



THE UNIVERSITY OF  
CHICAGO

DEPARTMENT OF STATISTICS

## Master's Thesis Presentation

Syris Shao

Department of Statistics  
The University of Chicago

“Comparing Univariate and Multivariate Models to Forecast Portfolio Value-at-Risk During COVID-19”

April 13, 2025, 10:30 AM  
Jones 111, 5747 S. Ellis Avenue

### Abstract

This thesis replicates and extends the framework of Santos, Nogales, and Ruiz (2013) to evaluate whether their findings on the superiority of multivariate GARCH models for portfolio Value-at-Risk (VaR) forecasting remain robust under the conditions of the COVID-19 pandemic. Using daily returns from ten US industry portfolios obtained from the Kenneth French data library (January 2015 to December 2022), we assess seven models — DCC-GJR-t, aDCC-GJR-t, GARCH-Norm, GJR-t, EGARCH-t, Filtered Historical Simulation (FHS), and CAViaR — for forecasting one-day-ahead 1% VaR on an equally weighted portfolio. Models are evaluated under both fixed and rolling estimation windows using the unconditional and conditional coverage back tests of Kupiec (1995) and Christoffersen (1998), and ranked via the Comparative Predictive Ability (CPA) test of Giacomini and White (2006) with an asymmetric tick-loss function. The results demonstrate that rolling parameter re-estimation is indispensable during structural breaks of this magnitude, as fixed-window models exhibit near-universal back testing failure. Under rolling estimation, multivariate DCC models achieve empirical coverage rates closer to the nominal 1% level and significantly outperform most univariate competitors in CPA tests, partially supporting the conclusions of Santos et al. (2013). However, EGARCH-t performs comparably to multivariate models, suggesting that capturing volatility asymmetry may be as valuable as modeling dynamic cross-asset correlations during an unprecedented exogenous shock.