We seek to answer the following question:

Can we present in a simple visual manner a comparison of the recent S&P 500 Index with its historic performance?

The Standard and Poors 500 is an equity index that includes 500 leading companies in leading industries of the US economy. It represents 75% of US equities, is large cap focussed, and is often a proxy for the total market

The S&P 500 Index is a capitalization-weighted index. It is calculated as below

$$S&P\ 500\ \text{Index Level} = \sum_{i=1}^{500} \frac{\text{Stock Price} \times \text{Number of Shares of Stock}}{\text{Index Divisor}}$$

The Index Divisor scales the 500 company market value (on 7-2-2010 9.3 T$) to a more manageable number which is the Index Value (currently 1030). The Index Divisor is adjusted to smooth the S&P 500 Index to additions or deletions of companies and to other Index maintenance activities

When repeated for each day in the index the following dataset results:

STEP 1
The relative change in the index is calculated for a range of time intervals. If \( i \) is the interval in days, relative change on day \( j \) is as \( \Delta \frac{S_i}{S_j} \)

STEP 2
When repeated for each day in the index the following dataset results:

STEP 3
Calculate statistics as mean, median, 10th, 25th, 75th, and 90th percentiles on \( S_i \).

STEP 4
Repeat Steps 1 to 2 for several time intervals (in days) \( \{20, 50, 100, 200, 400, 800, 1000, 1200, 2000 \} \) resulting in several datasets \( \{S_1, S_2, S_3 \ldots, S_{20}, S_{2400}\} \).

STEP 5
For the given date calculate the relative change values for all intervals.

STEP 6
Comparing the relative change values in STEP 5 against the statistics in STEP 4, allows a conclusion on the index lagging or leading the historical performance.

STEP 7
The data in STEP 6 is plotted in a various graphs to visualize the performance.

RADIAL PLOTS
Each dataset \( S_i \) is plotted on a radial axis. All datasets are normalized to unit length.

$$\theta = \frac{\arcsin(x)}{\arcsin(\cos(x))}$$

The mean, median and other statistics are plotted along the radial axis. The data from STEP 5 is similarly normalized and each interval is plotted along that axis.

HEAT MAPS
The entire dataset is plotted in horizontal plots, each individual plot representing one time interval. A vertical line of unit height and fixed width is plotted in 5 different colors. Green if it lies within the 25% and 75% percentiles, Blue if between 75% and 90th percentile, Grey if between 10th and 25th percentile, Black if less than the 10th percentile or Red if greater than the 90th percentile (i.e the outliers).

RUN CHARTS
The entire normalized dataset value is plotted in 5 different colors chosen as in Heat Maps. Each plot represents one dataset, and plots are stacked vertically.