

For release on delivery
1:00 p.m. EDT
February 18, 2025

Artificial Intelligence: Hypothetical Scenarios for the Future

Remarks by

Michael S. Barr

Vice Chair for Supervision

Board of Governors of the Federal Reserve System

at

Council on Foreign Relations

New York, New York

February 18, 2025

Advances in artificial intelligence (AI) have accelerated rapidly over the past few years.¹ It is now commonplace to see autonomous vehicles navigating city streets, and generative AI tools are available on phones and other devices wherever we go. AI innovations make headlines and play a big role in financial markets, and generative AI has the potential to change how we think about productivity, labor markets and the macroeconomy.² Today, I will address that question by outlining two hypothetical scenarios for AI's impact and the implications for businesses, regulators, and society. I will focus my comments on Generative AI, or GenAI, a subset of AI that has seen significant growth and integration into economic activity in just a few short years.

GenAI and Its Adoption

Compared to earlier iterations of AI, GenAI is able to generate content, which allows it to significantly enhance productivity across a range of knowledge-based activities and be used by people without coding skills. GenAI will likely become a “general purpose technology,” with widespread adoption, continuous improvement, and productivity enhancements to a wide range of sectors across the economy. We are already seeing GenAI improve the productivity of its own R&D.³ There is widespread enthusiasm for GenAI, and survey evidence shows much faster rates of consumer adoption of GenAI already than were seen for the personal computer or the

¹ The views expressed here are my own and are not necessarily those of my colleagues on the Federal Reserve Board.

² See, for instance, Lisa D. Cook, “Artificial Intelligence, Big Data, and the Path Ahead for Productivity,” (speech at Technology-Enabled Disruption: Implications of AI, Big Data, and Remote Work Conference, Atlanta, Georgia, October 1, 2024), <https://www.federalreserve.gov/newsevents/speech/cook20241001a.htm>.

³ See Gaurav Sett, “How AI Can Automate AI Research and Development,” *RAND Commentary*, October 24, 2024, <https://www.rand.org/pubs/commentary/2024/10/how-ai-can-automate-ai-research-and-development.html>.

internet.⁴ While actual deployment of GenAI is limited to some business functions, and there have been pitfalls along the way, businesses in almost every sector are experimenting with or considering how to make use of the technology.⁵

Firms are also exploring Agentic AI—Gen AI systems that not only produce new content, but are also able to proactively pursue goals by generating innovative solutions and acting upon them at speed and scale.⁶ Imagining Agentic AI’s ultimate application, some speculate that we could experience a “country of geniuses in a data center”—a collective intelligence that surpasses human capabilities in problem-solving and collaboration.⁷ Some believe Agentic AI has the potential to connect ideas in disparate domains, potentially transforming research and development and society more broadly.⁸

⁴ See Cory Breaux and Emin Dinlersoz, “How Many U.S. Businesses Use Artificial Intelligence?” (Washington: U.S. Census Bureau, November 28, 2023), <https://www.census.gov/library/stories/2023/11/businesses-use-ai.html>; Alexander Bick, Adam Blandin, and David J. Deming, “The Rapid Adoption of Generative AI,” NBER Working Paper No. 32966 (Cambridge, MA: National Bureau of Economic Research, September 2024, revised February 2025), <https://www.nber.org/papers/w32966>; and Leland Crane, Michael Green, and Paul Soto, “Measuring AI Uptake in the Workplace,” FEDS Notes (Washington: Board of Governors of the Federal Reserve System, February 5, 2025), <https://doi.org/10.17016/2380-7172.3724>.

⁵ There’s evidence of firms experimenting with these tools and then abandoning them—due to a multitude of reasons. See Kathryn Bonney, Cory Breaux, Cathy Buffington, Emin Dinlersoz, Lucia S. Foster, Nathan Goldschlag, John C. Haltiwanger, Zachary Kroff, and Keith Savage, “Tracking Firm Use of AI in Real Time: A Snapshot from the Business Trends and Outlook Survey,” NBER Working Paper No. 32319 (Cambridge, MA: National Bureau of Economic Research, April 2024), <https://www.nber.org/papers/w32319>.

⁶ For more on Agentic AI’s uses, advantages, and risks, see Mark Purdy, “What Is Agentic AI, and How Will It Change Work?” *Harvard Business Review* (December 12, 2024), <https://hbr.org/2024/12/what-is-agentic-ai-and-how-will-it-change-work>.

⁷ See Dario Amodei, “Machines of Loving Grace,” October 2024, <https://darioamodei.com/machines-of-loving-grace>.

⁸ For biology and drug discovery, see Jean-Philippe Vert, “Unlocking the Mysteries of Complex Biological Systems with Agentic AI,” *MIT Technology Review* (November 13, 2024), <https://www.technologyreview.com/2024/11/13/1106750/unlocking-the-mysteries-of-complex-biological-systems-with-agentic-ai>; and “Owkin Announces First Patient Dosed in Phase I AI-Optimized Clinical Trial of OKN4395, a First-in-Class EP2/EP4/DP1 Triple Inhibitor for Patients with Solid Tumors,” *Business Wire*, January 30, 2025, <https://www.businesswire.com/news/home/20250130436779/en/Owkin-Announces-First-Patient-Dosed-in-Phase-I-AI-optimized-Clinical-Trial-of-OKN4395-a-First-in-Class-EP2EP4DP1-Triple-Inhibitor-for-Patients-with-Solid-Tumors>.

Hypothetical Scenarios Considering How GenAI Could Evolve

Today, I will outline two hypothetical scenarios for considering how GenAI could evolve.⁹ In one, we see only incremental adoption that primarily augments what humans do today, but still leads to widespread productivity gains. In the other, we see transformative change where we extend human capabilities with far-reaching consequences. For each scenario, I consider the potential implications for the economy and financial sector.

Thinking through hypothetical scenarios can help widen our lens to a range of possible outcomes and provide a framework for assessing the balance between benefits and risks. Scenarios are not predictions of the future, but provide a framework for analyzing the factors that could lead to different outcomes. Reality is complex. GenAI adoption rates will vary across industries, leading to diverse impacts on market structures. Elements of both scenarios will likely come to pass, and play out at different rates, which will influence the effects on the economy and society. In the short term, GenAI may be overhyped, while in the long run, it may be underappreciated. And, of course, things might turn out differently from these hypotheticals.

Hypothetical 1: Incremental Progress with Widespread Productivity Gains

First, let me begin with the incremental scenario, where GenAI primarily augments work in existing processes and leads to steady and widespread productivity gains, but does not fundamentally unlock new capabilities or transform the economy.

⁹ Others have used other types of scenarios. See Anton Korinek, “The Economics of Transformative AI,” *The Reporter* (Cambridge, MA: National Bureau of Economic Research, December 31, 2024), <https://www.nber.org/reporter/2024number4/economics-transformative-ai>; Iñaki Aldasoro, Leonardo Gambacorta, Anton Korinek, Vatsala Shreeti, and Merlin Stein, “Intelligent Financial System: How AI Is Transforming Finance,” *BIS Working Papers* No. 1194 (Basel, Switzerland: Bank for International Settlements, June 2024), <https://www.bis.org/publ/work1194.pdf>; and Ethan Mollick, *Co-Intelligence: Living and Working with AI* (New York: Portfolio/Penguin, 2024).

In this state of the world, GenAI tools enhance efficiency and enable more personalized solutions across industries, in ways that have incremental—but still meaningful—effects on people’s lives. For instance, in customer service, professional writing—but not this speech—and software engineering, GenAI-powered tools are already supporting workers, improving accuracy and speed, and these effects could spread to other sectors.¹⁰ In this world, health care sees significant improvements as GenAI reduces administrative burdens, assists with diagnostics, and personalizes treatment plans based on real-time patient data. Medicines and other treatments are developed at a faster pace.¹¹ Education is similarly affected, as GenAI alleviates administrative

¹⁰ For worker productivity gains in customer service, see Erik Brynjolfsson, Danielle Li, and Lindsey R. Raymond, “Generative AI at Work,” NBER Working Paper No. 31161 (Cambridge, MA: National Bureau of Economic Research, April 2023, revised November 2023), <https://www.nber.org/papers/w31161>. For GenAI assisted writing gains, see Shakked Noy and Whitney Zhang, “Experimental Evidence on the Productivity Effects of Generative Artificial Intelligence,” *Science*, vol. 381, no. 6654 (July 2023): 187–92, <https://doi.org/10.1126/science.adh2586>; Jordan Usdan, Allison Connell Pensky, and Harley Chang, “Generative AI’s Impact on Graduate Student Writing Productivity and Quality,” *SSRN* (August 29, 2024), <https://dx.doi.org/10.2139/ssrn.4941022>. For software engineering, see Sida Peng, Eirini Kalliamvakou, Peter Cihon, and Mert Demirer, “The Impact of AI on Developer Productivity: Evidence from GitHub Copilot,” arXiv:2302.06590, February 13, 2023, <https://doi.org/10.48550/arXiv.2302.06590>; Leonardo Gambacorta, Han Qiu, Shuo Shan, and Daniel M. Rees, “Generative AI and Labour Productivity: A Field Experiment on Coding,” *BIS Working Papers* No. 1208 (Basel, Switzerland: Bank for International Settlements, September 2024), <https://www.bis.org/publ/work1208.pdf>; Zheyuan (Kevin) Cui, Mert Demirer, Sonia Jaffe, Leon Musolff, Sida Peng, and Tobias Salz, “The Effects of Generative AI on High-Skilled Work: Evidence from Three Field Experiments with Software Developers,” *SSRN* (September 5, 2024, revised February 10, 2025), <https://dx.doi.org/10.2139/ssrn.4945566>. For worker gains in the consulting industry, see Fabrizio Dell’Acqua, Edward McFowland III, Ethan Mollick, Hila Lifshitz-Assaf, Katherine C. Kellogg, Saran Rajendran, Lisa Krayer, François Candelon, and Karim R. Lakhani, “Navigating the Jagged Technological Frontier: Field Experimental Evidence of the Effects of AI on Knowledge Worker Productivity and Quality,” Harvard Business School Working Paper No. 24-013 (September 2023), https://www.hbs.edu/ris/Publication%20Files/24-013_d9b45b68-9e74-42d6-a1c6-c72fb70c7282.pdf.

¹¹ See Ethan Goh, Robert Gallo, Jason Hom, et al., “Large Language Model Influence on Diagnostic Reasoning: A Randomized Clinical Trial,” *JAMA Network Open* (October 28, 2024), <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2825395>; Nikhil Agarwal, Alex Moehring, Pranav Rajpurkar, and Tobias Salz, “Combining Human Expertise with Artificial Intelligence: Experimental Evidence from Radiology,” NBER Working Paper No. 31422 (Cambridge, MA: National Bureau of Economic Research, July 2023, revised March 2024), <https://www.nber.org/papers/w31422>; Ashley Capoot, “Reid Hoffman Enters ‘Wondrous and Terrifying’ World of Health Care with Latest AI Startup,” CNBC, February 2, 2025, <https://www.cnbc.com/2025/02/02/reid-hoffman-launches-manas-ai-a-new-drug-discovery-startup.html>; Kang Zhang, Xin Yang, Yifei Wang, Yunfang Yu, Niu Huang, Gen Li, Xiaokun Li, Joseph C. Wu, and Shengyong Yang, “Artificial Intelligence in Drug Development,” *Nature Medicine*, vol. 31 (January 2025): 45–59, <https://doi.org/10.1038/s41591-024-03434-4>; Qian Liao, Yu Zhang, Ying Chu, Yi Ding, Zhen Liu, Xianyi Zhao, Yizheng Wang, Jie Wan, Yijie Ding, Prayag Tiwari, Quan Zou, and Ke Han, “Application of Artificial Intelligence in Drug-Target Interactions Prediction: A Review,” *NPJ Biomedical Innovations*, vol. 2, no. 1 (January 2025), <https://doi.org/10.1038/s44385-024-00003-9>.

tasks for teachers, allows lessons to be tailored to individual students, and permits students to learn by doing.¹² In manufacturing, GenAI-optimized supply chains anticipate and adjust more quickly to disruptions, and current manufacturing processes are refined through virtual iteration.¹³ In materials science, GenAI-driven experimentation accelerates the discovery of new materials, leading to advances in everything from construction to electronics.¹⁴ Turning to the financial sector, we could see similar productivity gains. Community banks leverage GenAI-powered chatbots to provide customized financial advice rooted in local knowledge, while institutions of all sizes continue to advance use of GenAI for compliance monitoring, fraud detection, risk management, and document analysis.¹⁵

¹² For more on education, see Justin Wolfers, “An Econ Educators Guide to our AI-Powered Future,” Macmillan Learning, *EconEd* (presentation), September 26, 2024, [https://www.macmillanlearning.com/college/us/events/econed#:~:text=Justin%20Wolfers%20Speaks%20at%20EconEd%202024&text=He%20discusses%20AI%20tools%20like,focus%20on%20core%20economic%20principles](https://www.macmillanlearning.com/college/us/events/econed#:~:text=Justin%20Wolfers%20Speaks%20at%20EconEd%202024&text=He%20discusses%20AI%20tools%20like,focus%20on%20core%20economic%20principles;); and Anne J. Manning, “Professor Tailored AI Tutor to Physics Course. Engagement Doubled,” *Harvard Gazette*, September 5, 2024, <https://news.harvard.edu/gazette/story/2024/09/professor-tailored-ai-tutor-to-physics-course-engagement-doubled>.

¹³ See Maxime C. Cohen and Christopher S. Tang, “The Role of AI in Developing Resilient Supply Chains,” *Georgetown Journal of International Affairs* (February 5, 2024), <https://gjia.georgetown.edu/2024/02/05/the-role-of-ai-in-developing-resilient-supply-chains>; and Remko Van Hoek and Mary Lacity, “How Global Companies Use AI to Prevent Supply Chain Disruptions,” *Harvard Business Review*, November 21, 2023, <https://hbr.org/2023/11/how-global-companies-use-ai-to-prevent-supply-chain-disruptions>.

¹⁴ See Sheldon Fernandez, “How Generative AI Can Be Used in Electronics,” *Forbes*, April 26, 2023, <https://www.forbes.com/councils/forbestechcouncil/2023/04/26/how-generative-ai-can-be-used-in-electronics-manufacturing>.

¹⁵ For U.S. financial institutions, see Elizabeth Judd, “How to Balance Human and Machine While Using Chatbots,” *Independent Banker*, January 1, 2025, <https://www.independentbanker.org/article/2025/01/01/chatbots-finding-a-balance-between-human-and-machine>; and U.S. Department of the Treasury, “Artificial Intelligence in Financial Services” (Washington: U.S. Department of the Treasury, December 2024), <https://home.treasury.gov/system/files/136/Artificial-Intelligence-in-Financial-Services.pdf>. For foreign financial institutions, see Bank of England and Financial Conduct Authority, “Artificial Intelligence in UK Financial Services—2024” (London: Bank of England and Financial Conduct Authority, November 21, 2024), <https://www.bankofengland.co.uk/report/2024/artificial-intelligence-in-uk-financial-services-2024>; and Bank of Japan, “Use and Risk Management of Generative AI by Japanese Financial Institutions,” *Financial System Report Annex* (Tokyo: Bank of Japan, October 29, 2024), <https://www.boj.or.jp/en/research/brp/fsr/fsrb241029.htm>. For global financial institutions, see OECD, “FSB Roundtable on Artificial Intelligence (AI) in Finance,” Financial Stability Board, September 30, 2024, [https://www.oecd.org/content/dam/oecd/en/topics/policy-sub-issues/digital-finance/OECD%20%E2%80%93%20FSB%20Roundtable%20on%20Artificial%20Intelligence%20\(AI\)%20in%20Finance.pdf](https://www.oecd.org/content/dam/oecd/en/topics/policy-sub-issues/digital-finance/OECD%20%E2%80%93%20FSB%20Roundtable%20on%20Artificial%20Intelligence%20(AI)%20in%20Finance.pdf).

The impact to society would be incrementally positive in this state of the world. Humans would use GenAI as a tool to deliver goods and services that we currently produce in a more efficient way. Productivity would go up. The economy would grow at a faster pace.¹⁶

What does this mean for the labor force? The impact will depend on the industry and the nature of the job. GenAI experiments suggest the technology holds the promise of levelling up skills and bringing productivity of lower-performing workers into line with higher performing workers.¹⁷ In other cases, it could augment the highest performers, leaving them more time for creativity or strategic aspects of their roles. Increasing automation for certain tasks may displace some workers, where certain skills can be replicated by GenAI. Historically, as technology has replaced some jobs, it has augmented existing roles or created new ones.¹⁸ However, this is not to downplay the individual cost for workers who need to retrain, find other employment, or change careers in response to major changes in labor demand. Society will need to account for these possible effects of AI.

What does this mean for the economy? As I noted before, the economy should grow, if the incremental productivity gains are widespread. However, in this scenario, it is possible that the expected value creation from GenAI was overhyped, anticipating transformative breakthroughs rather than incremental productivity gains. This could trigger market corrections for the firms that have heavily invested in this technology if reality doesn't measure up to

¹⁶ Lida R. Weinstock and Paul Tierno, "The Macroeconomic Effects of Artificial Intelligence," *Congressional Research Service*, January 28, 2025, <https://crsreports.congress.gov/product/pdf/IF/IF12762>.

¹⁷ See Shakked Noy and Whitney Zhang, "Experimental Evidence on the Productivity Effects of Generative Artificial Intelligence," *Science*, vol. 381, no. 6654 (July 13, 2023): 187–92, <https://doi.org/10.1126/science.adh2586>; Brynjolfsson et al., "Generative AI at Work" (see footnote 9); and "for software engineering" from footnote 9; Korinek (2024) from footnote 7.

¹⁸ See David H. Autor, "Why Are There Still So Many Jobs? The History and Future of Workplace Automation," *Journal of Economic Perspectives*, vol. 29, no. 3 (Summer 2015): 3–30, <https://www.aeaweb.org/articles?id=10.1257/jep.29.3.3>. See Simona Abis and Laura Veldkamp.

expectations. While the U.S. economy experienced a surge of productivity growth during the dot.com boom in the late 1990s, it was followed by a wave of bankruptcies, capital overhang, and a cautious business investment climate.¹⁹ The effects of the ensuing recession were widespread.

What does this mean for financial stability and other financial risks? In this incremental scenario, GenAI may magnify both the vulnerabilities and sources of resilience that already exist in the system. Attractive trades become more crowded, but risk managers gain new insights.²⁰ Malicious actors gain new tools, but cyber defenders become better armed. So long as financial regulators, enterprise risk managers, and others charged with managing downside risks prioritize efforts to keep pace with the evolving financial ecosystem, there's nothing to suggest a wholesale transformation of the balance of risks. Of course, keeping pace will pose challenges, and it's important that we all focus on the need to meet these risks.

Hypothetical Scenario 2: Transformative Change

Now, let's consider a more dramatic hypothetical scenario, in which GenAI adoption extends beyond improving on what we currently do, and provides new expertise and capabilities that have transformative effects on the economy and society. In this scenario, humans deploy their imagination and creativity—combined with robust investment in research and development—to deploy intelligent GenAI systems to make rapid breakthroughs in, for example, biotechnology, robotics, and energy, fundamentally reshaping existing industries and creating

¹⁹ See Ben S. Bernanke, “Will Business Investment Bounce Back?” (speech at the Forecasters Club, New York, NY, April 24, 2003), <https://www.federalreserve.gov/boarddocs/speeches/2003/200304242/default.htm>.

²⁰ See Financial Stability Board, *The Financial Stability Implications of Artificial Intelligence* (Basel, Switzerland: Financial Stability Board, November 14, 2024), <https://www.fsb.org/2024/11/the-financial-stability-implications-of-artificial-intelligence>; and Jon Danielsson and Andreas Uthemann, “How AI Can Undermine Financial Stability,” VoxEU: CEPR, January 22, 2024, <https://cepr.org/voxeu/columns/how-ai-can-undermine-financial-stability>.

new ones. In this instance, to focus the mind, we can think of GenAI as no longer only a tool for scientists to analyze data—in a sense, it becomes the scientist, directing the research.²¹

For instance, let's say that GenAI applications in health care do not simply improve how we currently deliver care, but also enable therapies that target genetic mutations and cure diseases previously considered incurable.²² Similarly, manufacturing evolves to create GenAI-driven robotic factories, with goods produced with new materials and atomic precision.²³

Materials science is transformed through the discovery of programmable materials and self-healing substances, all of which reshape construction, technology, and consumer goods.²⁴

Meanwhile, GenAI optimizes fusion energy research, expediting the shift to sustainable energy

²¹ For some very early examples, see Davide Castelvetti, “Researchers Built an ‘AI Scientist’—What Can It Do?” *Nature*, August 30, 2024, <https://www.nature.com/articles/d41586-024-02842-3>; Daniil A. Boiko, Robert MacKnight, Ben Kline, and Gabe Gomes, “Autonomous Chemical Research with Large Language Models,” *Nature*, December 20, 2023, <https://www.nature.com/articles/s41586-023-06792-0>; and Helena Kudiabor, “Virtual Lab Powered by ‘AI Scientists’ Super-Charges Biomedical Research,” *Nature*, December 4, 2024, <https://www.nature.com/articles/d41586-024-01684-3>.

²² For more on drug discovery and gene therapy, see Betty Zou, “Team Uses AI and Quantum Computing to Target ‘Undruggable’ Cancer Protein,” *Phys Org*, January 27, 2025, <https://phys.org/news/2025-01-team-ai-quantum-undruggable-cancer.html>; and Mohammad Ghazi Vakili et al., “Quantum-Computing-Enhanced Algorithm Unveils Potential KRAS Inhibitors,” *Nature Biotechnology*, January 22, 2025, <https://www.nature.com/articles/s41587-024-02526-3>.

²³ See NASA Technology Transfer Program, “Robonaut 2: Hazardous Environments (MSC-TOPS-44),” <https://technology.nasa.gov/patent/MSCTOPS-44>.

²⁴ For more on material sciences innovation, see Andy Extance, “First GPT-4-Powered AI Lab Assistant Independently Directs Key Organic Reactions,” *Chemistry World*, January 8, 2024, <https://www.chemistryworld.com/news/first-gpt-4-powered-ai-lab-assistant-independently-directs-key-organic-reactions/4018723.article>; Chenyang Liu, Xi Zhang, Jiahui Chang, You Lyu, Jianan Zhao, and Song Qiu, “Programmable Mechanical Metamaterials: Basic Concepts, Types, Construction Strategies—A Review,” *Frontiers*, vol. 11 (March 19, 2024), <https://doi.org/10.3389/fmats.2024.1361408>; Aidan Toner-Rodgers, “[Artificial Intelligence, Scientific Discovery, and Product Innovation](https://aidantr.github.io/files/AI_innovation.pdf),” MIT, November 27, 2024, https://aidantr.github.io/files/AI_innovation.pdf; and Thomas Hayes et al., “Simulating 500 Million Years of Evolution with a Language Model,” *Science*, January 16, 2025, <https://doi.org/10.1126/science.ads0018>.

sources.²⁵ And GenAI helps to create the next generation of quantum computing.²⁶ In that way, GenAI improves its own energy sources and computing capabilities, enabling it to become a more powerful creative tool.²⁷

Finance also looks radically different than it does today. Individuals with access to hyper-personalized financial planning and businesses with innovative products and services seamlessly connect with one another through near-frictionless or novel forms of financial intermediation.²⁸ Trading strategies and risk-management practices are boosted by greater

²⁵ See Tan Sui, “AI Could Help Overcome the Hurdles to Making Nuclear Fusion a Practical Energy Source,” *The Conversation*, January 29, 2025, <https://theconversation.com/ai-could-help-overcome-the-hurdles-to-making-nuclear-fusion-a-practical-energy-source-247608>; Jaemin Seo, SangKyeun Kim, Azarakhsh Jalalvand, Rory Conlin, Andrew Rothstein, Joseph Abbate, Keith Erickson, Josiah Wai, Ricardo Shousha, and Egemen Kolemen, “Avoiding Fusion Plasma Tearing Instability with Deep Reinforcement Learning,” *Nature*, vol. 626, February 21, 2024, <https://doi.org/10.1038/s41586-024-07024-9>; and Massimiliano Lupo Pasini, German Samolyuk, Markus Eisenbach, Jong Youl Choi, Junqi Yin, and Ying Yang, “First-Principles Data for Solid Solution Niobium-Tantalum-Vanadium Alloys with Body-Centered-Cubic Structures,” *Nature: Scientific Data*, vol. 11, no. 907 (August 22, 2024), <https://doi.org/10.1038/s41597-024-03720-3>.

²⁶ Nakia Melecio, “Exploring the Synergy: Quantum Computing and Generative AI at the Intersection of Innovation,” ScaleUp Lab Program, Enterprise Innovation Institute, Georgia Tech, <https://scaleuplab.gatech.edu/exploring-the-synergy-quantum-computing-and-generative-ai-at-the-intersection-of-innovation/#:~:text=Solving%20Complex%20Challenges%3A%20Generative%20AI,leading%20to%20improved%20model%20performance.>

²⁷ For an example on GenAI and quantum computers, see Rahul Rao, “Quantum Computers Can Now Run Powerful AI That Works like the Brain,” *Scientific American*, April 22, 2024, <https://www.scientificamerican.com/article/quantum-computers-can-run-powerful-ai-that-works-like-the-brain>. For an example about AI and clean energy, see Office of Policy, “How AI Can Help Clean Energy Meet Growing Electricity Demand” (Washington: U.S. Department of Energy, August 16, 2024), <https://www.energy.gov/policy/articles/how-ai-can-help-clean-energy-meet-growing-electricity-demand#:~:text=AI%20can%20also%20be%20a,capable%20of%20meeting%20load%20growth>. For examples of how GenAI is augmenting creativity, see Tojin T. Eapen, Daniel J. Finkenstadt, Josh Folk, and Lokesh Venkataswamy, “How Generative AI Can Augment Human Creativity,” *Harvard Business Review* (July–August 2023), <https://hbr.org/2023/07/how-generative-ai-can-augment-human-creativity>; and Anil R. Doshi and Oliver P. Hauser, “Generative AI Enhances Individual Creativity but Reduces the Collective Diversity of Novel Content,” *Science Advances*, vol. 10, no. 28 (July 12, 2024), <https://www.science.org/doi/10.1126/sciadv.adn5290>.

²⁸ See Iñaki Aldasoro, Leonardo Gambacorta, Anton Korinek, Vatsala Shreeti, and Merlin Stein, “Intelligent Financial System: How AI Is Transforming Finance,” *BIS Working Papers* No. 1194 (Basel, Switzerland: Bank for International Settlements, June 2024), <https://www.bis.org/publ/work1194.pdf>; and Sarah Hammer, “From Turing to Trading: How AI Is Revolutionizing Finance,” Finance Centers at the Wharton School, July 10, 2024, <https://finance-pillar.wharton.upenn.edu/ai-in-finance/how-ai-revolutionizing-finance>.

GenAI-based analytic tools that have dynamic real-time access to an enormous knowledge base in both the public and private domains.²⁹

Although this transformative scenario is more speculative and is accompanied by a far greater degree of uncertainty than the first, it is important to consider given the extraordinary opportunities for human advancement and welfare that could arise, even if just one of its transformative components were to come to fruition. We would need to fundamentally reimagine how the economy is structured.

What are the impacts on the labor force, in a world where GenAI's capabilities extend beyond what humans can accomplish today? Humans may have a role to manage multi-agent GenAI frameworks, or fill gaps where GenAI solutions remain expensive or inefficient for some applications. But this is a world where some workers may see their current jobs disappearing. It is also a world in which they may see their own work transformed and have many more choices about the work they do. The nature of labor would radically change, and this will require us to have broader conversations about how to organize the economy. These conversations should wrestle with how to navigate major economic shifts in a way that recognizes the impact on the human condition, and the extent to which people derive their communities, friendships, personal sense of meaning and dignity from their work.

What about the competitive landscape? There is probably a greater likelihood that rewards for businesses would be distributed more unevenly at first, as significant breakthroughs with far-reaching ramifications may benefit a subset of firms and industries and concentrate

²⁹ Large language models may even allow for the creation of synthetic data that allows for enhancing macroeconomic nowcasting and forecasting through economic AI agents that can also help with analyzing macroeconomic trends and contribute to more informed financial decisionmaking. See Anne Lundgaard Hansen, John J. Horton, Sophia Kazinnik, Daniela Puzzello, and Ali Zarifhonarvar, "Simulating the Survey of Professional Forecasters," *SSRN* (December 1, 2024), <https://dx.doi.org/10.2139/ssrn.5066286>.

economic power in firms that control GenAI breakthroughs. If only a handful of firms have the ability to accomplish the incredible things I've mentioned above, they may dominate markets and crowd out competitors. To the extent that GenAI becomes broadly effective, widely available, and cheap, these market advantages could lessen over time if the right regulatory environment supports competitive market dynamics.³⁰ But history suggests caution in this regard; a handful of players may dominate.³¹

And finally, for finance, we should anticipate fundamental changes in this scenario. When it's working well, the financial system helps move money and risk through time and space.³² To the extent there are fundamental changes to how the economy is organized, we could need a new set of institutions, markets, and products to facilitate transactions among households, businesses, and GenAI agents.

What Should We Do?

Among the many ways in which we can help to harness the potential benefits of GenAI and minimize its risks, I will highlight only a couple today.

Financial institutions, and the Federal Reserve System, should consider investing sufficient resources in understanding GenAI technology, incorporating it into their workflows

³⁰ Kelly Ng, Brandon Drenon, Tom Gerken, and Marc Cieslak, "DeepSeek: The Chinese AI App That Has the World Talking," *BBC News*, February 4, 2025, <https://www.bbc.com/news/articles/c5yv5976z9po>.

³¹ For example, see IBM Newsroom, "Data Suggests Growth in Enterprise Adoption of AI Is Due to Widespread Deployment by Early Adopters, But Barriers Keep 40% in the Exploration and Experimentation Phases," *IBM*, January 10, 2024, <https://newsroom.ibm.com/2024-01-10-Data-Suggests-Growth-in-Enterprise-Adoption-of-AI-is-Due-to-Widespread-Deployment-by-Early-Adopters>; and Jefferies Editorial Team, "Can Startups Outsmart Big Tech in the AI Race?" *Jefferies*, September 17, 2024, <https://www.jefferies.com/insights/boardroom-intelligence/can-startups-outsmart-big-tech-in-the-ai-race>.

³² If AI agents proliferate in financial transactions, we will also need to be careful about the potential for unintended consequences such as collusion among AI agents. See Winston Wei Dou, Itay Goldstein, and Yan Ji, "AI-Powered Trading, Algorithmic Collusion, and Price Efficiency," Jacobs Levy Equity Management Center for Quantitative Financial Research Paper, The Wharton School Research Paper, May 30, 2024, <https://dx.doi.org/10.2139/ssrn.4452704>.

where appropriate, and training staff on how to use the technology responsibly and effectively.³³ Meanwhile, the financial regulatory community should approach the changing landscape with agility and flexibility. And beyond the financial sector, collaboration between governments, private industry, and research institutions will be critical to ensure that GenAI systems are not weaponized in catastrophic ways. We should continue to focus on responsible AI research and development and implement safeguards against misuse, including monitoring systems, standards for secure AI system development, and agreement on red lines for acceptable use cases.³⁴ We should be attuned to the impact of GenAI on our economic and political institutions. There's a risk that it concentrates economic and political power in the hands of the very few and could lead to the gains being realized only by a small group, while the rest are left behind.

Another thing I want to emphasize is AI governance. I think most would agree that the goal of the technology is to improve the human condition, and to do that, we need to be intentional in advancing that goal. We should make sure that we think about GenAI as enhancing, not replacing, humans, and set up best practices and cultural norms to that end. Every financial institution should recognize the limitations of the technology, explore where and when GenAI belongs in any process, and identify how humans can be best positioned to be in the loop. We should also focus on data quality, and make sure that uses of GenAI do not perpetuate or amplify biases inherent in the data used to train the system or make incorrect inferences to the extent the data is incomplete or nonrepresentative.³⁵ In the realm of regulation, frameworks for

³³ See Request for Information on the Development of an Artificial Intelligence (AI) Action Plan, 90 Fed. Reg. 9,088 (February 6, 2025), <https://www.govinfo.gov/content/pkg/FR-2025-02-06/pdf/2025-02305.pdf>.

³⁴ See Heather Domin, "AI Governance Trends: How Regulation, Collaboration, and Skills Demand Are Shaping the Industry," World Economic Forum, September 5, 2024, <https://www.weforum.org/stories/2024/09/ai-governance-trends-to-watch>.

³⁵ For more on bias introduced in models, see Moshe Glickman and Tali Sharot, "How Human–AI Feedback Loops Alter Human Perceptual, Emotional, and Social Judgements," *Nature Human Behavior*, December 18, 2024,

understanding model risk may need to be updated to address the complexity and challenges of explaining AI methods and the difficulty of assessing data quality.

We need to be attuned to the risk in finance. The very attributes that make GenAI attractive—the speed, automaticity, and ability to optimize financial strategies—also present risk.³⁶ When the technology becomes ubiquitous, use of GenAI could lead to herding behavior and the concentration of risk, potentially amplifying market volatility. As GenAI agents will be directed to maximize profit, they may converge on strategies to maximize returns through coordinated market manipulation, potentially fueling asset bubbles and crashes. Speed, automaticity, and ubiquity could generate new risks at wide scale.³⁷

We also should monitor how introduction of this technology changes the banking landscape. Nonbanks may be more nimble and risk-forward in incorporating GenAI into their operations, which may push intermediation to less-regulated, less transparent corners of the financial sector. In addition, this competitive pressure may push all institutions, including regulated institutions, to take a more aggressive approach to GenAI adoption, heightening the governance, alignment, and financial risks I mentioned before.

<https://www.nature.com/articles/s41562-024-02077-2>; Saul Asiel Flores, “‘Bias in, Bias out’: Tackling Bias in Medical Artificial Intelligence,” Yale School of Medicine, November 18, 2024, <https://medicine.yale.edu/news-article/bias-in-bias-out-yale-researchers-pose-solutions-for-biased-medical-ai>; and Adam Zewe, “Researchers Reduce Bias in AI Models While Preserving or Improving Accuracy,” MIT News, December 11, 2024, <https://news.mit.edu/2024/researchers-reduce-bias-ai-models-while-preserving-improving-accuracy-1211>. For governance in central banks, see Claudia Alvarez Toca and Alexandre Tombini, *Governance of AI Adoption in Central Banks* (Basel, Switzerland: Bank for International Settlements, January 2025), <https://www.bis.org/publ/othp90.pdf>.

³⁶ See, e.g., Michael P. Wellman, “Artificial Intelligence in Financial Services” (written testimony before the U.S. Senate Committee on Banking, Housing, and Urban Affairs, September 20, 2023), https://www.banking.senate.gov/imo/media/doc/wellman_testimony_9-20-23.pdf.

³⁷ See Jon Danielsson and Andreas Uthemann, “AI Financial Crises,” VoxEU: CEPR, July 26, 2024, <https://cepr.org/voxeu/columns/ai-financial-crises>. For more on algorithm collusion, see Wei Dou et al., “AI-Powered Trading, Algorithmic Collusion, and Price Efficiency” (see footnote 33).

In conclusion, while AI's impact will vary across industries and the reality is evolving, the scenarios I have outlined today provide a framework to begin thinking about how we should respond to developments in GenAI. However, as I mentioned above, elements of both scenarios will likely be present in the future, and play out at different rates, which will influence the effects on the economy and society. Rapid advances in this technology, such as Agentic AI and advancements in open-source models, underscore just how new this technology is and the importance of understanding what it means for individuals, businesses, and markets. Thank you.