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REVIEW

Empirical Dynamic Asset Pricing — Model Specification and Econometric Assessment. By KENNETH J. SINGLETON (Princeton University Press, 2006)

This book is about the correlations between the various financial economic models, data collection and econometric testing of dynamical asset pricing models (DAPMs). It is mainly written with academic researchers and experts in the field of financial economics in mind. However, the book is well written and self contained, so anyone with a graduate level of understanding of financial economics and probability theory should be able to follow the results.

The book is split into three sections:

Part 1 — Econometric Methods for Analysing DAPMs
Part 2 — Pricing Kernels and DAPMs
Part 3 — No Arbitrage DAPMs

Part 1

Part 1 consists of six chapters and provides a detailed treatment of the econometric methods used in dynamic asset pricing modelling. It begins with the area of model specification and estimation strategies. Here the author provides an introduction to the theory of joint distributions used in DAPMs and, in particular, how to estimate the variables used in these models when the joint distribution:

(a) is fully characterised;
(b) is constrained by restrictions on the moments of the variables; and
(c) is not well developed.

For each of these cases, the choice of DAPM determines the estimation strategy to be used. In particular, the author uses the maximum likelihood (ML), generalised method of moments (GMM) and the least squares projection (LP) methods to identify the various estimators.

Next, in Chapter 3 the author introduces the large sample properties of the extremum estimators focusing on the regularity conditions under which the estimators converge, the consistency of the estimators and their relative asymptotic efficiency.

Chapter 4 deals with the goodness of fit and hypothesis testing. It is a particularly interesting chapter, as the author presents a number of statistical tests to check the consistency of the model to the data and to test the consistency of the constraints on the parameters used in the DAPM.

Chapter 5 covers affine processes. This chapter begins with an overview of affine processes in continuous time and uses Duffie's exponential affine Fourier transform to provide a complete characterisation of the family of

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affine processes, including affine jump diffusion models. The author then constructs a discrete-time version of the affine process theory (making use of the affine Laplace transform). Finally, ML and GMM estimation methods are discussed in detail within the affine context.

Chapter 6 deals with simulation-based estimators of DAPMs. Here the author discusses two types of estimator in the presence of jumps and latent time series — the simulated moments estimator (SME) and the Markov chain Monte Carlo estimator (MCMC). Most of the chapter is devoted to discussing consistency and asymptotic normality of the SME. However, there is also a discussion of the SME and the MCMC applied to diffusion models.

Chapter 7 deals with stochastic volatility, jumps and asset returns. This chapter explores the shapes of the conditional distributions of the asset returns from two viewpoints: firstly, from the various descriptive statistics of the historical data used in assessing the goodness of fit of DAPMs (that is mean, volatility, skewness and kurtosis); and secondly, via the different probability models for the various risk factors (stochastic volatility and GARCH models with and without jumps).

Part 2

Part 2, Chapter 8, begins with a review of pricing kernel theory, both within a preference based and a no-arbitrage model context.

Chapter 9 deals with linear asset pricing models. A detailed review of two widely studied constraints on the conditional expected returns is presented. This is followed with an application of these results to the equity and bond markets. The author also discusses the tests for serial correlation in the asset returns.

Chapter 10 deals with consumption-based DAPMs. Here a summary of the various consumption-based and investment-based dynamic asset pricing models are discussed, backed up with empirical evidence on the goodness of fit.

In Chapter 11 the author then turns his attention to factor models in the single beta representation. The aim is to relate time varying beta models to the preference based DAPMs presented in Chapter 10.

Part 3

After carefully developing the dynamic asset pricing theory in Parts 1 and 2, the theory is then applied to the pricing of risk neutral models.

Chapter 12 discusses dynamic term structure models on default free bonds, focusing on the interplay between the theoretical model and the empirical fit to the historical changes in the yield curve. The key ingredients are the risk neutral distribution of the state variables, the mapping between these variables and the short-term interest rates and the risk premiums. Particular models looked at are continuous time and discrete time affine

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models, quadratic Gaussian models, non-affine stochastic volatility models and a discussion of bond pricing models with jumps.

Chapter 13 refers to the empirical investigation of the dynamic term structure models (DTSMs) discussed in Chapter 12, drawing heavily upon the theory of affine processes developed in Chapter 5. Here a number of the DTSMs previously discussed are fitted to Treasury and swap data.

Chapters 14, 15 and 16 then discuss a number of DTSMs and option pricing models for defaultable bonds (e.g. corporate bonds and credit default swaps), equity and fixed income options respectively.

Those readers only interested in the pricing aspects of the book can go straight to Part 3, though it is recommended that they also read Chapter 8 to familiarise themselves with the notation used.

My only criticism is that the author did not include any exercises within the book at the end of each chapter, to test the readers' understanding.

Overall, this is an excellent reference book, and should be on the shelf of anyone with an interest in financial economics.

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