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Can Machine Learning Improve Recession Prediction?

Big Data Applications in Economics: Part III

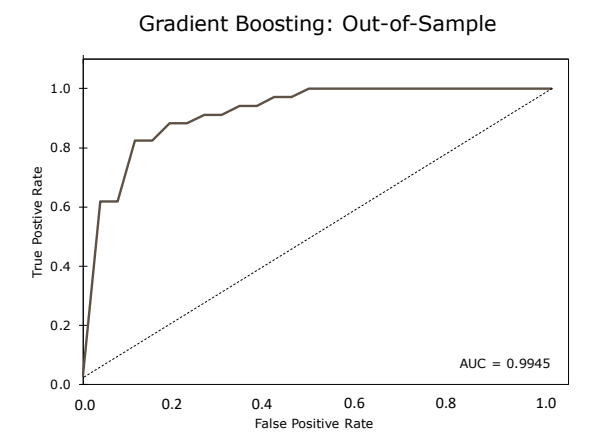
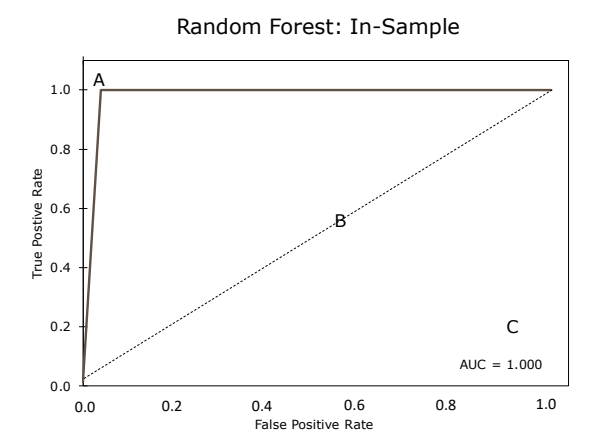
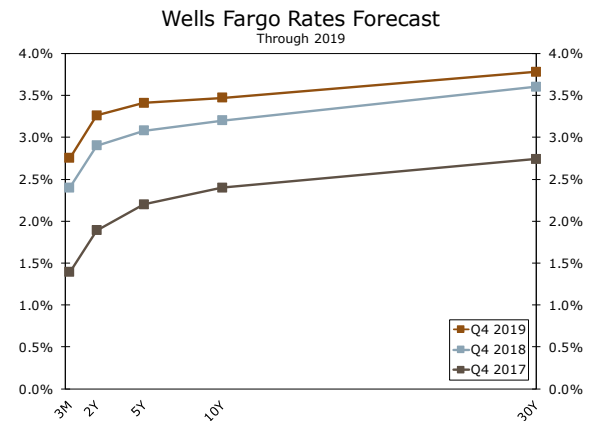
“Computers are useless. They can only give you answers.” – Pablo Picasso

Big data utilization in economics and the financial world has increased with each passing day. In previous reports, we have discussed issues and opportunities related to big data applications in economics/finance. This piece is a quick summary of a more-detailed [report](#) that outlines a framework to utilize machine learning and statistical data mining tools in the economics/financial world with the goal of more accurately predicting future recessions. Decision makers have a vital interest in predicting future recessions in order to enact appropriate policy. Therefore, to help decision makers, we raise the question: Does machine learning and statistical data mining improve recession prediction accuracy?

Our first method to predict recessions concerns statistical machine learning, also known as statistical data mining. This method examined over 500,000 variables as potential predictor variables in our tests. Furthermore, to obtain the final logit/probit model specification, we ran 30 million different models. The selected model was then utilized to generate recession probabilities. The second method is the random forest approach, which uses the same set of predictors that are utilized in the statistical data mining method. The third approach we use is known as gradient boosting, a technique that also belongs in the machine learning family. Moreover, we built an econometric model that utilizes the yield curve as an additional recession predictor and employ it as a benchmark. The other three approaches include hundreds of thousands of potential predictors that do not use any prior economic/financial theories. We set out with the question of whether machine learning tools are more useful than a simpler econometric model, a model with only one predictor.

To test a model’s accuracy, we employ both in-sample and out-of-sample criteria. In our tests, the random forest approach outperforms all the other models (gradient boosting, statistical machine learning and the simple econometric model) in both the in-sample and out-of-sample situations. The gradient boosting model comes in second place, while the statistical data mining approach captures third. Furthermore, if we combine all four probabilities, then that method is still unable to beat the random forest’s prediction accuracy. That is, the random forest approach, alone, is the best. Our analysis proposes that machine learning can improve recession prediction accuracy. Moreover, our models suggest a less than 5 percent chance of a recession during the next 12 months.

To sum up our big data application analysis, we would like to expand the aforementioned Picasso quote by emphasizing that it is up to the analyst to obtain either an accurate answer by utilizing computers (big data) efficiently, or end up with a useless answer by providing irrelevant inputs (more noise than signals) to the model. Therefore, the reliable answer many not depend on computers but rather on how one utilizes those computers.



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