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Smile and default: the role of stochastic volatility and interest rates in counterparty credit risk

Kees de Graaf (UvA) and Sarunas Simaitis (Right Random Decisions)

In this research we investigate the impact of stochastic volatility and interest rates on Counterparty Credit Risk (CCR) for FX derivatives. To achieve this we analyse two real life cases in which the market conditions are different, namely during the 2008 credit crisis where risks are high and a period after the crisis in 2014, where volatility levels are low. The Heston model is extended by adding two Hull-White components which are calibrated to fit the EURUSD volatility surfaces. We then present future exposure profiles for plain vanilla Cross-Currency Swaps (CCYS), Barrier and American options and compare the different results when Heston-Hull-White-Hull-White or Black-Scholes dynamics are assumed. It is observed that the stochastic volatility has a significant impact on all the derivatives. For CCYS, some of the impact can be reduced by allowing for time dependent variance. We further confirmed that Barrier options exposure is highly sensitive to volatility dynamics and that American options' risk dynamics are significantly affected by the uncertainty in the interest rates.

Asset-backed trading strategies in energy markets

Cyriel de Jong (KYOS)

The market value of energy assets can fluctuate strongly as a result of market price movements. For example, the market value of conventional power plants depends on the spark spread (gas-fired plant) or dark spread (coal-fired plant), as well as the volatility in these spreads. For other assets, the value is exposed to variations in time spreads (e.g. for gas storage), location spreads (e.g. for transport capacities) or outright commodity prices. In order to mitigate the exposure to market price fluctuations, energy companies tend to hedge with horizons of a few years out. In this presentation we first show some general characteristics of energy price movements and the valuation of energy assets. Then we highlight the main principles of dynamically hedging energy assets, explaining numerical techniques for the derivation of delta hedges, analyzing dynamic hedging strategies and backtesting past hedging strategies.

Advances in valuation adjustments

Diederik Fokkema (EY)

During this talk we will discuss the results of a survey amongst eleven banks on the application of xVA for x in {C,D, F, L, K, M, X, …} and the results obtained in the master theses:

· Delsing, G., Wrong Way Risk for Interest Rates, Utrecht Universiteit & EY, 2015;

· Meibergen, N., Continuous Term Structures for Implied Recovery, Delft University of Technology & EY, 2015;

· Timmer, J.W., Exposure Simulation for Interest Rate Swaps, Vrije Universiteit Amsterdam & EY, 2014.

Impact of negative rates on pricing models

Veronica Malafaia (ING)

Negative interest rates became recently a reality, as they are being imposed by several central banks in the hope to boost the economy. In this talk, we will discuss what are the specific implications on pricing models. In particular, the discussion will follow three main lines:

· How do negative rates affect pricing models?

· Specific cases: what pricing models will be viable?

· What are the challenges for validation and risk management?

Liquidity risk in the sovereign credit default swap market

Rob Sperna Weiland (UvA)

In this presentation, I discuss the use of sovereign credit default swap (CDS) premia in order to estimate sovereign default probabilities. I will argue that liquidity effects are highly priced into these premia and that it is therefore necessary to quantify and account for these distorting effects in order to get uncontaminated estimates of the default probabilities. I will introduce an intensity-based model that allows for a country-specific analysis and induces a natural decomposition of the CDS premia into a credit part and a liquidity part. In a case study, I test the model on Brazilian and Turkish CDS data and show that liquidity effects are indeed highly priced into the credit default swap premia. The model-implied default probability estimates are close to Rabobank's internal estimates, which boosts the confidence in the proposed methodology.

Testing for bubbles in asset prices: evidence from QE and other applications

Ryan van Lamoen (DNB)

Testing for bubbles in asset prices and the implementation of monitoring tools are of great importance for policy purposes. Phillips et al. (2015) developed a novel testing procedure to identify explosive price behavior and the corresponding episodes in which they occur. Their testing procedure

is based on a recursive identification algorithm. In addition to this procedure we propose an alternative test to detect bubbles in asset prices. The two estimation procedures are performed to examine the existence of explosive price behavior in several asset classes. Specifically, the focus is on the impact of Quantitative Easing (QE) in the Eurosystem on equity prices and government bonds, since this unconventional monetary policy may drive equity prices and government bond yields further away from their fundamental drivers. We also show some applications on the housing market in several European countries.

Riding the swaption curve

Gerben de Zwart (APG) and Johan Duyvesteyn (Robeco)

We conduct an empirical analysis of the term structure in the volatility risk premium in the fixed income market by constructing long-short combinations of two at-the-money straddles for the four major swaption markets (USD, JPY, EUR and GBP). Our findings are consistent with a concave, upward-sloping maturity structure for all markets, with the largest negative premium for the shortest term maturity. The fact that both delta–vega and delta–gamma neutral straddle combinations earn positive returns that seem uncorrelated suggests that the term structure is affected by both jump risk and volatility risk. The results seem robust for macroeconomic announcements and the specific model choice to estimate the risk exposures for hedging.

Arbitrage-free volatility parameterizations with stochastic collocation

Lech Grzelak (Rabobank)

When handling a large number of market volatility quotes it is natural to express them in terms of some parametric form so that the whole range of strikes can be explained by only a few parameters. Once the parametric equation is given one can instantly obtain volatilities by evaluating the parametric function. For several years a market standard for volatility parameterization is the well-known Hagan formula which originates from a short-maturity heat kernel expansion. Although very easy to implement, the density implied by the approximation is not always arbitrage-free, especially not for very low strikes (it becomes negative or the density does not integrate to one). Pricing of specific financial derivatives, like Constant Maturity Swaps (CMS), relies on integration of the payoff over the density which is implied from a volatility parameterization. For these CMS products industrial practice is based on marginals which should be properly defined and arbitrage-free. In other words, these marginals cannot be based on Hagan's formula. In this talk we propose an alternative.

During this presentation we will derive a method for determining an arbitrage-free density implied by Hagan's formula. Our technique is based on the stochastic collocation method. The principle is to determine a few collocation points on the implied survival distribution function and project them on a polynomial of an arbitrage-free variable for which we choose the Gaussian variable. In this way we have equality in probability at the collocation points while the generated density is arbitrage-free. Analytic European option prices are available and the implied volatilities stay very close to those initially obtained by Hagan's formula. The proposed method is very fast and straightforward to implement as it only involves 1D Lagrange interpolation and inversion of a linear system of equations. The technique is generic and may be applied to other variants or other models that generate arbitrage.

Valuation with liquidity risk

Bert-Jan Nauta (RBS)

Liquidity risk is an important risk for banks. However, the inclusion of liquidity risk in the valuation of a bank's assets is complicated. A simple model is presented to address this problem. In this model, the value of an asset is determined by optimizing its funding term. The optimal funding term maximizes the value and minimizes the sum of liquidity losses and funding costs. The model is applied to different assets.

Stochastic modelling of commodity prices for CFaR

Steffen Pang (Zanders) and Mitchell Ponder (Zanders, VU)

Where financial institutions look at Value-at-Risk, corporates look at Cash-Flow-at-Risk. Besides FX risk, some corporates are also exposed to commodity risk. Both rare risk drivers in our developed CFaR model. In order to model the stochastic behavior of commodity spot prices we extended the traditional multivariate mean reverting process with econometric methods for seasonality, time-varying mean and time-varying volatility features.

The traditional mean revering model, which is motivated by the argument of supply and demand, might lead to unrealistic simulation paths which result in an inappropriate risk measure because of their fixed long run mean. Seasonality, which plays an

important role in the commodity market, and time-varying mean are modelled with a local linear trend model with seasonal dummy, whereas a time covariance matrix is accounted by a PCA-GARCH method. This method turns out to be more applicable than a mean reverting model with a fixed mean.

Using open data and open source for the next generation of risk models

Philippos Papadopoulos (OpenRisk)

Open source, open data and web technologies are making rapid inroads in most areas of economic activity. In this talk I will focus on a range of newly developed tools that help embed those amazing technologies into quantitative risk modeling. I will first discuss semantic annotations of data, the SDMX standard and REST interfaces, with the ECB statistical warehouse as a core example of relevant data sources that implement these protocols. I will then move on to risk models and will present in detail an API (application programming interface) for integrating risk data and risk models into a well- documented, intuitive, and completely web based risk framework (Open Risk API). I will illustrate these concepts with small demos.

Regulatory CVA, from current exposure method (CEM) to standard approach for counterparty credit risk (SACCR)

Pieter van Zwol (DNB)

To overcome current and potential future credit exposure to financial counterparties resulting from OTC derivative transactions, banks are imposed a capital requirement called the regulatory Credit Valuation Adjustment (CVA). Banks that do not have an approved internal model should calculate the CVA capital using the standardized method (SA). One of the main ingredients is the exposure-at-default (EAD). The EAD is usually calculated using the current-exposure-method (CEM). Since 2014 the new standardized approach for measuring counterparty credit risk exposures (SA-CCR) was introduced and will be effective Jan-2017. The presentation will cover the main challenges of the current approach and analyse differences with the new SA-CCR using example derivative portfolios.