

Using Dynamic DCF and Real Options to Value, Manage and Finance Mining Projects

13–15 July 2011, Perth, WA, Australia

Day 1 – AM A conceptual valuation model. Valuation fundamentals.

Introductory comments. The role of project valuation. Three elements of a valuation model. Project structure (cash flow, design flexibility, stakeholders). Project uncertainty. Valuation estimation – DCF and real options. *Example:* Assessing risk impact of windfall taxes at Cu/Au Mine. Review of valuation fundamentals.

Day 1 – PM Financial markets. Price models and parameter estimation. Monte Carlo simulation.

Financial markets and instruments. Forward contracts. Why natural resource projects are like forward contracts. Output and forward price equations and parameter estimation. *Example:* Calculate the fair value of an electricity supply contract with electricity and foreign exchange forward curves. Re-interpreting static price equations as a Monte Carlo simulation. *Example:* Reproducing expected and forward price curves with Monte Carlo simulation.

Day 2 – AM Valuing cash flows with no flexibility.

Introduction to real options. A simple example of discounting differences between real options and DCF. Demonstration of discounting effects for a high- and low-cost mine. *Example:* Valuing a satellite oil field versus a tertiary recovery project. Design decisions: Higher capital spending and lower operating costs versus lower capital spending and higher operating costs. *Example:* Evaluating a long-life project. Summary of differential discounting

Day 2 – PM Valuing non-linear payoffs. Binomial techniques.

Non-linear cash flow payoffs. Royalties, corporate income taxes, windfall taxes. *Example:* Mongolian windfall taxes at a Cu/Au project. *Example:* Assessing a project finance proposal at a small gold project. The relationship between Monte Carlo and binomial techniques. Approximating a price process with a binomial tree. Developing a true and risk-adjusted probability price trees. *Example:* Building a true risk-adjusted probability price tree on a spreadsheet.

Day 3 – AM Introduction to valuing projects with flexibility.

Overview of management flexibility in project design and valuation. A simple binomial example of valuing a mine with an abandonment option. Building a project valuation model for a flexibly designed project. Using the Excel Binomial Real Options / DCF Valuation Add-in. Early closure at marginal project. *Example:* A marginal mine closure decision. *Example:* A closure decision at a coal-bed methane project. Early Real Option models and the Black-Scholes equation. Structure of cash flow uncertainty in the Black-Scholes equation.

Day 3 – PM Valuing natural resource projects with flexibility.

Restructuring a project in high or low commodity price environments. *Example:* An operating gold mine with optional sub-economic resource development. Deferring project development at a resource lease. *Example:* Valuing a gold lease. New frontiers in the valuation of natural resource projects. Course summary.

Please contact the course instructors for further information on course content.

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Using Dynamic DCF and Real Options

to Value, Manage and Finance Mining Projects



Ernst & Young Building • Perth, Western Australia
13–15 July, 2011

INSTRUCTORS:

Dr Michael Samis, Ph.D., P.Eng.
Vice President, Valuation and Business Modeling
Transaction Advisory Service, Ernst & Young LLP

Professor Graham Davis, Ph.D.
Professor, Division of Economics & Business
Colorado School of Mines

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Purpose and scope

Recent advances in finance theory and risk management have heavily influenced investment decision-making in the finance and insurance industries. Building on the discounted cash flow (DCF) technique, these advances allow valuation professionals to improve their economic and risk analysis via sophisticated cash flow models that combine dynamic descriptions of uncertainty with the ability to manage these uncertainties using flexible design and operational strategies. Non-financial industries, such as power generation and pharmaceuticals, are now applying these concepts to generate new investment insights and improve project analysis and management. Mining projects are ideally suited to these same techniques and many natural resource firms are beginning to incorporate these ideas into their project valuation and management practice.

This three-day course on Using Dynamic DCF and Real Options to Value, Manage and Finance Mining Projects will combine an innovative hands-on instruction style and real-world case studies to teach you how to:

- 1 Use these new concepts to develop a consistent, market-based valuation approach that can differentiate and value different projects and different project designs according to their unique cash flow uncertainty and risk characteristics;
- 2 Identify important elements of project structure, such as management flexibility and operational costs, and understand how they influence project value;
- 3 Examine how the terms of taxation and finance distribute project uncertainty and risk between equity, government, and creditor cash flow streams and how this affects the value and return of each stream.
- 4 Move from using a conventional valuation approach based on a static cash flow model and ad-hoc approaches to adjusting for and valuing risk to a dynamic valuation approach that can more fully represent the variability of the mining and petroleum project environment and the options that may exist to limit and take advantage of that variability;
- 5 Build confidence with practical examples so you can adapt these methods to a wide range of projects and situations.

Course materials

Participants will receive a set of course notes detailing valuation concepts, numerical calculations, and practical valuation examples. A course USB memory key is provided containing spreadsheet-based examples, graphical aids, and topical papers. Monte Carlo simulation exercises are run using a commercial spreadsheet-based simulation package made available to participants under a limited educational license. Case studies about flexibility are run with Microsoft Excel™ Binomial Dynamic Discounted Cash Flow / Real Option Valuation Add-in developed for the course by Dr Samis. This add-in may be used after the course by participants for educational and professional development purposes.

Participants must bring a laptop running Microsoft Windows XP and Microsoft Excel 2003 or later to run the course examples. There is no guarantee that earlier versions of these software packages will work with the course teaching aids and examples.

Three main course topics

- 1 **How the characteristics of the natural resource environment influence project value.** These include commodity price and cost uncertainty; operating leverage and management flexibility.
- 2 **How to build a dynamic valuation model that calculates a market-based project value and optimizes design and operating strategy by integrating financial market information, finance theory and a detailed project description.** This includes discussions on the risk adjustment information contained within financial markets; the concepts that allow a dynamic project environment to be represented within a valuation model; and the use of Monte Carlo analysis and decision trees to investigate the impact of operating leverage and management flexibility on project value.
- 3 **How to determine the investment decision situations in the mining and petroleum industries for which advanced valuation methods can provide new insights, and those for which these methods are not feasible or appropriate.** Suitable applications include analysis of windfall taxes, sliding-scale royalties, project financing, cost-reducing capital spending, design capacity choice, designing for possible development of sub-economic resources, satellite field or mineral resource development, and exploration or development deferral at a lease.

Who should attend

The course is designed for mining industry managers, geologists, engineers, bankers, analysts, and government officials involved in evaluating, designing, or managing projects or dealing with investment risk.

Participants do not require advanced mathematical skills to understand and apply the course material. However, to get the most from the course, they should be familiar with:

- 1 Basic statistical concepts such as variance, standard deviation, and covariance;
- 2 Constructing a traditional discounted cash flow valuation;
- 3 Introductory financial concepts such as the time value of money and risk-adjusted discounting.

Course instructors

Dr Samis and Professor Davis have been continually presenting and extending their Dynamic DCF and Real Options course since 2002. They have also consulted with many corporations in the mining and energy industries and bring these experiences into the classroom through discussions and case studies.

Dr Michael Samis, P.Eng. (michael.samis@ca.ey.com) is a leading Dynamic DCF and Real Options practitioner in the natural resource industries. He has extensive professional experience valuing base metals, precious metals, diamond, and petroleum projects with complex forms of flexibility and risk. His Real Option and Dynamic DCF assignments have ranged from exploration stage to late-stage capital investments. These assignments have also included power stations, analyzing project financing proposals, and the impact of windfall taxes on project economics. He has presented more than 30 workshops world-wide on valuation at universities, public companies, and professional organizations. Dr Samis is a registered Professional Engineer in Ontario, Canada, and a qualified person for valuation under NI43-101 guidelines. Dr Samis is currently a Vice President (Valuation and Business Modelling) in the Toronto office of Ernst and Young LLP's Transaction Advisory Service.

Dr Graham A. Davis (gdavis@mines.edu) is Professor of Economics and Business at the Colorado School of Mines. Dr Davis holds a Bachelor's degree in Metallurgical Engineering, an MBA, and a Ph.D. in mineral economics. He is recognized as an expert in applying Real Options to real world problems, and has undertaken Real Options valuation projects for government and private organizations worldwide. At the Colorado School of Mines he teaches the world's only 15-week graduate-level course on real options applications in the mining and petroleum industries. Dr Davis is a qualified person for valuation under Canada's NI43-101 guidelines for mineral property reporting, and a competent person under Australia's Joint Ore Reserves Committee code.

Registration fee

The registration fee is AUD3500 for the general public and AUD3100 for CRCMining affiliates. The fee includes course notes, coffee breaks and lunch. The fee must accompany the registration. Space is limited and early registration is encouraged. Enrollments will be accepted in the order received. The sponsor reserves the right to cancel the course and return registration fees if enrollment is low. Cancellations by registrants will be assessed an AUD300 service fee. No refunds will be made to registrants who fail to substitute or cancel five working days prior to the start of the course. Personnel substitutions may be made at any time without cost penalty.

Participation in this course may count towards Continuing Professional Education requirements.