Artificial Intelligence (AI) Creates Wave of Opportunity

Is 2023 the Year of Artificial Intelligence (AI) and Generative AI? Seemingly, not a day goes by in 2023 without an article, corporate release, or research report discussing opportunities in AI, all driving mainstream awareness and investor enthusiasm. Over the past few decades, advancement in computing power (think semiconductors) and software has led to AI adoption in a variety of business uses including social media digital advertising, algorithms used by streaming services (movies and music), autonomous driving, and personal voice assistants, to name a few. Until very recently, AI was not a major focus on the mind of many investors. While acknowledging value for businesses adopting AI solutions to increase production efficiency or enhance customer outcomes, it was difficult for investors to quantify the value of AI-based products or sellers of AI-capable hardware and software. But in late 2022, the landscape for investors changed when an AI development firm, OpenAI, made a version of its chatbot (a computer program that simulates a conversation with a human partner) available to the public[1]. "ChatGPT" was significantly more advanced than expected, leading many AI enthusiasts and industry insiders to predict that AI is finally poised to break into the mainstream. In early 2023, Microsoft (MSFT, Buy-rated), already an investor in OpenAI, was reported to have made an additional large investment in OpenAI[2] and has since added generative AI capabilities to multiple product offerings. Investor interest was further magnified after Nvidia (NVDA, not rated), a leading semiconductor company, significantly raised its near-term revenue outlook due to large AI-related orders from the leading cloud service providers[3]. Not only is the investment opportunity building, but these companies confirmed that meaningful capital investment is already underway. We expect large scale investment to continue into future periods as AI systems become more advanced and innovation continues in the space.

What are AI and Generative AI? Research on artificial intelligence goes back decades as early computer science innovators in the 1950s discussed how computers, if they could be programmed to think, could become smarter than humans. Nearly 20 years ago, in 2004, Stanford Professor John McCarthy published a paper about advancements in artificial intelligence discussing computers that could understand human intelligence[4]. We think of artificial intelligence as using advanced computers to process large amounts of data to ultimately approach human problem solving and decision making. Early versions were often called "machine learning" and could sift through large data sets and accurately predict single outcomes. Now, generative AI goes further to utilize all forms of inputs. Semiconductor leader Nvidia (NVDA, not rated) describes that generative AI, "enables users to quickly generate new content based upon a variety of inputs," including "text, images, sounds, animation, 3-D models…"[5]. This leads to more comprehensive answers. While still predictive models, generative AI can give detailed responses, much better than a search engine, which does a good job of telling the user where to go to find additional information. As generative AI systems access more data, they become larger and learn to make better decisions. At each iteration, the system gains knowledge, enhancing its predictive (reliable) capabilities and ability to produce original content. Generative AI systems become more robust as they are used as all new data can be trained into the system, creating new challenges and opportunities.

How is Generative AI Being Adopted? We have all read stories about college students using chatbots to write term papers, software developers using AI to improve computer code, and individuals asking ChatGPT to explain complex topics in layman's terms. These popular applications use text or speech and utilize advanced capabilities of generative AI large language models (LLMs) to analyze huge data sets and establish language patterns and connections between words. This enables these "chatbots" to answer questions, organize thoughts, and generate "human-like" output in written or verbal form. But language models are only part of the generative AI opportunity as the models can be applied to images and audio data as well. Generative AI can create art and illustrations, produce videos and charts, and build 3-D models used across a variety of research and development applications. Audio capabilities can be used to write music, recreate voices, and provide a "human-like" customer service experience. Among the industry groups that are widely deploying generative AI solutions are automotive (car design and autonomous driving), health care (drug discovery, diagnostics, and patient care), and entertainment (special effects, script writing, and film editing). Other applications include consumer products and retail companies using AI to optimize customer service responses, and Information Technology departments that adopt AI models to write computer code. Other important industries include Finance, Agriculture, Insurance, Manufacturing, Education and Cybersecurity. It is fair to say, in our opinion, that forms of AI are already in use or will be adopted in millions of business and consumer applications and that most of us will be impacted (for better or for worse) to some degree on a daily basis. With such a large net of use cases and applications, as investors, we must search for opportunities.

What are the Investment Implications? We expect investors to face generative AI opportunities on several fronts. Most obvious, initially, are technology providers of advanced computing systems (especially semiconductors and servers) as they provide the computing power needed to power the models. In addition, all of the large cloud service providers (according to public announcements) continue to spend heavily on generative AI infrastructure, with plans to add AI-driven services to subscription plans. While this is expected to generate additional revenue for the cloud companies, the level of return on investment must be proven over time. Other software and service providers will benefit from helping customers add AI models to their business. We expect AI systems to enable companies across most sectors and industry groups to realize efficiencies in terms of automating tasks, making existing labor more efficient, adding service capabilities, and other process improvements. This can potentially lead to higher sustainable revenue growth, as well as margin expansion and earnings upside. All emerging investment opportunities will ultimately include winners and losers along the way, but the potential for AI is that it can drive a sustained uptick in global productivity and economic growth. AI adoption will create challenges as well. For instance, can displaced workers be retrained into higher value positions, will responses protect copyright and patent laws, and can inherent biases be removed from responses?

We analyzed recent public filings from the seven largest companies (ranked by equity market capitalization) within the S&P 500 equity index to look at the spending levels assigned to research and development (R&D) and capital expenditures. In the most recent reported quarter (ending either May 2023 or June 2023), total spending increased 6% to $97B[6]. On an annualized run-rate basis (multiplying the quarterly number by 4), this suggests $388B of R&D and capital spending, a meaningful number from just seven (admittedly large) companies. While the data includes spending on all projects, not just AI, we expect to see continued investment growth in future quarters. A mid-2023 paper from McKinsey & Company estimated that generative AI could add between $2.6 trillion (T) to $4.4T to the global economy on an annual basis[7]. Using a midpoint of $3.5T and an estimated value of the global economy (from the World Bank) of $100.6T in 2022[8] suggests a potential lift in global

gross domestic product (GDP) of 3.5%. This is an aggressive number reflecting a potential generational surge in output and productivity that can provide a boost to global capital markets.

Investor enthusiasm for generative AI accelerated in 2023, contributing to gains in the Technology sector and other growth stocks. This creates potential valuation challenges if some of the near-term upside from ongoing AI investment is already assumed in current stock prices. On the other hand, we believe that AI investment is in the early stages and will continue to grow over the decade ahead. To evaluate individual stocks for potential additions to equity portfolios, investors should consider how generative AI can help or hurt the business. Can AI be adopted to reduce costs, drive efficiencies, or generate revenue opportunities? Will AI be used to reduce the employee count, or can AI solutions be used to make the existing labor force more productive? Does the company have sufficient cash flow to fund that investment, and how will success be measured? Also, what is the downside of not adopting AI (i.e., will the company become less competitive)? In summary, after decades of development, generative AI has quickly emerged as a driver of capital markets activity and expected economic growth. This creates investment opportunities for companies and investors, and also creates challenges as competitive dynamics could change rapidly.

James D. Ragan, CFA
Director of WM Research
(206) 389-8000
dadavidson.com

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Gross domestic product (GDP) refers to the monetary measure of the market value of all final goods and services produced within a country's borders within a specific time period. Real GDP is adjusted for the impact of inflation. U.S. GDP numbers are compiled by the Bureau of Economic Analysis (BEA), a division within the U.S. Department of Commerce. Global GDP data is compiled by the World Bank (using GDP from government agencies) and can be found: https://data.worldbank.org/indicator/NY.GDP.MKTP.CD

Citations:

[1] *While Anticipation Builds For GPT-4, OpenAI Quietly Releases GPT-3.5*

[2] *Microsoft and OpenAI Extend Partnership*

[3] *NVIDIA Announces Financial Results For First Quarter Fiscal 2024*

[4] *Notes on Self-Awareness – John McCarthy*

[5] *Glossary – Generative AI*

[6] *Recent SEC Filings (10-Qs and 10-Ks) of: AAPL, MSFT, GOOGL, AMZN, NVDA, META, TSLA; Data found in income statements and cash flow statements*

[7] *The Economic Potential of Generative AI: The Next Productivity Frontier – McKinsey & Company*

[8] Economic Indicator – GDP, World – The World Bank