Joint Optimization of Hydrocarbon PSC Parameters and Revenue Management via Stochastic Programming

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Project Abstract

With the ever increasing dependence of the global economy on hydrocarbons, the supply of fuel continues to lack the demand resulting in historical high fuel prices. Tapping to new fuel reserves has been an urgent priority for governments and oil companies alike. For example, over the recent years, the majority of the new oil reserves have been identified underwater, as it is the case in Lebanon and neighboring countries. In such an environment, e.g. offshore exploration, the risk in both reserve amounts and future revenues (prices) is very high. As such, novel analysis techniques that incorporate risk explicitly, via probability models, are needed for developing effective decision-aid tools.

The objective of this proposal is to perform decision analysis that assists governments in negotiating the parameters of production sharing contracts (PSCs) with international oil companies (IOCs) with a forward view of (i) the risk associated with reserve and future prices, and (ii) revenue management in terms of splitting the government share from the production, in the event of commercial discoveries, into different usages such as power production, export, domestic use, etc. The proposed work is sought to make a significant contribution since limited research in Oil and Gas takes the government prospective, and no previous work addresses joint contract structuring and revenue management. Moreover, we present our proposed research in a general context making it applicable to the global market, and we consider Lebanon as a case study for our analysis. Preliminary results include a two-stage stochastic optimization model (a stochastic program, SP). Stage 1 timing is prior to exploration, when the government is negotiating PSC parameters with IOCs under high uncertainty in future reserve and price level. Stage 2 timing is at the end of exploration, when, in the event of commercial discoveries, the government decides on allocating its production share among alternate usages. As typical in two-stage SPs, the output of the analysis from Stage 2, is fed into Stage 1, leading to a decision framework with a judicious integration of risk and decision facets at critical times. It is worth noting that our proposed Stage 2 analysis has a merit of its own, as it allows optimal revenue management for any possible scenario of price and reserve levels. It is also worth noting that our preliminary Stage 1 analysis attempts to make the PSC attractive for IOC by ensuring that the IOC rate of return is above a certain threshold.