On the rate of return and risk factors to international oil companies in Iran's buy-back service contracts☆

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ABSTRACT

We analyze the rate of return (ROR) and risk factors faced by Shell Exploration, an international oil company (IOC), in its Soroosh and Nowrooz buy-back service contract in Iran. In particular, based on our models of cash flow, we analyze the buy-back contract specific risk factors that can contribute to a reduction in the rate of return for the international oil company. Our cash flow models resemble the cash flow of buy-back service contracts before the Iranian government changed the way it determined the capital cost ceiling and pre-defined the oil price in these contracts in 2008–2009. Our actual and contractual cash flow models reveal that Shell Exploration's actual ROR was much lower than the contractual level. Furthermore, we find that among the risk factors that we considered, a capital cost overrun has the greatest negative effect on the IOC's ROR. Moreover, we show that there is a potential for modifying the contracts in order for the IOC to face an actual ROR closer to the contractual ROR even if the contract faces cost overrun or delay, without exceeding the maximum contractual ROR that the National Iranian Oil Company is willing to give.

1. Introduction

In recent years, some oil and natural gas producing countries have shown an increasing interest in adopting variations of service-type contracts rather than production sharing contracts or concessions in their oil and natural gas development and exploration projects (Ghandi and Lin, 2014).[1] A service contract[2] is a long-term contractual framework that governs the relation between a host government and international oil companies (IOCs) in which the IOCs develop or explore oil or natural gas fields on behalf of the host government in return for pre-determined fees and in which in most cases the host

government does not hand over the control of the extracted or subsoil or sub-surface resources to the IOCs (Ghandi and Lin, 2014).[3] One type of service contract is Iran's buy-back service contract.

This paper assesses the risks factors that international oil companies (IOC) face in Iran's oil and natural gas buy-back service contracts and their effects on the IOC's rate of return (ROR) on these contracts. A buy-back service contract is the primary framework that the National Iranian Oil Company (NIOC) uses to engage IOCs in the development of Iran's oil and natural gas fields in order to benefit from the IOCs' expertise and investment. In these contracts, once the fields reach contractual full production level, the operation of the developed fields

is transferred to the NIOC, and the IOC recovers its cost plus additional remuneration fees through an allocation of the developed fields' produced crude based on an agreed-upon targeted rate of return (ROR).[4]

Studies that discuss Iran's buy-back service contracts can be categorized in three groups. The first group, which includes Bindemann (1999) and Marcel (2006), provide basic definitions and some general characteristics of buy-back service contract. Both studies consider this contract as having characteristics that lie in between a service contract and a production sharing contract.

The second group of studies cover more aspects of a buy-back contract, and include Shiravi and Ebrahimi (2006) and van Groenendaal and Mazraati (2006). Shiravi and Ebrahimi (2006) discuss the terms and a history with a brief overview of some possible risk factors for the IOCs in these contracts. Van Groenendaal and Mazraati (2006) further the discussion over risk factors by analyzing the effects of two risk factors, oil price and delay, on the IOC's rate of return. Based on their model of cash flow of a natural gas buy-back service contract, they show the potential of oil price fluctuations and delays in reducing the IOC's rate of return. However, they limit the scope of the study on just these two risk factors with a limited range of possible values for each. Our paper expands upon their study by considering a larger set of possible risk factors including a capital cost overrun, which we find to be an important risk factor.

The third distinct group of buy-back related studies includes Ghandi and Lin (2012), who study the Soroosh and Nowrooz buy-back service contract. Based on a model of dynamically optimal oil production model, Ghandi and Lin (2012) show that the NIOC has not reached its contractual goals, nor has it achieved optimality in either profit maximization or cumulative production maximization. The low level of production can be partially explained by the terms of the contracts (the NIOC operatorship) and the crude share arrangements based on the cash flow calculations (marketing/customer issues) of the buy-back service contracts (Ghandi and Lin, 2012). Ghandi and Lin Lawell (2017) develop a dynamic model of oil production and well drilling to analyze the economic efficiency of oil contracts, including technical service contracts, buy-back contracts, and production sharing contracts.

The unique nature of a buy-back service contract and the fact that the IOC does not share in the profit raise the question of how much the inherent risk due to the nature of the buy-back service contract could affect the IOC's actual ROR. To answer this question, we model Shell Exploration's contractual and actual cash flow in its Soroosh and Nowrooz buy-back service contract as a case study. Our cash flow models resemble the cash flow of buy-back service contracts before the Iranian government changed the way it determined the capital cost ceiling and pre-defined the oil price in these contracts in 2008–2009.

Based on our models of cash flow, we analyze the buy-back contract specific risk factors that can contribute to a reduction in the IOC's rate of return. These risk factors include capital cost, the time profile for capital expenditures, operating and maintenance cost, delay in construction, oil price fluctuations, deviations from the contractual production level, London Interbank Offered Rate (LIBOR) reduction, and finally the remuneration not being realized.[5] Based on our detailed analytical risk-sharing cash flow models, we also propose modifications to buy-back service contracts that enable the IOC to face a lower degree of risk.

A comparison of our contractual and actual cash flow models of the Soroosh and Nowrooz buy-back service contract reveals that Shell ended up with an actual rate of return which is significantly lower than the contractual rate of return. This finding clearly suggests that the IOC may face high degrees of risk in a buy-back service contract. In addition, we find that even though all the risk factors we considered are capable of reducing the IOC's actual rate of return, a capital cost overrun has the largest potential effect.

Sensitivity analysis based on the change of one factor may not be enough to determine the importance of economic factors. However, by gauging the relative effects of changes in the contract parameters on the IOC's actual rate of return, we are able to identify the degree of each risk factors' potential effect in terms of reducing the IOCs' rate of return.

In addition, the framework that we have designed to study these effects could be used to do scenario analysis for a combination of risk factors as well. In fact, we use our framework and methodology to do the scenario analysis based on the realization of all the relevant factors. This way we avoid choosing scenarios arbitrarily. We also study the effect of a combination of three factors including the capital cost overall, status of bank charges during the delay period, and finally proportional increase of the remuneration in accordance to capital cost overrun.

Furthermore, our methodology is an important contribution to the literature on Iran's buy-back service contracts. Our main contribution is to reemphasize on the potential effects of capital cost overrun, in contrast to existing literature's view that delay and oil price are the most important risk factors.

The remainder of this paper is structured as follows. Section 2 describes our methodology in analyzing the risk factors and rate of return in three sub-sections. Sub-section 2.1 discusses the modeling of Soroosh and Nowrooz contractual and actual cash flow followed by these models' contractual and actual ROR results. Sub-section 2.2 examines each risk factor's ROR effect. Sub-section 2.3 illustrates our proposed risk-sharing cash flow modeling and the potential ROR effects of such modification in a buy-back service contract. Section 3 concludes.

2. Model and results

2.1. Contractual and actual ROR comparison

To analyze the rate of return and risk factors faced by an IOC in a buy-back service contract, we model Shell Exploration's contractual and actual cash flow in its Soroosh and Nowrooz buy-back service contract as a case study. Based on our models, we compare Shell's contractual and actual rate of return in this contract in order to examine the difference between what Shell agreed to contractually and what the company actually ended up with in terms of the rate of return. The rate of return is mathematically the rate that gives a net present value (NPV) of zero dollars in the cash flow.

We focus on the rate of return in our analysis for two reasons. First, in the buy-back service contract, the rate of return serves as the main contract parameter since the NIOC and the IOC need to agree on a ceiling for the rate of return for the IOC.[6] Second, examining the IOC performance in the contract using other indices such as the net present value requires inputting the discount rate in the net present value formula.[7] Determining an appropriate discount rate, however, requires additional assumptions about the IOC's expected return on competing

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[4] We avoid using the term internal rate of return (IRR) since the internal rate of return for the IOC could be different from the rate of return on this project from the IOC perspective. In fact, during the contract negotiations, NIOC and the IOC must agree on a rate of return for the IOC based on a cash flow similar to the one we design in this study based on Soroosh and Nowrooz buy-back service contract. Such a cash flow produces a rate of return that might be different from the IOC's true internal rate of return.

[5] We do not consider other risks including geology, geopolitical factors, sanctions, domestic economic and political instability, and inflation/recession related effects.

[6] That means that the rate of return cannot exceed the contractual or targeted value. However, it can be lower.

[7] In showing the effects of the delay as a risk factor, van Groenendaal and Mazraati (2006) report the IOC's net present value for a 10% discount rate as well as the return on invested capital as the division of sum of the remuneration and bank charges by the capital cost.