

# ESSAYS IN HONOR OF JOON Y. PARK

Econometric Methodology in  
Empirical Applications

**Edited by** Yoosoon Chang, Sokbae Lee  
and J. Isaac Miller

ADVANCES IN  
ECONOMETRICS

**VOLUME 45B**

ESSAYS IN HONOR OF  
JOON Y. PARK

# ADVANCES IN ECONOMETRICS

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- Volume 45A Essays in Honor of Joon Y. Park – Edited by Yoosoon Chang, Sokbae Lee and J. Isaac Miller

ADVANCES IN ECONOMETRICS VOLUME 45B

**ESSAYS IN HONOR OF  
JOON Y. PARK:  
ECONOMETRIC  
METHODOLOGY IN  
EMPIRICAL APPLICATIONS**

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# CONTENTS

List of Contributors	vii
Introduction	ix

## PART I MACROECONOMETRICS

<b>Chapter 1</b> Aggregate Output Measurements: A Common Trend Approach <i>Martín Almuzara, Gabriele Fiorentini and Enrique Sentana</i>	3
<b>Chapter 2</b> Markov Switching Rationality <i>Florens Odendahl, Barbara Rossi and Tatevik Sekhposyan</i>	35
<b>Chapter 3</b> The Econometrics of Oil Market VAR Models <i>Lutz Kilian and Xiaoqing Zhou</i>	65

## PART II FINANCIAL ECONOMETRICS

<b>Chapter 4</b> Quantile Impulse Response Analysis with Applications in Macroeconomics and Finance <i>Whayoung Jung and Ji Hyung Lee</i>	99
<b>Chapter 5</b> Risk Neutral Density Estimation with a Functional Linear Model <i>Marine Carrasco and Idriss Tsafack</i>	133
<b>Chapter 6</b> Estimating Diffusion Models of Interest Rates at the Zero Lower Bound: From the Great Depression to the Great Recession and Beyond <i>Lealand Morin</i>	159
<b>Chapter 7</b> A Market Crash or Tail Risk? Heavy Tails and Asymmetry of Returns in the Chinese Stock Market <i>Zeyu Xing and Rustam Ibragimov</i>	181

**PART III  
PANDEMIC, CLIMATE, AND DISASTER**

- Chapter 8 Predicting Crashes in Oil Prices During the COVID-19 Pandemic with Mixed Causal-Noncausal Models**  
*Alain Hecq and Elisa Voisin* 209
- Chapter 9 Depth-Weighted Forecast Combination: Application to COVID-19 Cases**  
*Yoonseok Lee and Donggyu Sul* 235
- Chapter 10 Identification of Beliefs in the Presence of Disaster Risk and Misspecification**  
*Saraswata Chaudhuri, Eric Renault and Oscar Wahlstrom* 261
- Chapter 11 A New Model for Agricultural Land-Use Modeling and Prediction in England Using Spatially High-Resolution Data**  
*Namhyun Kim, Patrick Wongsart-art and Ian J. Bateman* 291
- Chapter 12 Local Climate Sensitivity: What Can Time Series of Distributions Reveal About Spatial Heterogeneity of Climate Change?**  
*J. Isaac Miller* 319

**PART IV  
MICROECONOMETRICS AND PANEL DATA**

- Chapter 13 Maximum Likelihood Estimation of Dynamic Panel Data Models with Interactive Effects: Quasi-Differencing Over Time or Across Individuals?**  
*Cheng Hsiao and Qiankun Zhou* 353
- Chapter 14 Informational Content of Factor Structures in Simultaneous Binary Response Models**  
*Shakeeb Khan, Arnaud Maurel and Yichong Zhang* 385

**PART V  
RETROSPECTIVE**

- Chapter 15 Forty Years of *Advances in Econometrics***  
*Asli Ogunc and Randall C. Campbell* 413

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# INTRODUCTION

Volume 45 of *Advances in Econometrics* honors Professor Joon Y. Park, who has made numerous and substantive contributions to the field of econometrics over a career spanning four decades since the 1980s and counting. Volume 45 consists of 28 chapters and is in fact split between two volumes with the first focusing on econometric theory and the second focusing on econometric applications. These papers have been contributed by Joon's friends, colleagues, coauthors, former students, and even his dissertation advisor, Professor Peter C. B. Phillips, and the volume is edited by his wife and most frequent collaborator, Professor Yoosoon Chang, and two of his former students.

In the typical fashion of *Advances in Econometrics*, the papers were to be submitted in early 2021 after a conference in Joon's honor in April 2020, which would have nearly coincided with his 65<sup>th</sup> birthday. Of course, the COVID-19 pandemic forced much of the world into lockdown in April 2020, so plans changed. Papers were still submitted in 2021, but the conference was delayed and, as of this writing, is scheduled for September 29–30, 2023, in Bloomington, Indiana, which Joon and Yoosoon have called home for nearly 15 years.

We introduce the 15 chapters of the second volume. The first 14 are grouped into 4 sections that are related – some closely and some very loosely – to Professor Park's work and especially to his more recent work. We conclude the volume with a retrospective article summarizing four decades of this series, *Advances in Econometrics*.

The first two decades of Joon's published record is dominated by contributions to theoretical time series that relate to empirical macroeconomics, broadly defined, more closely than to any other field outside of econometrics. However, much of his work then and up to the present has been motivated by a sincere interest in how the tools he pioneered could be used in empirical applications. These methodologies have influenced empirical work of all sorts.

In macroeconometrics, he has published influential work on regime switching (Chang et al., 2017) and common stochastic trends (Chang et al., 2010), for example. Intensively studying high-frequency time series in the early 2000s, his contributions to financial econometrics include Ait-Sahalia and Park (2012), Choi, Jeong, and Park (2014), and Kim and Park (2017). His recent record contains several well-cited papers with methodologies motivated by understanding and forecasting energy consumption for the Republic of Korea and the world more generally, including Chang et al. (2014) and Chang et al. (2021). Related to energy consumption is climate change, and Park continues to make contributions to the econometric analysis of climate change, starting with Chang et al. (2020).

Following the themes mentioned above, the chapters in this volume are grouped as follows: (I) macroeconometrics, (II) financial econometrics, (III) pandemic, climate, and disaster, and (IV) microeconometrics and panel data.

## **PART I: MACROECONOMETRICS**

We open the volume with a contribution by Martín Almuzara, Gabriele Fiorentini, and Enrique Sentana, entitled “Aggregate Output Measurements: A Common Trend Approach,” which relates the study of common trends, an area in which Professor Park has contributed significantly, to macroeconomic aggregates. The authors analyze a model for different measurements of a single persistent latent time series with mean-reverting measurement errors, thereby allowing for a common trend among these measurements. They find that over-differencing drives potentially large biases in estimation and reduces the precision of smoothed estimates of the latent variable. They obtain an improved aggregate output measure using US quarterly data.

Forecast rationality is a key principle of macroeconometrics. While existing forecast rationality tests either focus on constant deviations from forecast rationality over the full sample or are constructed to detect smooth deviations based on nonparametric techniques, in “Markov Switching Rationality,” Florens Odendahl, Barbara Rossi, and Tatevik Sekhposyan propose novel parametric tests for detecting Markov switching deviations from forecast rationality. They find that forecasters tend to systematically overpredict interest rates during periods of monetary easing, while the forecasts are unbiased otherwise. Their findings emphasize the special role played by monetary policy in shaping interest rate expectations above and beyond macroeconomic fundamentals.

Energy is a factor of production in the macroeconomic production function of any country, so few commodities are as important as oil in understanding macroeconomic fluctuations. Lutz Kilian and Xiaoqing Zhou survey the extensive literature on oil market VARs in their contribution, “The Econometrics of Oil Market VAR Models.” As this literature has expanded at a rapid pace, it has become increasingly difficult for most economists to track the differences between alternative oil market models and the basis for divergent conclusions reached in the literature. This survey provides a useful guide, with a particular focus on the econometric foundations of the analysis of oil market models.

## **PART II: FINANCIAL ECONOMETRICS**

In their contribution entitled “Quantile Impulse Response Analysis with Applications in Macroeconomics and Finance,” Whayoung Jung and Ji Hyung Lee study the dynamic responses of the conditional quantiles and their applications in macroeconomics and finance. This chapter builds a multi-equation autoregressive conditional quantile model and proposes a new construction of quantile impulse response functions (QIRFs). The new QIRF toolset the authors provide adds nicely to the burgeoning research efforts that have been devoted to measuring distributional effects of economic shocks. Using the QIRFs, the authors find that the left tail of economic activity is most responsive to monetary and financial market shocks, and they use this result to evaluate the impact of economic shocks on the 5% quantile of economic activity, a measure of growth-at-risk, during the global financial crisis.

In “Risk Neutral Density Estimation with a Functional Linear Model,” Marine Carrasco and Idriss Tsafack propose a nonparametric estimator of the risk neutral density based on cross-sectional European option prices. They show that the risk neutral density can be viewed as the solution of an ill-posed integral equation and estimate it using an iterative method called Landweber-Fridman. They establish the consistency and asymptotic normality of their estimator and provide an application to S&P 500 options.

Lealand Morin, in his contribution entitled “Estimating Diffusion Models of Interest Rates at the Zero Lower Bound: From the Great Depression to the Great Recession and Beyond,” proposes a new way to properly estimate a class of parametric diffusion models that can be used to represent the interest rate over a long time span possibly including several episodes where the interest rate may stay near or at the zero lower bound. This approach makes it easier to learn about the interest rate dynamics from major historic zero lower bound episodes in the United States, most notably the Great Depression and Great Recession. This enhanced understanding may help us predict future responses of key macroeconomic variables to the interest rate that has recently gone through a new episode of zero lower bound, from the outset of the COVID-19 pandemic to monetary policy tightening implemented to moderate inflation in early 2022.

Rapid stock market growth without real economic back-up has led to the 2015 Chinese stock market crash. In “A Market Crash or Tail Risk? Heavy Tails and Asymmetry of Returns in the Chinese Stock Market,” Zeyu Xing and Rustam Ibragimov analyze structural breaks in heavy-tailedness and asymmetry properties of returns in Chinese A-share markets due to the crash using robust methods for inference on the tail index. Their empirical results show that the main determinants of heavy-tailedness in Chinese financial markets are liquidity and company size.

### **PART III: PANDEMIC, CLIMATE, AND DISASTER**

Continuing with the theme of crashes, the next set of articles relates to disasters past, present, and future, with an emphasis on the COVID-19 pandemic and climate change. Alain Hecq and Elisa Voisin contribute “Predicting Crashes in Oil Prices During the COVID-19 Pandemic with Mixed Causal-Noncausal Models,” which sheds light on how data transformations can substantially impact predictions made by mixed causal–noncausal models that rely on specifications in which time series depend not only on their lags but also on their leads. The authors investigate oil prices and estimate probabilities of crashes before and during the first wave of the COVID-19 pandemic in 2020, comparing various mechanical detrending methods with a detrending performed using the level of strategic petroleum reserves.

Yoonseok Lee and Donggyu Sul also investigate the recent pandemic in their contribution, “Depth-Weighted Forecast Combination: Application to COVID-19 Cases.” They develop a novel forecast combination approach based on the order statistics of individual predictability from panel data forecasts. Defining the notion of forecast depth based on normalized forecast errors during the training

period, they derive the limiting distribution of the depth-weighted forecast combination. Using this novel forecast combination, they predict the national level of new COVID-19 cases in the United States and find that the proposed method yields more accurate and robust predictions compared with other popular forecast combinations, including the ensemble forecast from the Centers for Disease Control and Prevention.

While the recent COVID-19 pandemic provides a tangible example of an economic disaster, economic disasters may have disparate causes. Saraswata Chaudhuri, Eric Renault, and Oscar Wahlstrom examine economic disasters more broadly in their contribution, entitled “Identification of Beliefs in the Presence of Disaster Risk and Misspecification.” They reconsider the equity premium puzzle and related asset market puzzles in light of the effect of rare disasters on asset prices. Low-probability economic disasters can restore the validity of model-implied moment conditions only if the amplitude of disasters may be arbitrarily large in due proportion. Yet they prove that there is no such thing as a population empirical likelihood-based model-implied probability distribution in the presence of unbounded disasters.

The next two chapters do not consider disasters explicitly, but there is a broad consensus within the scientific community on the potential for climate change to induce economic disasters. Land use is an issue that is inextricably tied to both the effects of climate change, by way of changes in arable land, for example, and to the causes of climate change, by way of changes in albedo, or reflection of solar energy. In their contribution “A New Model for Agricultural Land-Use Modeling and Prediction in England Using Spatially High-Resolution Data,” Namhyun Kim, Patrick Wongsart, and Ian J. Bateman contribute to a better understanding of farmers’ responses to behavioral drivers of land-use decisions by establishing an alternative analytical procedure that overcomes various drawbacks suffered by methods currently used in existing studies. Specifically, high-resolution spatial data ameliorates the idiosyncratic effects of the physical environment, and their model is equipped to deal with censoring, spatial dependence, and heterogeneity in the data and errors.

Also on the topic of spatial heterogeneity, J. Isaac Miller contributes “Local Climate Sensitivity: What Can Time Series of Distributions Reveal About Spatial Heterogeneity of Climate Change?” He introduces an easily implemented semiparametric statistical approach based on a physical energy balance climate model to estimate net heat transport and allow for spatial heterogeneity in the response of temperature to climate forcings. He finds that areas dominated by ocean tend to import energy and are relatively more sensitive to climate forcings, but that these areas warm more slowly than areas dominated by land.

## **PART IV: MICROECONOMETRICS AND PANEL DATA**

In “Maximum Likelihood Estimation of Dynamic Panel Data Models with Interactive Effects: Quasi-Differencing Over Time or Across Individuals?” Cheng Hsiao and Qiankun Zhou consider the quasi-maximum likelihood

estimation (MLE) of dynamic panel models with quasi-differencing to remove interactive effects. They show that the quasi-difference MLE over time is inconsistent when  $T$  is large, whether  $N$  is fixed or large, and is consistent and asymptotically unbiased when the difference is across individuals when  $N$  is large, whether  $T$  is fixed or large.

Factor structures have been employed in a variety of settings in cross sectional and panel data models. In “Informational Content of Factor Structures in Simultaneous Binary Response Models,” Shakeeb Khan, Arnaud Maurel, and Yichong Zhang investigate the informational content of factor structures in discrete triangular systems. Their main finding is that imposing a factor structure yields point identification of parameters of interest, such as the coefficient associated with the endogenous regressor in the outcome equation, under weaker assumptions than are usually required in these models.

## PART V: RETROSPECTIVE

*Advances in Econometrics* is a series of research volumes first published in 1982. Professor Park’s contribution of the variable addition test for cointegration to *Advances in Econometrics* in Park (1990) is both one of his most highly cited works and one of the most highly cited in the series. So, it seems appropriate to conclude this volume in his honor with a retrospective piece on the series. Asli Ogunc and Randall C. Campbell, with “Forty Years of *Advances in Econometrics*,” present an update to the history of the *Advances in Econometrics* series published in 2012. They describe key events in the history of the series and provide information about key authors, contributors, and other historical data on the series.

One of the joys of compiling this volume, “*Essays in Honor of Joon Y. Park: Econometric Methodology in Empirical Applications*,” has been to see the many in ways in which Joon’s research has influenced the methodologies used in empirical applications throughout the discipline. We hope you enjoy reading these chapters as much as we have.

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