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Our planned Special Issue, *Physics and Financial Derivatives*, is proceeding to publication in early 2020. We have many submitted articles several of which have successfully completed review. As I noted last quarter, the deadline for submissions is December 31, 2019. Please continue to help us publicize the request for specialized article submissions.

Our Guest Editors for *Physics and Financial Derivatives* are Andrey Itkin (also a JoD Board member), Alexander Bogdanov, and Alex Lipton. You'll find further details in the announcement within these pages.

WHEN RISK-FREE REPO GOES ROGUE

"Overnight repo" is secured lending for a tenor of just one day. The "repo" means "repurchase," since the lender in a repo transaction literally buys collateral bonds from the borrower with the additional legal agreement to sell the bonds back to the borrower the following day at a marginally higher price. Typical repo employs "general collateral" consisting of Treasury and government agency bonds that are not individually and specifically disclosed to the lender.

Conventional wisdom states that overnight repo is the safest imaginable loan—tenor of just one day and over-collateralized with liquid, allegedly risk-free bonds. While default of the borrower is possible, I've never known an overnight repo lender in this US market to suffer any loss.

However, since August of this year and also previously at various month-end dates, daily rates for overnight repo have spiked violently. What does that mean? There are conjectures but no satisfying explanations. Ultimately it just is a case of too little cash available to lend relative to the borrowing demand on specific days. Scott Skyrm of *Curvature Securities* has the best discussion I've read. One of the several guesses for this onset and continuation of repo volatility is that a single, large, unknown cash lender has left the room.

BAD TIDINGS FOR SOFR

As I wrote in the Spring 2019 Editor's Letter, this overnight repo rate is known as SOFR (secured overnight financing rate). The Alternative Reference Rate Committee (ARRC) chose SOFR to be the LIBOR alternative and replacement. An excellent article in the Summer 2019 issue of *The Journal of Structured Finance* (see Thomas Hughes "LIBOR Replacement—The Long and Winding Road") documents some criticisms and shortcomings of all potential LIBOR replacements, including SOFR.

For both practitioners and academics, Treasury rates are an evident candidate to replace LIBOR rates for bond and derivative purposes. Yet the ARRC argues that "Treasury rates can … move idiosyncratically based on fluctuations in technical supply and demand factors that are not reflective of the true risk-free rate relevant to the market."

It appears now, though, that this implied advantage of SOFR over Treasury rates is non-existent. SOFR is not a calm, rational, slowly changing measure of a risk-free interest rate or of anything else. It is a market variable, which, ironically based on its connection to the ARRC, the Federal Reserve Bank of New York is trying to control by offering repo loans to meet daily demand.

DOES A TRUE RISK-FREE RATE EXIST?

The ARRC statement I quoted above employs the phrase "the true risk-free rate." My interpretation from context is that there are financial professionals who believe that a risk-free rate cannot be "true" if it changes inexplicably from one day to the next. Yet if we want the market, rather than a panel or committee, to determine our risk-free rate, we cannot hope to achieve a "true" risk-free rate in this sense of the word.

Think of the equivalent but simpler question of "what is the true value of IBM stock?" We've all navigated this thought process as we've learned what markets are. There is no acceptable answer to this question other than that the value is the traded value of IBM at the moment. There's no model, no smoothing of historic prices, no clever analysis and projection of future earnings, and certainly no arbitrage that gives a better answer than just "current traded price." A "true" or "intrinsic" value of any market variable is a chimera.

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The six articles of this issue begin with provocative contributions of Carr and Itkin, both of New York University and also members of our Advisory Board, in extending and improving local volatility models for derivative valuation. The authors create a Gamma time-changed geometric, rather than arithmetic, Brownian motion model. Further, the reader will find a comparison of several piecewise linear models for the local variance as a function of strike price in the calibration of the local volatility model to option prices.

Bams (Maastricht University), Blanchard (Deloitte Luxembourg), and Lehnert (University of Luxembourg) apply a statistical testing framework to the evaluation of option pricing models. This framework is suitable for a broad set of models and pricing data. A specific example considers a discrete time volatility model for S&P 500 option price data.

Brooks (University of Alabama), Chance (Louisiana State University and a member of our Advisory Board), and Hemler (University of Notre Dame) argue that many previous studies claiming superior performance of covered call options on the S&P 500 index are erroneous. Specifically, a careful analysis of data with the authors' conceptual interpretation shows that a portfolio consisting of the S&P 500 and a short call option does not outperform the S&P 500 itself. This topic has great relevance both practically and theoretically and is multi-faceted. Different experts may well stake out different positions.

Lindström of Lund University argues and demonstrates that Fourier-based techniques are highly suitable for computing option values in a manner that incorporates parameter uncertainty. The author shows that bias correction for a large class of processes is superior within the Fourier framework relative to Monte Carlo simulation and deterministic quadrature rules. Empirically for S&P 500 option data, the resulting corrected models are generally better than the non-corrected counterparts.

Neo (Singapore University of Social Sciences) and Tee (Singapore Management University) formulate a risk-based swaption portfolio management framework with the goal of selecting different, optimal models in different interest rate regimes. The method incorporates stability and robustness as part of the model selection process. The authors claim that this technique leads to superior profit and loss attribution and hedging performance.

He and Zhu, both of the University of Wollongong, consider a regime switching model applied to certain barrier options. The authors create an analytical approximation as a Fourier series. Numerical evaluations attest to the efficiency and accuracy of the approximation.

Joseph M. Pimbley
Editor