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BEFORE THE TASK FORCE OF ARTIFICIAL INTELLIGENCE
UNITED STATES HOUSE COMMITTEE ON FINANCIAL SERVICES

HEARING ON “ROBOTS ON WALL STREET: THE IMPACT OF AI ON CAPITAL MARKETS AND
JOBS IN THE FINANCIAL SERVICES INDUSTRY”

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Introduction

Thank you Chairwoman Waters, Ranking Member McHenry, Chairman Foster and Ranking Member Loudermilk, and the distinguished members of the Task Force, it is a personal honor to be here to discuss the role of automation and Artificial Intelligence (AI) in the financial services industry, our capital markets and future of the workforce.

I am Kirsten Wegner, Chief Executive Officer of Modern Markets Initiative, an education and advocacy organization comprised of automated trading firms. Together, our firms trade in over 50 markets globally and employ 1600 people. Our Advisory Board, made of half women, promotes responsible innovation, including advancing leadership opportunities for a diverse workforce.ⁱ

The Rise of Automation in Trading

Over the past few decades, we’ve seen computerization of our capital markets, including the rise of automated traders, taking the place of the exchange-floor based traders depicted in 1980s Wall Street movies.ⁱⁱ So too have we seen the proliferation of automated trading systems available to retail investors, where at the click of a button, and in many cases for free, the average investor can buy and sell stocks in a fraction of a second.

It is now beyond debate that our technology has reduced the cost of trading for the average investor, both in direct trading costs and savings through tighter bid ask spreads.ⁱⁱⁱ Investors in 529 college savings plans, 401ks, pension funds, and university endowments have benefited from what are now the best markets ever when it comes to low cost trading and dependable liquidity.^{iv} Specifically, over a decade, automation of the electronic intermediaries has brought down trading costs by 50 percent,^v and yielded 30 percent more in lifetime savings for investors.^{vi}

Future Automation and Rise of AI

As the pace of technology continues to quicken and companies continue to innovate, we can anticipate further growth in automation and AI in these areas:

- **Asset management industry** –AI will likely be used by robo-advisors and others for “Know Your Customer” services to understand risk tolerance, investment goals, and to help humans make more informed decisions, and deliver performance results in an increasingly competitive and global industry.
- **“Regtech” space** – AI will be used to deliver more detailed, accurate, and timely reporting and compliance functionality, likely at cost-savings.
- **Fraud Detection and Cyber-Defense** –AI will be in demand for faster, and more accurate detection, surveillance, and reporting of domestic and international bad actors to protect the capital markets and public.

Key Take-Aways

As we step back and look more broadly at the future of AI and further automation in our capital markets, I would like to discuss four key take-aways.

1. GLOBAL COMPETITION IN AI AND AUTOMATION DRIVING EFFICIENCIES, COST SAVINGS IN DECISION-MAKING

Today the U.S. is the place where international companies come to list, and where international investors come to invest. As further automation and AI capacity emerges, U.S. companies will need to innovate and invest in leading technology to continue to compete in a global marketplace. It is anticipated that this competition to adopt the latest AI technologies will make human decision making more efficient in terms of speed, processing time, depth of data, and will confer further efficiencies and cost savings for all U.S. investors. Already, competition in the markets has resulted in near-zero commission online trading from Fidelity, Charles Schwab and Robinhood. Similarly, automated trading has brought overall trading costs down to a fraction of the price from decades ago.

As we look ahead, we can see AI and competition on pricing to further deliver savings to investors in the form of robo-advisors, ETFs, and other areas of our capital markets.^{vii} Moreover, it will be vital for U.S. financial firms to continue to innovate to compete in a global economy and keep America’s capital markets the world leader.

2. ROBOCOP: AI FOR SURVEILLANCE, CYBER SECURITY, AND FRAUD DETECTION

Second, artificial intelligence will become of increasing value for firms and regulators to police against cyber-risk, irregular trading, illegal speculation and fraud, and we can anticipate an expansion of an area known as “regtech.”

Through public-private partnerships, private firms can play a role in working with regulators to share resources on AI and cutting edge technology. For example, since 2017, several Modern Markets Initiative members have welcomed the opportunity to work together with FINRA in a private-public partnership, contributing their private sector know-how, to deploy artificial intelligence to surveille the market.^{viii} Automated trading firms are incented to detect bad actors as they, too, can be victims of fraud.

Further, “Regtech,” is a growing space in which companies offer technology to other companies and regulators to help humans manage decision-making and processes for regulatory purposes. It is often faster, more efficient and comes with a cost savings to better deploy the limited government resources of regulators. Examples of regtech include:

- Monitoring, reporting, and compliance of regulatory filings
- Loan origination processing, in the lending space
- Processing of filings received by regulators
- Help for regulators to identify misconduct and illegal trading through regulatory filings or other data.^{ix}

As bad actors become more sophisticated, it is vital that financial regulators have the funding resources, technological capacity, and access to AI and automated technologies to be a strong and effective cop on the beat.^x

3. DATA: THE FUEL OF AI; DEMAND FOR ALTERNATIVE DATA

As the technology for AI systems matures, we can expect to see an increased demand for high quality, robust data – including alternative data, used to obtain insight into the investment process – to provide the crude oil for the engines of AI.^{xi} This will entail large quantities of data, including alternative data, too vast and complex for humans, alone, to digest.

Policy questions in the future are likely to arise regarding:

- integrity of alternative data sets and algorithms used to process data, including nondiscrimination in consumer finance fields such as mortgages and lending
- cost of data and access to such data
- intellectual property rights, ownership rights, and privacy rights of data
- competition and antitrust questions related to data ownership^{xii}

A positive discussion point on usage of alternative data has centered on helping establish credit history for the underbanked.^{xiii} This is an example of responsible innovation that policy-makers should encourage.

Notably, algorithmic bias is an area for which you have invited discussion. Academic research has been conducted on questions of potential risk in algorithmic bias, even unintentionally, to be modeled into statistical analysis regarding consumer lending, for example: mortgage origination, credit scoring, consumer lending, and other areas.^{xiv} Generally, I think it is vital that industry participants share information with one another on addressing this issue, mitigating against risk of discrimination, establishment best practices, and, where applicable, consider use of ethics officers collectively (within the “regtech space”) or individually within firms to mitigate against algorithmic bias.

4. FUTURE OF WORKFORCE: JOBS LOST, JOBS GAINED, INCLUSION

Worries of robots replacing humans have been around since the start of the century – and the fear of automation replacing workers has been around since the beginning of the industrial revolution.^{xv}

What I can tell you is this: AI and automation can and should be a *tool*, rather than a *replacement*, for humans.^{xvi} Some jobs will disappear, and others will grow. We can expect to see declines in: office support,^{xvii} administrative/compliance, and manual trading.^{xviii}

We can expect to see growth in “computer occupations,” anticipated to increase by 12% in the next decade.^{xix} We will see growth in jobs related to the transmission, storage, security, privacy, and integrity of data that fuels the AI economy.

There is a massive demand in virtually all sectors of our economy, particularly in the financial sector, for qualified technology talent.^{xx} To ensure that a diverse and

prepared workforce share in the up-side of growth of AI, public policy makers and private sector employers should consider the following:

- Promote private-public educational partnerships for STEM fields, beginning in middle school, in geographically diverse regions nationwide to engage and encourage youth to explore careers in technology and programming.^{xxi}
- Educational institutions should consider offering two-year degrees in technology fields, in addition or alternative to four year degrees, to reduce student debt obligations and allow students to enter the STEM workforce.^{xxii}
- Public-private apprenticeships for summers between high school and college, in the areas of STEM, to expose and recruit women and minorities to these fields.^{xxiii}
- Investment in reskilling current employees, supporting mobility and job rotation to growth areas.^{xxiv}
- Promote women and minorities in leadership in the private sector and government.^{xxv}

Notably, the current baseline of participation of women, and in particular women of color, in the financial sector leaves room for substantial improvement and it is vital that policymakers include diversity as part of discussions over responsible innovation.^{xxvi} According to The Institute for Women’s Policy Research on AI, social policy is needed for access to training and employment, as well as social policy to improve equity going forward, such that women, and in particular minority women, may enter “high tech” occupations such as software engineering.^{xxvii}

Conclusion

A skilled workforce for tomorrow’s Wall Street is only as good as companies there to invest in technology and AI and hire more employees. Lawmakers should promote policies that encourage responsible private sector innovation, reward innovative companies and allow the U.S. capital markets to remain a global leader in the innovation economy.

I appreciate the opportunity to present my views to the Committee today and I look forward to answering any questions you may have.

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ⁱ Established by MMI in Q4 2017, the MMI Advisory Board is dedicated to promoting core values and mission, with one of our five core stated goals since then of “promoting women in technology/innovation.” See <https://www.modernmarketsinitiative.org/leadership>.

ⁱⁱ See 1980s floor-based traders in popular culture movies such as *Wall Street* (1987), *Trading Places* (1983), and *Dealers* (1989). There have been specialists, or market intermediaries, at the exchanges since their establishment, providing an intermediary role between a buyer and a seller, matching the so called “bid” or price one is willing to buy a stock, and an “ask” or the price one is willing to sell a stock. Thus, we have the so-called “bid-ask” spread that the intermediaries match. With a human on an exchange as intermediary, in 1988 the bid-ask spread such that a market maker netted four cents in profit for every share they traded. With electronic intermediation through HFT – with humans programming computers, rather than humans on a trading floor – the bid-ask spread such that by 2010 electronic intermediaries were making 0.07 of a cent per trade, or 50 times less than humans on the trading floors. See Harold S. Bradley and Robert E. Litan “[Choking the Recovery](#): Why More Companies Aren’t Going Public And Unrecognized Risks Of Future Market Disruptions,” (Nov. 8, 2010)(The authors found that in 1988, the typical market maker netted about four cents in profit for every share traded. In contrast, the typical HFT today reportedly nets 7/100 of a cent or less for every share traded. In short, the HFTs are willing to work for 98 percent less than what the average market marker of yesteryear made.)

ⁱⁱⁱ Academic literature, studies, statements on the cost savings benefits of automation of the markets to investors:

- Vincent Van Kervel and Albert J. Menkveld, “[High-Frequency Trading around Large Institutional Orders](#)” (Jan 29, 2016) (HFT provides liquidity for six hours to large buy side orders, to their benefit, and in doing so challenges the belief that HFT profits from quick “electronic front-running.” This prolonged period of HFT leaning reduces institutional trading costs by 39% and by extension all the individual investors they represent.”)
- Hal Scott, “[Why U.S. Investors are Better Off Today](#),” Washington Times, (January 21, 2016). (Vanguard estimates that the shift from the old market structure to today’s automated market structure has reduced trading costs by 35-60 percent, resulting in a 32% greater yield for long-term investors.)
- “[Remarks](#) of Chairman Timothy Massad before the Global Exchange and Brokerage Conference (New York),” (June 3, 2015), Speech of Former CFTC Chair Tim Massad, (“Numerous studies – including the recently released UK Foresight HFT project – have shown that transaction costs for both retail and institutional traders decreased substantially with the growth of high-frequency trading.”)
- Barbara Novick, et al., “[US Equity Market Structure: An Investor Perspective](#),” Blackrock Viewpoint, (April 2014)([Electronic market making] brings tangible benefits to our clients through tighter spreads.”)
- Terrence Hendershott, Charles Jones, Albert J. Menkveld, “[Does algorithmic trading improve liquidity?](#)” *Journal of Finance*, VOL. LXVI, NO. 1, (February 2011), 66(1):1-33 (lead article). Finalist, Smith-Breeden best paper prize.
- Charles Jones, Erik Sirri, “[Examining the Main Street benefits of our modern financial markets](#)” (March 2010) Center for Capital Markets Competitiveness, U.S. Chamber of Commerce. (“Lower trading costs and retirement savings - Our markets help investors manage their financial well-being and retirement needs. Lower trading costs mean investors can keep a bigger part of their nest eggs. Twenty years ago, buying a few hundred shares of stock would have taken several minutes and could have easily cost over \$100. Today, this trade can happen in seconds with the click of a mouse and is likely to cost less than \$10.”...Our modern financial markets enable the real economy and are fundamental to our nation’s economic prosperity. It is critical that policymakers understand that our markets are increasingly global and investors and companies have a choice of where to turn for their financial needs.”)

^{iv} For further information on automated trading and liquidity, including in times of volatility, please see:

- Prof. Terrence Hendershott, Haas School of Business University of California at Berkeley, Ryan Riordan, Department of Economics and Business Engineering Karlsruhe Institute of Technology, “[Algorithmic Trading and Information](#)” (August 18, 2009), (algorithmic trading “contributes more to the discovery of the efficient price than human trading. Contrary to conventional wisdom we find no evidence of AT behavior that would contribute to volatility beyond making.”);

Austin Gerig, Division of Economic and Risk Analysis U.S. Securities and Exchange Commission, David Michayluk, Finance Discipline Group University of Technology, Sydney, [Division of Economic and Risk Analysis \(DERA\) – Automated Liquidity Provision](#), (The authors create a model showing how automated HFT liquidity providers set more efficient prices, increase informed and decrease uninformed traders' transaction costs, and have no effect on volatility).

- - "HFT Supplies Dependable Liquidity During Market Volatility," Modern Markets Initiative, (February 16, 2018) at <https://www.modernmarketsinitiative.org/latest-news/2018/12/14/hft-supplies-dependable-liquidity-during-market-volatility>.
- "[Market volatility ensures a larger role for FinTech in 2019](#)," Kirsten Wegner, The Hill (January 9, 2019)
- Comerton-Forte, C., Hendershott, T., Jones, C. M., Moulton, P. C., & Seasholes, M. S. (2010). "[Time variation in liquidity: The role of market-maker inventories and revenues](#)". (The authors show that market-maker balance sheet and income statement variables explain time variation in liquidity, suggesting liquidity-supplier financing constraints matter).

^v Menkveld, Albert J., "The Economics of High-Frequency Trading: Taking Stock" (June 1, 2016). Annual Review of Financial Economics, Volume 8, Forthcoming. Available at SSRN: <https://ssrn.com/abstract=2787542> (In the decade of migration to electronic trading and HFT arrival, transaction cost decreased by over 50% for both retail and institutional investors.")

^{vi} [April 21, 2010: Vanguard Comment letter on SEC Concept Release on Equity Market Structure](#) ("...we conservatively estimate that transaction costs have declined 50 bps, or 100 bps round trip. For example, if an average actively managed equity mutual fund with a 100% turnover ratio would currently provide an annual return of 9%, the same fund would have returned 8% per year without the reduction in transaction costs over the past decade. Today's investor with a 30 year time horizon would see a \$10,000 investment in such a fund grow to approximately \$132,000 in 30 years, compared to approximately \$100,000 with the hypothetical return of 8% associated with the higher transaction costs. Thus, any analysis of "high frequency trading" must recognize the corresponding benefits that long-term investors have experienced through tighter spreads and increased liquidity.")

^{vii} In April 2019, FINRA formed an "Office of Innovation" to conduct thoughtful research on the current and potential applications of AI on financial services industry. Haimera Workie, the inaugural chair of this group, is an excellent resource for information on general questions of impact of fintech and AI on the capital markets. See <https://www.finra.org/media-center/news-releases/2019/finra-forms-office-financial-innovation-announces-haimera-workie-head>.

^{viii} Market Surveillance Advisory Group in FINRA's Special Notice (March 21, 2017) (Notice announces the establishment of group to work with FINRA on initiatives to utilize artificial intelligence and technology to detect bad actors, e.g. spoofers and others, and report to FINRA; several MMI member firms are participants).

^{ix} "See Financial institutions have been making limited headway in cutting the cost of complying with increasing post-crisis regulation. That may be changing." PWC, <https://www.pwc.com/us/en/industries/financial-services/research-institute/top-issues/regtech.html>

^x Regulators can work with FINRA and SROs to build better, multi-layered approaches to detecting market disruption, to enhance kill switches, and deter market disruptions. Discussed by the SEC in 2013, a "kill switch" is a mechanism "pursuant to which one or more limits could be established by a trading venue so that if a participant exceeded those limits, the trading venue could stop accepting incoming orders from the participant³⁰ — in essence, a "kill switch" that would stop further trading." See "Addressing Market Instability through Informed and Smart Regulation, Commissioner Luis A. Aguilar, U.S. Securities and Exchange Commission." at <https://www.sec.gov/news/speech/2013-spch022213laahtm>. Since then, exchanges such as NASDAQ and NYSE have implemented kill switches as a way to safeguard against market disruption.

^{xi} See Deloitte: [“Alternative data for investment decisions: Today’s innovation could be tomorrow’s requirement”](#)
See also “Why investors want alternative data,” Z., W. *The Economist*. (August 22, 2016)(“An explosion of data, which has revolutionised industries like health care and advertising already—is at last making itself felt in finance. A cottage industry is springing up to provide investors with data of a kind that will not show up on everybody else’s terminal: these are means for measuring a company’s performance that do not rely on solely on financial statements or company reports. The providers are themselves a disparate group, pumping out databases ranging from satellite imagery to social-media posts. Though their businesses may look utterly different on the surface, as vendors of data all are competing in the same space. Recent advancements in machine-learning have made it possible for companies to efficiently parse through millions of satellite images a day. Some data providers are now studying pictures of the car parks of big-box retailers to estimate sales, while others are looking at farmland to estimate corn yields.”)

^{xii} Testimony of Nicol Turner Lee, Fellow, Center for Technology Innovation, Brookings Institution, House Financial Services Committee Hearing on “Perspectives on Artificial Intelligence: Where We Are and the Next Frontier in Financial Services” (June 26, 2019).

^{xiii} “To Bank the Unbanked, Start Using Alternative Data,” Rodrigo Sanabria (August 14, 2018), Center for Financial Inclusion.

^{xiv} “Consumer-Lending Discrimination in the FinTech Era” Bartlett *et al* (November 2019), U.C. Berkeley, at <https://faculty.haas.berkeley.edu/morse/research/papers/discrim.pdf>.

^{xv} “Robots have been about to take all the jobs for more than 200 years. Is it really different this time?” Louis Anslow (May 16, 2016) (Noting, in relevant part, “Technology has always triggered fears of mass unemployment.... The same persistent fear has been playing out in the pages of newspapers for the last century: In 1921, *The New York Times* featured a book review titled “Will Machines Devour Man?,” In 1940s, “Does Machine Displace Man in the Long Run?...In the 1980s, “A Robot is After Your Job.”)

^{xvi} “Artificial Intelligence, Automation, and the Economy,” Executive Office of the President (December 20, 2016) at <https://obamawhitehouse.archives.gov/sites/whitehouse.gov/files/documents/Artificial-Intelligence-Automation-Economy.PDF> (“CEA has identified four categories of jobs that might experience direct AI-driven growth in the future. Employment in areas where humans engage with existing AI technologies, develop new AI technologies, supervise AI technologies in practice, and facilitate societal shifts that accompany new AI technologies will likely grow.”)

^{xvii} “Jobs Lost, Jobs Gained: Workforce Transitions in a Time of Automation,” McKinsey Global Institute (December 2017) .

^{xviii} “Five Million Jobs by 2020: the Real Challenge of the Fourth Industrial Revolution,” World Economic Forum (Jan. 18, 2016) (Noting, “The Fourth Industrial Revolution, combined with other socio-economic and demographic changes, will transform labour markets in the next five years, leading to a net loss of over 5 million jobs in 15 major developed and emerging economies. Skills and jobs displacement will affect every industry and geographical region, but losses can be offset by job growth in key areas.”)

^{xix} “Computer Systems Analyst: Job Outlook,” U.S. Department of Labor, Bureau of Labor Statistics (2019)

^{xx} “How to Protect Workers From Job-Stealing Robots: President Obama’s chief economist argues that, with the right policies, artificial intelligence can be boon to the labor market, not a threat,” Jason Furman, *The Atlantic* (September 21, 2016). See also “Notes From the AI Frontier Modeling the Impact of AI on the World Economy.” McKinsey Global Institute (September 2018) (“ Based on early evidence, our average simulation shows around 70 percent of companies adopting at least one of these types of AI technologies by 2030, and less than half of large companies may be using the full range of AI technologies across their organizations. In the aggregate, and netting

out competition effects and transition costs, AI could potentially deliver additional economic output of around \$13 trillion by 2030, boosting global GDP by about 1.2 percent a year.”).

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^{xxi} I am the result of a public-private partnership in STEM in the 1990s at [TJHSST](#). These types of models in the public school system, including the [Bronx High School of Science](#) and [Benjamin Banneker Academic High School](#), might be encouraged. A more diverse workforce can be established through partnerships with school groups and on-campus recruiting for internships at the high school as well as college levels to increase diversity headcount.

^{xxii} “Technology is changing jobs. Here’s how community colleges are responding.” Emily Arnim (November 13, 2019)(“As the artificial intelligence (AI) revolution transforms what work will look like in the future, community college leaders must take the lead in reskilling our workforce.”

^{xxiii} “Employment and Jobs: Automation and a Changing Economy: The Case for Action, Pollack, Fitzpayne, and McKay, (April 2, 2019) The Aspen Institute (noting, “Investments in education, training, and the social safety net, along with a social contract between employers and workers that provided workplace benefits and protections, have helped mitigate automation’s negative impacts in the past and helped workers succeed in the changing economy.”

^{xxiv} “How to Protect Workers From Job-Stealing Robots: President Obama’s chief economist argues that, with the right policies, artificial intelligence can be boon to the labor market, not a threat,” Jason Furman, The Atlantic (September 21, 2016) (Noting, in relevant part, “there is no economic reason that the United States cannot address inequality and increase employment while enjoying even higher levels of technology and productivity than seen today. What matters is how labor-market institutions—such as job-training programs, relocation assistance, licensing regimes, and so on—cope with these changes, support the creation of new jobs, and successfully match workers to them.”).

^{xxv} “Women in Financial Services: Quick Take,” Catalyst (May 21, 2019) (noting that Only 19.4% of executive and senior-level professionals are women in the US securities industry); policies aimed at improving these numbers should be implemented by private sector.

^{xxvi} “Closing the gap: Leadership perspectives on promoting women in financial services,” by Stacey Chin, Alexis Krivkovich, and Marie-Claude Nadeau; (September 2018), McKinsey Report, See Exhibit 1

^{xxvii} Institute for Womens’ Policy Research: [Women, Automation, and the Future of Work](#), Hegewisch *et al.* (March 13, 2019) “Women are more likely than men to work with computer and digital media but remain substantially underrepresented in the highest paid tech jobs, the jobs that require the highest knowledge and use of computers and digital media and that produce the technology of the future. Encouragingly, the number of women in such jobs has increased, particularly for women of color; time trends, however, also show that overall these occupations are becoming even more male-dominated because men’s employment in high tech fields has grown faster than women’s. This report reminds us of women’s historical role in the development of computing; working with computers and digital media is a much more integral part of most women’s work, than it is of most men’s. Many women are already digitally literate—the challenge is to help them move into fields where their digital skills can be developed and returns on those skills are higher and more secure than in the fields where women are now concentrated”