On Model Selection for Causal Inference

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ABSTRACT

Causal inference in financial econometrics becomes one of the hot topics in the literature. See, for instance, Liu, Masulis and Stanfield (2021, *JFE*), Carlin, Umar and Yi (2023, *JFE*), and Dasgupta, Huynh and Xia (2023, *RFS*, 2023). In this paper, we modify the covariate selection criterion (CSC) developed by Lu (2015, *JBES*), and minimize the mean squared errors (MSE) of the *focused* parameter in causal methods such as regression discontinuity design (RDD) and difference-in-differences (DiD). Synthetic controls (SC) and inverse probability weighting (IPW) estimator will also be discussed. Monte-Carlo simulations and empirical examples are performed. Our modified CSC are compared with the usual model selection criteria such as AIC, Lasso and OGA+HDIC. We also discuss the further extensions to: (i) partially linear models; and (ii) high-dimensional models.

Keywords: Covariate selection criterion (CSC); difference-in-differences (DiD); focused parameter; mean squared errors (MSE); regression discontinuity design (RDD)

Multi-View Dynamic Network Modeling

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ABSTRACT

A flexible multi-view dynamic network model is developed using a regression-like structure, incorporating exogenous and endogenous variables from the lagged networks to model edge changes. The model does not rely on latent space, simplifying network estimation and prediction. Furthermore, it integrates a multi-view feature to represent various relationship types at each time point. The proposed model offers an intuitive interpretation of the estimation. Bayesian model averaging method is also applied to predict networks.

Keywords: Bayesian analysis, network modeling, time series analysis

Probabilistic Loss Reserving Prediction via Denoising Diffusion Model

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ABSTRACT

This paper introduces an innovative approach to predicting loss reserves in the insurance industry through a revised diffusion model. This model leverages run-off triangles of claim data as graphical representations, highlighting the interconnections among data points within the triangle. Unlike the traditional cross-classified over-dispersed Poisson (ccODP) model, our proposed diffusion model not only enhances accuracy and efficiency but also provides probabilistic forecasts. Through comprehensive simulation and empirical studies, we demonstrate the superior forecasting capabilities of our diffusion model compared to existing methods. These findings indicate that using network-based interactions within run-off triangles can significantly improve loss reserve forecasting.

Keywords: Machine Learning; Diffusion Model; Loss Reserving; Run-off Triangle