

# Advanced Energy Finance Analytics

## INTRODUCTION

- Corporations involved in the energy sector need executives who understand the extreme volatility of global energy markets and how to manage the financial risks created by changing energy prices.
- This training course on Advanced Energy Finance Analytics is designed to give participants an in-depth understanding of energy finance by addressing three areas of finance in an energy context: Pricing, asset valuation and risk management. This training course will increase your comprehension of the energy markets, as well as demonstrate how to model and forecast energy and forward / futures prices.
- This training course will build knowledge of energy-related derivatives, including the different derivative products and how to apply them in the energy markets to develop hedging and risk management strategies.

This training course on Advanced Energy Finance Analytics will develop an understanding of pricing, risk management, asset valuation and derivatives within the energy markets:

- Learn to use financial models to analyze and forecast energy prices; extrapolate forward prices beyond the liquidity tenor
- Understand the risk of and return from futures and options contracts on energy commodities
- Manage and optimize your organization's energy risk exposure
- Learn to estimate and calculate volatility in energy prices
- Utilize real options theory to value energy assets; use information from futures / option prices to make optimal production decisions: Optimal timing for extraction, optimal rate at which to extract oil (gas) from a field; value oil fields, pipelines and storage facilities, power plants

## OBJECTIVES

- The objectives of this Advanced Energy Finance Analytics training course are to give an introduction into the basics of energy trading as well as price formation mechanism in the oil and gas industry and to introduce delegates to the manner by which energy corporations manage their business risk (esp. price) exposures, and the derivative securities which can be utilized for this purpose:
- General Overview about Trading (terminology, tools, etc.)
- Overview of Energy Markets
- Principles of Risk Management: Objectives and Tools
- Proper Role of Derivatives in Firms' Risk Management
- Differences between exchange and OTC Markets

## ORGANISATIONAL IMPACT

- Use financial models to analyze and forecast energy prices; extrapolate forward prices beyond the liquidity tenor
- Understand the risk of and return from futures and options contracts on energy commodities
- Manage and optimize their corporations' energy risk exposure
- Estimate and calculate volatility in energy prices
- Apply option valuation techniques to the energy markets
- Understand and use derivative products to mitigate energy price risk; use structured products to enhance firm value; understand exotic structures unique to oil (e.g., average option) and gas and power (e.g., swing options, weather derivatives)
- Utilize real options theory to value energy assets; use information from futures / option prices to make optimal production decisions: Optimal timing for extraction, optimal rate at which to extract oil (gas) from a field; value oil fields, pipelines and storage facilities, power plants
- Apply Value-at-Risk to the energy industry

## PERSONAL IMPACT

The skills acquired in this training course include:

- Understanding the main terminology used in the industry
- Understanding the formation of oil and gas prices
- Understanding the linkage between physical and financial oil & gas markets
- Understanding the role of financial markets as efficient conveyors of information and assessors of risk
- Understanding the valuation and role of futures contracts and swap agreements
- Understanding the principles of option and derivative-claim valuation, hedging and uses
- Understanding the structuring, reverse engineering and valuation of OTC derivatives

## WHO SHOULD ATTEND?

- This training course on Advanced Energy Finance Analytics is designed for individuals working in financial analysis, valuation, trading, marketing, risk management or quantitative analysis positions with oil and gas exploration companies; investment and commercial banking, consulting, and financial services firms working in the energy sector; production and distribution companies; energy trading firms; and corporations outside the energy industry with a significant cost exposure to energy prices, such as energy-intensive manufacturing industries, transportation including air, coal companies and oil-field services.

In terms of job titles, these individuals include:

- Financial Analysts
- Quantitative Analysts or Researchers
- Energy Traders dealing with commodities
- Risk Managers dealing with commodities
- Commercial and Investment Bankers dealing with commodities
- Consultants in the commodity arena
- Government and Regulatory Officials, especially those with responsibilities for the energy sector

## Course Outline

The Current State of the Equity and Commodity Markets - The "Message from Markets"

- Measuring Nervousness / Uncertainty of Equity and Commodity Markets
- The Crude-Oil Markets
- Level and Slope of Crude-Oil Futures Markets
- Impact of Economic / Financial / Geopolitical Events on Implied Volatilities in the Crude-Oil Market
- Impact of Seasonality on Global NatGas Markets
- Future Inflation Rates
- Quantifying Future Inflation Rates
- Energy Prices and Inflationary Pressures
- The Refining Spread and Retail Gasoline Prices
- The Domestic NatGas Market: The Impact of Seasonality
- The March / April 2007 Futures Contracts

Overview of Risk Management

- Fundamentals of Forwards and Futures Contracts: Definition, Payoff Diagram, Pricing by Arbitrage
- Forward / Future Prices and Forecast Prices
- Risk-Management from a Corporate Perspective
- Commodity Swaps

## Option Pricing

- Payoffs and Put-Call Parity
- Black-Scholes Formula
- Option “Sensitivities” (the “Greeks”): Delta and Gamma
- The Binomial Model and the Valuation of American-Style Options
- Real Options in Energy Markets: Power Plants as a Strip of Spark Spread Options; Oil Fields as the Valuation of an Extraction Option

## Estimating the Price Process in Energy Markets

- Historical Volatility: The Term Structure of Volatility (TSOV)
- Estimating Volatility from Market Prices of Options in Energy Markets
- Historical or Implied Vols?
- Estimating a Mean-Reverting Process
- Characterizing the Volatility “Surface” Across Time and Strike
- Jump-Diffusion Process
- The Need to Extrapolate in Energy Finance: Valuation of Long-Dated Real Assets and Financial Structured Products; Extrapolating Crude-Oil Prices; Extrapolating Natural-Gas Prices; Extrapolating the Term Structure of Volatilities (TSOV); Extrapolating Correlations
- VAR and CVAR (Credit Value-at-Risk) in the Energy Industry

## Energy Derivative Products: The Role of Structuring, Calibration, Valuation and Hedging in Profitable Market-Making

- Commercial Structured Products
- Categorizing Derivative Products: Option Collars, Average Options, Spread Options, Swing Options, Weather Derivatives, Commodity-linked bonds; “Swing” Options; Weather Derivatives
- Structuring and Valuing Option Collars
- Structuring and Valuing Average (Asian) Options
- Example of Calibration: Using Vanilla Options to Determine the Value of Volatility for Valuation of Average Options
- Non-Commercial Structured Products