live trade for foreign exchange forward contracts leveraging blockchain and smart contracts. It demonstrated a way to "reduce our customers' operational challenges through process automation and state of the art technologies." Warren Pennington, head of Vanguard's Investment Management FinTech Strategies Group, said, "The lower risk and increased speed will lead to lower costs and improved outcomes for investors."

In another DLT application, State Street's Charles River Development subsidiary in February announced a collaboration giving investment firms access to corporate bond liquidity from the LedgerEdge ecosystem via the Charles River Inventory Hub and Order and Execution Management System.

Martin Chavez, Vice Chairman, Sixth Street Partners, Director, Santander Group

Goldman Sachs Group has had a long and impressive line of technologists designing systems and executing strategies on behalf of the firm and its clients, none of them more visionary and transformative than R. Martin Chavez. A computer scientist and software entrepreneur with interests in life sciences as well as finance, Chavez was a Goldman Sachs partner from 2006 through 2019 who served as global co-head of the securities division, chief information officer (overseeing a force of 9,000 engineers) and chief financial officer. He has gone on to be a partner at investment firm Sixth Street Partners; is a Santander Group non-executive director and chairman of its board's innovation and technology committee; and is in advisory capacities with artificial intelligence and deep learning start-up Abacus.AI, the Digital Dollar Project, data control, governance and security company Ketch, and a number of medical-tech innovators such as Earli in cancer detection.

"When I began building 'digital twins' in the 1970s, it was 30 years too early – the computers couldn't keep up," Chavez said in a LinkedIn post about Jennifer Doudna, Nobel laureate for her work with CRISPR, who was named Sixth Street's chief science adviser. "Now, we are at last entering a golden age of biotech innovation." A company Dr. Doudna founded, Mammoth Biosciences, is a Sixth Street investment. Another example is digital analytics company Heap, which closed a $110 million Series D financing in December led by Sixth Street and with the Growth Equity business within Goldman Sachs Asset Management participating.

Chavez, who has a computer science master's degree from Harvard University and a medical information sciences PhD from Stanford University, was chief technology officer and co-founder of Quorum Software Systems (1989-1993), global head of energy derivatives at Credit Suisse Financial Products (1997-2000) and CEO and co-founder of Kiodex (2000-2004), which was acquired by SunGard Data Systems. He made a lasting impact with his work on Goldman's 1990s-vintage Securities Database, SecDB, which he says "transformed the trading business into a software business." In 2013, SecDB became available to institutional clients with application programming interfaces via the Marquee platform.

A 2016 New York Times article noted that Goldman was increasing its recruiting of students with science and technology majors while the firm's overall headcount was little changed, and Chavez was quoted as saying, "I'm pretty sure there are going to be new jobs 10 or 20 years from now that none of us could even imagine today."

Peter B. Cherecwich, President of Asset Servicing, Northern Trust Corp.

For all the hype surrounding cryptocurrencies and digital assets building up around them, established custodians like Northern Trust were in no hurry to jump into that fray. The underlying blockchain technology was more intriguing. Northern Trust, now with $16.2 trillion in assets under custody and administration, in 2017 launched the first blockchain platform for the historically opaque and inefficient private equity transaction lifecycle. Considered a significant proof of concept, it streamlined expensive, duplicative and time-consuming legal and administrative processes, said Peter Cherecwich, then Northern Trust's president of corporate and institutional services.

Two years later, Cherecwich announced a course correction: Even as "the platform delivers real-time insight and transparency to all parties, including fund managers, investors and auditors, and enables regulatory access when required . . . For the benefit of our clients and the industry as a whole, it's now time to hand over the reins to a technology provider with deep fintech expertise," namely Broadridge Financial Solutions.

It was a stick-to-the-knitting decision, not a retreat from innovation. Cherecwich, who joined Northern from State Street Corp. in 2007 and is now an executive vice president and president of asset servicing, has been blogging since 2018 on technology and related management issues, and the Chicago-based bank has continued its run with, for example, enhanced digitization of unstructured data for alternative asset investors, in partnership with Accelex; and a related machine learning application in asset-owner research management. In December 2020, Northern Trust and Standard Chartered's SC Ventures launched Zodia Custody for digital assets. The startup's U.K. Financial Conduct Authority registration seven months later was "a significant milestone," Cherecwich said, enabling support of "the growing number of institutional asset owners, family offices and asset managers around the world investing in this emerging asset class."

Mazy Dar, Chief Executive Officer, OpenFin

"Powerful and easy-to-use APIs," a feature touted by OpenFin with its operating system for enterprise productivity, are well within reach for financial firms in 2022. Not so in the early 2000s. OpenFin CEO Mazy Dar saw the need and helped launch a movement.

"The legacy financial desktop is rife with applications that cannot share information with one another," said an OpenFin article posted last December. "This contrasts sharply with the experiences Apple and Google deliver on our smartphones" – easy access, practical prompting and auto-populating from one application to the next, not to mention the ability to connect from anywhere that was a necessity over the past two years of remote working.

Dar observed institutions "paying for all kinds of powerful applications, but whose employees are not able to leverage them to their full extent. The insights they gain are offset by the sheer frustration of navigating these platforms."

Inspired by what the likes of Google had achieved with consumer interfaces, and orchestrating available tools, OpenFin launched in New York in 2010 and drew global financial institutions and start-ups alike into its vision of bringing "seamless functionality to the financial desktop to dramatically reduce the inefficiency of manually re-keying information and switching between windows." Backed by Bain Capital Ventures, HSBC, JPMorgan Chase and other investors, OpenFin assembled a community of "thousands of thought leaders, product specialists, and software engineers"; an ecosystem of more than 3,500 apps; over 2,400 banks, asset managers and hedge funds; and 300,000 users overall.

Dar, who has a Cornell University degree in computer science and French literature, started out as a programmer at UBS. He became chief strategy officer of credit derivatives brokerage Creditex, which was acquired in 2008 by Intercontinental Exchange, where he stayed on until 2010. OpenFin took its concept to industry-standard level through the Financial Desktop Connectivity and Collaboration Consortium (FDC3), which the company founded in 2017 and contributed a year later to the Fintech Open Source Foundation (FINOS). Then-FINOS chairman Brad Levy, currently CEO of Symphony Communication Services, called financial-desktop interoperability "one of the most important open source initiatives in financial services."

Terrence A. Duffy, Chairman and Chief Executive Officer, CME Group

Revenue at CME Group, at $4.7 billion, declined a slight 4% in 2021, lagging the growth of some other top exchange operators. But that hardly represents the whole story – present and past – of the world's largest derivatives marketplace, where operating income held steady, at $2.6 billion, and where average daily volume is on a healthy upswing. ADV overall this February increased 19% year-over-year, to 29 million contracts, with significant spikes in equity index contracts (46%, led by 58% growth in Micro E-mini Equity Index Futures), options (20%, with Equity Index options at 82%), and SOFR futures, based on the principal U.S. benchmark alternative to Libor (833%, within the interest rate category whose total ADV climbed 13%).

Economic uncertainty has driven derivatives trading to record levels, noted CME Group chief executive Terrence Duffy, as fourth-quarter 2021 ADV grew 26%, to 20.5 million contracts, followed by 24.6 million in January. CME succeeds as a platform for innovations like e-mini and micro size products and, recently, options on Micro Bitcoin and Micro Ether futures. All but a small fraction of trades are executed on the round-the-clock, round-the-world Globex network, which was the first electronic system of its kind when it went live in 1992. A Center for Innovation and Competitive Markets Advisory Council – with members including Nobel Prize winners as well as Duffy and CME chairman emeritus Leo Melamed – carry the tradition forward, and another technology milestone is in process: a 10-year partnership with Google Cloud to enhance the markets' accessibility and efficiency. Google made a $1 billion equity investment in CME, and Kendal Vroman was appointed chief transformation officer to oversee the migration.

Duffy grew up professionally as a Chicago Mercantile Exchange member since 1981 and board member since 1995. He has had chairman and/or CEO titles since 2002, and in 2007 presided over the landmark CME-Chicago Board of Trade merger. The New York Mercantile Exchange was acquired in 2008, and 10 years later came NEX Group and its BrokerTec (fixed income) and EBS (foreign exchange) platforms. Other executives in the CME spotlight include Suzanne Sprague, senior managing director and global head of clearing and post-trade services; Sean Tully, senior managing director, global head of rates and OTC products; and Sunil Cutinho, chief information officer, this year succeeding Kevin Kometer, who retired after being CIO since 2008.

Shawn Edwards, Chief Technology Officer, and Vlad Kliatchko, Chief Product Officer and Vice Chairman, Bloomberg LP

"Team building is hugely important," says Bloomberg chief technology officer Shawn Edwards. It could hardly be otherwise at a financial information and networking enterprise of Bloomberg's scale, complexity and global reach. Not even the top of the tech-management pyramid is a solo act. It's Edwards in partnership with Vlad Kliatchko. Both have been at the company 19 years. Edwards ran the global engineering group before becoming CTO in 2008. Kliatchko rose to head of global engineering in 2012, now overseeing about 7,000 software developers and infrastructure engineers. That's in addition to joining the management committee in 2018 and being promoted to vice chairman and chief product officer at the start of this year.

Engineering is a literal window into what makes Bloomberg tick. Keeping pace with the ever-expanding financial markets and demand for data and analytics, along with what the firm's founders fashioned as a "culture of constant innovation," drives continuous growth in the engineering force – up from 5,000 five years ago. It's distributed worldwide, with concentrations in New York and London hubs. Micromanagement is not the way. Edwards speaks of assembling teams around an appropriate mix of skill sets and "creating the right conditions to innovate quickly, to move fast and adapt." What works in the "organization of many teams," Kliatchko says, is "to let people do what they do well and get out of the way." The culture is attractive and exciting for those "who make their own decisions and keep an entrepreneurial edge."

"We look decades ahead to create what our clients will someday need," says the Tech at Bloomberg home page. As Kliatschko puts it, "Everything we do is incremental on a long-term roadmap."

System capacity, speed and reliability are paramount, and an infrastructure of some 70,000 servers in data centers, 100 petabytes of historical data, in addition to systems that ingest some 300 billion real-time market data ticks each day, has proved resilient through all volume and volatility peaks.

Investing significantly in R&D – as it has done for years in machine learning, natural language processing and other emerging technologies to advance its product capabilities and user interfaces – Bloomberg builds into its platform tools and solutions for customers to integrate in such areas as trade workflows, alternative data and quantitative modeling. Case in point: the cloud-based, open-architecture BQuant Enterprise, which Edwards said is "a turnkey environment where [clients] can connect to their existing systems, bring their own data, mix it with Bloomberg's comprehensive data sets, and enhance the collaboration of their investment professionals as they test and deploy new quantitative investment strategies."

On the cloud leading edge, Bloomberg made its real-time B-PIPE market data feed available on Amazon Web Services in 2018; last year, all enterprise data became available cloud-native on AWS; and in March this year a B-PIPE collaboration with Google Cloud made it "the only financial data provider to enable cloud-native access to tick-for-tick data . . . including access to 35 million instruments, over 330 exchanges and 80 billion ticks a day."

Bridget E. Engle, Chief Operations and Technology Officer, BNY Mellon

Bank of New York Mellon Corp. is "a central orchestrator in the global financial ecosystem, touching in excess of 20% of investable assets globally," CEO Thomas P. Gibbons wrote in his 2021 annual report letter. The $15.9 billion-in-revenue institution is "the world's largest custodian, with nearly $47 trillion assets under custody and/or administration; we clear about $10 trillion of securities and process over $2 trillion of payments per day; and we manage $2.4 trillion of assets on behalf of our Investment and Wealth Management clients," he said, underscoring the principle of "leading with innovation and earning trust every day . . . The heart of our strategy is to be an open platform on which clients can build their businesses, offering best-in-class services, technology and data," Gibbons added, noting among other developments the formation of a Digital Assets unit and "our quest to build the industry's first multi-asset platform that bridges digital asset custody, execution and administration seamlessly with traditional assets."

All of that puts technology – and chief operations and technology officer Bridget Engle – at center stage. An executive committee member and one of the highest-ranking women in corporate IT, Engle oversees an operations and technology agenda that in 2019 alone involved nearly $5 billion in investments supporting resiliency, cybersecurity, innovative digital solutions and every stage of the client investment lifecycle.

She joined BNY Mellon in 2017 – it had $30.6 trillion in assets under custody and/or administration at the time – as chief information officer, with then-CEO Gerald Hassell saying "her focus on aligning technology solutions to create value for clients will support our ambition to be the investment industry technology leader." Engle's current title is the same as that of Catherine Bessant at Bank of America, Engle's previous employer, from 2010 until 2021. (Bessant is currently vice chair of strategy.) Starting in 2010, Engle was at BofA as global commercial banking and markets technology executive and consumer banking technology and operations chief information officer. She was previously Depository Trust & Clearing Corp. managing director and chief technology officer, and before that worked for 19 years at Lehman Brothers.

In a Google Cloud Summit presentation last year, Engle said that BNY Digital Assets was building a client-facing prototype and “will accelerate our development of solutions and capabilities that our clients are really demanding,” Traders Magazine reported. When the unit filled senior positions last fall with executives from Amazon Web Services, Commerzbank and Galaxy Digital, asset servicing CEO and head of digital Roman Regelman called it “yet another example of our ongoing commitment to attract top talent in a very competitive market to support our clients’ evolving needs across the investment lifecycle.”

Henry A. Fernandez, Chairman and Chief Executive Officer, MSCI

MSCI’s indexing heritage traces back to Capital International in the 1960s. The company’s growth in and beyond that original core has been led since the 1990s by Henry Fernandez, a former managing director of Morgan Stanley (the MS in MSCI, arising from a historical licensing arrangement). Including the indexes that stand as global investing benchmarks, MSCI is a $2 billion-in-revenue, $40 billion market-cap enterprise encompassing analytical data and decision support, with portfolio construction and risk management tools and “investment solutions as a service.” It was on the spot in late February when, as the Ukraine crisis heated up, a dedicated web page offered a Q&A on the conflict’s potential impact on MSCI indexes, as well as articles on Federal Reserve rate hikes and inflation and on companies most exposed to revenue shortfalls.

Attentiveness to investor trends and needs resulted in a hyper-focus on ESG (environmental, social and governance) and climate issues with, for example, a Net-Zero Knowledge Hub and national climate commitments tracker. “Our model indicates,” CEO Fernandez wrote last year, “that without any change to current practices, these companies will emit 16.8 gigatons of CO_2e by 2050, leading to a planet that is 3.5˚C warmer by the end of the century. This trajectory demonstrates the tremendous challenge in reaching net zero and the urgency to act now. Addressing climate change will require the largest reconstruction of the global economy since the Industrial Revolution.”

In January, citing “record full-year and quarterly recurring sales and recurring net new sales, along with the 32nd consecutive quarter of double-digit subscription growth in our index business,” Fernandez vowed to “continue investing and executing aggressively” in opportunities “including ESG and climate. The global race to net zero keeps accelerating, and we have positioned MSCI as a leading provider of climate-related tools for the capital markets industry.” Strategic partnerships announced in February with GeoQuant (providing the ESG Geopolitical Risk Dataset) and ELEVATE (Supply Chain ESG Risk Ratings) “will enhance the capability of MSCI’s ESG data ecosystem,” MSCI said.

Another collaboration, with institutional digital-asset firm Menai Financial Group, brings “a robust set of tools” for investors eyeing that emerging space, Fernandez said. “We are committed to capturing market disruptions – like digital assets – and helping our clients better understand their exposure to related trends as they construct portfolios with an eye towards forces shaping our future.”

Patrick Flannery, Chief Executive Officer, MayStreet

“The race is on,” Patrick Flannery said, “to figure out how to most effectively extract value out of the ocean of market data that gets created each day.” That was in July 2020. MayStreet, which CEO Flannery and chief technology officer Michael Lehr co-founded in New York in 2012, had just closed a $21 million Series A financing led by the Credit Suisse Asset Management NEXT Investors fund. Coming eight months after MayStreet had taken over as the data provider to the Securities and Exchange Commission’s MIDAS (Market Information Data Analytics System) monitoring platform, the funding was a booster shot for addressing “the incredibly exciting problem” that veteran software engineer Flannery and his team were working to solve “in conjunction with some of the world’s most demanding users of market data” – a steadily widening circle of high-tech trading firms and top Wall Street names. “I have witnessed countless examples of legacy market data infrastructure that have caused a substantial drag on performance for firms of all types,” said Rishi Nangalia, former CEO of REDI Global Technologies (acquired in 2017 by Refinitiv) who became a MayStreet director and adviser. “MayStreet brings a powerful and scalable solution to these problems.”

As of May 2021, with the addition of 19 Asia-Pacific markets, MayStreet had largely completed the global, multi-asset class buildout of the cloud-based Market Data Lake repository of exchange data for pre-trade, trading and post-trade analytics. Full depth-of-book U.S. equity options data were added in October, followed by the HPQ (High Performance Query) API for flexible near-real-time and historical full-depth data streaming, and a new-generation Analytics Workbench in March. MayStreet’s other flagship product is the ultra low latency Bellport Enterprise market data feed handler.

Manisha Kimmel, who was senior adviser, regulatory reporting in the office of then-SEC chairman Jay Clayton, joined MayStreet in 2021 as chief policy officer. “The most interesting and impactful market structure issues being debated today center around market data,” Kimmel said, “and MayStreet is well positioned to be a productive voice and agent of change in the space.”

Adena T. Friedman, President and Chief Executive Officer, Nasdaq

Technology-driven from the start – its original "automated quotation" system was billed as the first electronic stock market, circa 1971 – Nasdaq has gotten ever more serious about "relentlessly reimagining the world of tomorrow," to quote from a mission statement. That world is "built on innovative technology fueled by market-moving insights and driven by forward thinking."

Adena Friedman, CEO since 2017 and chief operating officer and chief financial officer before that, has only doubled down on that vision. A Nasdaq lifer since earning a Vanderbilt University MBA in 1993 (except for a 2011-2014 stint as Carlyle Group's CFO), Friedman played a key role in acquisitions including the INET ECN trading platform and OMX, the Nordic exchange operator that became the core of Nasdaq Market Technology, which produced $463 million in 2021 revenue serving market infrastructures worldwide. More recently, Nasdaq added asset management information servicer eVestment, trading solutions vendor Cinnober, alternative data company Quandl and anti-fraud and -crime software provider Verafin, further reinforcing what Friedman once termed a "pivot" toward technology, data and analytics. Beginning this year, Nasdaq is phasing in a cloud computing framework, co-designed with Amazon Web Services, as the "capital markets infrastructure of the future."

Helming what she terms "Nasdaq's journey as a technology business serving the financial system," Friedman has also championed workplace and board diversity, in part through a rule, approved in August 2021 by the Securities and Exchange Commission, requiring listed U.S. companies to disclose board-level diversity statistics and to have, or explain why they do not have, at least two directors from diverse backgrounds.

Thomas P. Gallagher, Chairman and Chief Executive Officer, Miami International Holdings

A constant churn of entrepreneurial innovation enlivens the exchange marketplace. The 2014 book Flash Boys made a sensation out of one start-up, IEX, but there is more to the new wave. Take, for example, Miami International Holdings (MIH) and its MIAX complex, which over 10 years has attained a sizable share of U.S. listed options trading (lately above 14%), extended its reach into U.S. equities, and gone beyond with the 2020 acquisitions of Minneapolis Grain Exchange (MGEX) and Bermuda Stock Exchange (BSX). The latter, a fully electronic fit with MIH's baseline strategy, was positioned as an outlet for MIH "to expand its world-class technology, derivatives trading and regulatory expertise to address emerging markets, such as digital assets, and provide the BSX with additional support in the evolving global (re)insurance risk market." Chairman and CEO Thomas Gallagher, also BSX chairman, said that "the Bermuda government's commitment to fintech regulation and the country's established (re)insurance market make the BSX and Bermuda key components of MIH's global ambitions."

A lawyer and longtime adviser on corporate and securities matters including debt and equity financings, Gallagher was a principal founder of MIH – which has executive offices in Princeton, New Jersey – and instrumental in managing the launch of Miami International Securities Exchange (MIAX), which commenced trading in 2012, followed by MIAX Pearl (2017) and MIAX Emerald (2019). Under the MIAX Pearl exchange license, MIAX Pearl Equities launched on September 29, 2020.

In March, Gallagher said he was especially proud to accept Fund Intelligence Operations and Services' Best Options Trading Platform award, "as global challenges resulting from the Covid-19 pandemic and geopolitical instability have led to unprecedented volatility and market turmoil over the past two years. Our technology is built and designed in-house to support the requirements of today's electronic derivative markets." Among available tools is Vesica Technologies-powered SHIFT, billed as "the most powerful search engine for investing." Under an agreement announced in March, MGEX will take delivery of a real-time, artificial-intelligence-driven clearing system developed by Stockholm-based Vermiculus.

J. Christopher Giancarlo, Senior Counsel, Willkie Farr & Gallagher

So-called revolving doors, such as when a government official becomes a private-sector lobbyist, are frowned upon if not prohibited. Not an issue for J. Christopher Giancarlo, who went through a door of his own design when he stepped down as Commodity Futures Trading Commission chairman in 2019.

His first move, to New York law firm Willkie Farr & Gallagher, was fairly conventional for someone with a legal, regulatory and financial markets background – he was executive vice president and U.S. legal counsel of Fenics Software and EVP of the interdealer brokerage that acquired it, GFI Group. However, while at the CFTC, Giancarlo called for its organizational and technological transformation into a "21st century regulator," established the LabCFTC innovation hub, and his "first do no harm" attitude toward digital assets brought him popularity as "Crypto Dad" and thousands of Twitter followers. He ran with it, titling his 2021 book Crypto Dad: The Fight for the Future of Money.

Expertise on crypto, its potential and policy implications are a big part of the Giancarlo brand. He founded the Digital Dollar Project, a partnership of Accenture and the nonprofit Digital Dollar Foundation advocating for a U.S. digital currency, in part to ensure global competitiveness. Other board and advisory roles range from the Chamber of Digital Commerce, Baton Systems, BlockFi and CoinFund; to American Financial Exchange, which sets the Ameribor Libor-alternative benchmark, where Giancarlo is a director; and he was chairman of the Fannie Mae-Freddie Mac joint venture Common Securitization Solutions. This January he joined the board of Digital Asset Holdings, which last year raised $120 million in Series D financing.

Giancarlo's guidance on the unsettled state of crypto asset regulation: "Take the ad hoc cryptocurrency working group that I and [former Securities and Exchange Commission chair] Jay Clayton created between the CFTC and SEC and develop it into a bureau," with oversight from the congressional banking and agriculture committees. When Russian sanctions were being discussed, Giancarlo told Coindesk that such actions "could drive and accelerate work by China and Russia to develop CBDCs [central bank digital currencies] and move portions of the globe off the dollar-based system that we have today . . . In the same way [China has] done with 5G technology, they can be a major exporter of CBDC infrastructure."

Robert Gutmann, Chief Executive Officer, NYDIG

It may be only natural for hedge fund managers to dive into digital as an alternative asset class. Alan Howard is actively investing in the fintech and crypto sectors, and the firm he co-founded, Brevan Howard Asset Management, formed a digital assets division last year. Michael Novogratz, formerly of Fortress Investment Group, founded the investment and ecosystem firm Galaxy Digital. But it was NYDIG, a subsidiary of Stone Ridge Asset Management, making a $1 billion splash last December. That was the round number raised in a growth equity financing, led by WestCap, that valued the venture above $7 billion and accelerated its "bitcoin for all" and "gateway to a new era of financial products" visions. Participants in the funding ranged from the buy-now-pay-later innovator Affirm to insurers MassMutual and New York Life, as well as Bessemer Venture Partners and Morgan Stanley. "Our roster of partnerships and strategic investors lays the foundation for NYDIG to become the leading provider of bitcoin solutions for businesses in any industry, and this new equity capital will further accelerate progress towards making this exciting network accessible – and useful – to all," said Robert Gutmann, CEO of NYDIG and co-founder with Ross Stevens of Stone Ridge and NYDIG.

Stevens, CEO of Stone Ridge and executive chairman of NYDIG – the name is short for New York Digital Investment Group – launched the offshoot in 2017. It adopted an institutional-minded, long-term view of bitcoin as a global "open source monetary system," Gutmann explained in a podcast. NYDIG obtained a New York State virtual currency and money transmitter license and a trust company charter – "arguably the most robust and forward-thinking regulatory framework in the world for digital assets," in Gutmann's view. NYDIG turned to former New York financial services superintendent Benjamin Lawsky, architect of the "BitLicense," as head of regulatory affairs.

NYDIG formed a bank solutions business, partnering with vendors such as FIS, Fiserv and Jack Henry. Last October, it was designated sub-custodian for cryptocurrency services offered by U.S. Bank, and in February it unveiled a bitcoin savings plan for employee benefit programs. A New York Times ad heralded NYDIG's work with banks and credit unions "to bring bitcoin to Main Street."
When Cboe Global Markets agreed to acquire the ErisX exchange, in which NYDIG invested, Gutmann commented, "We share Cboe and ErisX's vision of building an even more robust global marketplace for bitcoin spot and derivatives trading."

Alasdair Haynes, Chief Executive Officer, Aquis Exchange

From 2009 to 2011, Alasdair Haynes was chief executive of Chi-X Europe, which challenged the old stock exchange order and was acquired in 2011 by Bats Global Markets to become the top pan-European market operator. (Now under Cboe Global Markets, its fourth quarter, 2021 European equities market share was 19.8%.) For Haynes, the competitive juices still flowed. In 2012 he founded Aquis Exchange in London, which is still making enough waves to justify its description in an Evening Standard headline as "The Challenger Stock Market Looking to Shake Up The City." CEO Haynes worked to sell the start-up's users on a subscription pricing model along with a rule set that discouraged abusive non-client trading, oversaw development of highly efficient home-grown technology, and formed Aquis Technologies to license the matching engine and trade surveillance systems. It will be powering the Investre tokenized funds trading market expected to launch this year.

Aquis is profitable, with revenue rising 37% in 2021's first half, to £6.7 million, and 42% for all of 2021. Its two pan-European multilateral trading facilities surpassed 6% in market share last July. Adding Czech and Hungarian stocks this year brings Aquis' number of covered countries to 17.

Aquis Stock Exchange (AQSE), launched in 2020 when NEX Exchange was acquired from CME Group, has segments designed for early-stage growth companies and larger, more established businesses; it "introduced a number of strategic initiatives which have significantly improved liquidity, spreads and the overall attractiveness of the market," Haynes said in the interim results release last September. Aquis Exchange PLC has also received Financial Conduct Authority approval to operate a bond trading market, Aquis-EIX.

Over more than three decades in The City, Haynes has worked at investment banks including HSBC and UBS and before leading Chi-Ex spent 11 years heading Investment Technology Group's international business. In January, Haynes was appointed inaugural chair of TheCityUK Business Council, representing chairs, managing partners and chief executives of around 35 high-growth, innovative companies in financial and related professional services. The sector is "a national asset," Haynes said, "so it is vital to ensure the industry, government and regulators work together to present a coherent and united vision for the industry at all levels."

Jeanine Hightower-Sellitto, Chief Executive Officer, Atomyze LLC

Backed by a consortium of investors in the world of metals and mining, Atomyze stands out in the blockchain-ecosystem crowd with a unique commodity tokenization strategy and a seasoned executive team led by Jeanine Hightower-Sellitto. She spent more than a decade in increasingly senior roles with electronic-options-market operator International Securities Exchange and was its chief operating officer for a year after ISE was acquired by Nasdaq in 2016. In July 2020, after nearly two years in the cryptocurrency space as Gemini Trust Co.'s managing director of operations, Hightower-Sellitto took the helm at Connecticut-based Atomyze, which in announcing the appointment spelled out the mission "to create a new trading paradigm for physical assets by transferring real world objects such as palladium, platinum, copper and cobalt into digital assets using blockchain technology." Pointing to her "more than 20 years of experience building markets and using disruptive technology to develop platforms that serve the evolving needs of institutional investors" and "combination of financial services and blockchain experience," Atomyze board chairman John Macfarlane said, "We believe blockchain technology will improve access to trading physical assets, will provide much needed liquidity to the market and ultimately help evolve the way commodities are traded."

Atomyze is well on its way in a "soft launch," Hightower-Sellitto says, which began with palladium and platinum asset-backed tokens (ABTs), with other metals to follow. The company has licensing for 29 U.S. states, expects to be up to 43 by yearend, and is pursuing a trust company charter. The tokens represent title to physical assets, the chosen blockchain is Hyperledger Fabric, and the platform facilitates storage and other logistics for assets both digital and physical. The CEO points out that the metals are not only in high demand and ripe for digitization and supply-chain innovation, but some will be essential in the transition to a greener economy.

Atomyze's leadership includes chief technology officer Cory Wendling, former head of engineering at Paxos, and chief commercial officer Matthew Ardizzone, who founded capital-markets blockchain consulting firm Marlu Capital Partners. Atomyze rounded out its board in April 2021 with the appointment of Thomas Erickson, a former commissioner of the Commodity Futures Trading Commission.

Paul Humphrey, Chief Executive Officer, BMLL

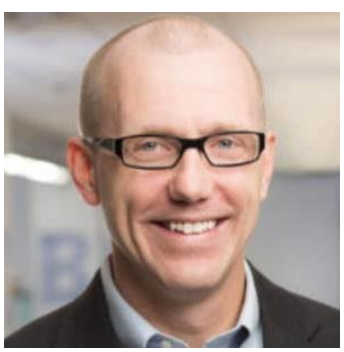
How big is big data? For BMLL it's a proprietary 15 petabyte warehouse of Level 3 market data from 65 venues – meaning full-order-book, all-transaction granularity – engineered in the AWS cloud in what is said to be the only commercially available data-science-as-a-service platform of that type. That's "all the power required to turn big data into relevant insight and analytics that help clients improve their trading analysis and outcomes."

A TradingTech Best Trading Analytics Platform Award in February cited BMLL's "ability to provide some of the world's most sophisticated institutions, including Tier 1 investment banks, buy side, hedge funds and global exchange groups, with the most granular Level 3 order book data alongside a comprehensive suite of analytics. Firms can now analyze long-term cycles and trends, back-test strategies and generate alpha more predictably, removing the operational complexities of data engineering." Said CEO Paul Humphrey: "Access to data is getting easier, but access to alpha-generating analytics will remain a priority for market participants in 2022 as they look to gain a competitive edge."

The platform was founded in University of Cambridge machine learning laboratories in 2014, with applications ranging from pre- and post-trade analytics to simulations to compliance, and giving users cost-effective, instant web-portal access to the data science environment. Multi-asset market data is delivered into workflows via methods known as Data Lab, Data Feed and Data Viz (visual components). The importance and value of Level 3 was explained in an article by chief product officer Elliot Banks: "For traders to achieve best execution and maximize trading performance, it is essential for them to understand and account for the nuances between the U.S. and European trading landscape . . . It is only by examining the true depth of the order book – which can only be achieved through analysis of Level 3 data – that participants can truly understand market behavior and maximize trading performance."

Last November, BMLL pulled together global Level 3 futures data from CME, Eurex and ICE in one harmonized format. "Packaging our futures product is a natural evolution to our core equities offering. As major trends such as the Libor transition and the explosion in retail trading in the futures environment take center stage, the ability to analyze these complex and diverse data sets is vital," said Humphrey, who has also been interim CEO of Euronext London, global head of FICC at Euronext NV and CEO of Electronic Broking & Information at Tullett Prebon.

In February, BMLL became a founding member of the Sustainable Trading Initiative, strategically important, Humphrey said, as "ESG is at the forefront of our minds." In March, former IEX, UBS, Refinitiv and Thomson Reuters executive Tim Baker joined BMLL as senior adviser to build its U.S. presence.



Chris Isaacson, Executive Vice President and Chief Operating Officer, Cboe Global Markets

The 2017 acquisition of Bats Global Markets brought the parent of the Chicago Board Options Exchange more than just product diversification and international expansion. Central to the $3.2 billion deal was the sleek and battle-tested Bats technology platform, on which all Cboe and Bats options, equities and futures markets were to be unified by 2019 under the aegis of its architect, Chris Isaacson. From 2005 he was a member of the founding team and chief information officer of the Bats alternative trading system (ATS) in Kansas City that morphed into a full-scale, multi-exchange complex including BZX, on which Bats' shares were listed in 2016 and where Cboe's now trade.

Isaacson is currently chief operating officer under Edward T. Tilly, Cboe CEO since 2013, who characterized the combined Cboe Global Markets as “bringing together Cboe’s product innovation, indexing expertise, and options and volatility market position, with Bats’ proven proprietary technology infrastructure, global ETP [exchange-traded product] listing and trading venues, global foreign exchange marketplace and market data services.” The $3.5 billion-in-revenue company “demonstrated our ability to diversify and strengthen our revenue profile as a global market operator, something we believe will accelerate in 2022 as we continue to broaden our geographic reach and extend access to our unique set of products and services around the globe,” Tilly said when announcing 2021 results.

Acquisitions and integrations continue to fuel Cboe’s momentum. In 2020 it added Hanweck Associates and two other firms to Cboe Data and Access Solutions, acquired the EuroCCP clearinghouse as well as Canada’s MATCHNow. The last, as of February 2022, was fully migrated onto the tech platform and joining a more recent ATS acquisition, BIDS Trading. The June 2021 purchase of Chi-X Asia Pacific brought Australia and Japan into the Cboe footprint. Last October, Cboe agreed to bring Eris Digital Holdings, known as ErisX, into the fold as Cboe Digital. Said Isaacson: “With ErisX, in a single step, Cboe is able to enter the digital-asset spot, data, derivatives and clearing ecosystem. Now is the right time to fully embrace and help define this emerging asset class,” led by CEO Thomas Chippas “along with the ErisX management team of finance and technology veterans.”

Brad Levy, Chief Executive Officer, Symphony Communication Services

When David Gurlé, who founded Symphony Communication Services in 2014, stepped down as CEO in April 2021, the company, fueled by $510 million raised from institutional investors, was in his words “a true digital transformation partner” with its secure messaging and collaboration platform for financial services firms. Brad Levy rose from president and chief commercial officer to CEO. “The financial services industry has arrived at an inflection point, as technological developments and demand for expanded digital offerings call for true, industry-wide transformation,” Levy said when he joined Symphony in July 2020. “From day one, I’ve admired how Symphony has evolved to meet the specific needs of its clients, and I look forward to working with David and the Symphony team to grow our community.”

With a workflow infrastructure connecting more than 500,000 financial professionals, serving over 1,000 institutions and powering over 2,000 community-built applications and bots, Symphony has, if anything, been picking up the pace. A 2021 yearend review noted acquisitions of voice communication systems innovator Cloud 9 Technologies and verified-identity directory StreetLinx; a multi-year agreement with Google Cloud as primary cloud provider; partnerships with AccessFintech, Saphyre, Unqork and Quant Insight, addressing various data and capital market needs; the rollout of Symphony 2.0, the second-generation core collaboration platform “built in close partnership with financial firms to address their workflow needs, from front to middle to back office, and from the buy side to the sell side"; and a deal with HSBC Global Private Banking to develop and deploy HSBC GPB Chat, enabling clients to interact in a secure and compliant way with their relationship managers via one-to-one chat, group chat, document sharing and video/audio conferencing on WhatsApp or WeChat.

Levy knew Symphony and collaborative workflow solutions well. He spent 18 years with Goldman Sachs, which played a key role in the formation of Symphony, and was board chairman of Symphony Software Foundation, now the Fintech Open Source Foundation. After heading Goldman's Principal Strategic Investments Group and before Symphony, he was with IHS Markit (now part of S&P Global) as CEO of the MarkitServ derivatives processing business and global head of the loan settlement and software services division.

Symphony announced in February a partnership with Digital Asset to bring efficiencies to the broadly syndicated loans market. "The loans market is a key part of our strategy," Levy said, and the partnership "will allow us to solve real pain points in this space. Further automation in broadly syndicated loans workflows will flag and remove errors that can typically arise from manual processes."

Ronnie Mateo, Co-Chief Executive Officer, Trumid

The early dot-com boom saw an explosion of R&D, within firms and in newly formed consortiums, to electronify and attack pain points in the vast and complex fixed income markets. After a shakeout, even as high-profile survivors MarketAxess and Tradeweb thrived, there was still plenty of market share up for grabs. Ronnie Mateo started Trumid in 2014 stressing liquidity, offering a predictive Fair Value Model Price service, and ease of use on systems designed by credit market experts and participants.

The company has been well funded, its credibility underlined by the participation of funds managed by BlackRock and T. Rowe Price in a $208 million financing last October, led by Point Break Capital Management and with Motive Partners in the group. Trumid did some consolidating of its own back in 2017 by acquiring Electronifie, then bringing the number of buy- and sell-side institutions on the corporate bond network above 350.

Now with more than 600 institutions on board, Trumid in February had average daily volume of $1.7 billion, up 72% year-over-year. Reported 2021 highlights included 51% growth in average number of users executing a trade, launch of the Trumid 3 version of the platform, introduction of emerging markets trading, and the November elevation of president and founding team member Mike Sobel to co-CEO with Mateo.

The promotion was "a natural progression," said Mateo, who previously ran the credit group of inter-dealer broker Trinity Brokers and was a managing director at Salomon Brothers/Citibank trading corporate bonds and credit default swaps, emerging markets and CDX indexes. "At Trumid," he continued, "we dream big and we execute small. To truly pull off the latter, we need every team member to spend all their focused energy on what they're best at. This move embodies just that." He called Sobel, who came from credit trading and management roles at Lehman Brothers and Barclays, "a proven world-class operator and strategist."

In December, in what Mateo hailed as a "massive win," JPMorgan joined as a strategic partner, would "utilize Trumid's Attributed Trading protocol to provide liquidity directly to its institutional clients" and work with Trumid "to integrate workflows and deliver innovative market structure solutions for the credit market." ION Markets in January announced a connectivity upgrade to support Attributed Trading through the ION Credit solution.

Richard M. McVey, Chairman and Chief Executive Officer, MarketAxess Holdngs

Amid the 1990s technology boom, J.P. Morgan & Co. stood up the LabMorgan incubator. Out of it emerged MarketAxess, proposed by Richard McVey, a J.P. Morgan executive with futures and options experience who in 1996 was appointed head of North American fixed income sales and investor client relations. The pioneering web-based, multi-dealer credit markets platform was launched in 2000 with McVey, chairman and CEO since inception, steering its expansion from an initial focus on corporate bond trading into becoming a mainstay in fixed income markets globally and across the trade cycle. Publicly owned since its 2004 IPO and in the S&P 500 as of 2019, MarketAxess along the way produced innovations like Corporate BondTicker for pricing data (2002), request for quote functionality (patented in 2009) and the all-to-all, liquidity enhancing Open Trading concept (2012), which was refined and spread internationally in alliance with BlackRock.

With record revenue of $699 million last year, MarketAxess reported average daily volumes of $10.5 billion total credit and $16.6 billion rates. Its estimated fourth-quarter U.S. high-grade and high-yield market share was 19.5%, Eurobond share 13.2%. Total client firms numbered 1,877, international 956.

McVey pointed to "strong performance across our core markets compared to pre-pandemic levels," and "investments in new trading protocols and trading automation solutions continue to gain traction, driving higher trading efficiency and lower trading costs for our clients." Reporting February statistics – total trading volume rose 17% from a year earlier – he said that "volumes are approaching levels last seen during the pandemic, and credit spreads and credit spread volatility have continued to increase, which, we believe, are creating a more favorable environment for Open Trading, our differentiated liquidity pool."

Alongside McVey, as president and chief operating officer since 2019, is Chris Concannon, a market technology leader in his own right, who was president and COO of Cboe Global Markets and CEO of Bats Global Markets before Cboe acquired it in 2007. Nick Themelis retired after 16 years as chief information officer and was succeeded in March by Goldman Sachs Asset Management global co-head of technology Nash Panchal, who reports to Concannon.

David Mercer, Chief Executive Officer, LMAX Group

High-performance, low latency transaction technology, combined with advocacy of open access, institutional-grade transparency and reliability, made LMAX a currency-market force to be reckoned with as it completed a management buyout in 2018 under CEO David Mercer. Four years on, the group operates five exchanges; has matching centers in London, New York and Tokyo and 11 offices worldwide; and aims to become pre-eminent not just in foreign exchange, but also cryptocurrency.

Validation and a new burst of energy came last July in the form of a $300 million ownership stake taken by J.C. Flowers & Co., for a $1 billion valuation. “LMAX Group is an exciting and well-respected company with a leading position in a market with great potential, making it a highly compelling opportunity for our firm,” said managing director Christopher Flowers. “The LMAX Group exchange infrastructure offers efficiency and transparency, both of which are in high demand by the growing numbers of institutional participants in foreign exchange and cryptocurrency trading.”

The group consists of LMAX Exchange, which has a CLOB (central limit order book) execution model and is regulated by the U.K. Financial Conduct Authority as a multilateral trading facility; LMAX Global, a regulated FX, metals and commodities broker offering access to deep institutional FX liquidity, tight spreads and transparent execution with no “last look” that can delay or reject a trade; and the LMAX Digital spot crypto exchange.

Experienced with frequent price changes and volume swings in currencies, “LMAX Group has built both its institutional FX and cryptocurrency execution venues on the same low latency, high throughput institutional-grade infrastructure to manage this kind of intense volatility,” LMAX Group explained in a February post on The Block. Mercer told Markets Media that based on “conversations with some of the biggest asset managers in the world, [he] would be surprised if they weren’t offering a crypto product this year. LMAX is here to help build an institutional ecosystem, and we view it as a long-term opportunity.” With more than 500 investors actively trading, LMAX Digital had a daily record $6.5 billion volume on May 19, Mercer said in his first half, 2021 review.

Where he stands on improving FX market practices is evident in survey reports on transaction cost analysis metrics, restoring trust, and “The Road to FX Reformation.”

Michael Novogratz, Founder and Chief Executive Officer, Galaxy Digital Holdings

In February 2021, Michael Novogratz predicted a $100,000 bitcoin price by yearend. It didn't go higher than $69,000, but that was still 10 times what it was in 2017 when the hedge fund billionaire publicly expressed regret that he didn't buy more cryptocurrency on an earlier dip. He has so far proved right on the trend, at least, and he put everything on the line – strategically and reputationally – with Galaxy Digital, the multifaceted digital-asset enterprise he founded in New York after retiring in 2015 as a partner and president of Fortress Investment Group. Presenting quarterly results last November, Novogratz said, "I have never been more bullish about the future of our company." In fact, bullishness is a constant. Despite reporting a loss in the prior quarter, Novogratz contended that "strong tailwinds of adoption" were of greater import than gyrations in bitcoin and other valuations. In 2021 through November, "we have provided shareholders with approximately $1.6 billion in net comprehensive income, on the back of our strong operational and investing portfolio growth."

Galaxy Digital has five business lines: asset management ($2.4 billion as of February, compared with $1.1 billion a year earlier); principal investments (more than 150 portfolio companies in the digital-asset ecosystem); trading (over 690 institutional counterparties, 100-plus crypto assets supported); investment banking (including capital raising and M&A); and mining. The firm is seeking to be more environmentally friendly in mining operations as part of its sustainability program, which includes a senior-level ESG Steering Committee supported by a working group.

Among indications of institutional crypto adoption are Galaxy fund offerings with Goldman Sachs, where Novogratz was formerly a partner. In the past year, Goldman alumni Michael Daffey and Fabien Vanderwilt joined Galaxy; Daffey is board chair and senior adviser, Vanderwilt is co-president (with Christopher Ferraro) and head of global markets. Based in Europe along with Daffey is Tim Grant, hired last August as head of Europe after leading SIX Group's SDX digital exchange.

In November, Neal Katyal, a Hogan Lovells partner and Georgetown University law professor, became a Galaxy senior adviser and chair of a newly formed advisory board. In March, Jane Dietze, chief investment officer and vice president of Brown University, who was a managing director at Fortress Investment Group, joined Galaxy's board.

Lee Olesky, Chairman and Chief Executive Officer, Tradeweb Markets

Tradeweb Markets originally approached fixed-income trading automation from a direction different than that of MarketAxess, with government securities first in its sights. It has no less of a claim to trailblazing or to milestones achieved as it grew into a fixture of global market infrastructure across rates, credit, equities and money markets.

In 1996, while chief operating officer of Credit Suisse First Boston's Fixed Income Americas division in New York, Lee Olesky co-founded Tradeweb and was its chairman in a consortium ownership structure. In 1999 he started BrokerTec and was the multibank-owned brokerage's founding CEO in London before its 2003 sale to ICAP (it later went to CME Group). Rejoining Tradeweb as president in 2002, still in London, Olesky oversaw its growth internationally and into derivatives, as well as the 2004 sale to Thomson Corp., which maintained majority control as Thomson Reuters and later Refinitiv.

Olesky became CEO in 2008 and built out institutional, wholesale and retail segments now serving a total of 2,500 clients worldwide. Tradeweb, which went public in 2019, provides market access, data and analytics, electronic trading, straight-through processing and reporting for more than 40 products.

"Tradeweb recorded its 22nd consecutive year of revenue growth in 2021 and surpassed $1 billion in annual revenues for the first time," Olesky said in the earnings statement. "We became the largest electronic trading platform for U.S. Treasuries, and as rates volatility increased we benefited from a global resurgence in swaps market activity on our platform . . . While increased adoption of electronic trading has been a long-term trend in recent years, we saw a clear acceleration of that trend during 2021." In February, average daily volume was $1.17 trillion, up 10.7% year-over-year, with ADV records set in U.S. and European government bond trading, fully electronic U.S. High Grade credit and emerging market swaps.

Olesky will hand the CEO reins on January 1, 2023 to president William Hult, who joined Tradeweb as a product manager in 2000. "From a fintech start-up to a $20 billion company," said Olesky, who will remain chairman, "what I am most proud of is the team of people I have been so fortunate to associate with over the last two decades . . . Tradeweb has always stood apart for having a uniquely strong culture, and nobody embodies that better than Billy does."

Hester Peirce, Commissioner, Securities and Exchange Commission

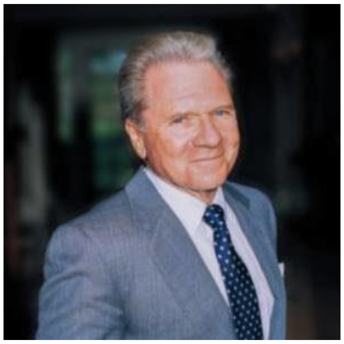
While repeatedly rejected in past attempts to gain SEC approval for bitcoin exchange-traded funds, Fidelity Investments, VanEck Securities and others could count on having one commissioner on their side. "By precluding approval of cryptocurrency-based ETPs [exchange-traded products] for the foreseeable future, the commission is engaging in merit regulation," Hester Peirce asserted in opposing a 2018 majority vote to reject a proposed listing on Bats BZX Exchange. She said it was not appropriate for the SEC to be a "gatekeeper of innovation" or to pre-judge success or failure. "An ETP based on bitcoin would offer investors indirect exposure to bitcoin through a product that trades on a regulated securities market and in a manner that eliminates some of the frictions and worries of buying and holding bitcoin directly . . . The commission's action today deprives investors of this choice."

A Yale Law School graduate, Peirce was at the free-market-oriented Mercatus Center of George Mason University, focused on financial market regulation, when appointed to the

SEC by President Donald Trump in 2018. Whether part of the commission's Republican majority or, as now, on the minority side, Peirce's is a singular voice. She has long advocated for a regulatory safe harbor to allow for digital token experimentation, and today maintains that crypto assets have achieved sufficient maturity and familiarity that the SEC can lower its resistance. "With each passing day, the rationale that we have used in the past for not approving seems to grow weaker," she told CNBC last year.

Although Peirce has been especially vocal on crypto – hence the nickname "Crypto Mom," analogous to "Crypto Dad" J. Christopher Giancarlo, formerly of the Commodity Futures Trading Commission – choice and innovation are where she comes from philosophically. A 2017 Mercatus paper critiqued "the current regulator-centric approach" and called instead for a "regulatory system that is grounded in the superior ability and incentives of market participants to collect, process, and act on information. An effective regulatory system punishes fraud, holds the institutions and people who take risks responsible for any resulting losses, avoids nonregulatory social objectives, forecloses bailout opportunities, embraces creative destruction, presumptively fosters innovation, and removes roadblocks to competition in the financial system."

In January, Peirce dissented on proposed changes to Regulation ATS as "an expansion in the definition of exchange that would apply to any trading venue, including so-called communication protocol systems, for any type of security . . . This change could deter innovation and dissuade new entrants from entering into the market for trading venues and execution services." And in March, she warned that a cybersecurity governance and disclosure proposal "flirts with casting us as the nation's cybersecurity command center, a role Congress did not give us."



Thomas Peterffy, Chairman, Interactive Brokers

"Put the world in the palm of your hand with IBKR GlobalTrader," says a promotion on Interactive Brokers' website. It's a smartphone app for trading on more than 80 stock exchanges around the world. As much as technology has advanced, it harkens back to a handheld invention that put Thomas Peterffy and his brokerage on the electronic-market map.

A Hungarian immigrant in the 1960s, Peterffy developed computer programming and financial modeling skills, wrote trading software, and in 1977 bought a seat on the American Stock Exchange to trade equity options. Operating under the T.P. & Co. and Timber Hill brands before rising to e-brokerage prominence leading Interactive Brokers Group, Peterffy claimed firsts in fair value pricing, algorithmic trading and, in 1983, trading with handheld computers. These devices and pricing screens were so radical a departure that they encountered resistance, but the rest is history. Peterffy moved on, recalling in a Motley Fool interview that "around 1993, I began to realize that there would be other people in this business, and I would not be able to compete because they would hold onto the order flow, so I decided to branch into the brokerage business while keeping the option market-making business [in Timber Hill]. That's when we started Interactive Brokers. The idea always was that we'll automate everything that a broker has to do, and that will enable us to do our work extremely inexpensively so that we can share the benefits with our clients. That is still the idea today."

With Milan Galik, who joined Timber Hill in 1990, now president and CEO, Interactive Brokers increased customer accounts by 56% between the fourth quarters of 2020 and 2021 and as of March had 1.75 million; customer equity grew 30% year-over-year, to $373.8 billion. Peterffy, remaining chairman after stepping aside as CEO in 2019, in comments prepared for the January 2022 earnings presentation called the rising popularity of options and option spreads "the most remarkable story of the year . . . For a long time, Interactive Brokers was alone, trying to stir up industry interest to computerize these markets. But now, finally, people are beginning to understand what fantastic versatile instruments options are." He is also a frequent and opinionated media presence, for instance, warning on Yahoo Finance Live in January about deficit spending, the Federal Reserve's rate-setting challenges, and the possibility of "endemic" inflation.

Yuval Rooz, Chief Executive Officer, Digital Asset Holdings

Blockchain was a new frontier for financial markets when Digital Asset was getting off the ground in 2014 and Yuval Rooz joined as a co-founder – a title shared with, among others, Don Wilson, founder and CEO of the Chicago high-tech trading house DRW. Rooz had managed an algorithmic trading desk at DRW and helped launch DRW Venture Capital. At New York-based Digital Asset, which in its early years had well-connected former JPMorgan executive Blythe Masters as CEO, Rooz served as chief financial officer and chief operating officer – hiring most of the executive team and overseeing four acquisitions – before being named CEO in 2019. Although Digital Asset is primarily known as a leader "in the category known as 'enterprise blockchain,' particularly for the high-profile projects with major stock exchanges," Rooz wrote in April 2021, the business increasingly revolves around its Daml platform for multi-party applications and a grand-scale interoperability concept called the Global Economic Network. That's what Rooz was getting at, in a blog on the occasion of raising $120 million in Series D funding.

With that financing, Digital Asset targeted 50% staff growth for the year; in July, reporting what it characterized as "massive momentum," it said the workforce had increased 33% in six months, to more than 180, with new chief marketing, product and technology officers. Partnership deals with the Nasdaq Marketplace Services Platform, commodity marketplace Xpansiv, clearing provider Baymarkets, the Broadridge Distributed Ledger Repo platform, and European post-trade servicer LiquidShare were "key milestones in our journey to create the global economic network of interconnected businesses," Rooz said. Daml underlies that envisioned "network-of-networks in which information and value are shared efficiently and transactions occur seamlessly, while data from all parties remains private and secure."

In February, Digital Asset and SETL said they were jointly working on a protocol for regulated institutions to launch interoperable tokens. They noted that the "Daml language allows banks and custodians to describe any kind of financial instrument or contractual agreement in a smart contract, which then automatically governs interactions between parties during the lifecycle of the arrangement." Also in February, Digital Asset announced its partnership with Symphony Communication Services to automate broadly syndicated loan workflows; and in March came general availability of Daml 2.0, with Deutsche Börse and Goldman Sachs billed as first movers.

Richard L. Sandor, Chairman and Chief Executive Officer, American Financial Exchange

As if living multiple lives, Richard Sandor has pushed financial market innovation across generations. In the 1970s, while vice president and chief economist at the Chicago Board of Trade, he introduced the concept of financial derivatives along with the first interest rate derivatives contract. He was also researching and advocating electronic trading before CBOT and other markets initially committed to it. "The father of financial futures" went on be "the father of carbon trading": Through Environmental Financial Products, established in 1998, Sandor built Climate Exchange PLC. Its Chicago Climate Exchange, Chicago Climate Futures Exchange and European Climate Exchange were acquired in 2010 by Intercontinental Exchange.

Sandor's current, burgeoning invention is Ameribor, a credit-sensitive, risk-free-rate alternative to Libor, which is being phased out at global regulators' urging. Sandor launched American Financial Exchange (AFX) in 2015 to establish a benchmark based on, and catering to, interbank transactions outside the New York money center. By yearend 2021, with 229 members and reaching 1,200 correspondent banks, the electronic AFX marketplace had recorded a cumulative $1.5 trillion in transactions since inception, a growing number of Ameribor-based products were trading on Cboe Futures Exchange, and an IFLR survey found Ameribor to be the most preferred credit-sensitive rate. For Sandor, offering a choice versus Libor and replacements like the Secured Overnight Financing Rate (SOFR) was paramount, and "it was our sense from the time that we set out on this journey that there was a need for that."

Travis Schwab, Chief Executive Officer, Eventus

Financial markets are constantly evolving and proliferating. More instruments trading across a greater variety of firms and venues, subject to compliance rules and regulatory enforcement, and risks at every turn, create needs for transaction surveillance and monitoring that are being met by a new generation of high-performance computing and analytics. A case in point is Eventus, whose Validus platform has been adopted by both established and upstart trading entities in multiple asset classes, as well as the regulatory community. Austin, Texas-based Eventus enjoyed record revenue, client and staff growth in 2021, and CEO Travis Schwab underlined the addition of “some of the biggest household names in their respective asset classes, including FTX US in cryptocurrencies and LedgerEdge in fixed income.”

He vowed a continuing “focus on the highest level of service, in-house capital markets and regulatory expertise, high-performing technology and constant enhancements to the platform.” Upon closing a $30 million Series B funding round last September, led by Centana Growth Partners with participants including DRW VC, CMT Digital, Jump Capital and LiveOak Venture Partners, Schwab noted, “We became the leading trade surveillance solution for the major digital asset exchanges globally and expanded our reach into the fixed income and foreign exchange markets.”

CEO since 2015, Schwab previously had senior roles at CME Group, Calyon Financial (now SG Americas Securities), RGM Advisors and Trading Technologies. His board of directors includes Centana partner Ben Cukier, former DRW head of market structure Richard Gorelick, and Kim Taylor, who retired in 2017 as CME president of clearing and post-trade services.

Nick Solinger, Chief Executive Officer, FIA Tech

Financial engineering, product innovation and the creativity behind them, which are hallmarks of derivatives and risk hedging, could not be unleashed without computing power and high-speed communications. For derivatives industry trade associations, tech is more than just an item on the issues agenda. The International Swaps and Derivatives Association, for example, has a Digital Regulatory Reporting initiative and won a Bank for International Settlements G-20 TechSprint competition in that category for its Common Domain Model.

The Futures Industry Association in 2007 formed FIA Tech, which runs a software-as-a-service and transaction processing platform called Accelerate over which 8,000 futures market participants use one or more services. The unit’s CEO, Nick Solinger, joined in 2015 after serving as head of product strategy at the ICAP subsidiary Traiana, which later became part of CME Group. Also since 2015, Innovators Pavilions at FIA conferences have been showcases for entrepreneurs.

Last year, 10 global clearing firms – including ABN AMRO, Citi, Goldman Sachs, JPMorgan and Morgan Stanley – invested $44 million in a recapitalization that Solinger said would support bringing “greater innovation and efficiency to their firms, clients and investors” and “further address the needs of the market – buy-side firms, end users, clearing firms, introducing brokers and market makers.”

Other announcements followed. In August, FIA Tech added U.S. listed options support – functionality developed with Options Clearing Corp. – to the Atlantis brokerage processing service, delivering “much needed automation and a common invoice format and process.” Solinger said it is “the first step in FIA Tech’s strategy of bringing the innovative solutions we have developed for futures to the wider derivatives industry. Having all products on a single global platform creates efficiencies and synergies for operations and accounts payable/receivable teams." Also introduced were an enhanced reference data offering; and an analytic service for trading of index futures, launched in partnership with nine futures exchanges and five index providers.

In January, FIA Tech opened a London subsidiary, its first office outside the U.S. "The U.K. and Europe are core markets for FIA Tech's customer base, and London is a global hub for fintech innovation," Solinger stated. "FIA Tech will be expanding in R&D and client services to support our rapid growth, and London offers unparalleled access to a cutting edge fintech talent base."

Jeffrey C. Sprecher, Chairman and Chief Executive Officer, Intercontinental Exchange

Once a market technology entrepreneur, always a market technology entrepreneur. Twenty-five years since Jeffrey Sprecher bought an Atlanta power market, planting the seed for what grew to become Intercontinental Exchange, the label still fits. Renowned, first, for a web-based, digitized trading platform that launched in 2000, Sprecher then engineered acquisitions ranging from International Petroleum Exchange (2001) to Chicago's Climate Exchange (2010) to the New York Stock Exchange (2013) to the Mortgage Electronic Registration Systems (MERS) database (2018). They combined to set an arguably unmatched standard for the scale and scope of a data- and technology-driven, multinational, multi-asset-class market and financial-infrastructure operator. Results for 2021 underscore ICE's unrelenting momentum, with record revenue for a 16th consecutive year; net revenue rose 18% from 2020, to $7.1 billion, and with an operating margin of 48%, operating income hit a record $3.4 billion. Exchanges accounted for a majority of the revenue, while $1.9 billion from fixed income and data services (up 4%) and $1.4 billion from mortgage technology (137%) delivered on Sprecher's diversification moves.

Where are the synergies? Sprecher told a Goldman Sachs conference in December that in mortgages, ICE's Ellie Mae, MERS and Simplifie units are connected in an "end-to-end network" with 1,400 third-party users. "We took a team of our data scientists, particularly people that deal with unstructured data, and put them together with the mortgage team just to explore what data is in the manufacturing of a mortgage, and what data do we have legal rights to, and what are the regulatory requirements around consumer data," and real-time mortgage rate data and related products are emerging.

Sprecher also makes the most of a deep bench of senior talent, typified in December when Lynn Martin, president of fixed income and data services, was named president of NYSE, succeeding Stacey Cunningham. Amanda Hindlian, NYSE's global head of capital markets, took Martin's place, and ICE director and former Commodity Futures Trading Commission member Sharon Bowen became NYSE chair. In February, when ICE took a "significant" minority interest in blockchain brokerage and tokenization venture tZERO, ICE chief strategy officer David Goone was installed as CEO. Said Sprecher: "David's leadership and his mastery of trading, data and clearing technology will be a big asset as tZERO begins its next chapter leading the growth and adoption of next-generation market infrastructure."

Andrea Remyn Stone, Group Head, Data & Analytics, London Stock Exchange Group

It took almost a year and half, until January 2021, for the London Stock Exchange Group to close its agreed $27 billion acquisition of Refinitiv and move into the formal integration phase. A year later, the results were resounding: "Good revenue growth across all businesses and ahead of previous guidance (up 6.1% at constant currency)," said the LSEG 2021 earnings summary. "Data & Analytics grew strongly, up 5.3%." Cost synergies were "significantly ahead of target with £151 million run-rate achieved in 2021 . . . Adjusted EBITDA up 8.3% to £3,283 million."

CEO David Schwimmer noted that Data & Analytics, now led by Andrea Remyn Stone, grew at double the previous two years' rate, "driven by improved customer service and expansion of content which resulted in record customer retention levels. We have made targeted investment to further enhance services across Data & Analytics, notably on the development of Workspace next-generation software that transforms human interaction with financial data distributed from our data platform."

Effective July 1 last year, as Refinitiv chief David Craig was transitioning out, Remyn Stone was promoted from chief product officer to become head of the group. Schwimmer credited Craig for taking "a long-term view" when he recruited her, adding, "Her appointment reflects the leadership bench strength in place across LSEG and our emphasis on developing strong talent."

Remyn Stone joined Refinitiv in January 2020 as chief customer proposition officer. She was chief strategy officer at Dealogic from 2015 to 2019, and before that spent five years at Bloomberg as global head of strategy and corporate development. A Wharton School MBA, she also held leadership positions at Standard & Poor's and McGraw Hill, and was an equity research analyst and worked in convertible bond sales at Lehman Brothers.

In February, LSEG's data unit announced the launch of Refinitiv AI Alerts, an artificial intelligence-driven personalized assistant delivering market insights in Microsoft Teams. The goal is "allowing users to discover and act on timely information across Teams, Refinitiv solutions and Microsoft 365 seamlessly," Remyn Stone explained. That was followed by an agreement to acquire TORA and its order, execution and portfolio management systems for trading equities, fixed income, foreign exchange, derivatives and digital assets. "This acquisition is a great example of LSEG's strategy to provide customers with a global, multi-asset class financial infrastructure that operates across the capital markets and investment lifecycle as an open ecosystem."

Stacie Swanstrom, Chief Product Officer, Pico

Pico bolstered its market technology and services ecosystem with acquisitions of Corvil in 2019 and Redline Trading Solutions this year. In March, Stacie Swanstrom, who retired from a 27-year Nasdaq career in 2019 and had been consulting since, was named chief product officer. “Her background across the financial markets landscape will greatly benefit Pico’s mission to be the leading globally comprehensive provider of infrastructure, connectivity, data, software and analytics to the financial services industry,” Pico founder, chairman and CEO Jarrod Yuster said of Swanstrom, whose Nasdaq roles included executive vice president of Global Corporate Solutions and global head of Access services.

Yuster said Pico is positioned for a more globalized, data-rich trading environment in which “clients are seeking greater efficiency in market infrastructure services and data consumption. Financial institutions want a trusted and globally comprehensive technology partner who understands their business, the market landscape and how to apply technology solutions.”

Swanstrom said Corvil’s analytics and Redline’s high-performance market data and order entry software strengthened a “globally comprehensive offering,” adding, “I’ve seen how Pico is at the forefront of enabling global borderless trading, market access as well as the ability to get data from anywhere to anywhere. Pico is at an inflection point, poised for strong growth, and we have an incredible opportunity to be the premier provider of global infrastructure, data and analytics to financial services firms.”

Mona M. Vernon, Head of Fidelity Labs

A financial services brand primarily associated with asset management and brokerage – serving 40 million individual investors, reporting $4.2 trillion in total discretionary assets and $11.1 trillion under administration – Fidelity Investments is also an engine of technology and innovation (30 patents issued over the past year). Those are values imbued by founder Edward C. Johnson II and manifest in entities such as the Fidelity Center for Applied Technology, Fidelity Digital Assets, Fidelity Labs and F-Prime Capital. Mona Vernon is head of Fidelity Labs in-house fintech incubator and a venture partner of F-Prime Capital, which has a global portfolio of more than 200 companies in healthcare and technology and over $3 billion under management.

“Fidelity Labs was founded in 2005 to accelerate the development of new tools and capabilities for Fidelity.com,” says the website. Vernon highlights as a new-product success “the industry-leading Student Debt Employer Contribution Program. First introduced at the end of 2017, it allows employers to help their employees pay off student debt through after-tax contributions toward participants’ student loans.” Among other posted case studies are Fidelity ESG Pro (2021), developed by an internal start-up to streamline the work of financial advisers starting environmental, social and governance investment practices; and FidSafe for Business, an enterprise document-sharing platform which was accelerated as part of the firm's COVID-19 remote and paperless office adaptation.

Before Fidelity Labs, which she has headed since 2019, Vernon was with Thomson Reuters for more than eight years and chief technology officer of Thomson Reuters Labs, a network of innovation hubs that she founded and scaled up internationally. In addition, she oversaw the research and development function, including the Center for Cognitive Computing and blockchain engineering, and managed the corporate start-up investment fund. Vernon has B.S. and M.S. degrees in mechanical engineering from Tufts University and a S.M. in Engineering and Management from MIT. She is an executive board member of Boston's FinTech Sandbox.

Jeffrey Wecker, Chief Technology Officer, Two Sigma Investments

Before Jeffrey Wecker was appointed CTO of Two Sigma, in 2020, the post was held for five years by Alfred Spector, a distinguished computer scientist (Stanford University PhD), member of the American Academy of Arts and Sciences, formerly of Google and IBM – befitting the data- and science-driven hedge fund firm that boasts that 60% of its 1,700 employees come from non-financial backgrounds and more than 600 of them have advanced degrees. Wecker's grounding is in Wall Street and automated trading, his most recent stops being Bridgewater Associates, as head of front office transformation and chief business architect between 2010 and 2017; and Goldman Sachs, where, as the firm's first chief data officer, he put in place an enterprise data strategy, formed Data Intelligence and Data Engineering departments, and established data offices across Goldman's divisions. David Siegel, who-co-founded Two Sigma in 2001, said that Wecker "brings an ideal combination of commercial experience, business acumen and technical understanding of data analytics and architecture" to a firm that is anchored in science and technology.

More Two Sigma data points: $61 billion in assets under management, more than 144 petabytes of data stored per year, over 4,800 person-years of R&D, over 2.7 billion trades since inception, and nearly 100 venture investments (Wecker is a Two Sigma Ventures adviser).

Wecker has a bachelor's degree in civil engineering from Princeton University, with a Certificate in Operations Research and Financial Engineering. After working in quant strategies at Goldman Sachs earlier in his career, he was co-founder and managing director of Caspian Securities in the late 1990s; MD and head of electronic client services at Lehman Brothers; CEO of trading systems company Townsend Analytics, which Lehman acquired in 2005; and CEO of Lime Brokerage, before moving to Bridgewater. In 2021, Two Sigma acquired "onshore, socially responsible" business process outsourcing company Liberty Source, which Wecker, who joined its board, said "has been an important partner for Two Sigma's data pipeline and ingestion processes, supporting our engineering team with crucial data workflow management services and the collection, curation and structuring of data, all delivered through a highly disciplined and talented workforce." Wecker is also a co-founder and adviser of both climate analytics and risk management firm Jupiter Intelligence and consumer privacy start-up Datamarx. He was recently appointed to the Dean's Advisory Board, Carnegie Mellon University School of Computer Science.

Cathie Wood, Chief Executive Officer, ARK Investment Management

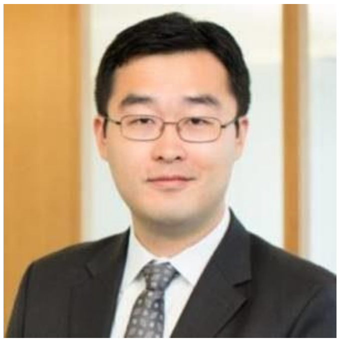
Celebrated as an apostle of disruptive innovation who caught the Big Tech wave, ARK Invest CEO and chief investment officer Cathie Wood became a lightning rod when the cycle turned. She looks for large-scale public investment opportunities in areas ranging from genomic sequencing to artificial intelligence to blockchain, and her moves are scrutinized and parsed for meaning, as happened in February when ARK sold shares of data analytics company Palantir Technologies while adding more of Tesla. Either way, Wood's convictions and the firm's all-in embrace of disruption don't waver. "The idea of shorting innovation in America is ridiculous," she said in a February television interview, even as the flagship ARK Innovation ETF, which gained 150% in 2020, fell 23% in 2021 and continued to slide in early 2022.

"The wall of worry has scaled to enormous heights," Wood observed in a blog late last year analyzing inflation and other market forces. She saw reason to be "encouraged by talk of a 'bubble' in the public equity markets as valuations associated with disruptive innovation have collapsed . . . Which market has it wrong: stocks associated with disruptive innovation, or broad-based public equity indexes?" Wood noted that, on one hand, Brazilian fintech Nubank was privately valued in early 2021 at $25 billion and later went public 60% higher. "Meanwhile, shares of Mercadolibre, a well-managed, competitive e-commerce and fintech stock growing at nearly the same rate, have been cut in half."

Wood concluded that innovation stocks are not in a bubble, but are in "deep value territory."

Before registering ARK Investment Management with the Securities and Exchange Commission in 2014, Wood spent 12 years with AllianceBernstein as CIO of Global Thematic Strategies. In 2000 she co-founded hedge fund Tupelo Capital Management, and before that was with Jennison Associates for 18 years as chief economist, equity research analyst, portfolio manager and director.

A new vehicle, ARK Venture Fund, according to an SEC filing will mirror such ARK Invest themes as energy transformation, AI, next-generation internet, and fintech innovation including crypto and blockchain technology. In March 2021, Jana Haines joined ARK as chief strategy officer after 14 years with MSCI, where she was most recently managing director and head of index products, Americas and EMEA, and global head of fixed income indexes.



Peng Zhao, Chief Executive Officer, Citadel Securities

When the U.S. House Financial Services Committee was looking into the meme stock frenzy early in 2021, Chicago hedge fund titan Kenneth Griffin testified on the subjects of market making, settlement and payment for order flow. The founder and CEO of Citadel is also the founder and principal shareholder of Citadel Securities, which, he told the committee, was started in 2002 and became "one of the world's preeminent market makers. We have been a leader in using technology to transform our market infrastructure, particularly for retail investors . . . Technological innovation advanced by market makers has dramatically improved the efficiency with which buyers and sellers come together." A May 2021 white paper laid out detailed recommendations for enhancing competition, transparency and resiliency in equities, Treasuries and OTC derivatives markets.

It may now be a footnote in Citadel Securities history that, in 2016, Griffin hired as CEO of the separately managed high-tech unit Kevin Turner, who was Microsoft Corp.'s CEO since 2005. Turner stayed only half a year, giving way in early 2017 to Peng Zhao, who joined the firm as a senior quantitative researcher in 2006, and under whom it has only solidified its position at the top of the market making league, with $7 billion in revenue and 1,600-plus clients around the world. In January, a $1.15 billion minority investment by Sequoia and Paradigm valued Citadel Securities at a reported $22 billion. The Silicon Valley investors "appreciate how the strength of our market expertise, advanced predictive analytics and superlative software engineering can redefine an industry," Griffin said. Zhao noted, "Many companies that have transformed the world have achieved their highest ambitions with Sequoia as their partner," Apple and Google among them. "As technological innovation in financial markets becomes only more important, we see enormous opportunities to meet the needs of our clients across more markets and more products," as well as "broaden into new markets and attract the world's most brilliant minds."

Zhao's executive suite is replete with trading and market structure experts including head of markets Joe Corcoran (28 years at Barclays and Lehman Brothers), global head of FICC Paul Hamill (formerly global head of FX, rates and credit execution services at UBS), head of execution services Joseph Mecane (ex-Barclays and NYSE), global head of business development Jamil Nazarali (headed electronic trading at Knight Capital Group) and head of ETF Kelly Brennan (13 years with Goldman Sachs).
Leveraging data and technology has "resolved problems of trading and dramatically increased the efficiency of how financial markets operate today. We fully expect that similar things ought to be happening [to solve problems] in areas like climate and inequality," Zhao said in a Singapore Exchange video series. He has a bachelor's degree in applied mathematics from Peking University and a PhD in statistics from the University of California at Berkeley.

10 More to Watch on the leading edge of change and innovation in financial markets

- Tony Barchetto, Chief Executive Officer, Salt Financial
- Lawrence Calcano, Chairman and Chief Executive Officer, iCapital
- Robert Catalanello and Phillip Gillespie, Co-CEOs, B2C2
- Anton Katz, Chief Executive Officer, Talos
- Gil Mandelzis, Chief Executive Officer, Capitolis
- Mathew McDermott, Global Head of Digital Assets, Goldman Sachs
- Christian Nentwich, Chief Executive Officer, Duco
- Cynthia Sachs, Chief Executive Officer, Versana
- Dan Shepherd, Chief Executive Officer, BTON Financial
- David Taylor, Co-President and Chief Technology Officer, Exegy

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Tony Barchetto, Chief Executive Officer, Salt Financial

Five-year-old Salt Financial has carved a differentiated niche in the index market with its truVol Risk Control Engine (RCE). The cutting-edge technology was developed by founder and CEO Tony Barchetto and his team, based on intellectual property grounded in academic work going back over four decades. truVol's crucial ingredient of intraday data is said to be intuitively preferable to less-current or more-static observations for predictive analytic purposes. In contrast to traditional risk control approaches, truVol opportunistically adjusts based on different historical volatility regimes and reacts faster to changing market conditions. Major insurance carriers use truVol in quantitative fixed index annuity strategies, and Salt has partnered with investment banks including Bank of America, Citi, BNP Paribas and Credit Suisse.

Unveiled this March was the Nasdaq-100 5% Target Volatility Index, the first of a projected suite of indexes with new volatility-controlled strategies powered by Salt. "We pride ourselves on partnering with best-of-breed firms to deliver solutions for this specialized market and are looking forward to working with the Nasdaq team to deliver risk-controlled versions of some of their popular indices," Barchetto, who in the past worked at Knight Capital Group, Lava Trading, Liquidnet and Bats Global Markets, said in a LinkedIn post.

Lawrence Calcano, Chairman and Chief Executive Officer, iCapital

Partnering with major financial institutions, iCapital (Institutional Capital Network) has established itself as a premier technology platform for buying and selling alternative investments, serving a 10,000-member marketplace network and servicing $117 billion in global client assets as of February. The company recently agreed to acquire an alternatives feeder fund platform from Stifel, which CEO Lawrence Calcano described as "an industry leader"; and is leading a consortium to develop an ecosystem leveraging the efficiency, security and auditability of distributed ledger technology. The group includes Apollo, BlackRock, Blackstone, BNY Mellon, Carlyle, KKR, Morgan Stanley, State Street, UBS and WestCap. "Leadership of this initiative, which brings together many of the most influential market participants to leverage emerging technology, is well aligned with iCapital's mission," said Calcano, a former Goldman Sachs technology banker. "We are completely committed to making investing in and owning alternative investments easier for advisers and their high-net-worth investors."

Robert Catalanello and Phillip Gillespie, Co-CEOs, B2C2

The December 2020 acquisition of B2C2 by a subsidiary of Japan's SBI Holdings made SBI the first financial conglomerate with a cryptocurrency dealing desk. Founded in London in 2015 by former Goldman Sachs interest rates trader Max Boonen along with software architect Flavio Molendini, B2C2 became a 24/7 liquidity provider of choice on the proverbial bridge between traditional financial markets and cryptocurrencies.

Now with a top-management cast including co-CEOs Robert Catalanello (ex-Credit Agricole) and Phillip Gillespie (Goldman Sachs), and B2C2 USA president Nicola White (Citadel Securities), B2C2 added a crypto non-deliverable forward transaction last November to its list of firsts. As of March, when it joined both the Futures Industry Association and International Swaps and Derivatives Association, B2C2 had more than 450 active clients in over 50 countries. "Everything about our offering – from the technology to the products and services we provide – is built to enable institutional access," Catalanello said.

Anton Katz, Chief Executive Officer, Talos

The headway that Talos has made in developing institutional-grade infrastructure technology for the full digital-asset trading cycle is a function of its founders' experience and the team they have assembled. CEO Anton Katz was previously head of trading technology at AQR Capital Management; before that he worked at Broadway Technology, as did CTO Ethan Feldman, on projects for dozens of top banks, asset managers and vendors. Founded in 2018, Talos went into a higher gear in 2021, growing the staff from 11 to nearly 50; going global by hiring Samar Sen from Deutsche Bank securities services as head of Asia-Pacific; and closing a $40 million Series A funding led by Silicon Valley venture capital stalwart Andreessen Horowitz (PayPal Ventures, Fidelity Investments, Galaxy Digital and others participated). In December, Talos joined the trading and data Who's Who in the Pyth Network, with Katz saying that the effort "helps further advance critical DeFi infrastructure and has the potential to unlock greater efficiency and transparency in our financial system. We look forward to working alongside leading players across both the crypto and TradFi ecosystems – firms like Jump Trading, DRW, FTX, 0x, Galaxy, Jane Street, IEX, Two Sigma and Virtu – on this exciting project."

Gil Mandelzis, Chief Executive Officer, Capitolis

With a vision of reimagining capital markets by breaking down operational obstacles, Gil Mandelzis, formerly of ICAP (he founded its Traiana subsidiary and headed EBS BrokerTec), started Capitolis in 2017, backed by an impressive roster of banks and venture capitalists and with ex-Thomson Reuters chief Tom Glocer as a co-founder and executive chairman. This March, Capitolis raised $110 million in a Series D funding, at a $1.6 billion valuation, and Mandelzis totted up the progress: "Just two years after launch, the capital marketplace business has already transacted $60 billion-plus notional from over 30 investors. Capitolis has optimized over $13 trillion in trades through its compression & novation engine, serving over 100 financial institutions. Our vision is becoming a reality, and we look forward to super-charging our marketplace in the months and years to follow."

Mathew McDermott, Global Head of Digital Assets, Goldman Sachs

The biggest names on Wall Street wrestled for years with questions of how fast and deep to dive into cryptocurrencies, and what would be their institutional appeal. There has been progressively less doubt about Goldman Sachs' commitment and momentum since Mathew McDermott, a London-based managing director, became global head of digital assets in 2020.

A bitcoin trading desk, which had been shut down, was restarted last year. Goldman has also been partnering with Galaxy Digital, and in March, Galaxy's trading unit facilitated for Goldman a bitcoin non-deliverable option in "the first OTC crypto transaction by a major bank in the U.S."

Christian Nentwich, Chief Executive Officer, Duco

Described in his company bio as "a lifelong technologist with a relentless passion for simplifying complex data using augmented machine learning and AI automation," University College London computer science BSc/PhD Christian Nentwich co-founded Duco in 2010 to do just that. Major financial services firms – Societe Generale is one that has taken it enterprise-wide – have found in Duco's platform a powerful data management, control and reconciliation technology, no-code and cloud-native. In February, Chris Stevens, formerly Nasdaq Governance Solutions chief revenue officer, took on that role at Duco, and Nentwich stated, "Duco is growing rapidly as we continue to provide enterprise-wide solutions for our customers while also expanding into new vertical markets such as insurance and new asset classes such as cryptocurrency. Having Chris on board will help us to further our mission to make managing data easy for more enterprises across the globe."

Cynthia Sachs, Chief Executive Officer, Versana

Versana, a consortium with founding members JPMorgan, Bank of America, Citi and Credit Suisse, is aiming to launch a platform this year to bring "transparency, efficiency and velocity" to the $5 trillion syndicated loan market. The plan is to create a digitally transformed, "inclusive market structure" that will make 20-day settlement times and other operational headaches things of the past. Leading the effort as CEO and director is Cynthia Sachs, who brings "more than 25 years of Wall Street experience, primarily creating, growing and leading loan-related businesses in the banking and technology sectors," Versana said. She spent the majority of her career as a leveraged finance banker, portfolio manager and trader at Morgan Stanley, Natixis and BofA. As global head of fixed income valuations at Bloomberg, Sachs led the creation of the BVAL pricing service, and she was most recently CEO and chief investment officer of Athena Art Finance. "We know firsthand the challenges that exist today and are passionate about fixing the market's inefficiencies and inherent risks, setting it up for accelerated growth for years to come," Sachs said in a mid-March statement.

Dan Shepherd, Chief Executive Officer, BTON Financial

BTON was founded in 2017 by Dan Shepherd to offer an "insourced" dealing desk as an automated alternative to asset managers' traditional in-house and outsourced trading approaches. It's a software-as-a-service, broker-neutral framework, enabling choice of partner and vendor relationships, along with smart routing, data and decision support, and transaction cost analysis features. In March, Adam Mingos, Fidelity Investments' head of portfolio and systematic trading in Europe for the past 10 years, joined BTON as head of trading technology. "He brings significant trading and workflow expertise from some of the most prestigious firms in our industry [also Morgan Stanley and Merrill Lynch], the ideal mix of experience and industry knowledge to help us grow our business in the coming years," said CEO Shepherd, who worked in prime brokerage at Societe Generale, Marex Spectron, ING Barings and MF Global. "The industry now widely acknowledges that data and technology are the way to compete, and our data collaboration and machine learning solution enables trading desks to handle far greater volume, drive value, get leaner, more automated, and more competitive."

David Taylor, Co-President and Chief Technology Officer, Exegy

Before he joined Exegy as CTO, in 2005, David Taylor was on the faculty of the Applied Research Laboratory at Washington University in St. Louis, where he earned three computer engineering degrees. Exegy was started two years earlier – CEO Jim O'Donnell was an early investor through Bush O'Donnell & Co. – to commercialize high-performance, low-latency computing technology developed at the university. Its ticker plant powered by field programmable gate arrays (FPGAs) was launched in 2006. Ongoing R&D has resulted in 175 patent awards and the more recent Signum Trading Signals and Xero Volatility Trading Engine products, which the company says have "democratized" capabilities that historically were within reach of only the biggest firms. "Purpose-built hardware systems, predictive signals, plus the elastic nature of cloud computing [are] coming together for clients, where they can access those specialist systems on demand to deploy new strategies or to scale their existing business to meet market demands," Taylor explained in a Nasdaq TradeTalks interview. In March, 10 months after merging with Vela Trading Systems, Exegy unveiled an expanded, unified product portfolio, resulting in "the ability to deliver more alpha opportunities, improve execution quality and reduce operational risk with a holistic approach to [clients'] business goals and technology constraints," Taylor said.

***Jeffrey Kutler** is contributing editor to TabbFORUM. He is also a contributing editor of Global Association of Risk Professionals' GARP Risk Intelligence site. He served as editor-in-chief from 2008 through 2019. Before joining GARP, he had senior editorial roles at Institutional Investor, Securities Industry News and American Banker.*