**Bachelor Thesis**

**Thema:** The influence of the investment horizon on the asset allocation

(in continuation of the Projektarbeit of fall 2018)

**Students:**

- Fabio Simone Bührer, buehrfab (WI)

- Joël Fabian Meili, meilijoe (WI)

**Hauptbetreuer:** Christoph Schmidhuber, scdh

**Description**

Mean-variance portfolio optimization is based on the assumption that the standard deviation is a suitable measure of risk for all investors. Under this assumption, the optimal portfolio does not depend on the investment horizon of the investor.

In practise, however, investors are not only concerned about the standard deviation of returns, but also about «tail risk». This has important implications for their asset allocation, because the return distributions of most assets are not normal, but have different degrees of «fat tails».

The goal of this thesis is to show how tail risk can be accounted for in the optimization process. We match the optimal amount of tail risk with the investor’s investment horizon . For a given overall risk appetite, this yields different optimal asset allocations for long- vs. short-term investors.

Common and suitable risk measures that account for «Fat Tails» are Value at Risk (VaR) and expected shortfall (ES) under a chosen VaR target. We consider

Thus, measures the risk of events that, on average, occur once every 26'000 business days ≈ 1 century. We consider investment horizons ranging from day to years.

To simulate the “fat tails” of various investments, we use Student’s t-distributions with various numbers of degrees of freedoms, and certain extensions of them, namely generalized hyperbolic distributions including skewed Student’s t-distributions, as well as Poisson distributions.

Using a variety of statistical tests, we calibrate the parameters of these distributions to the historical returns of a variety of asset classes: equities, bonds, currencies, commodities, and alternative investments that include short-option strategies and insurance-linked strategies.

Using Monte Carlo Simulations in R, we construct an optimal strategic allocation to these asset classes for each target volatility *and* for each investment horizon. Resampling techniques and shrinkage estimators are used to ensure that the optimization results are robust.

The numerical results are interpreted and explained by theoretical considerations, and consequences for capital market theories such as the CAPM model are discussed.