Recent Advances in Econometric Forecasting

2015 Summer School on Econometrics and Statistics
Xiamen, July 6-10, 2015

Instructor:  Professor Tae-Hwy Lee, University of California, Riverside
Lectures:  8:30-11:45 am & 2:30-5:45 pm, July 9-10, 2015, N402 Econ Bldg
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Course Overview: We review the recent development in time series forecasting research in econometrics with applications in finance and macroeconomics. We begin with a review of basic forecasting theory, loss functions and econometric models, properties of optimal forecasts, concept of forecast rationality under flexible loss functions, forecast combination and forecast encompassing. We then review the methods of comparing predictive ability of non-nested and nested models. We discuss issues in Diebold-Mariano statistic in comparing two or more forecast models, issues in inference in predictive regression (to test for Granger-causality in the conditional mean, conditional quantiles, conditional expectiles and in conditional expected shortfalls) when the predictors are weakly stationary and also when they are persistent possibly with drift, possibly with contemporay correlation between the forecast target and the predictor, forecasting with many predictors, using factor models based on the principal components, Nelson-Siegle factor models, partial least squares, and Stein-type shrinkage. Also considered are forecasting with constraints and decompositions, using bootstrap bias correction, using nonlinear time series models, GMM estimation of the forecaster’s loss function using observed forecasts, and etc. Each topic will be demonstrated with examples and applications in financial econometrics.

Course Outline

Lecture 1: Loss functions and econometric models
(various regression functions in moments, quantiles, expectiles; loss functions for probability forecast, binary forecast, density forecast, density forecast in tails; entropy based loss; stochastic loss dominance)

Lecture 2: Introduction to forecasting
(univariate, multivariate, stationary, nonstationary time series)
References: Granger and Newbold (1986), Hamilton (1994)

Lecture 3: Forecast combination
(for mean forecast, quantile forecasts, expectile forecasts, binary forecasts and classifiers, averaging, majority vote, democracy, bagging, boosting, Bayesian model averaging)
Lecture 4: Forecasting with many predictors and with many forecasts
(principal component regression, Nelson-Siegel factor models, forecasting combination where there are many forecasts)

Lecture 5: Forecast comparison and inference in predictive regressions

Lecture 6: Estimation of a loss function using observed forecasts
(GMM estimation of loss/preference given the revealed forecasts, overidentifying testing of forecast optimality under estimated loss function, encompassing test for counter-factual evaluation of forecasts)

Lecture 7: Forecasting using shrinkage
(ESTIMATION with constraints, forecasting with constraints, bagging)

Lecture 8: Forecasting using decompositions
(multiplicative decomposition, additive decomposition, copula, aggregation)
*References:* Lee, Xi, and Zhang (2014), Anatolyev and Gospodinov (2010), Ferreira and Santa-Clara (2011)

Lecture 9: Forecasting using boosting
(classification, regression, forecasting using nonlinear models)
*References:* Hastie, Tibshirani, and Friedman (2009), Murphy (2012), James, Witten, Hastie, and Tibshirani (2013), Leek (2013), Varian (2014), Bai and Ng (2009), Ng (2014)

Lecture 10: Model selection
(Entropy, Kullback-Leibler divergence, logarithmic probability score, AIC, BIC, and TIC, cross-validation, Mallow criterion)
*References:* Hastie, Tibshirani, and Friedman (2009), Yang (2005)

Lecture 11: Model averaging
(Stein estimator, Mallow model averaging, Bayesian model averaging, boosting)
Selected References

82. James, G., D. Witten, T. Hastie, and R. Tibsirani (2013), An Introduction to Statistical Learning, Springer.