Endogeneity in Stochastic Frontier Model Using Neural Networks in the LIML Approach

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Stochastic Frontier Models (SFMs) are widely used to analyze efficiency, but their validity is challenged by endogeneity, where input variables correlate with unobserved inefficiency shocks. Classical approaches like Limited Information Maximum Likelihood (LIML) address this issue under linear assumptions, but they struggle in complex, nonlinear settings. We propose extending LIML with deep learning by replacing the linear first-stage model with a neural network, allowing flexible modeling of instrumental variable effects. This approach preserves the statistical rigor of LIML while capturing nonlinearities and high-dimensional interactions, offering a scalable solution to endogeneity in SFMs and expanding the applicability of econometric inference in machine learning.