This study exposes several results. Firstly, the assumption of normality for returns of financial instruments is not valid, notably for short-term investment horizons. Therefore, especially for short time scales, portfolio management methodologies should put more emphasis on models based on heavy-tailed distributions.

Secondly, the skewness in the returns of various asset classes is confirmed and dealt with by introducing asymmetry in the respective distributions. Skewness represents an additional parameter to be considered by investors looking to optimize profits. Generally, hedgers will tend to prefer assets with positively skewed return distributions, while speculators will tend to prefer assets with negative skewness, if this is compensated for by additional return.

We found that the multivariate skewed Student’s t-distribution is a good proxy for different asset classes as it incorporates heavy tails and skewness, and the related t copula provides the marginal distributions with the empirically observed tail correlation, all features the Gaussian distribution and its copula are unable to replicate. We find a range of 3-5 for the number of degrees of freedom of these distributions.

Lastly, results from the portfolio optimization show that the optimal asset allocation depends on the investor’s investment horizon. Assets with heavy left tails are strongly under-weighted for short-term investors. On the other hand, long-term investors can allocate a greater weight of their portfolios to assets with heavier left tails, as they can sit out occasional sharp losses, provided that they are over-compensated in the long run by higher long-term returns.

As an implication, we find that long-term investors such as pension funds should not be too afraid of tail risk. Rather, they should be willing to leverage their long-term investment horizon to benefit from the long-term premium that is expected to accompany tail risk.