The Uncertainty of Machine Learning Predictions in Asset Pricing

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Machine learning in asset pricing typically predicts expected returns as point estimates, ignoring uncertainty. We develop new methods to construct forecast confidence intervals for expected returns obtained from neural networks. We show that neural network forecasts of expected returns share the same asymptotic distribution as classic nonparametric methods, enabling a closed-form expression for their standard errors. We also propose a computationally feasible bootstrap to obtain the asymptotic distribution. We incorporate these forecast confidence intervals into an uncertainty-averse investment framework. This provides an economic rationale for shrinkage implementations of portfolio selection. Empirically, our methods improve out-of-sample performance.