**Part 3**

To extend on the risk metrics that we saw in part 2, we will go a bit more into detail in part 3 by including Skewness and Kurtosis, and 6 other risk metrics. We will explain the metric and then provide an interpretation of the metric with the example of the SPY (S&P 500).

**Skewness** describes the asymmetry of returns. A negative skewness indicates return outliers are higher on the downside than on the upside. This is exactly the case for the SPY, as there are bigger negative shocks than positive ones. The skewness for the daily and monthly returns is -0.48 and -0.38 respectively.

**Kurtosis** describes the “tailedness” and indicates the distribution of tail returns toward the returns closer to the average. A normal distribution has a kurtosis of 3, with higher values indicating more data in the tails. The SPY has a Kurtosis of 12.2 and 0.5 for daily and monthly returns respectively. This is evidence against the idea of a stable distribution.

**Conditional Value at Risk (CVaR)** describes the average of returns below the VaR threshold. It provides insights into the severity of extreme losses. The lowest 5 percent of daily and monthly returns for the SPY average are -2.6% and -8.6% respectively. This indicates that there seems to be at least some level of mean reversion as the monthly returns are not proportional to the daily returns.

**Lower Partial Moment (LPM)** describes the downside risk of returns falling below a certain benchmark (in our example 0%). In the case of the SPY, the LPM for daily and monthly returns are 0.01% and 0.2% respectively. This indicates that the severity of the monthly returns is higher, which is expected.

**The Omega Ratio** compares the probability of gains to the probability of losses above a benchmark (in this case 0%). It gives an intuition on the relative frequency of good and bad outcomes. The omega ratio for SPY for daily returns and monthly returns is 1.17 and 2.02. This shows that while it is still more likely to have a day with positive returns than negative returns, the probability significantly increases with time. As it is often preached, time in the market beats timing the market.

**Conditional Drawdown (CDaR)** describes the average drawdown (peak-to-trough) during periods of extreme negative cumulative returns (in our case the deepest 5% of drawdowns). For the SPY this results in -19.2% and -17.8% of daily and monthly returns respectively. It is only reasonable that the CDaR is less severe for monthly data because with fewer data points finding a bigger range from peak to trough becomes more difficult.

**Downside Deviation** is the the standard deviation of returns below a benchmark (in our case 0%). It is a simple complement to the normal standard deviation, as fund managers usually do not mind the volatility to the upside. For the S&P this was 1.2% and 4.6% for daily returns and monthly returns respectively. Annualized this amounts to 18.3%, which is higher than the normal annualized standard deviation of 14.6%. This shows that returns to the downside fluctuate more, than to the upside.

**Other risk metrics:**

Extensions of this project can look further into other risk assessments that do not only require return data. We want to point out two current risk metrics, namely concentration and liquidity risk, that would be interesting to research further given, the current market situation.

A metric for Concentration Risk measures the funds exposure to individual securities. Since high concentration can lead to amplified losses in unfavorable circumstances. Especially, the rally of the magnificent seven, has led us to take a deeper look into this, as it mitigates the so sought after diversification effects. The current market outlook from Goldman Sachs, expects an annual growth of 3% for the S&P 500 citing concentration risk as the main factor for the downward revision. Without it, their model suggests a 7% annual growth rate over the next decade. An example of a metric would be the normalized Herfindahl index (HHI). It takes values between 0 and 1, with 0 being an equal weight portfolio and 1 being a one stock only portfolio.

<https://www.gspublishing.com/content/research/en/reports/2024/10/18/29e68989-0d2c-4960-bd4b-010a101f711e.pdf>

Liquidity Risk can be interpreted as the investor's ability to exit the position quickly without a significant price change. A good indicator of this is the trading volume compared to Net Asset Value. With the current market situation showing significant inflows into passive investment instruments, negative shocks can be devastating if panic breaks out.

