

Empirical Evaluation of Procedures to Assess Unconventional Natural Gas Resources when Spatial Anomalies are Present

Coburn, Timothy C.¹; Attanasi, Emil D.²; Freeman, Philip A.² (1) Management Science, Abilene Christian University, Abilene, TX. (2) Eastern Energy Resources, US Geological Survey, Reston, VA.

Nonparametric prediction models have previously been applied to making site-specific and regional estimates of volumes of natural gas resources at untested sites in continuous-type (unconventional) shale gas plays. These procedures used a combination of cross-validation for model selection, the jackknife for capturing site uncertainty, and the bootstrap for capturing uncertainty in the regional estimates. Previous simulation studies showed that in the presence of a geologic trend a series of transformations proposed by Tomczak offers an improvement in the mean square error prediction performance of the estimates when the trend is not severely mis-specified. This presentation examines the empirical importance, at the regional scale, of capturing the natural fracture orientation when predicting well recoveries at undrilled sites. It examines the results of drilling in the Devonian Antrim shale gas play of the Michigan Basin. The geologic literature provides a working hypothesis for a specific orientation for the natural fracture network in that play. Statistical tests of the well recoveries (EURs) estimated from publically available data are made to determine whether at the regional scale EURs reflect the hypothesized fracture network. Alternatively we examine whether the relationship between the EURs and fractures is sufficiently strong so that one can infer from the EURs the nature of the fracture network. Finally, we examine whether the incorporation of the hypothesized fracture network information offers any improvement in predictive performance of the nonparametric prediction models.