GUANG ZHANG
Department of Economics, Boston University
270 Bay State Road
Boston MA 02215 USA
Cell: (857) 205-5326
Email: gzhang46@bu.edu
Web site: http://blogs.bu.edu/gzhang46

EDUCATION

Ph.D., Economics, Boston University, Boston MA, May 2020 (expected)
Dissertation Title: *Essays on nonlinear filtering and its application in finance*
Main advisor: Zhongjun Qu
Dissertation Committee: Zhongjun Qu, Pierre Perron and Jean-Jacques Forneron

M.S., Economics, University of Wisconsin, Madison, WI, 2013

M.A., Economics, Hitotsubashi University, Tokyo, JAPAN, 2010

B.A., Japanese, Xi'an International Studies University, Xi'an, CHINA, 2008

FIELDS OF INTEREST

Financial Econometrics, Time Series, Computational Finance

WORKING PAPERS

"Quasi Monte Carlo Kalman Filter for Nonlinear and Non-Gaussian State Space Models," September 2019.
"Maximum Likelihood Estimation and Inference of Continuous Time Regime Switching Models: with Application on Treasury Bill Rates Data," (with Anlong Qin and Li Chen), October 2019.
"Pairs Trading: A State Space Model Approach," September 2019.
"Hermite Polynomial Based Valuation of American Options with General Jump-Diffusion Process," (with Li Chen), September 2019.

WORK IN PROGRESS

"Pricing of American Option under Stochastic Volatility Models Based on Unscented Kalman filter"
"A *k*-means Clustering Estimator for Nonparametric GARCH Models"
"A Continuous Time GARCH (1,1) Model with Regime Switching: Formulation and Estimation" (with Li Chen)

FELLOWSHIPS AND AWARDS

Dean's Fellowship and Teaching Fellowship, BU, 2015-2019

WORK EXPERIENCE

Research Assistant, Department of Economics, Boston University, Fall 2017- Spring 2019

TEACHING EXPERIENCE

Teaching Assistant, Department of Economics, BU

EC303/304 Empirical Economic Analysis (BA level), Spring 2017, Fall 2019

EC203/204 Empirical Economics (BA level), Fall 2016

LANGUAGES

Native in Mandarin, Fluent in English and Japanese

COMPUTER SKILLS: R, Python, STATA, MATLAB, LaTeX

CITIZENSHIP/VISA STATUS: China/F1

REFERENCES

Professor Zhongjun Qu
Department of Economics
Boston University
Phone: (617) 358-5921
Email: qu@bu.edu

Professor Pierre Perron
Department of Economics
Boston University
Phone: (617) 353-3026
Email: perron@bu.edu

Professor Jean-Jacques Forneron
Department of Economics
Boston University
Phone: (617) 353-4824
Email: jjmf@bu.edu

GUANG ZHANG

Quasi Monte Carlo Kalman Filter for Nonlinear and Non-Gaussian State Space Models (Job Market Paper)

In this paper, we propose a new approach, Quasi Monte Carlo Kalman filter, to nonlinear and non-Gaussian models. QMCKF inherits the "predict step" and "update step" from Kalman filter, and applies Quasi Monte Carlo approach to compute the posteriori distribution. Quasi Monte Carlo is an efficient method for numerical integration using low-discrepancy sequences, such as the Halton sequence and the Sobol' sequence. In addition, Gaussian mixture is suggested to approximate the distribution of non-Gaussian noises and this can heavily simplify the computation of the posteriori distribution and achieve a faster rate of convergence.

Maximum Likelihood Estimation and Inference of Continuous Time Regime Switching Models: with Application on Treasury Bill Rates Data *(with Anling Qin and Li Chen)*

In this paper, we provide a likelihood-based method for the estimation and inference of continuous time regime switching models. A continuous time regime switching model consists of a jump-diffusion process such that the parameters in the process are state dependent. The state follows a continuous time Markov chain. We approximate the transition kernel of the model based on Hermite polynomials and derive the likelihood associated with the parameter. The MLE is selected to maximize the resulting likelihood. Asymptotic properties of this MLE is also discussed in this paper for inference. In addition, we apply this approach to Treasury bill rates data and compare the filtered state with NBER recession dates.

Pairs Trading: A State Space Model Approach

As popular short-term arbitrage strategy, Pairs Trading works by constructing a self-financing portfolio with a long position in one security and a short position in another one. In this paper, we first propose a new state space model for Pairs Trading. This new model allows for (1) non-Gaussianity and heteroskedasticity of the noises effect the spread between two securities; (2) nonlinear mean-reversion of the spread. Then, we propose a new trading strategy and trading rule based on the mean-reverting property of spread. We apply this new model and trading strategy to simulated data and real data and show our approach gives better performance of Pairs Trading than existing approaches.

Hermite Polynomial Based Valuation of American Options with General Jump-Diffusion Process *(with Li Chen)*

We present a numerical scheme with proof of convergence for the approximation of the price and exercise policy of American options. The scheme is based on Hermite polynomials expansions of the transition density of the underlying asset dynamics and the early exercise premium representation of American option. Our approach, shown to be fast and accurate, does not require the transition density and characteristic functions of the underlying asset dynamics to be attainable in closed form. Our approach has a wide range of application scopes and is straightforward to implement, and could be easily extended to higher dimensional cases and jump-diffusion models.