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Education

University of California, Riverside
PhD in Economics

Expected: June 2025

Delhi School of Economics, University of Delhi
M.A. in Economics

2018

University of Delhi
B.A. (Hons) in Economics

2015

Fields of Interest

High-Dimensional Econometrics, Machine Learning, Causal Inference, Forecasting.

Fellowships, Honors, and Awards

- Dean's Distinguished Fellowship, University of California, Riverside *2019*
- Dissertation Completion Fellowship, University of California, Riverside *2024*
- Conference Travel Grant Award, Graduate Division, University of California, Riverside *2024*

Research

Job Market Paper

- **Forecasting Using Supervised Factors and Idiosyncratic Elements** (With Tae-Hwy Lee)
[Draft](#)

Summary: We extend the paper on "Three-Pass Regression Filter (3PRF)" in two significant dimensions: first, by accommodating weak factors, and second, by allowing for correlations between the target

variable and predictors, even after adjusting for common factors. Our primary theoretical contribution establishes the consistency of the 3PRF in estimating target-relevant factors under these broader assumptions. We show that while our estimator is consistent, convergence occurs at a slower rate compared to the case when underlying factors are strong. Methodologically, we introduce a Lasso step to model idiosyncratic dependence, resulting in the 3PRF-Lasso estimator. The augmented 3PRF-Lasso estimator demonstrates strong performance in both simulations and our empirical exercise, forecasting key macroeconomic aggregates.

Working Papers

- Kernel Three-Pass Regression Filter (With Rajveer Jat)

Submitted June 2024. [Draft](#)

Summary: When predictors share common underlying dynamics, a latent factor model effectively captures their co-movements, succinctly summarizing the data and aiding in prediction while mitigating the curse of dimensionality. However, using latent common factors for prediction has two drawbacks: (1) not all factors may be relevant, leading to inefficiency when included in forecasts, and (2) typical models assume a linear dependence of the target on the predictors, which limits accuracy. We address these issues with a novel method: the Kernel Three-Pass Regression Filter. This approach extends the Three-Pass Regression Filter to accommodate nonlinear dependencies, while excluding irrelevant information. Our method is computationally efficient and provides robust empirical performance, especially over longer forecast horizons.

- Weak Supervised Factors

Summary: This paper examines the Three-Pass Regression Filter (3PRF) in environments where underlying relevant factor strengths are disparate, a common occurrence in many economic settings. The main finding is that varying factor strengths render the 3PRF estimator inconsistent unless new assumptions about proxy loadings are imposed. We demonstrate that the auto-proxies satisfy these new sufficient conditions under certain mild assumptions, allowing researchers to reliably employ auto-proxy 3PRF in environments with varying factor strengths. Given the similarities between the auto-proxy 3PRF and Partial Least Squares (PLS), our results provide valuable insights into the theoretical properties of PLS under general factor strengths.

Work in Progress

- Supervised Instruments in a Data-Rich Environment

Summary: The paper examines the estimation of a causal parameter when dealing with endogenous regressors and many instruments (IVs), which are driven by a set of common underlying factors. A large number of IVs can render the two-stage least squares (2SLS) estimator inconsistent. Instead of using all available instruments in the first stage, we estimate a smaller set of factors that influence both the instruments and the endogenous regressors. These factors are assumed to be orthogonal to the structural error, as in Bai (2010), which facilitates identification. We derive conditions under which inference on the causal parameter can be performed as if the true relevant factors driving the endogenous regressors were observed. Specifically, the estimation error of these factors has an asymptotically negligible impact on the distribution of the causal parameter, with these conditions depending on the strength of the relevant underlying factors.

- Supervised Deep Factor Model (With Rajveer Jat)

Summary: We use a neural network to forecast a single time series. Inspired by Bai's (2008) "Targeted Predictors" approach, we first select predictors by fitting a non-parametric regression of the target on each predictor. Thereafter, an auto-encoder is used to estimate the underlying non-linear factors driving the selected predictors. Unlike traditional factor models that restrict the search to a planar

structure, our method explores a non-linear, low-dimensional representation of the predictors that best explains the target.

Teaching Experience

Teaching Assistant, Department of Economics, UC Riverside

Introductory Courses

- ECON 002: Introduction to Macroeconomics (S'21, F'21, W'22, F'22, W'23, S'23, S'24)
- ECON 003: Introduction to Microeconomics (F'23)

Intermediate Courses

- ECON 101: Statistics for Economics (F'20, Su'23)
- ECON 104B: Intermediate Microeconomics II (W'21, W'22, Sp'22, Su'24)

Graduate Course

- ECON 205B: Econometric Methods II (W'24)

Presentations

- 34th Midwest Econometrics Group Conference (Upcoming), Lexington, KY, 2024
- California Econometric Conference, Davis, CA, 2024
- Winter 2024 Econometrics Seminar, UC Riverside
- Spring 2023 Brown Bag Seminar, UC Riverside

References

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