Nonparametric Pricing Kernel Models

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Abstract

The capital asset pricing model (CAPM) and the arbitrage asset pricing theory (APT) have been the cornerstone in theoretical and empirical finance for the recent few decades. The classical CAPM usually assumes a simple and stable linear relationship between an asset's systematic risk and its expected return. However, this simple relationship assumption has been challenged and rejected by several recent studies based on empirical evidence of time variation in betas and expected returns.

It is well documented that large pricing errors could be due to the linear approach used in a nonlinear model and treating a non-linear relationship as linear could lead to serious prediction problems in estimation. To overcome these problems, in the first part of this dissertation I would like to investigate a general nonparametric asset pricing model designed to avoid functional form misspecification of betas, risk premia, and the stochastic discount factor by considering estimating unknown functionals involved in the nonparametric pricing kernel. To estimate the nonparametric functionals, I propose a new nonparametric estimation procedure, termed as nonparametric generalized estimation equations (NPGEE), which combines the local linear fitting and the generalized estimation equations. I establish the asymptotic properties of the resulting estimator. Also, as a rule of thumb, I propose a data driven method to select the bandwidth and provide a consistent estimate of the asymptotic variance.

The nonparametric method may provide a useful insight for further parametric fitting, while parametric models for time-varying betas can be most efficient if the underlying betas are specified. However, a misspecification may cause serious bias and model constraints may distort the betas in local areas. Hence, to test whether the pricing kernel model has some specific parametric form becomes essentially important. In the second part of this dissertation, I propose a consistent nonparametric testing procedure to test whether the model is correctly specified and I establish the asymptotic properties of the test statistic using a U-statistic technique.

Finite sample results are investigated using Monte Carlo simulation studies in order to show the usefulness of the estimation method and the test statistics. The empirical applications using CRSP monthly returns are also implemented to illustrate our proposed models and methods.

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