SECOND QUARTER 2023

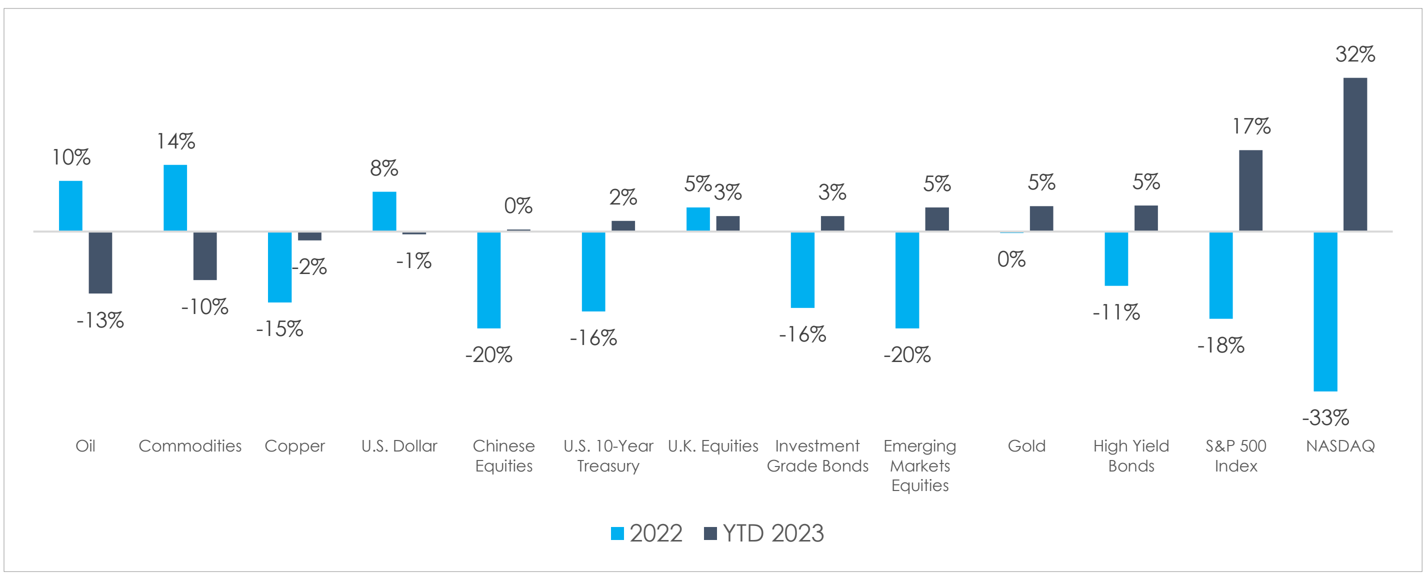
Market Update

Despite looming recession risks, regional bank challenges, and the Federal Reserve continuing to tighten with no signs of easing on the horizon, the S&P 500 rallied over 20% from its October 2022 low and closed its longest bear market since 1948. Though the stock market rally has been exceptionally narrow and led by Artificial Intelligence (AI) fever, the S&P 500 has returned almost 17% in the first half of 2023 with the NASDAQ returning over 32%! Treasury yields have rebounded from their March lows as U.S. economic data, particularly over the last few weeks, has surprised to the upside and a resolution was reached in the recent debt ceiling debate.

The Fed's 25 basis point hike in May was thought by many to be the last interest rate increase of the current cycle, but resilient economic data, strong market performance, and Fed commentary suggest that we could see another one or two interest rate hikes this year. Inflation continues to slow but remains persistent and is not decelerating quickly enough to prompt any meaningful change to the Fed's current stance.

Corporate earnings declined in the first quarter, albeit to a less-than-feared extent than what was expected at the start of the earnings season. Throughout the first half of 2023, sentiment has waxed and waned regarding the outlook for inflation, recession, corporate profits, geopolitics, and especially a Fed pivot back to more accommodative policy, but at this juncture, sentiment appears to have shifted more toward the camp of optimism or "soft landing" compared to a more cautious tone that prevailed following the failures of Silicon Valley Bank and Signature Bank at the end of the first quarter. As we look to the second half of the year, we expect to see a further push-pull between caution and optimism as we digest more economic data, corporate earnings reports, and Fed guidance.

Asset class returns 2022 versus YTD 2023



Source: Bloomberg as of June 30, 2023. Past performance is not indicative of future returns. Indices are unmanaged. You cannot invest directly in an index.

Oil = Brent Crude Oil Spot Price; Commodities = Bloomberg Commodity Index; U.S. Dollar = DXY Dollar Index; Investment Grade Credit = Bloomberg U.S. Corporate Investment Grade Bond Index; High Yield Bonds = Bloomberg U.S. Corporate High Yield Bond Index; U.K. Equities = FTSE 100 Index; Emerging Markets Equities = MSCI Emerging Markets Index; U.S. 10-Year Treasury = S&P U.S. Treasury Bond Total Return Index; Chinese Equities = Shanghai Shenzhen CSI 300 Index; Copper = CME Copper Futures Price; S&P 500 Index = S&P 500 Index; Gold = Gold Spot Price; Nasdaq Comp Index = Nasdaq Composite Index.

AI elation drives equity bull market

2023 equity market performance is shaping up to look quite different from 2022 thanks to Chat Generative Pre-Trained Transformer or ChatGPT, an AI chatbot that became the fastest-growing consumer software application in history. According to the McKinsey Global Institute, generative AI is set to add up to $4.4 trillion of value to the global economy annually, and half of all work will be automated between 2030 and 2060. Many investors are betting that AI will boost productivity and profit margins, and based on this year's price action, are already predicting which companies will benefit most from the AI revolution. Take NVIDIA, which is the posterchild for the AI frenzy, and has returned approximately 190% in the first half of 2023.

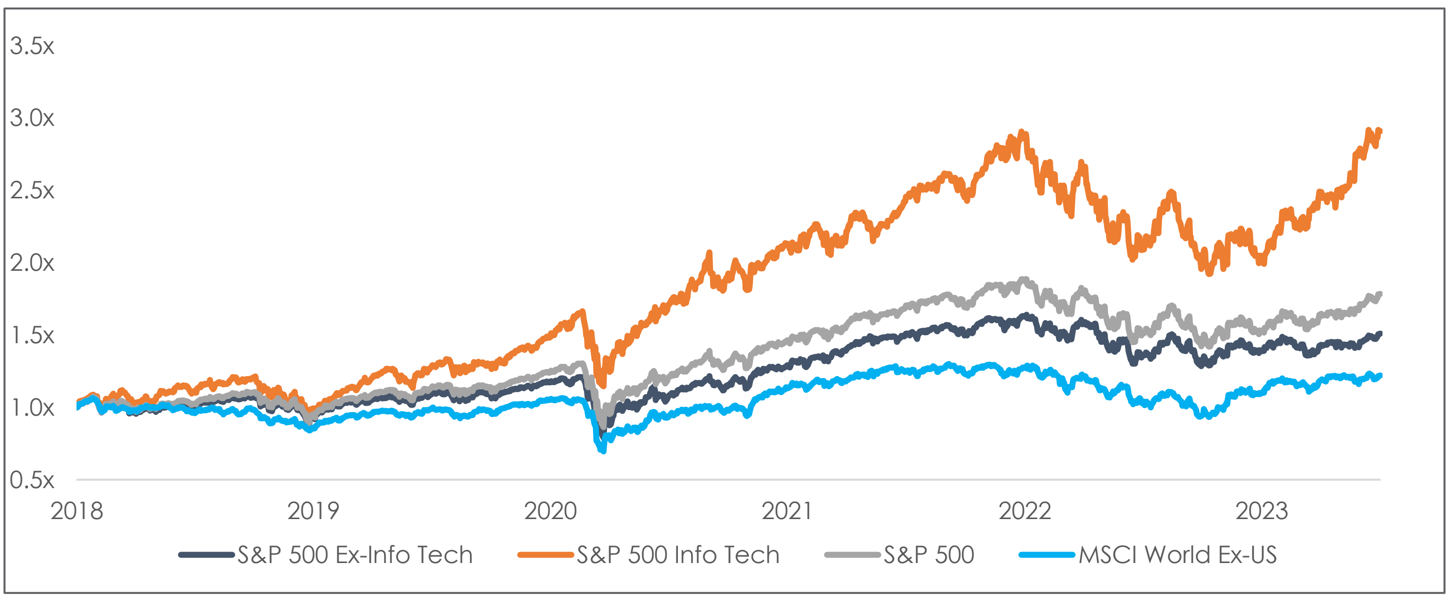
The enormous eight	2023 first half total returns
NVIDIA	+190%
Facebook/Meta	+138%
Tesla	+113%
Amazon	+55%
Apple	+50%
Netflix	+49%
Microsoft	+43%
Google	+36%

As a result of AI excitement, this year's U.S. stock market rally has been exceptionally "narrow" and driven by a small group of technology companies. Just eight stocks (Facebook/Meta, Apple, Amazon, Netflix, Alphabet, Microsoft, NVIDIA, and Tesla) have contributed approximately 80% of the S&P 500's return in the first half of the year. We have written before about the dominance of technology companies in the U.S. stock market, and the trend has only intensified. According to Goldman Sachs, Apple and Microsoft now comprise a larger share of the S&P 500 (14%) than any two companies have since 1979.

Will AI change the global economy in the same way as the internet or the iPhone? Perhaps, but it might take several years, and we are still in the early innings of discovering which industries and companies will benefit most. New technology is exciting, and investors do not want to miss out on the next Apple or Amazon. However, amid all the excitement and exponential growth in stock prices, we continue to stress the importance of diversification, fundamentals, and a long-term view when investing.

Source: Bloomberg as of June 30, 2023. Past performance is not indicative of future returns.

Total Returns: S&P 500 Information Technology sector dominates



Source: Bloomberg as of June 30, 2023. Reindexed values such that Jan. 1, 2018, = 1. Past performance is not indicative of future returns. Indices are unmanaged. You cannot invest directly in an index.

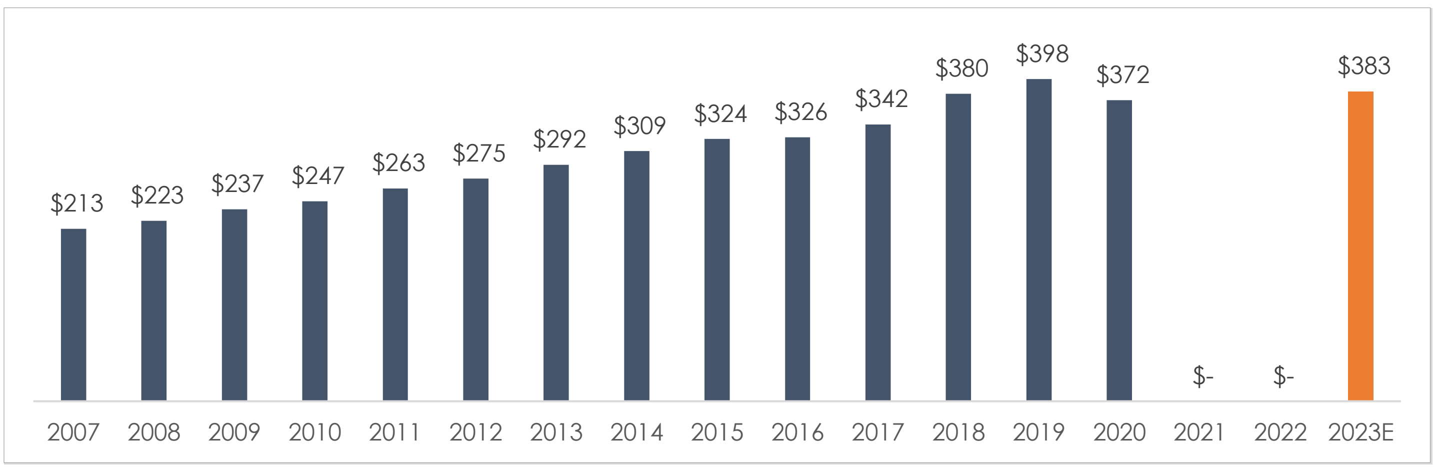
U.S. economic resilience prevails in the second quarter

For more than a year now, recession fears have gripped economists and market participants alike. The consensus still calls for a 65% probability of the U.S. economy entering recession within the next twelve months. The economy is not exactly firing on all cylinders, but a tight labor market continues to support consumer spending, which accounts for around two-thirds of the U.S. economy. Unemployment sits at a historically low 3.6%, and monthly job growth is a far cry from recession. First quarter GDP was recently revised up to 2.0% from 1.3%, driven by consumer spending.

Despite recent data indicating a relatively resilient economy, many economists remain cautious. Some still see a chance of recession beginning as soon as this year while some believe that the timeline has simply been pushed back. The jobs market, while strong, is no longer "red hot" with job openings down about two million from their 2022 peak and wage growth decelerating.

Excess pandemic savings are dwindling (and are depleted in the case of lower and many middle-income households), and according to Federal Reserve data, U.S. household debt now sits at $17.05 trillion, increasing by $2.9 trillion since the end of 2019, just before the pandemic. The resumption of student loan payments could be a headwind to growth, affecting around 40 million people, and totaling $1.75 trillion across federal and private loans. With an average student loan payment of around $380 per month, that is an approximate $15 billion per month headwind to consumer spending.

Estimated federal student loan monthly payments



Source: Strategas Macro as of June 30, 2023.

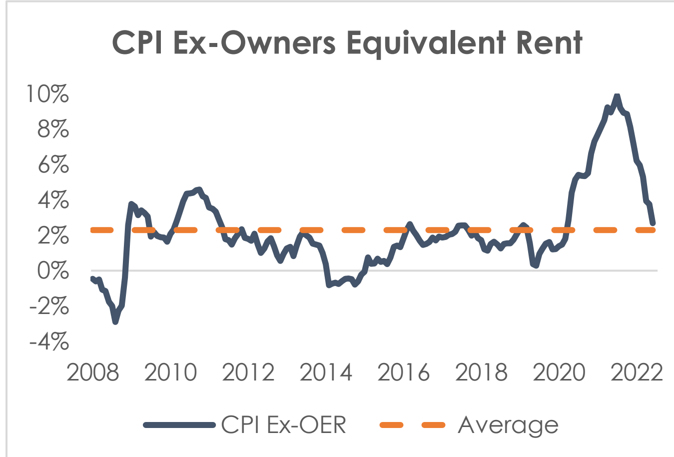
Fed reiterates high-for-longer interest rates as inflation remains sticky

At the beginning of this year, bond markets priced in a peak Fed funds rate of around 5% and around two, 25-basis point *cuts* in the second half of the year. Now, the market expects another 25-basis point increase in July, resulting in a target Fed funds rate of 5.25%-5.50%, and interest rate cuts are no longer expected in 2023. In fact, the Fed expects to hike two more times this year and does not expect to cut interest rates until 2024.

The Fed is unequivocally more concerned about getting inflation down to its target than it is about the risks of recession. Although inflation has more than halved from a year ago when it was 9%, it is still 4% year-over-year, which is well above the Fed's 2% target. Inflation is certainly moving in the right direction, and excluding certain measures like rent, it is not far off from the Fed's target. CPI excluding owner's equivalent rent has risen 2.6% year-over-year.

With higher-for-longer a prevailing market theme, interest rates have rebounded from their spring lows, particularly shorter-dated Treasury yields. As a result, at the end of the second quarter, the yield on the 2-Year U.S. Treasury was 106 basis points higher than that of the 10-Year U.S. Treasury (commonly referred to as the 2s10s curve), near the most extreme level of inversion seen this year, last observed before the failure of Silicon Valley Bank. The yield curve has now been inverted for more than a year.

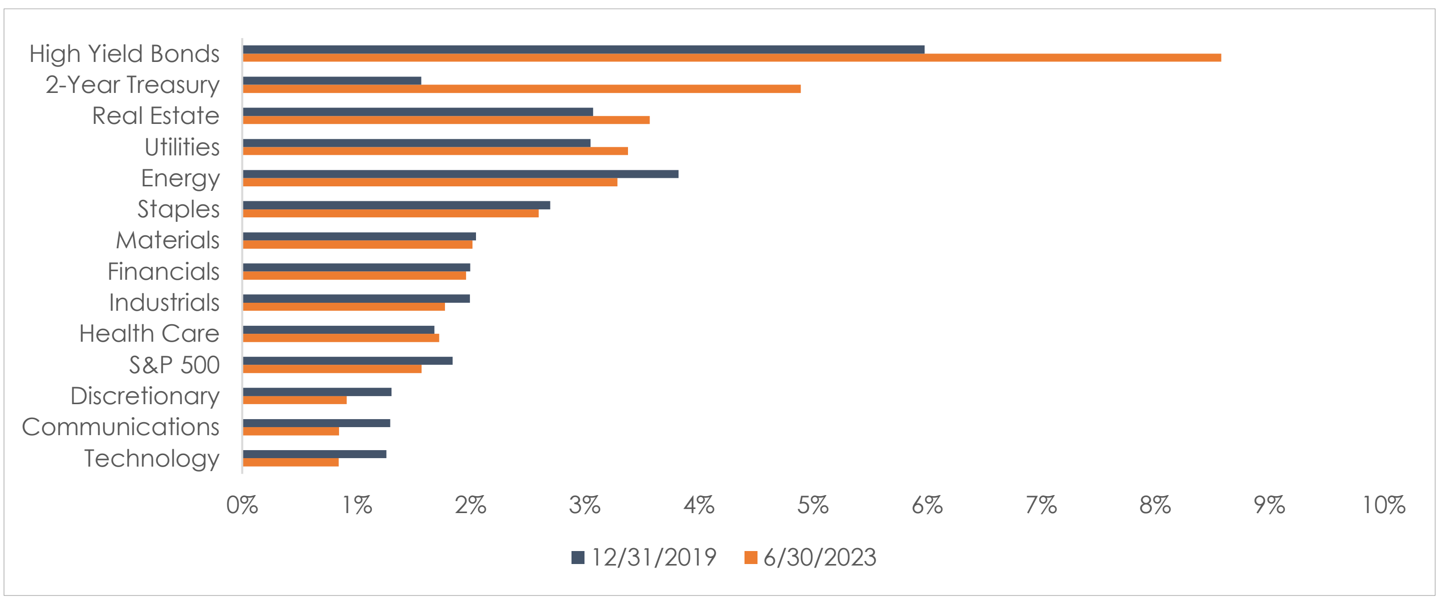
Government bond yields	YE 2021	YE 2022	6/30/ 2023	Change (bps)
2-Year Treasury Yield	0.73%	4.43%	4.90%	+40 bps
5-Year Treasury Yield	1.26%	4.00%	4.16%	+16 bps
10-Year Treasury Yield	1.51%	3.87%	3.84%	-3 bps
30-Year Treasury Yield	1.90%	3.96%	3.86%	-10 bps
Japan's 10-Year Government Bond Yield	0.07%	0.41%	0.39%	-2 bps
Germany's 10-Year Government Bond Yield	-0.18%	2.57%	2.39%	-18 bps
U.K.'s 10-Year Government Bond Yield	0.97%	3.66%	4.38%	+72 bps



Source: Bloomberg as of June 30, 2023.

As we have written before, bond yields remain attractive. Furthermore, the competition for capital remains high and ultimately makes the proposition for taking equity risk less compelling. For example, U.S. and European high yield bonds currently offer average yields in the 8% to 9% range, roughly twice the level available at the end of 2021. There are currently no S&P 500 sectors that have a larger dividend yield than the 2-year Treasury bond.

Pre and post pandemic dividend/bond yields



Source: Bloomberg as of June 30, 2023. Past performance is not indicative of future results.

Looking ahead

Looking to the second half of 2023, we are wrestling with the same debates we had at the start of the year:

- *What is the timing of recession?*
- *How severe will the recession be?*
- *How far will the Fed go with interest rate hikes?*, and so forth.

We have seen some historically unique dynamics in the first half of the year, including a handful of companies driving market returns due to the emergence of AI. Concerns over the banking system faded following some of the largest banking failures in history, and despite the Fed continuing to tighten, the economy continues to outperform expectations.

There are also few signs of stress in the current backdrop. Credit spreads, a measure of risk or stress in the market, are below long-term historical averages, and both investment grade and high yield bond spreads have retreated to early March levels, before the failure of Silicon Valley Bank. Credit defaults and consumer delinquencies are rising, but from historically low levels.

As we round out six months of very strong market performance, we remain focused on risks and opportunities on the horizon. Economic growth has been stronger-than-anticipated, but the trend remains one of slowing growth and fading tailwinds. AI and associated productivity gains are certainly reasons to be optimistic, but how quickly the economy can reap the benefits of these gains is uncertain. We asked ChatGPT how we should invest based on the current environment and got the following response "remember, investing involves risks, and past performance is not indicative of future results. It's crucial to do thorough research, seek professional advice, and make informed decisions based on your unique circumstances". Well said, ChatGPT.

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MassMutual Investment Management

Please see important disclosures on the following page.

Disclosures

Market Indices have been provided for informational purposes only; they are unmanaged and reflect no fees or expenses. Individuals cannot invest directly in an index.

Description
DXY Dollar Index indicates the general international value of the USD. The USDX does this by averaging the exchange rates between the USD and major world currencies.
Brent Crude Oil - ICE Brent Futures is a deliverable contract based on EFP delivery with an option to cash settle.
Bloomberg Commodity Index is calculated on an excess return basis and reflects commodity futures price movements. The index rebalances annually weighted 2/3 by trading volume and 1/3 by world production and weight-caps are applied at the commodity, sector, and group level for diversification.
FTSE 100 Index is a capitalization-weighted index of the 100 most highly capitalized companies traded on the London Stock Exchange.
Gold Spot Price is quoted as dollars per Troy Ounce.
Euro/USD Spot Exchange Rate – the price of 1 EUR in USD. The euro is the official currency of the European Economic & Monetary Union. The U.S. dollar is the official currency of the United States of America.
S&P U.S. Treasury Bond Total Return Index - The S&P U.S. Treasury Bond Current 10-Year Index is a one-security index comprising the most recently issued 10-year U.S. Treasury note or bond.
Bloomberg U.S. Corporate Investment Grade Bond Index measures the investment grade, fixed-rate, taxable corporate bond market. It includes USD denominated securities publicly issued by US and non-US industrial, utility, and financial issuers.
Euro - Bund Futures - Long-term notional debt securities issued by the German Federal Govt with a term of 8.5-10.5 yrs.
JPY/USD Spot Exchange Rate - the price of 1 JPY in USD. The Japanese yen is the official currency of Japan. The U.S. dollar is the official currency of the United States of America.
Shanghai Shenzhen CSI 300 Index is a free-float weighted index that consists of 300 A-share stocks listed on the Shanghai or Shenzhen Stock Exchanges.
Copper Futures - Copper futures (HG) are exchange-traded contracts on the Chicago Mercantile Exchange
S&P 500 Index is widely regarded as the best single gauge of large-cap U.S. equities and serves as the foundation for a wide range of investment products. The index includes 500 leading companies and captures approximately 80% coverage of available market capitalization.
MSCI Emerging Markets Index is a free-float weighted equity index that captures large and mid-cap representation across Emerging Markets (EM) countries. The index covers approximately 85% of the free float-adjusted market capitalization in each country.
Nasdaq Composite Index is a broad-based capitalization-weighted index of stocks in all three NASDAQ tiers: Global Select, Global Market and Capital Market.

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