University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Arts

of

IBRAHIM KHAN

BA (University of Victoria, 2014)

"A Time Series Analysis of Price Formation in Power Markets"

Department of Economics

Friday, January 26, 2018
2:00 P.M.
Clearihue Building
Room B021

Supervisory Committee:
Dr. Judith Clarke, Department of Economics, University of Victoria (Supervisor)
Dr. G. Cornelis van Kooten, Department of Economics, UVic (Member)

External Examiner:
Dr. Stuart Snaith, Peter B. Gustavson School of Business, UVic

Chair of Oral Examination:
Dr. Charles Curry, School of Earth and Ocean Sciences, UVic

Dr. Stephen V. Evans, Acting Dean, Faculty of Graduate Studies

Abstract

This study examines price formation in one of the largest wholesale electricity markets in the world: the Pennsylvania Jersey Maryland Interconnection, which serves 13 states and the District of Columbia with over 60 million consumers. The contribution of this thesis is to apply a variety of time series models offered in the literature to a large data set describing a single market, allowing for a comparison of their performance as well as demonstrating their validity. A central question that drives market deregulation is if it has created efficiency gains. To formalize this notion of efficiency, we implement tests for stationarity to measure the degree of randomness over time, finding that short run volatility can result in the outcomes for these tests that are inconclusive. We explore this volatility structure using Asymmetrical Power Autoregressive Conditional Heteroskedastic (APARCH) framework which captures the asymmetric nature of price shocks, finding that this behavior is unique to electricity returns, and that APARCH offers a better modelling alternative than simpler representations. Additionally, we account for long memory given the seasonal drivers of electricity prices which are persistent using Autoregressive Fractionally Integrated Moving Averages (ARFIMA). Temperature related market drivers are further modelled using Fourier based seasonality functions which enable us to capture cycles over multiple frequencies. Lastly, we provide an application of Markov Regime Switching models to account for the possibility of multiple states. Although appealing from a theoretical perspective, we find that the increased complexity of the model does not necessarily translate to better performance over simpler non-switching alternatives. These findings highlight the importance of establishing the features of the time series before selecting an appropriate model, and motivating it with economic rationale.