NORTH CAROLINA STATE UNIVERSITY

OPERATIONS RESEARCH PROGRAM
SEMINAR SERIES

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4:30PM-5:45PM

In-Person: 4290 Fitts-Woolard Hall
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Assessing Undiversified Holding and Contagion Risks in the Banking Sector with Bayesian Semi-Non-Negative Matrix Factorization

Abstract

Recent financial crises and bank failures have focused attention on identifying and measuring bank health, interconnectedness, and systemic risk. In this paper, we propose a novel methodology to estimate the portfolio composition of banks as a function of daily stock returns. Building on a model where individual bank balance sheets connect through common holdings, we derive and solve a constrained semi-non-negative matrix factorization problem that results in daily estimates of bank portfolios, which we use to measure undiversified holding and contagion risks in the banking sector. The factorization problem has a unique structure where the rows (corresponding to banks) of one latent matrix factor (representing asset holdings) are subject to probability constraints. We develop a Markov chain Monte Carlo estimator that resolves the well-known issues of scale and rotational invariance in non-negative matrix factorization models. We validate our estimates of asset holdings by showing they match real balance sheet data reported in regulatory filings and demonstrate utility for prudential supervision and risk management by identifying banks as troubled well before they failed in the first quarter of 2023.

Biography

Shawn Mankad is an assistant professor of analytics at NCSU Poole College of Management. His research focuses on developing and applying statistical methods for addressing business, economic, and policy issues. He specializes in using text documents to explain and predict economic variables, and in the modeling of networks to characterize network structure evolution over time. Prior to NCSU, Prof. Mankad held faculty positions at Cornell University and the University of Maryland and was a visiting scholar at the Federal Reserve Bank of Philadelphia. His undergraduate degree is from Carnegie Mellon University in mathematics, and he received his PhD in statistics from the University of Michigan.

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