

STANFORD UNIVERSITY
DEPARTMENT OF STATISTICS
DEPARTMENTAL SEMINAR

4:15 p.m., Tuesday, July 26, 2005
Sequoia Hall Room 200
(Cookies at 3:45 in 1st Floor Lounge)

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**STATISTICAL TESTING OF OPTIMALITY CONDITIONS IN
SIMULATION-BASED OPTIMIZATION**

We derive a novel procedure for testing the Karush-Kuhn-Tucker (KKT) first-order optimality conditions in random models. Such models arise in simulation-based optimization with multiple random (multivariate) outputs. We focus on expensive simulations, which have small sample sizes. We estimate the gradients (in the KKT conditions) through second-order polynomials, fitted locally; we use Ordinary Least Squares (OLS) and a central composite design (CCD). This enables us to estimate the covariance matrix of the estimated gradients. Using these estimates, we apply the bootstrap method to test the KKT conditions. First, however, we apply the classic Student t test to check whether the simulation outputs are feasible, and whether any constraints are binding. Furthermore, we test for lack-of-fit of the fitted polynomials. We apply our procedure to both a synthetic Monte Carlo example and a dynamic inventory simulation.