MORNING BRIEFING
June 28, 2023

More AI & More Lithium

Check out the accompanying chart collection.

Executive Summary: AI is sparking a new industrial revolution that's bound to transform business processes in every industry. But capitalizing on the promise may mean upgrading legacy IT systems in multiple corporate areas—launching a new technology capital spending cycle. Jackie looks at how companies in various industries are planning to leverage AI to their advantage. … Also: A more efficient way to extract the lithium that electric vehicles' batteries use is under development. If direct lithium extraction proves viable, it could do for lithium production what fracking did for oil production. That could mean cheaper EVs, EVs with expanded driving range, or both.

Technology: AI Everything Everywhere All at Once. Lately, a day doesn't pass without a company touting how it plans to use artificial intelligence (AI) to revolutionize its business. Yesterday, it was Snowflake's turn. The cloud data analytics company announced that it was partnering with Nvidia so customers could build AI models using their own data hosted in Snowflake's cloud. AI is the new Gold Rush.

"Every industry is on this. They used to say software is eating the world. Well, now data is eating software," said Snowflake CEO Frank Slootman in a June 26 Reuters *article*. Both companies' shares rallied on the news; Snowflake's shares jumped 4.2%, and Nvidia's shares added 3.1% on Tuesday compared with a 1.2% gain for the S&P 500.

The news also helped to arrest the slide in the S&P 500 Information Technology sector, which had fallen 3.8% from its June 15 peak through Monday's close compared with a 2.2% decline for the S&P 500 (*Fig. 1*). The sector gained 2.0% on Tuesday, leaving it only 2.6% from its December 2021 record close (*Fig. 2*). The AI-adoption race is taking place across sectors and industries, as hopes are high that the technology will make operations of all sorts more efficient and boost operating margins.

S&P 500 companies' profit margins on the whole have held up remarkably well over the past year with the US economy evading an economy-wide recession. Here are the forward operating margins for the S&P 500 and its 11 sectors today and one year ago: Information Technology (24.1, 25.4), Financials (18.5, 19.0), Real Estate (17.0, 17.9), Communications Services (15.4, 16.0), Utilities (13.0, 13.8), S&P 500 (12.5, 13.4), Energy (11.2, 11.7),

Materials (11.1, 13.6), Industrials (10.6, 10.4), Health Care (9.5, 11.0), Consumer Discretionary (7.6, 7.7), and Consumer Staples (6.7, 7.3) (*Table 1* and *Fig. 3*).

The widespread adoption of AI reinforces our anticipation of the Roaring 2020s, a time when we expect companies will use technological innovations to solve labor shortages and boost productivity. I asked Jackie to take a look at some recent corporate announcements that shed light on how executives hope to harness AI:

(1) *AI develops drugs.* Insilico Medicine, a biotech company backed by China's Fosun Group and Warburg Pincus, reported that one of its drugs discovered and designed using AI was beginning Phase 2 clinical trials. The drug treats idiopathic pulmonary fibrosis, a chronic lung disease.

Insilico's founder Alex Zhavoronkov believes his AI-powered company can roughly double the productivity of every big pharmaceutical company, a June 26 *FT* *article* reported. The company's AI platforms could halve the time it takes to discover drugs and cut the cost of bringing medicines to market. "AI platforms can crunch vast amounts of data to rapidly identify drug targets—proteins in the body associated with particular diseases—and molecules that can be made into medicines," the *FT* article explained.

Insilico has used AI to select 12 pre-clinical drug candidates, three of which are in clinical trials. That said, AI isn't infallible. Benevolent AI's leading drug candidate, developed using its AI drug discovery platform, failed.

(2) *AI designs cars.* Toyota announced that it's using AI in the early stages of car design when different versions of a project are being evaluated by engineers. "[S]imply put, if the automaker decides to build a new large two-door coupe, it could ask AI to generate a number of early designs based on preset parameters," explained a June 22 Motor1.com *article*.

Parameters like a drag coefficient and chassis dimensions are fed into the AI system along with descriptive terms, like "sleek" and "modern." The system tends to focus on designing the most aerodynamic cars to help improve their energy efficiency. "Toyota says the AI-enhanced early design process could help the company design electrified vehicles more quickly and efficiently," the article reported. BMW likewise says that it is evaluating the use of AI in its automobile designs.

(3) *AI finds minerals.* Kobold Metals is exploring how AI can help it explore for metals.

"Traditionally, geologists examine spatial data to guess where metals are most likely to be located underground, and then mining companies explore those areas manually to see if that expert judgment was correct. Kobold combines AI with large volumes of data on the Earth's crust, building complex sub-surface models to locate minerals in areas that are less obvious," a June 23 *article* in *Global Corporate Venturing* reported. Some of the metals used in batteries and windmills have become harder to find, and it's hoped that AI tools can make the process easier and more efficient.

(4) *AI requires IT investment.* Here are a few more examples that caught our eye of AI either being tested or deployed in various industries: Booking.com, a digital travel platform, announced yesterday the launch of its AI Trip Planner, which will make better destination and accommodation recommendations to users. Mattel is exploring how it can use generative AI to help its cybersecurity team eliminate tedious tasks. Paul McCartney tapped AI to isolate John Lennon's voice from an old demo tape and used it to mix a new record. And Wendy's is working with Google to create an AI chatbot that can take drive-thru orders.

Developing and rolling out features that use AI may first require companies to update their existing technology systems. In a survey by Rackspace Technology, 83% of IT executives at global retailers said they would benefit from AI only if they modernize legacy apps and data. Enterprise resource planning, customer relationship management, and HR apps were identified as those that most needed upgrading, followed by business intelligence, data storage, content management, data analytics, governance and security, and data integration, according to a June 23 *article* in *Chain Store Age*. Looks like a new technology capital spending cycle—and the Roaring 2020s—are underway!

This isn't news to technology stock investors. Here's how some of the largest S&P 500 Technology industries have performed ytd through Monday's close: Semiconductors (67.5%), Technology Hardware, Storage & Peripherals (41.4), Systems Software (37.4), Information Technology Sector (36.6), Application Software (32.3), Semiconductor Equipment (23.7), Communications Equipment (7.3), IT Consulting & Other Services (1.9), and Home Entertainment Software (0.3) (*Fig. 4*). (In comparison, the S&P 500 is up 12.7% ytd.)

Materials: A Lithium Game Changer. The advent of battery-filled electric vehicles (EVs) has sent the price of lithium heavenward as many feared there won't be enough to meet the growing demand. But enterprising scientists are developing new lithium extraction methods that may dramatically increase supplies, perhaps within the next five years.

Traditionally, lithium is either dug out of the ground in mines or separated from brine through evaporation over some 18 months. Direct lithium extraction (DLE) is a new method that extracts the lithium from brine by using chemicals or a sorbent; the process takes hours, not months, and increases the recovery of lithium dramatically. The hope is that this new technology jumpstarts the production of lithium just as fracking did for the production of US oil.

The impact could be substantial: If viable, DLE could drive down the price of lithium, the cost of EV batteries, and perhaps even the sticker price of EVs themselves. Automakers may have more pricing flexibility: They could opt to increase battery size—extending driving range—for the same EV prices as today, or to keep the current battery size and lower the prices of the cars they sell, or to implement some combination thereof.

Again, I asked Jackie to take a look at what has experts so excited:

(1) *A bit of background.* The amount of lithium produced is expected to increase from 737,000 tonnes of lithium carbonate equivalent in 2022 to an estimated 964,000 tonnes this year and 1,167,000 tonnes in 2024, an April 21 Reuters *article* reported, citing the Australian Department of Industry, Science and Resources. Nonetheless, the price of lithium has soared in recent years, as demand is expected to outstrip supply increases. The price of lithium carbonate fell sharply during the pandemic, then soared to a high of $81,375 in December 2022 before tumbling this year to a low of $26,850 during early May (*Fig. 5*).

The price slump earlier this year occurred as China ended its national subsidy for EVs at year-end 2022 and manufacturers of autos with combustion engines cut their prices to boost demand, a June 21 Reuters *article* reported. EV sales subsequently picked up after Tesla cut its prices and China reversed course: China recently announced $72 billion of tax breaks over four years for EVs and other green cars to boost demand. The price of lithium has responded, jumping to $43,775 as of Monday's close.

Lithium prices may also have been boosted by news in April that Chile's President Gabriel Boric plans to nationalize the country's lithium industry. While he said he will respect current contracts with SQM and Albemarle, he plans to establish a state-owned company, and future contracts will be issued as "public-private partnerships with state control," an April 21 Reuters *article* reported. SQM's contract expires in 2030 and Albemarle's in 2043. Chile has the world's largest lithium reserves and is the second largest producer behind Australia.

An arm of the new state-owned company will be tasked with developing technology to

reduce the environmental impact of lithium extraction, and the use of DLE will be favored over evaporation ponds, the Reuters article noted. While Chile's move to favor DLE could help the technology progress, nationalizing the industry may prompt companies investing in lithium development to favor business-friendlier countries.

(2) *The promise of DLE.* The amount of new lithium production may be determined by whether DLE is successfully developed. An April 27 Goldman Sachs *report* called DLE a "potential game changing technology" that could double lithium recoveries from brine to 70%-90%, up from 40%-60% currently. (Lithium recoveries from hard-rock mining range 60%-80%).

Improved recoveries will more than offset the higher upfront capital costs involved with the equipment needed for DLE, Goldman's analysts contend. DLE also has environmental benefits, as it uses less land and water than the traditional brine evaporation method. However, there are some concerns about pollution that may result if DLE uses chemicals as part of the separation process, and it does require more energy than the traditional evaporation process.

Goldman expects projects using DLE could be up and running between 2025 and 2030 in Chile and Argentina. If 20%-40% of Latin American brine projects adopted DLE, Latin American lithium brine supply could increase by 35%, and global raw supply by 8%. If DLE is adopted in China or America, the impacts would be even larger.

(3) *Who's doing what.* There are a handful of companies developing DLE technologies, and some of them are hoping to use the technology to develop lithium supplies in the US. Compass Minerals is using DLE absorption technology from EnergySource Minerals at its Great Salt Lake location. Compass *received* a $252 million equity investment from Koch Minerals & Trading in September, most of which will be used to fund the development of its DLE project.

Energy Exploration Technologies (EnergyX) received $50 million from General Motors and is building demonstration facilities in Argentina, Chile, California, Arkansas, and Utah. The facilities in the US will be near brine owned by Standard Lithium, Compass Minerals International, and CTR.

Lilac Solutions, which counts Bill Gates' Breakthrough Energy Ventures as an investor, is working with Controlled Thermal Resources to develop a DLE at the Salton Sea in California. Controlled Thermal wants to use the super-heated underground fluid in the area

to power a geothermal plant. The company then would like to extract lithium from the fluid using Lilac's technology, a March 16, 2020 *Los Angeles Times* *article* reported.

Calendars

US: Wed: MBA Mortgage Applications; Goods Trade Balance Advance; Crude Oil Inventories & Gasoline Production; Fed Stress Test Results; Powell. **Thurs:** GDP & GPD Price Index 1.4%/4.2%; PCED Headline & Core PCED 4.2%/5.0%q/q; Corporate Profit -6.8%; Pending Home Sales 0.2%; Initial & Continuous Jobless Claims 266k/1.765m; Natural Gas Storage; Powell; Bostic. (Bloomberg estimates)

Global: Wed: Germany Gfk Consumer Climate -23.0; France Consumer Confidence 84; Italy CPI -1.2%m/m/8.3%y/y; Italy PPI -6.2%m/m/-9.4%y/y; Spain Retail Sales 0.6%; Japan Retail Sales 5.4%y/y; BoE Quarterly Bulletin; Lagarde; Enria; De Guindos; Lane; Pill; Bailey. **Thurs:** Eurozone Business & Consumer Survey 96.0; Germany CPI 0.3%m/m/6.7%y/y; Spain CPI 0.4%m/m/1.5%y/y; Japan Household Confidence 36.2; Japan Unemployment Rate 2.6%; Japan Industrial Production -1.0%; China M-PMI & NM-PMI 49.0/53.7; ECB Economic Bulletin; EU Leaders Summit; Mauderer; Balz; Tenreyro. (Bloomberg estimates)

Strategy Indicators

S&P 500 Buybacks (*link*): S&P 500 quarterly buybacks rose 2.1% q/q during Q1-2023 to a three-quarter high of $215.5 billion from $211.2 billion during Q4-2022. That's up just 2.2% from Q3-2022's five-quarter low of $210.8 billion and remains 23.3% below its record high of $281.0 billion during Q1-2022. Still, that's well above its 22-quarter low of $88.7 billion during Q2-2020, when companies were seeking to preserve cash amid the highly uncertain economic outlook caused by Covid-19. The four-quarter sum of buybacks fell 7.1% q/q to $857.2 billion during Q1-2023 in the fastest pace of decline since Q4-2020 and is down 14.7% from its record high of $1.0 trillion during Q2-2022. As a percentage of the S&P 500's total market capitalization, buybacks edged down to a seven-quarter low of 0.63% in Q1-2023 from 0.66% in Q4-2022. That's up from an 11-year low of 0.35% during Q2-2020, and compares to a 29-quarter high of 1.06% in Q4-2018 and the record high of 1.28% during Q3-2007.

S&P 500 Sectors Buybacks (*link*): Buybacks rose q/q during Q1-2023 for just three of the S&P 500's 11 sectors. That was the lowest count since Q2-2020 during the pandemic when only one sector rose. None of the 11 sectors had buybacks at a record high during Q1, but Utilities' buyback amount was the highest since Q3-2020. Communication Services' buyback amount was at a five-quarter high, and Financials' was the highest in four quarters. Financials accounted for 21.8% of the S&P 500's buybacks in Q1-2023. At that rate, it leads all sectors for the first time since Q3-2017, placing ahead of Information Technology (21.3%), Communication Services (16.6), and Health Care (10.8). Communication Services was the most prolific share repurchaser during Q1, as companies in that sector repurchased 1.29% of their market cap, followed by Financials (1.06%), Consumer Discretionary (0.53), and Tech (0.51%, a 14-year low).

US Economic Indicators

Consumer Confidence (*link*): "Consumer confidence improved in June to its highest level since January 2022, reflecting improved current conditions and a pop in expectations," notes Dana Peterson, chief economist at The Conference Board. *Headline* consumer confidence jumped by 7.2 points in June, after falling four of the first five months of the year by 6.5 points, with both the *expectations* (+7.8 points to 79.3) and *present situation* (6.4 to 155.3) components posting solid gains this month. The expectations component was just a shade below 80.0—a level the Conference Board associates with a recession within the next year. It's been below 80.0 every month since February 2022, but that string is likely to end. *Current business conditions* improved again in June, with the percentage of consumers saying business conditions were good climbing to 23.7% from 19.7% in May and those saying conditions were bad falling from 16.7% in May to 16.3% in June—the lowest percentage since March 2020. Meanwhile, the *current labor market* also improved, with 46.8% of consumers saying jobs are plentiful, up from 43.3% in May, and 12.4% saying jobs are hard to get, slightly lower than May's 12.6%. *Short-term business conditions* (six-month outlook) this month was more optimistic than in May: 14.2% expected business conditions to improve this month, up from 13.2% in May, while the percentage expecting conditions to worsen sank to 17.7% from 21.4% in May. Consumers' assessment of the *short-term labor market* was also more favorable, with the percentage of consumers expecting more jobs to be available six months from now climbing to 15.5% from 13.8% last month; only 16.0% anticipated fewer jobs, down from 21.1% last month. Their *short-term financial prospects* worsened in June, with 16.9% of consumers expecting their incomes to increase, down from 18.9% last month, and 11.9% expecting incomes to decrease, up from 11.4% in May. After climbing steadily since August 2022, *recession fears* eased in the June

survey, with 69.3% of consumers saying a recession is "somewhat" or "very likely" over the next 12 months, down from 73.2% in May.

Regional M-PMIs (*link*): Five Fed districts have reported on manufacturing activity for June—New York, Philadelphia, Kansas City, Dallas, and Richmond—and show *manufacturing activity* (to -9.9 from -17.5) fell at a slower pace this month. The New York (to 6.6 from -31.8) region showed a big swing from contraction to expansion, while the Richmond (-7.0 from -15.0) region fell at half of May's pace and Dallas' (-23.2 from -29.1) contracted at a slower pace. Meanwhile, Kansas City's (-12.0 from -1.0) manufacturing activity fell deeper into negative territory, while Philadelphia's (-13.7 from -10.4) fell at a slightly faster pace than in May. New orders (-10.7 from -19.2) fell at a slower pace, with billings in the New York (3.1 from -28.0) region showing a return to expansion in June, while Richmond's (-15.0 from -29.0) fell at half of May's pace, while Kansas City's (-14.0) and Dallas' (-16.6 from -16.1) orders fell at the same pace as they did in May and Philadelphia's (-11.0 from -8.9) contracted at a slightly faster pace than in May. *Employment* (-2.4 from 1.9) slipped into negative territory this month, as hirings in the Kansas City (-12.0 from 7.0) area swung from positive to negative, while New York's (-3.6 from -3.3) fell at a steady pace and Dallas (2.2 from 9.6) and Richmond (2.0 from 5.0) factories hired at a slower pace. Meanwhile, hirings in the Philadelphia (-0.4 from -8.6) area moved back toward the breakeven point of zero.

Regional Prices Paid & Received Measures (*link*): We now have June's prices-paid and -received data for the five Fed regions—New York, Philadelphia, Richmond, Dallas, and Kansas City. (Note: The New York, Philadelphia, Dallas, and Kansas City measures are diffusion indexes, while Richmond's measures are average annualized inflation rates—which we multiply by 10 for easier comparison to the other regional measures.) The *prices-paid* measure in June eased for the fourth month after a brief blip up in February (to 40.3), falling to 16.0 this month, the lowest since July 2020; it peaked at a record high of 90.2 during September 2021. Both the Dallas (1.4 from 13.8) and Kansas City (4.0 from 16.0) regions are in a freefall, fast approaching zero, while Philadelphia's (10.5 from 10.9) measure held steady, not far from April's 8.2 reading—which was its lowest since mid-2020. New York's (22.0 from 34.9) posted its lowest reading since August 2020, while Richmond's (41.9 from 49.4) was the lowest since January 2021. Turning to the *prices-received* measure, it eased for the seventh month, from 39.0 in November to a 32-month low of 9.7 in June; it was at a record high of 59.0 in March 2022. The Dallas (-1.9 from 0.4) measure dropped below zero, while New York's (9.0 from 23.6) eased to its lowest reading since October 2020 and Kansas City's (3.0 from 16.0) to the lowest since July 2020. Richmond's (38.4 from 53.9) was the lowest since March 2021, while Philadelphia's (0.1 from -7.0)

moved up to zero, holding near recent lows.

Durable Goods Orders & Shipments (*link*): Durable goods orders rose for the third successive month in May to a new record high, as transportation equipment orders continued to soar. *Durable goods orders* expanded 1.7% in May and 6.4% over the three months through May, more than reversing the 4.0% drop the first two months of the year, with transportation equipment orders climbing 3.9% in May and 19.6% during the three month through May. Excluding transportation, durable goods orders expanded for the fifth time in six months, by 0.6% in May and 1.0% over the period, to within 0.3% of last May's record high. Meanwhile, *nondefense capital goods orders excluding aircraft* (a proxy for future business investment) rebounded for the second month, by 0.7% in May and 1.3% over the period, to a new record high, more than recovering from the 0.8% decline recorded during the two months through March. *Nondefense capital goods shipments excluding aircraft* (used in calculating GDP) rose for the third time this year, up 0.6% in May and 1.2% ytd to yet another new record high. In May, orders for motor vehicle & parts reached a new record high, while orders for electrical equipment, appliances & components held just below March's record high, while orders for machinery, primary metal, and fabricated metals remained in record-high territory.

New Home Sales (*link*): New home sales (counted at the signing of a contract) posted another strong gain in May, jumping for the third month, by 12.2% in May and 22.1% over the period to a 15-month high of 763,000 units (saar). It is up a whopping 40.5% since bottoming at 543,000 units last July. Sales rose in all regions last month, led by the Northeast (17.6%) and West (17.4), followed by the South (11.3), and Midwest (4.0). The median sales price for a new home fell for the second month on year-over-year basis, dropping 7.6% in May. Of the 763,000 homes sold in May, 298,000 units were under construction, while 270,000 were completed and 195,000 not yet started—the highest not started since January 2022. There were 428,000 new homes for sale at the end of May, down from a recent peak of 466,000 last October, representing 6.7 months' supply at the current sales pace—the lowest since February 2022. Of the 428,000 units, only 69,000 units were completed and 100,000 not yet started; 259,000 were under construction. Builders are rushing to create new inventory to satisfy pent-up demand.

Mali Quintana, Senior Economist, 480-664-1333
Jackie Doherty, Contributing Editor, 917-328-6848
Valerie de la Rue, Director of Institutional Sales, 516-277-2432
Mary Fanslau, Manager of Client Services, 480-664-1333
Sandy Cohan, Senior Editor, 570-228-9102