ABSTRACT

The following thesis inquires into and compares selected methods of portfolio optimization accounting for turnover or transaction costs constraints. The focus lies on two optimization approaches introduced by Han, 2020, and Bonaccolto, 2021, respectively. The former presented a two stage portfolio optimization procedure allowing for the maximization of (quadratic) utility on the first stage of the procedure while penalizing a turnover measure on the second stage. Since this approach does not make any ex-ante assumptions on the distribution of the error term, it can in a sense be considered a non-parametric approach. The second optimization approach studied considers a quantile regression based procedure introduced by Bonaccolto, 2021. This approach as well solves for an optimal portfolio in two distinct optimization stages. The first stage consists of a LASSO-penalized quantile regression that is used to perform model selection by restricting the universe of available assets. The second stage considers only the restricted set of assets on which it runs a standard quantile regression problem subject to a mean return constraint.

The thesis furthermore attempts to combine the two approaches in different ways. These always include a LASSO-penalized quantile regression setup as the first stage to perform model selection. On the second stage different optimization approaches are employed. Either a quantile regression based method subject to a form of turnover constraint, or a quadratic programming problem with a turnover measure as its objective function subject to expected shortfall and mean return constraints.

The resulting portfolios of the four optimization approaches are compared with respect to turnover, mean return and expected shortfall. In addition a variation of the Sharpe ratio is employed as a risk adjusted performance measure. It is found that the procedure by Han, 2020, outperforms all other three with respect to having minimal turnover, the best expected shortfall value, the best performance as measured by the Sharpe Ratio, and the same target mean return. A trade-off is found between minimizing turnover and achieving a better expected shortfall value comparing the procedure of Bonaccolto, 2021, with the one of the combined approaches in form of a quadratic programming problem with a turnover measure as its objective function. The combined approach in form of a quantile regression based method subject to a turnover constraint is found not to work as intended.