

LOCALIZING MULTIVARIATE CAVIAR

Xiu Xu¹, Yegor Klochkov², Li Chen^{*3} and Wolfgang Karl Härdle^{4,5}

¹*Jimei University*, ²*ByteDance*, ³*Xiamen University*,
⁴*Humboldt-Universität zu Berlin* and
⁵*Bucharest University of Economic Studies*

Abstract: Risk transmission among financial markets and their participants is time-evolving, especially for extreme risk scenarios. Possibly sudden time variation of such risk structures asks for quantitative techniques that can cope with such situations. Here we present a novel localized multivariate CAViaR-type model to respond to the challenge of time-varying risk contagion. For this purpose, we construct a test for parameter homogeneity with totally data-driven critical values. We prove that these critical values lead to the required confidence level. Based on this test, we propose an estimation procedure that adapts to a possible time-variation of the parameter. A comprehensive simulation study supports the effectiveness of our approach in detecting structural changes in multivariate CAViaR. Finally, when applying for the US and German financial markets, we can trace out the dynamic tail risk spillovers and find that the US market appears to play a dominant role in risk transmissions, especially in volatile market periods.

Key words and phrases: Change point detection, conditional quantile autoregression, local parametric approach, multiplier bootstrap.

1. Introduction

Financial risk dependence and the mechanism of risk spillover among international equity markets have attracted increasing attentions among theorists, empirical researchers, and practitioners. A risk contagion is generated through dependence between extreme negative shocks across financial markets. It is well-known that large downside market movements occurring in one country would unavoidably have substantial effects on other international equity markets. There now exists a wide-spread consensus in the empirical literature that the dependence between the returns of financial assets is non-Gaussian with asymmetric marginals and nonlinear features, and shows massive time-variation (D’Innocenzo et al., 2024; Gong, Liu and Wang, 2021; Okimoto, 2008).

In order to address some of these properties, Engle and Manganelli (2004) propose a conditional autoregressive value at risk (CAViaR) model to specify the evolution of conditional quantile over time for univariate time series. Later, White, Kim and Manganelli (2015) (denoted as WKM) built up a multivariate

*Corresponding author. E-mail: lichen812@xmu.edu.cn