Quantitative Methods in the Commodities Markets

Overview

Commodities markets have been much in the public eye recently as volatility has increased and they changed from markets dominated by physical participants to ones which have a significant investor component. The largest banks either already have profitable commodities franchises already or are actively building them, and money managers and funds are increasingly including these assets in their portfolio mix. The end result is a dramatic increase in focus on these markets from all aspects of the financial markets, including the quantitative end.

Goals

The goals of the course are to give the students

• An introduction to the various commodity markets fundamentals – metals, energy, and environmental markets – since the market structure in commodities markets is quite different from other financial markets;
• An understanding of the standard modeling approaches for the different commodity markets and why different markets require different approaches;
• Practical skills in solving common derivatives pricing and risk management problems.

Course Outline

Part I: Metals

Class 1: Precious metals markets
• Standard instruments and conventions
• Storage, arbitrage across the forward curve and forward curve dynamics
• Contango curves
• Overview of volatility models

Class 2: Base metals markets
• Standard instruments and conventions
• Storage, arbitrage across the forward curve and forward curve dynamics
• Two-factor curve modeling
Part II: Energy

Class 3: Oil markets
- Standard instruments and conventions
- Forward curve dynamics
- Standard exotic pricing and forward curve modeling

Class 4: Gas markets
- Standard instruments and conventions
- Seasonal forward curve models
- Natural gas storage facility pricing

Class 5: Natural gas storage pricing
- The early exercise optimization problem
- Rolling intrinsic approximation
- Basket of spread options approximation
- Tree pricing under a multifactor model

Class 6: Power markets
- Standard instruments and conventions
- Stack models and load modeling
- Load following contract pricing & unhedgeable risk

Part III: Environmental Markets

Class 7: Environment markets
- Emissions market frameworks
- Carbon credit markets
- Risk management of credit-producing projects