Time-Varying Systemic Risk: Evidence from a Dynamic Copula Model of CDS Spreads*

Dong Hwan Oh† Andrew J. Patton‡

Federal Reserve Board Duke University

13 May 2015

Abstract

This paper proposes a new class of copula-based dynamic models for high-dimensional conditional distributions, facilitating the estimation of a wide variety of measures of systemic risk. Our proposed models draw on successful ideas from the literature on modeling high-dimensional covariance matrices and on recent work on models for general time-varying distributions. Our use of copula-based models enables the estimation of the joint model in stages, greatly reducing the computational burden. We use the proposed new models to study a collection of daily credit default swap (CDS) spreads on 100 U.S. firms over the period 2006 to 2012. We find that while the probability of distress for individual firms has greatly reduced since the financial crisis of 2008-09, the joint probability of distress (a measure of systemic risk) is substantially higher now than in the pre-crisis period.

Keywords: correlation, tail risk, financial crises, DCC.

J.E.L. codes: C32, C58, G01.

*We thank Christian Brownlees, Drew Creal, Jeff Russell, and seminar participants at Chicago, Duke, Monash, Montréal, NYU, Sveriges Riksbank, Toulouse School of Economics, UNC-Chapel Hill, UNSW and UTS for helpful comments. An appendix containing additional results and a MATLAB toolbox for this paper is available at `http://www.econ.duke.edu/~ap172/research.html`. The views in this paper are those of the authors and do not necessarily represent the views or policies of the Board of Governors of the Federal Reserve System or its staff.

†Quantitative Risk Analysis Section, Federal Reserve Board, Washington DC 20551. Email: donghwan.oh@frb.gov

‡Department of Economics, Duke University, Box 90097, Durham NC 27708. Email: andrew.patton@duke.edu