



**Universität  
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# **Two-Stage Portfolio Optimization via Sentiment Analysis and Deep Learning**

Master Thesis

Banking & Finance

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## Abstract

The significance of the pre-selection of high-quality assets before the official formation cannot be ignored during the portfolio optimization process. Therefore, with the top 30 most discussed Chinese A-share stocks in GUBA, this thesis has tried to combine deep learning techniques for predicting the stock price to select high-quality stocks, with different portfolio allocation strategies to see the portfolio performance of the combinations. In the first place, LSTM with benchmark inputs, LSTM with subjective sentiment extracted from comments data of GUBA, and LSTM with objective sentiment extracted from market-based indexes were separately constructed to predict the stock price. The results have shown that adding investors' sentiment in a subjective way or in an objective way can significantly elevate the prediction performance. In the second stage, high-quality stocks screened from those three models in the first stage and randomly-chosen stocks were respectively combined with three portfolio allocation strategies, including "Equal Weights", "Global Minimum Variance Optimization(GMV) without short-selling", and "Global Minimum CVaR(GMC) without short-selling". The results have validated the importance of the pre-selection of high-quality assets before the official formation of a portfolio. The combination of LSTM and GMC has achieved the highest return. The combination of LSTM considering investors' sentiment extracted from comments data of GUBA and equal weights strategy has shown the highest Sharpe ratio.

*Keywords: Stock Price Prediction, Deep Learning, LSTM, Portfolio Optimization, Sentiment Analysis, Markowitz Mean-Variance Optimization, CVaR*