



METALS AND ENERGY FINANCE

27 - 31 March 2017

Registration includes pre-course access to e-learning and a course demonstration licence for IC-MinEval software.

Given the design component it involves, financial engineering should be considered equal to conventional engineering. By adopting this complementary approach, financial models can be used to identify how and why timing is critical in optimizing return on investment and to demonstrate how financial engineering can enhance returns to investors. Metals and Energy Finance capitalizes on this approach, and identifies and examines the investment opportunities offered across the extractive industry's cycle, from exploration through evaluation, pre-production development, development and production.

Background

There are some notable similarities between mineral and petroleum projects. Both are based on depleting resources and therefore companies are under constant pressure to replace reserves. The products are commoditised and globally traded on both spot and futures markets as well as being based on long-term contracts (iron ore, coal and gas supplies). These are products that have low demand elasticity, are capital intensive, require long development lead times and are associated with high technical and commercial risk. There are also environmental compliance and regulatory burdens associated with the development of all natural resource projects.

Thus course covers many of the concepts delivered as part of the MSc Metals and Energy Finance degree. This is a joint Faculty of Engineering and Business School programme and the structure of this course is based on its teaching modules. This course is based on the book Metals and Energy Finance published by Imperial College Press which is part of World Scientific which is an advanced textbook on the Evaluation of Mineral and Energy Projects.

Course Objectives

The aim of the course is to develop strategic approaches for evaluating projects at the prefeasibility stage. Delegates will be provided with the training needed to establish an independent valuation of mineral projects. The course also aims to cover the underlying accountancy, financial and technical principles which apply to mineral projects, and to demonstrate how these influence the way a financial model is constructed. Particular attention will be given to the treatment of the key independent variables, such as grade, and dependent variables, such as grade-tonnage relationships, and the way these influence the rate of mining, associated costs and optimisation of the net present value of a project. The distinction between technical appraisal and financial engineering will also be addressed and the reason why discounted cash flow models need to be integrated correctly into financial accounts explained. This will be linked to concepts of shareholder value and the role of gearing to maintain an efficient balance sheet.

A copy of the book '*Metals and Energy Finance*' (Prof. Dennis Buchanan, 2016) will be provided as part of the course pack which will include copies of all PowerPoint slides used in the delivery.

IC MinEval and CoalEval

In the workshop sessions use will be made in the workshop sessions of the IC-MinEval software, an Excel™-based spreadsheet programme automating all stages required to produce models for a wide range of mineral projects. The functionality of IC-MinEval will be delivered over the internet through the Software as a Service (SaaS) system with InfoMine (<http://software.infomine.com/>). Delegates will be expected to have their own laptop computers available and will be provided with wireless access to the Business School's internet. They will need to have administrative rights for their laptops, as there will be the need to install ActiveX to access the system. Delegates will be given access to SaaS a few days before the start of the course. (Delegates with AppleMac and Firefox internet browsers may need some support). Delegates all have access to the functionality of IC-MinEval through SaaS for a further three weeks after the course. Access beyond that will be available on subscriptions.

Participants will be able to retain digital copies of the spreadsheets that they generate during the course. It produces a Balance Sheet and Profit and Loss account from the cash flows, with tax provisions linked to the Profit and Loss account. Output modules include the base case discount cash flows, as well as key financial ratios and performance indicators such as NPV, IRR payback and maximum cash exposure. Sensitivity analysis can be undertaken on key variables.

Who Should Attend?

The course will be of particular interest to all professionals involved in mining finance within the minerals industry and related financial services and investment communities. This includes those associated directly with the appraisal, financing, and developing of mining projects such as geologists and engineers with a technical orientation, as well as financial services sectors including mining analysts, fund and asset managers, brokers, investment bankers and accountants.

COURSE PROGRAMME

DAY 1	27 MARCH 2017 - MINERAL & PETROLEUM GEOSCIENCES	
08.40 - 09.00	<i>Registration</i>	
09.00 - 09.15	Welcome and Profile of Participants	
09.00 - 11.00	Petroleum and Coal.	M. Ala
	Wessex Basin Petroleum System. Unconventional Hydrocarbons reviews.	
11.00 - 11.30	<i>Break</i>	
10.00 - 11.00	Management of Projects, Markets and Supplies.	O.Dubrule
	Quantifying Uncertainty in hydrocarbon production forecasts. Demonstration of the approach needed in calculating recoverable reserves and their associated uncertainty based on monte-carlo simulation and the application to the SPE Petroleum Resource Management System	
13.00 - 14.00	<i>Lunch</i>	
14.00 - 15.30	Petroleum and Coal	D. Buchanan
	Organic chemistry. Coalification process. Hydrocarbon formation. Coal versus Gas. Unconventional Hydrocarbons supplementary.	
15.30 - 15.45	<i>Break</i>	
	Mineral Deposits	D. Buchanan
	The origin of mineral deposits and Terminology. Strategic minerals. Chemical composition of the Earth's crust. Geochemically abundant and scarce metals. Mineralogical barrier. Relationship between value and tonnage. Diversity.	
DAY 2	28 MARCH 2017 - MANAGEMENT & BUSINESS: CASH FLOW MODELLING	
09.30 - 10.30	Extractive Industry Finance and Mineral Economics.	D. Buchanan
	Financial Engineering. Role of Finance in Society. Minerals.	
	Hydrocarbons	
09.30 - 11.00	Cash Flow Modelling and Financial Accounting.	D. Buchanan
	Principles. Valuation of Mineral of Mineral Projects.	
	Analysis of Risk and Uncertainty	
11.00 - 11.30	<i>Break</i>	
11.30 - 13.00	Cash Flow Modelling and Financial Accounting.	D. Buchanan
	Project Finance and the Cost of Equity.	
13.00 - 14.00	<i>Lunch</i>	
14.00 - 15.00	Cash Flow Modelling and Financial Accounting.	C. Howard
	Petroleum Fiscal Regimes.	
15.30 - 15.45	<i>Break</i>	
15:45 - 17.00	Cash Flow Modelling and Financial Accounting.	C.Howard
	Generation of Financial Models.	

DAY 3**29 MARCH 2017 - QUANTITATIVE FINANCE**

09.00 - 11.00	Strategic Management. Exploration Stage. Drivers. Resource Base and Asset Life. Funding Options. Synergies and Portfolio Optimisation	D.Buchanan
11.00 - 11.30	<i>Break</i>	
11.30 - 13.00	Strategic Management. Value Creation in Mineral Projects. Funding Options for Mineral Projects.	D.Buchanan
13.00 - 14.00	<i>Lunch</i>	
14.00 - 15.30	Management of Projects, Markets and Supplies. Constraints on Mineral Resource Development. Cost of Environmental Compliance and Closure Provision. Site Visits and Due Diligence	D. Buchanan
15.30 - 15.45	<i>Break</i>	
15.45 - 17.15	Resource Evaluation. Sampling. Process Mineralogy. Concepts around Geological Continuity. Polygons of Influence and Inverse Distance. Inverse Distance.	D. Buchanan

DAY 4**30 MARCH 2017 - QUANTITATIVE FINANCE**

09.00 - 11.00	Resource Evaluation	D. Buchanan
11.00 - 11.30	Geostatistical Methods. Reserve and Resource Definitions. Evaluation versus Production.	
11.00 - 12.00	<i>Break</i>	
12.00 - 13.00	Metals and Energy Project Appraisal and Finance	D. Buchanan
13.00 - 14.00	Role of Stock Exchanges. Preliminary Feasibility Study. Joint Venture. Feasibility Studies.	
14.00 - 15.30	<i>Lunch</i>	
15.30 - 15.45	Metals and Energy Project Appraisal and Finance	D. Buchanan
15.45 - 17.00	Project Finance Parameters. IC-MinEval generated base metal case history. Off-take Agreements.	
	<i>Break</i>	
	Minerals Engineering	T. Shaw & D. Buchanan
	Metal Reconciliation. Management. Grade control. Dilution. Mass balance	
	Introduction to Mining Methods	
	Transition from open pit to underground. Operating costs estimation. Economies of scale.	

DAY 5**31 MARCH 2017 - QUANTITATIVE FINANCE**

09.00 - 11.00	Minerals Engineering	T. Shaw
	Surface Mining. Slope stability. Stripping ratio. Explosives. Loading. Transport Underground Mining. Traditional longwall. Room and pillar. Mechanisation. Case histories. Coal Mining	
11.00 - 11.30	<i>Break</i>	
11.30 - 13.00	Minerals Engineering	S. Neethling
	Minerals Engineering. Extractive Metallurgy. The central role of mineralogy in effective mineral processing. Comminution. Liberation. Physical and chemical separation processes.	
13.00 - 14.00	<i>Lunch</i>	
14.00 - 15.30	Quantitative Finance and Financial Engineering	C. Worcester
	Decision Tree. - Determining the Cost of Equity. WACC Computations and Optimal Funding. Inputs for the Monte Carlo Simulations. Real Option Valuation. Theory and Application to Mining Projects. Black-Scholes-Merton Formula – Inputs and case history.	
15.30 - 15.45	<i>Break</i>	
15.45 - 17.00	Quantitative Finance and Financial Engineering	D.Buchanan
	IC-MinEval generated Platinum Group Metal Case History. IC-CoalEval generated Longwall . Coal. Case History and Role of Infrastructure.	