

Essays on Multivariate Modeling in Financial Econometrics

DISSERTATION SUMMARY

Chapter 1: Autocontours: Dynamic Specification Tests

Motivated with the methodological advances in nonlinear time series models with non-Gaussian density functions and in density forecasting, we focus on dynamic specification tests for the joint hypothesis of i.i.d.-ness and density functional form. We propose a new battery of tests based on the fundamental properties of independent random variables with identical distributions and introduce a graphical device -the autocontour- that helps to visualize the modeling problems. Based on the theoretical probability coverage of the autocontours, we construct asymptotic t -tests and chi-squared tests with standard convergence rates. The tests do not require probability integral type transformations commonly encountered in the density forecasting literature. The effects of parameter uncertainty on the distributions of test statistics are explicitly accounted for by using a simple bootstrap procedure. Monte Carlo simulations show that the finite sample performance of the tests is very good in terms of size and power even in relatively small samples. We illustrate the usefulness of this methodology within the context of GARCH and ACD models using return and duration data from the U.S. stock markets.

Chapter 2: Multivariate Autocontours for Specification Testing in Multivariate GARCH Models

In this paper we propose a new battery of test statistics for dynamic specification and density functional form in a wide range of multivariate time series models including linear and nonlinear VAR specifications with multivariate GARCH disturbances. The tests are applied to the vector of generalized errors that must be i.i.d. with a certain parametric multivariate probability density function under the null hypothesis of correct specification. The basic idea of the proposed methodology is to calculate the percentage of observations contained within the probability autocontour plots corresponding to the assumed multivariate density of the vector of independent innovations, and compare it to the population percentage. We develop t -tests based on a single autocontour and also more powerful chi-squared tests based on multiple autocontours. In the spirit of goodness-of-fit tests, we also propose an additional test that focuses on the multivariate density functional form of the vector of innovations. We explicitly consider parameter uncertainty and show that a simple bootstrap procedure overcomes this problem. We perform Monte-Carlo simulations to investigate the size and power properties of the test statistics in finite samples. We apply our tests to multivariate GARCH models fitted to excess returns on portfolios sorted according to market capitalization.

Chapter 3: Testing and Modeling Threshold Asymmetries in Multivariate Distributions of U.S. Equity Returns

In this paper we aim to model asymmetries in the conditional means, volatilities and correlations of stock returns simultaneously in a multivariate threshold framework. We consider alternative specifications in which the threshold variable is based on the excess return on the market portfolio, the size and value factors of Fama and French (1993), and the realized volatility of the market. We find strong threshold effects with respect to return based threshold variables, but not with respect to the market realized volatility. Our results indicate that the threshold variable based on the Fama-French factors provides a rich and computationally inexpensive specification for modeling asymmetries, especially when dimensionality is high. Using subsampling for drawing inference, we find that small size portfolios exhibit the strongest conditional return asymmetry. In terms of the correlations with the market portfolio, defensive industries, small firms, and value firms exhibit the greatest asymmetries. Substantial asymmetry in conditional volatility appears to be a common characteristic of all portfolio groups. We evaluate the performance of the proposed model in an out-of-sample setup and find that there are substantial economic gains in incorporating asymmetries in the portfolio decisions.