

**CONSISTENCY OF MONTE CARLO ESTIMATORS
FOR RISK-NEUTRAL PDE-CONSTRAINED
OPTIMIZATION**

JOHANNES MILZ*

ABSTRACT

We apply the sample average approximation (SAA) method to risk-neutral optimization problems governed by nonlinear partial differential equations (PDEs) with random inputs. We analyze the consistency of SAA optimal values, SAA solutions, and SAA critical points. Our analysis exploits hidden compactness in PDE-constrained optimization problems, allowing us to construct deterministic, compact subsets of the feasible set that contain the critical points of the risk-neutral problem and those of its SAA problems. The construction then allows us to study the consistency using results established in the literature on stochastic programming. The assumptions of our framework are verified on nonlinear PDE-constrained optimization problems under uncertainty.

* TECHNICAL UNIVERSITY OF MUNICH, DEPARTMENT OF MATHEMATICS, BOLTZMANNSTR. 3, 85748 GARCHING, GERMANY, MILZ@MA.TUM.DE