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Dynamic Decision Trees as an Alternative for Real Options Valuation

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Abstract

This paper suggests a model to incorporate Real Options Valuation (ROV) to the decision-making process concerning E&P projects, through a robust, flexible and innovative technique: Dynamic Decision Trees (DDT). The proposed approach integrates Discounted Cash Flow (DCF), Decision Trees and Montecarlo Simulation into one practical methodology much easier to utilize and understand than the traditional binomial lattices. The DDT model is presented using as framework the valuation of developing the Sardinata field in Colombia.

Given that the Net Present Value (NPV) of the Discounted Cash Flow associated to the project was negative and close to break-even, the decision to execute it was delayed, despite management's good feelings regarding production potential and high oil prices. However, by modeling the project via DDT, it was possible to calculate the value inherent in project's uncertainty and managerial flexibility, allowing decision-makers to apply the Real Options concept and make better informed decisions. Consequently, the decisions to obtain 3D seismic and drill 25 infill wells were triggered.

Real Options are a direct extension of Financial Options, as well as its most common valuation methods. Therefore, the assumptions upon which this theory is built must also apply for Real Options Valuation. However, this does not occur when using these valuation methods in highly risky projects such as those of the Oil & Gas Industry. The authors offer an alternative solution for valuing real options in E&P projects, yet still complying with the assumptions that support the theory.

Through the use of DDT it was possible to avoid limitations in volatility estimation and option valuation, leading to a far-reaching and more accurate application of the theory. DDT proved to be a simpler, more robust, and more flexible manner for valuing real options than the traditional binomial lattices when dealing with E&P projects.

1. Introduction

Given the high levels of uncertainty in the Oil and Gas Industry, and the great proportions of potential gains and losses, decisions made for capital budgeting in oil companies justify thorough attention and deserve profound analysis. The right way of valuing projects has changed in the last decades, along with the business itself. Today, non-stochastic project valuation that results in deterministic decision-making overlooking future uncertainty or management's flexibility, have ceased being consequent with this industry's environment.

It does not make sense anymore valuing projects in a deterministic manner like it used to be done 30 years ago, nor doing it by assuming that future circumstances will be a straightforward extrapolation of present conditions. Facing today's ever-changing landscape, in which innovation and correct strategic planning make the difference between the leading companies and their followers, it becomes indispensable the use of valuation tools that incorporate criteria such as risk, uncertainty, managerial flexibility, best moment in time to invest, etc. In other words, it is essential to use methodologies that consider the value of unknown information and of optional future decisions.