

Rotman

INTRO TO DATA VISUALIZATION

Part II Intro to Matplotlib – From Default to Publication-Ready

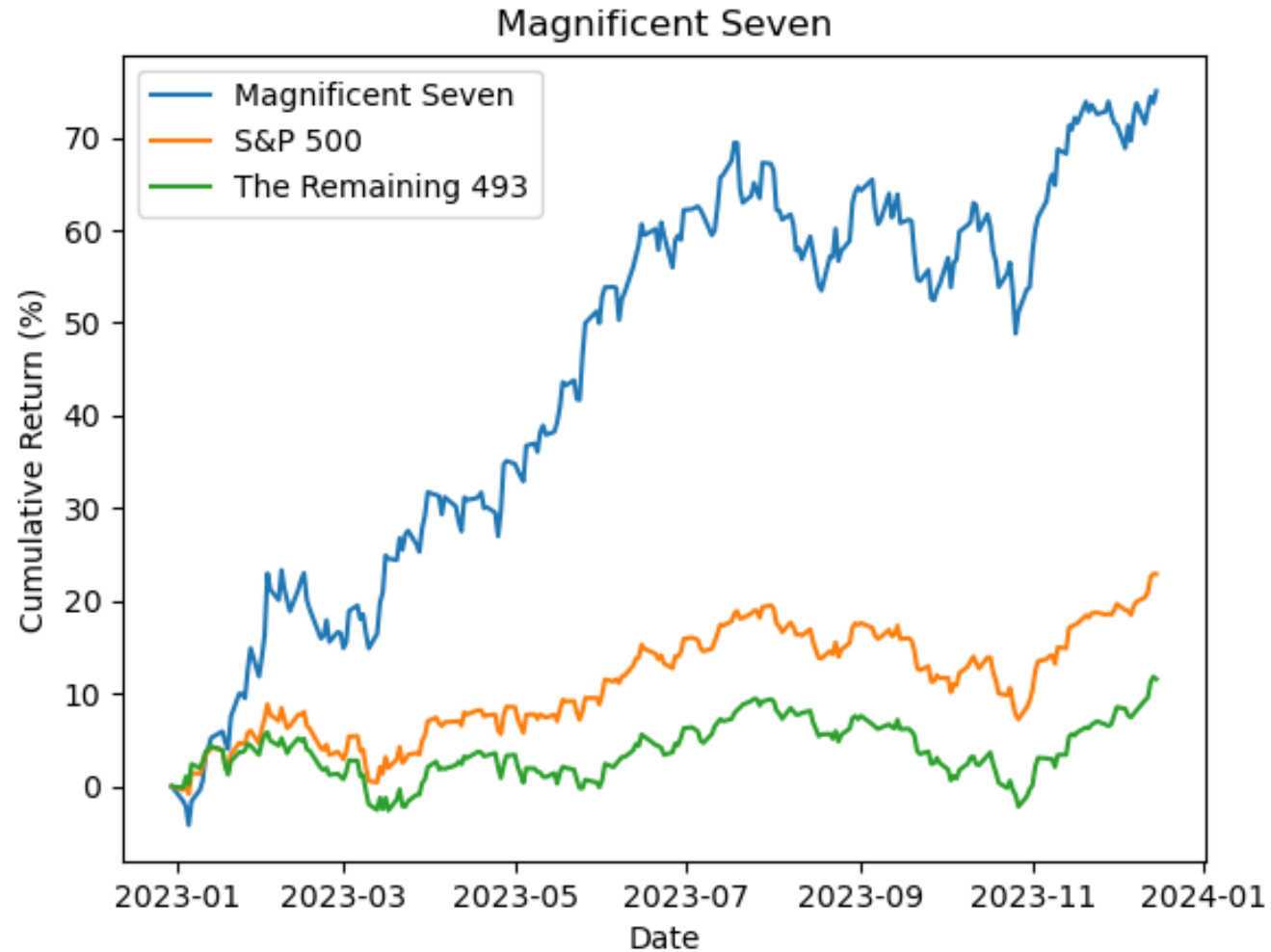
September 3, 2025 Prepared by Jay Cao / [MDAL](#)

Website: <https://rmdal.github.io/mma-dv-2025/>

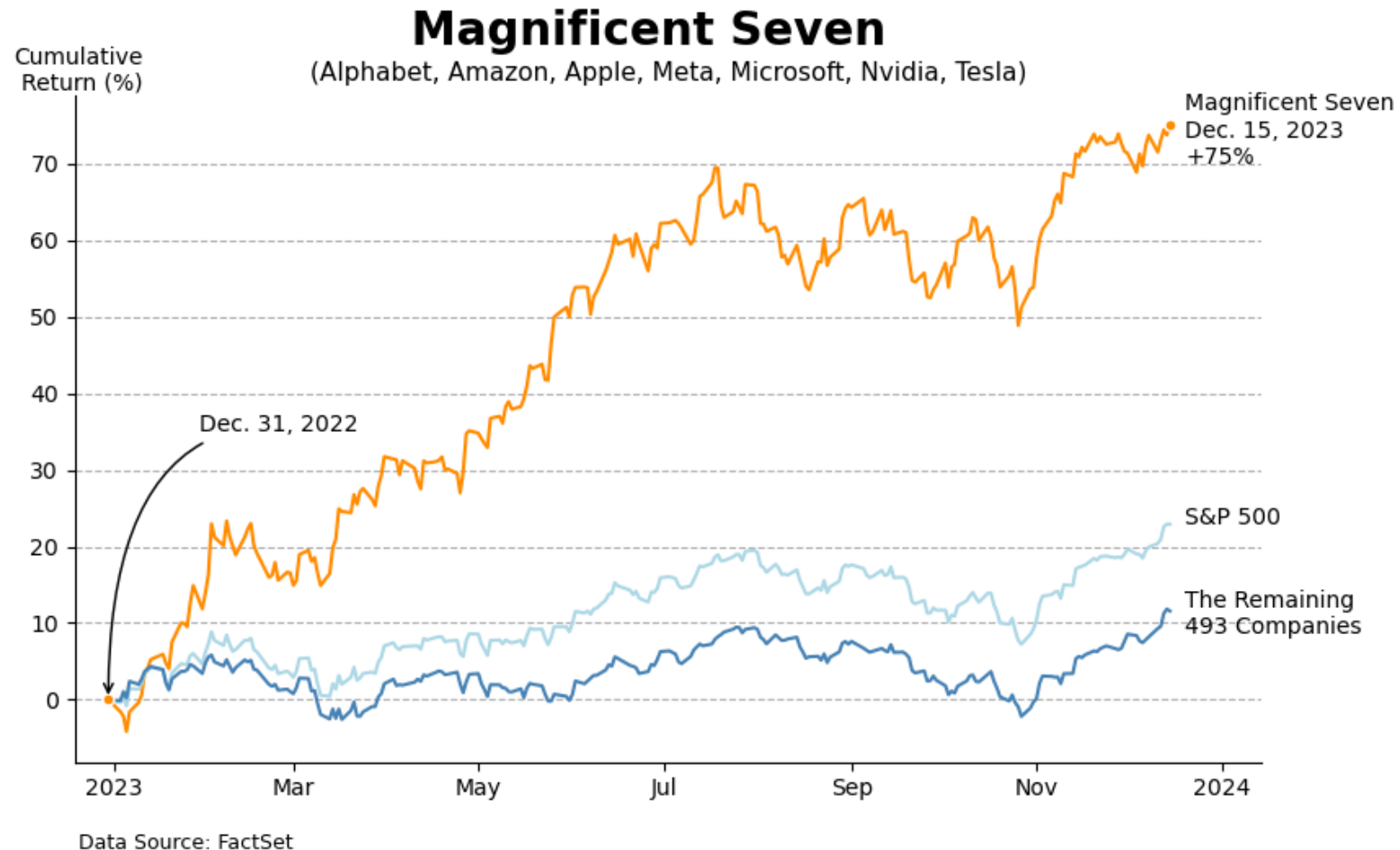


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Hands-on: From Matplotlib Default



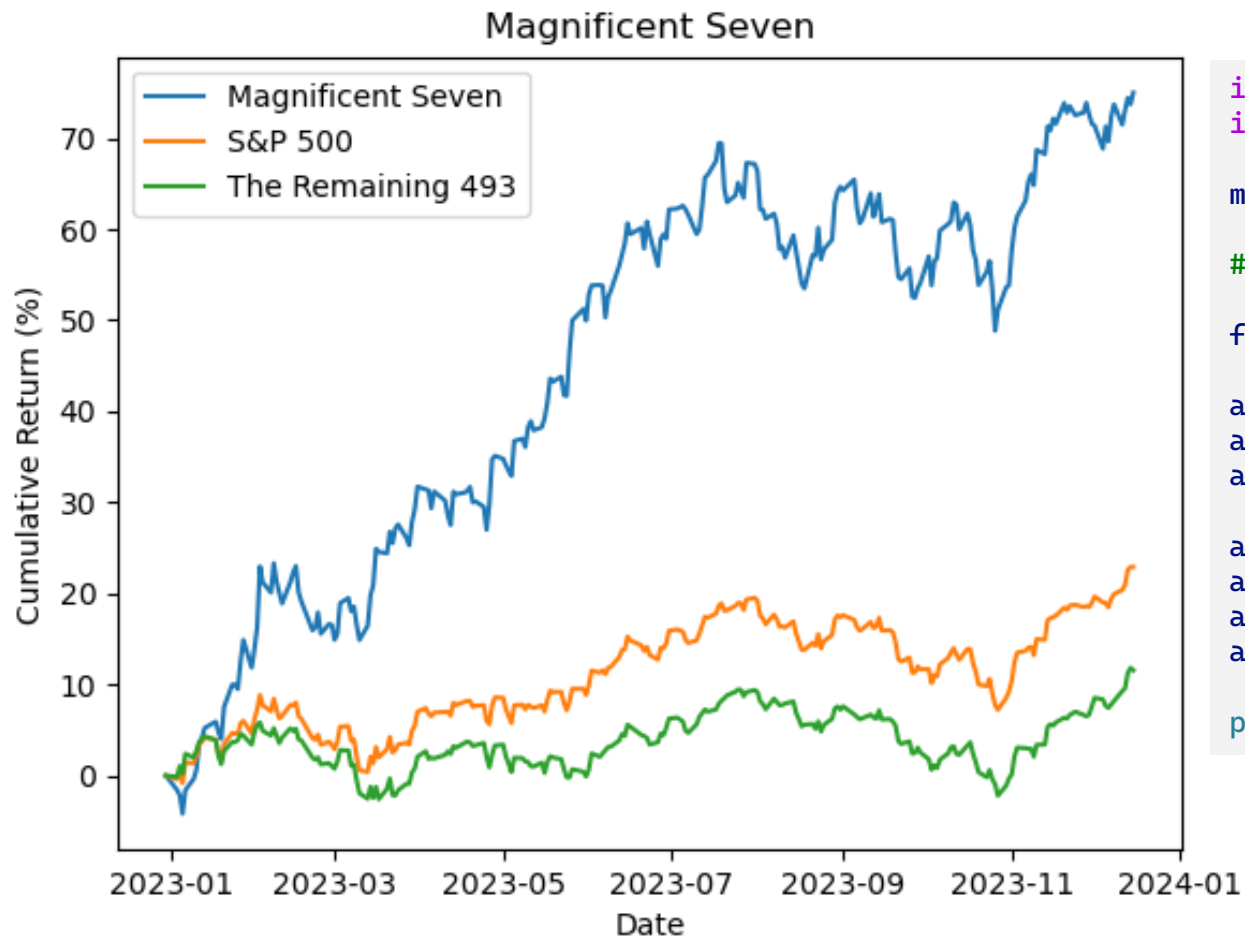
Hands-on: To Publication-Quality



Inspiration Source 1: <https://www.nytimes.com/interactive/2024/01/22/business/magnificent-seven-stocks-tech.html>

Inspiration Source 2: <https://www.wsj.com/finance/stocks/its-the-magnificent-sevens-market-the-other-stocks-are-just-living-in-it-5d212f95>

Round 1 - Matplotlib Default



```
import pandas as pd
import matplotlib.pyplot as plt

mag7_df = pd.read_csv("mag7.csv", parse_dates=["date"])

# Round 1

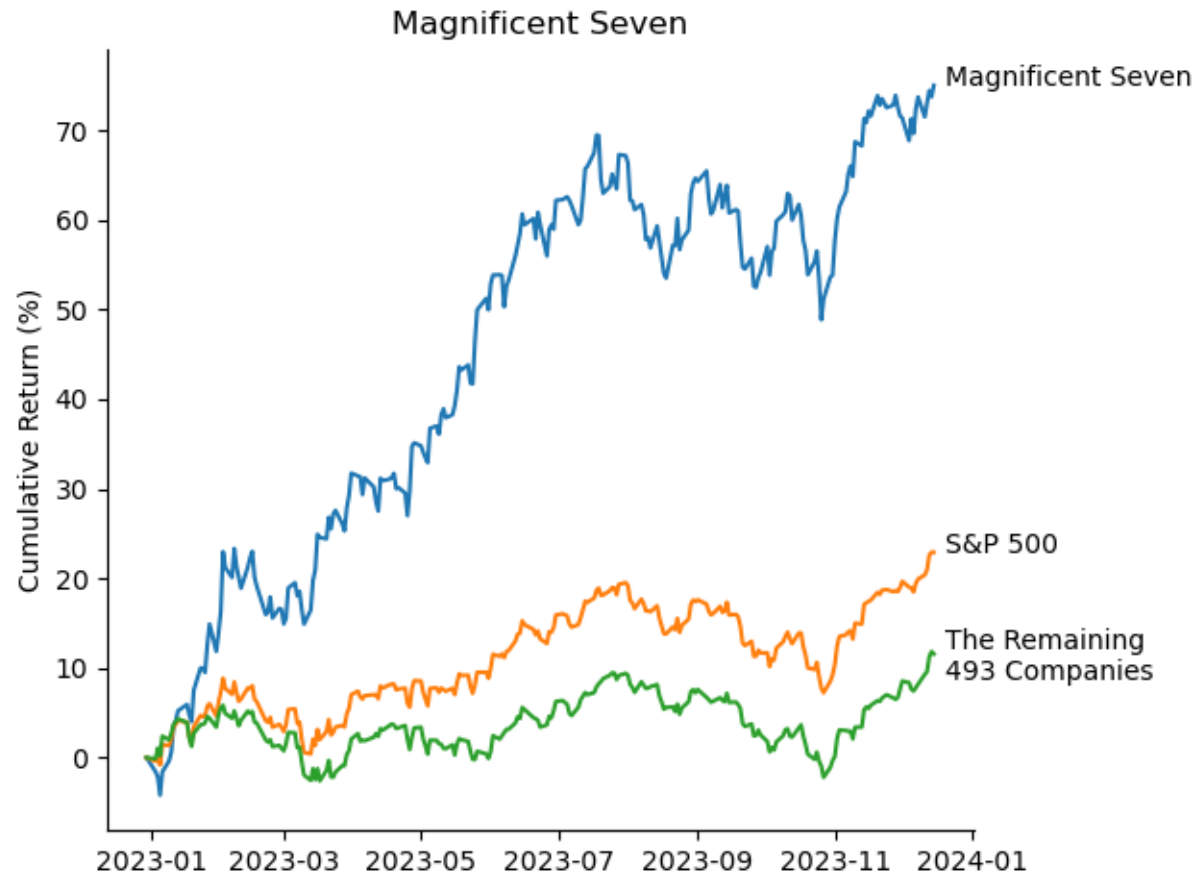
fig, ax = plt.subplots()

ax.plot(mag7_df["date"], mag7_df["mag7"])
ax.plot(mag7_df["date"], mag7_df["sp"])
ax.plot(mag7_df["date"], mag7_df["rest"])

ax.set_xlabel("Date")
ax.set_ylabel("Cumulative Return (%)")
ax.set_title("Magnificent Seven")
ax.legend(["Magnificent Seven", "S&P 500", "The Remaining 493"])

plt.show()
```

Round 2

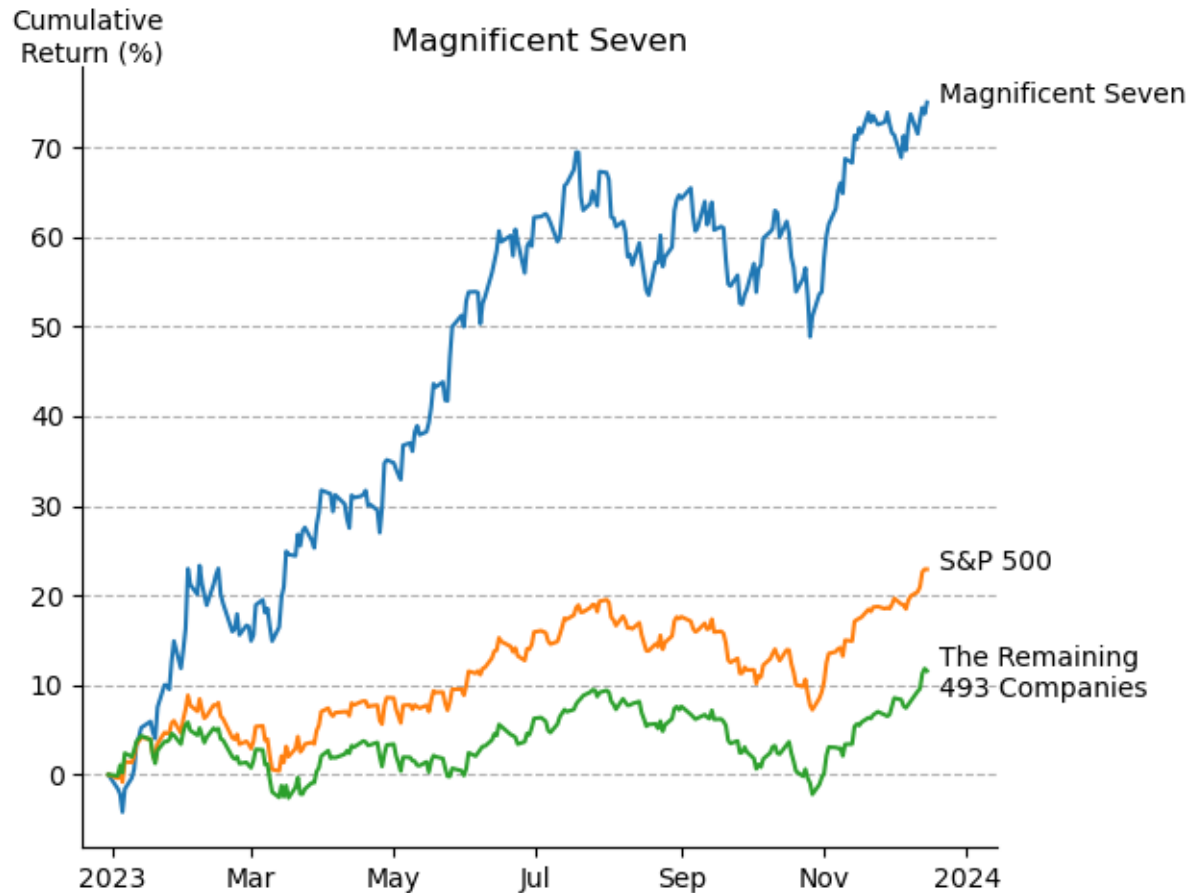


Ref 1. <https://matplotlib.org/stable/users/explain/text/annotations.html>

Ref 2. https://matplotlib.org/stable/api/as_gen/matplotlib.axes.Axes.annotate.html

```
...  
  
# Round 2  
  
# remove x-axis label  
# remove legend  
# annotate at the end of each line  
# hide top and right spines  
  
# add annotations  
ax.annotate(  
    text="Magnificent Seven",  
    xy=(mag7_df["date"].iloc[-1], mag7_df["mag7"].iloc[-1]),  
    xytext=(  
        mag7_df["date"].iloc[-1] + pd.Timedelta("5 day"),  
        mag7_df["mag7"].iloc[-1],  
    ),  
)  
  
...  
  
# hide top and right spines  
ax.spines["top"].set_visible(False)  
  
...  
  
# use tight_layout() to automatically adjusts subplot  
plt.tight_layout()  
  
...
```

Round 3



Ref 1. https://matplotlib.org/stable/api/dates_api.html

Ref 2. https://matplotlib.org/stable/api/_as_gen/matplotlib.pyplot.grid.html

```
import matplotlib.dates as mdates

...

# Round 3
# improve the x-axis tick labels
# improve the y-axis labels (move it to the top)
# add y grid

...

# set x-axis view limits
ax.set_xlim(mag7_df["date"].iloc[1] - pd.Timedelta("15 days"),
            mag7_df["date"].iloc[-1] + pd.Timedelta("30 days"))

# set x-axis tick labels
locator = mdates.AutoDateLocator()
formatter = mdates.ConciseDateFormatter(locator)
ax.xaxis.set_major_locator(locator)
ax.xaxis.set_major_formatter(formatter)

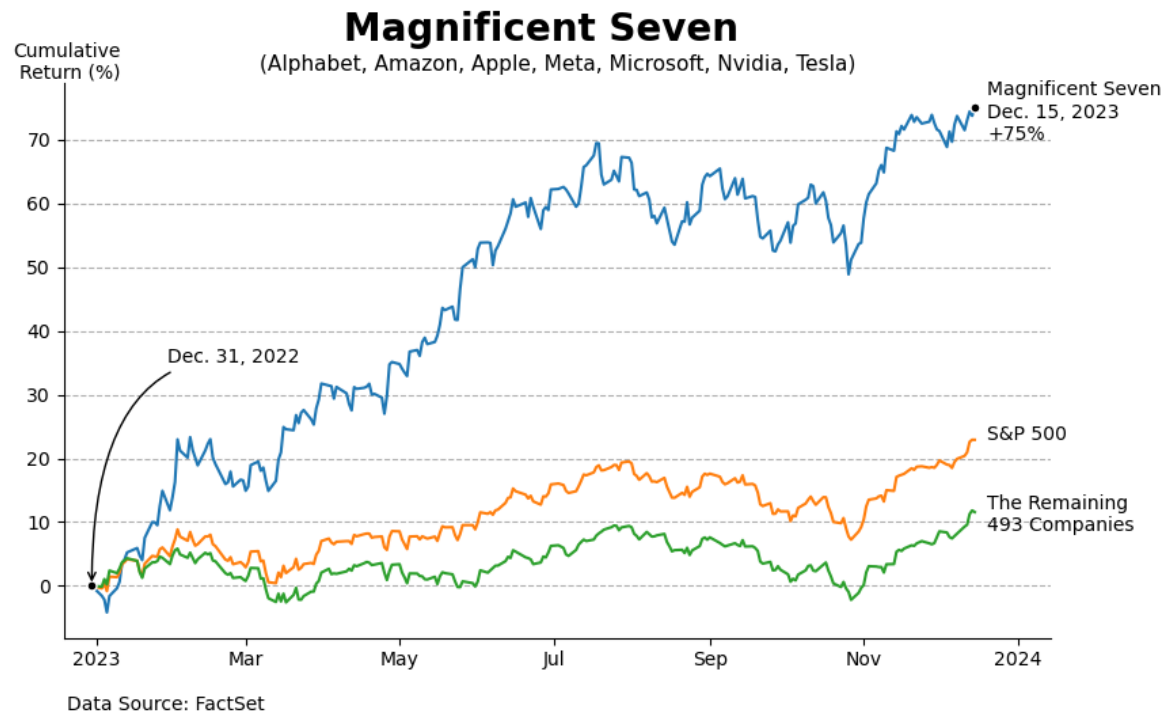
# set the y-axis label
ax.set_ylabel("Cumulative\nReturn (%)", loc="top",
              rotation=0, labelpad=-50)

...

# add y grid
ax.grid(visible=True, axis='y', linestyle="--")

...
```

Round 4



```
# Round 4
# add the first data point as a dot and annotate it
# add the last data point of the mag7 as a dot and annotate it
# improve title
# add caption
# adjust axes aspect ratio
# add the figure size
# remove tight_layout()
...

# set ax aspect ratio and figure size
aspect_ratio = 9 / 16
ax.set_box_aspect(aspect_ratio)

scale = 1.05
fig_width = 9 * scale
fig_height = fig_width * aspect_ratio
fig.set_size_inches(fig_width, fig_height)

# set title and subtitle
fig.suptitle("Magnificent Seven", fontsize=20, fontweight='bold')
ax.set_title("(Alphabet, Amazon, Apple, Meta, Microsoft, Nvidia, Tesla)",
             fontdict={'fontsize': 11})

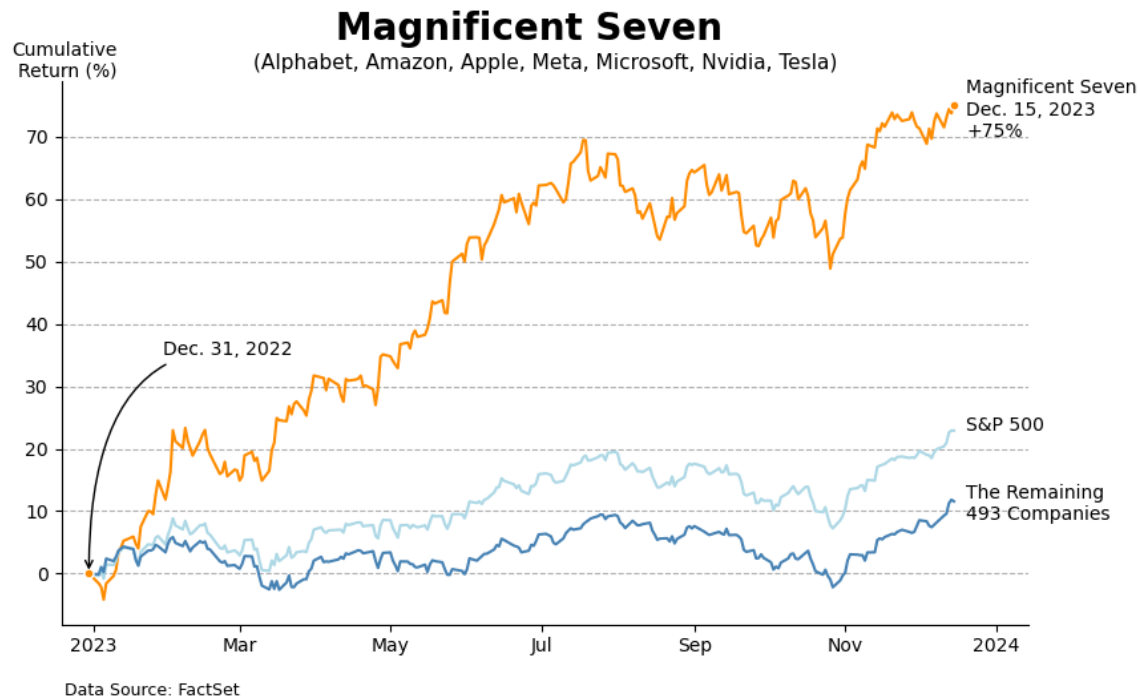
# plot the first data point as a dot and annotate it
ax.plot(mag7_df["date"].iloc[0], mag7_df["mag7"].iloc[0],
        color="black", marker="o", markersize=5, markeredgcolor="white")
ax.annotate(
    text="Dec. 31, 2022",
    xy=(mag7_df["date"].iloc[0], mag7_df["mag7"].iloc[0]),
    xytext=(
        mag7_df["date"].iloc[0] + pd.Timedelta("30 day"),
        mag7_df["mag7"].iloc[0] + 35,
    ),
    arrowprops=dict(arrowstyle="->", connectionstyle="angle3, angleA=0, angleB=90"),
)
...

# add caption
# https://matplotlib.org/stable/api/_as_gen/matplotlib.figure.Figure.text.html
fig.text(0.13, 0.01, "Data Source: FactSet")
# plt.tight_layout()
```

Ref 1. <https://matplotlib.org/stable/users/explain/text/annotations.html#customizing-annotation-arrows>

Ref 2. https://matplotlib.org/stable/gallery/subplots_axes_and_figures/figure_title.html

Round 5



```
...

# Round 5
# adjust colors and fonts

...

# plot the data
ax.plot(mag7_df["date"], mag7_df["mag7"], color="darkorange")
ax.plot(mag7_df["date"], mag7_df["sp"], color="lightblue")
ax.plot(mag7_df["date"], mag7_df["rest"], color="steelblue")

# set title and subtitle
fig.suptitle("Magnificent Seven", fontsize=20, fontweight='bold')
ax.set_title("(Alphabet, Amazon, Apple, Meta, Microsoft, Nvidia, Tesla)",
             fontdict={'fontsize': 11})

...

# plot the first data point as a dot and annotate it
ax.plot(mag7_df["date"].iloc[0], mag7_df["mag7"].iloc[0],
        color="darkorange", marker="o", markersize=5, markeredgcolor="white")

...

# plot the last data point of magnificent seven as a dot
ax.plot(mag7_df["date"].iloc[-1], mag7_df["mag7"].iloc[-1],
        color="darkorange", marker="o", markersize=5, markeredgcolor="white")

...

# add caption
fig.text(0.13, 0.01, "Data Source: FactSet",
        fontdict={'fontsize': 9, 'fontweight': 'light'})

...
```

Ref 1. https://matplotlib.org/stable/gallery/color/named_colors.html

Ref 2. https://matplotlib.org/stable/users/explain/text/text_intro.html