Financial Econometrics Modeling: Derivatives Pricing, Hedge Funds and Term Structure Models

Also by Greg N. Gregoriou and Razvan Pascalau

FINANCIAL ECONOMETRICS MODELING: Market Microstructure, Factor Models and Financial Risk Measures

NONLINEAR FINANCIAL ECONOMETRICS: Markov Switching Models, Persistence and Nonlinear Cointegration

NONLINEAR FINANCIAL ECONOMETRICS: Forecasting Models, Computational and Bayesian Models

Financial Econometrics Modeling: Derivatives Pricing, Hedge Funds and Term Structure Models

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Abstracts

1 The Operation of Hedge Funds: Econometric Evidence, Dynamic Modeling, and Regulatory Perspectives

Willi Semmler and Raphaële Chappe

This chapter presents a stochastic dynamic model that can be used to describe situations in asset management where the use of leverage to generate above-average promised returns can result in some hedge funds finding themselves embroiled in a Ponzi financing scheme. Greater transparency is necessary to reduce such opportunities as well as to understand systemic risk implications of hedge-fund operations. This chapter also assesses the new regulatory frameworks proposed by the Obama Administration and by the European Commission to that effect.

2 Inferring Risk-Averse Probability Distributions from Option Prices Using Implied Binomial Trees

Tom Arnold, Timothy Falcon Crack, and Adam Schwartz

We generalize the Rubinstein (1994) risk-neutral implied binomial tree (R-IBT) model by introducing a risk premium. Our new risk-averse implied binomial tree (RA-IBT) model has both probabilistic and pricing applications. We use the RA-IBT model to estimate the pricing kernel (i.e., marginal rate of substitution) and implied relative risk aversion for a representative agent; we are the first to use wholly implied methods for this. We also discuss applications of the RA-IBT to stochastic volatility option pricing models.

3 Pricing Toxic Assets

Carolyn V. Currie

The current global financial crisis has been triggered by a huge increase in credit default swaps and securitization of bundled mortgages into collateralized debt obligations (CDOs) which have layers of equity and

debt with the latter then bundled into entities known as CDO squared. The pricing of both has been faulty, resulting in misplaced credit ratings of AAA or above, resulting in severely degraded assets known as “toxic.” This article discusses a new pricing policy for toxic assets which does not rely on traditional finance theory but uses the pricing associated with simple floor plans developed in Australia during the twentieth century for gold and other commodity and agricultural products. Binomial theory can be used to price the associated collar that relies on put and call options. This chapter begins by defining toxic assets and then describing pricing methods to hedge risk in commodities, concluding with a suggested pricing solution based on Basel 2 capital allocation methods.

4 A General Efficient Framework for Pricing Options Using Exponential Time Integration Schemes

Muddun Bhuruth, Ravindra Boojhawon, Ashvin Gopaul, and Yannick Desire Tangman

We develop a general and efficient framework for pricing options under various models. These include the Black–Scholes, Merton’s jump-diffusion, Heston’s stochastic volatility (SV), Bates’ stochastic volatility with jumps models (SVJ), and infinite activity models such as CGMY as well. The semi-discrete systems arising from numerical discretizations of the pricing equations are solved using exponential time integration (ETI) schemes. For such integrators, it is well known that computation of the matrix exponential can be expensive. We show how the algorithms based on ETI can be speeded using best rational approximations via Carathéodory–Fejér points and that only four sparse linear solves are sufficient for obtaining convergent solutions in the case of European and barrier options. For American options, we combine an exponential forward Euler scheme with Richardson extrapolation in an operator splitting spatial discretization framework.

5 Unconditional Mean, Volatility, and the FOURIER–GARCH Representation

Razvan Pascualau, Christian Thomann, and Greg N. Gregoriou

This chapter proposes a new model called Fourier–GARCH which is a modification of the popular GARCH(1,1). This modification allows for

time-varying first and second moments via means of flexible Fourier transforms. A nice feature of this model is its ability to capture both short- and long-run dynamics in the volatility of the data, requiring only that the proper frequencies of the Fourier transform be specified. Several simulations show the ability of the Fourier series to approximate breaks of an unknown form, irrespective of the time or location of breaks. This chapter shows that the main cause of the long-run memory effect seen in stock returns is the result of a time-varying first moment. In addition, the study suggests that allowing only the second moment to vary over time is not sufficient to capture the high persistence observed in lagged returns.

6 Essays in Nonlinear Financial Integration Modeling: The Philippine Stock Market Case

Mohamed El-Hedi Aroui and Fredj Jawadi

This chapter aims to study the hypothesis of stock-market integration with the world equity market for the Philippines in a nonlinear framework using recent developments of nonlinear cointegration, nonlinear cointegration tests, and nonlinear error correction models. Our results suggest further evidence of nonlinear integration and show an asymmetrical and time-varying stock-price mean-reverting phenomenon toward the world index.

7 A Macroeconomic Analysis of the Latent Factors of the Yield Curve: Curvature and Real Activity

Matteo Modena

This chapter extends the strand of literature that examines the relation between the term structure (TS) of interest rates and macroeconomic variables. The yield curve is summarized by three latent factors which are obtained through Kalman filtering the Nelson–Siegel TS model. In this chapter, we address the challenging issue of attributing a macroeconomic interpretation to the curvature factor, finding evidence that curvature reflects the cyclical fluctuations of the economy. Interestingly, this result holds in spite of whether curvature is extracted from the nominal or the real TS. A negative shock to curvature seems either to anticipate or to accompany a slowdown in economic activity. The curvature effect thus

complements the transition from an upward-sloping yield curve to a flat one.

8 On the Efficiency of Capital Markets: An Analysis of the Short End of the UK Term Structure

Andrew Hughes Hallett and Christian Richter

In this chapter, we test the expectations hypothesis (EH) for the term structure of interest rates jointly with the uncovered interest parity (UIP) condition for the short end of the UK term structure. We find that the US interest rate, the UK monetary instrument, and the (spot) exchange rate all affect the short-term interest rate. However, the impact of the US rate is the biggest effect, although that has decreased a little during the recent financial crisis. We also test a bounded rationality approach. We deviate from the contemporary literature by refusing to impose rational expectations. Instead, we assume extrapolative expectations as an obvious behavioral alternative. We show that incorporating extrapolative expectations in both hypotheses turns out to be a significant improvement. Hence, and in contrast to previous work which has assumed rational expectations, we find the UIP and the EHs are not rejected. Thus, the problem seems to have been violations of the rational expectations paradigm, not violations of UIP or the EH of the term structure per se.

9 Continuous and Discrete Time Modeling of Short-Term Interest Rates

Chih-Ying Hsiao and Willi Semmler

The objective of this chapter is to compare continuous and discrete time models of short-term interest-rate data. Regarding the continuous-time method, three discretization methods, the Euler method, the Milstein method, and the new local linearization method are employed to obtain discrete-time approximate models. We estimate the short-term interest rates of Germany, the UK, and the USA. Results of the specification tests of autocorrelation and normality indicate that the model suggested by Chan et al. (1992) is not a very strong candidate to be the data-generating process for these short rates as well as the other continuous-time models suggested by Ait-Sahalia (1996) and Andersen and Lund (1997). Therefore, we turn to adopt discrete-time models.

We find that the ARMA-ARCH model with level dependent volatility performs better than the continuous-time models in terms of the likelihood values and the specification tests as well as the in-sample and out-of-sample forecasts.

10 Testing the Expectations Hypothesis in the Emerging Markets of the Middle East: An Application to Egyptian and Lebanese Treasury Securities

Sam Hakim and Simon Neaime

Despite many rejections, the expectations hypothesis remains the widely accepted premise believed to explain the shape of the yield curve. This chapter investigates the stochastic properties of the term structure of interest rates in Egypt and Lebanon, two emerging bond markets in the Middle East. Our results show that interest rates in each of these two countries are non-stationary and can be modeled as unit root processes. Further, cointegration analysis indicates that the interest rates do not drift apart but move together over time, a finding that supports the expectations hypothesis. Our results shed light for the first time on two of the Middle East's bond markets, a region where interest rates have received little attention before. Furthermore, the results suggest that the expectations hypothesis is strong enough to hold even in infant emerging markets.