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Around the world, uncertainty of all kinds keep growing: economic, political, intellectual, even meteorological. In the European Union, some countries are reeling from interconnected problems in their banking sectors and the market for their sovereign debt; some have adopted punishingly austere fiscal policies, hoping that strong medicine will allow them to bring their budgets under control without killing their economies. The rest, in better shape economically but holding a lot of debt of their at-risk partners, desperately hope the euro will hold together while everyone recovers. What are the chances of success? And what happens if success is elusive? In the U.S., the Fed is following a different policy from its European counterparts, with its “quantitative easing” program, but in the Congress, with its new contingent of conservative Tea Party members, the prospects for U.S. fiscal policy are very hard to predict. China, in contrast, was only mildly hurt by the global downturn, but it is instead experiencing inflation at politically unsettling rates. In facing these serious economic disruptions, the more or less established Keynesian model we all learned in school, with its prescription of fiscal stimulus to counter a recession, has been called into question and, in many cases, abandoned in favor of fiscal “discipline” to squeeze out budget deficits. Then there’s Tunisia and Egypt where, “out of the blue,” apparently stable regimes of long standing have been overturned in a matter of days, leaving great uncertainty about what form the new governments will take and whether the opposition will be able to run the country effectively once they are in power. And if this were not enough, aberrations in weather patterns have cropped up all over the world, including devastating floods in Pakistan and Australia, blistering heat across Asia, and massive snowfalls in Europe and the U.S. If this is mainly the result of global warming, we may have some very hard times ahead.

And yet, corporate profits and the U.S. stock market keep charging upward.

One thing the current situation makes clear is that there is a major difference between uncertainty and volatility. Volatility, as we normally measure and use it in pricing options, is a property of very short term price changes. Uncertainty, on the other hand, refers to not knowing what the state of the world will be at some more distant point in the future. Uncertainty is not knowing where we are going; volatility is the degree of short-run price fluctuation along the way. Right now, volatility is not particularly high, even though uncertainty has gone through the roof.

So, turning to this issue of JOD

Option pricing models have progressed tremendously over the years in the types of stochastic processes that can be handled. But just as Black and Scholes introduced the finance profession to new mathematical tools like diffusion processes, Ito's Lemma, and stochastic partial differential equations, the newer models now require excursions into the complex domain of characteristic functions and Fourier transforms. The power of the new techniques to solve much harder problems means that much of the future derivatives pricing research will be heading in this direction. Our first article, by Fiodar Kilin, reviews the characteristic function technology for several of the more popular new models, such as Heston's stochastic volatility model, and presents a computational technique that can improve estimation performance by an order of magnitude.

The next two articles focus on the risk-neutral probability density (RND). The RND is the market's estimate of the probability distribution over the future price of an underlying asset, modified to incorporate the market's risk preferences. The RND (a measure more tied to uncertainty than to volatility) is what determines option prices, and it can be extracted from the prices for a set of options written on the same underlying, with different exercise prices. Of course, theory is always a little simpler than practice. For one thing, the RND must be calculated from prices of European options. In our second article, Yisong Tian shows how to develop the RND from American options. The third article discusses two features that are regularly observed for the distribution of stock returns: asymmetry (typically negative skewness) and fat tails relative to a Gaussian density (especially in the left tail). Sheri Markose and Amadeo Alentorn propose an option pricing model based on the generalized extreme value (GEV) distribution, which allows for both of these features. Their article includes a valuation formula complete with expressions for the Greek letter risks and empirical evidence that the GEV option pricing model substantially outperforms Black-Scholes for options on the FTSE Index.

Credit derivatives are hard to value, for many reasons, and the experience of the last few years makes it clear how wrong our best efforts at valuing them can be. Among the problems is that although nearly all theorists can agree that models should not permit internal discrepancies that would create profitable arbitrage opportunities, models for pricing synthetic CDOs (i.e., collateralized debt obligations constructed from single-name credit default swaps) may do just that, especially with regard to the term structure of credit spreads. This interferes with model calibration and with determining appropriate hedges between CDO tranches and the underlying CDSs. In the fourth article, Dominic O'Kane shows how to nudge the CDS prices into an arbitrage-free alignment in a straightforward and efficient way. In our final article, Lars Holden, Anders Løland, and Ola Lindqvist tackle a particularly intricate problem of valuing long-term contracts with numerous contingent features. Purely academic derivatives research sometimes sets up artificially complex valuation problems just so they can be solved in clever ways, but these contracts are widely used in European energy markets, and the optionality is the market's response to complex fluctuations in demand and supply for the underlying commodity. The authors explain the nature of these contracts and offer a valuation approach that encompasses the most important embedded options that they contain.

Looking ahead, the uncertainty is huge in so many directions that maybe one needs to restrict one's hopes for resolution. In that vein, I will simply hope that by the time I write my next Editor's Letter in May, the weather is back closer to normal. I am truly tired of shoveling snow.

Stephen Figlewski
Editor