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Original Article

Revenue/cost production sharing contract (psc) fiscal regime on marginal gas fields in Malaysia: Case study

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Abstract

Despite the increasing global demand for natural gas, there are many marginal oil and gas fields that lie idle and are not developed mainly due to the uneconomic feasibility of the project. One of the main factors hindering the monetization of these small fields is the unfavourable fiscal conditions. This is the main reason why many potential marginal fields that do not meet the economic criteria required for commercial development are stranded. Thus, this paper aims at assessing the existing Revenue/Cost (R/C) Production Sharing Contract (PSC) fiscal regime on marginal gas fields in Malaysia via sensitivity and scenario analysis studies. It is found that reduction in cost of capital, tax rate or other PSC payments parameters helps to improve the NPV however the analysis shows the R/C tranches consists of cost recovery limit, excess cost recovery and profit-sharing percentage are the significant factors driving the cash flow.

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1 Introduction

The economics of the upstream petroleum business is very much complex and dynamic. In the context of the oil and gas industry, the petroleum fiscal regime, which plays an important role, describes all legislative, taxation policy, contractual, and fiscal elements under which petroleum operations are conducted in the petroleum nations [1].

The regime regulates transactions between the political entity (host government), and the legal entities involved are usually oil and gas companies. The fiscal terms of petroleum contracts are the most important factors for independent oil and gas companies to consider when seeking to engage in petroleum transactions in a country. The attractiveness of fiscal terms has a fundamental impact on the feasibility of a project and the economic benefits to independent oil companies and is therefore an important success factor in assessing the investment environment of a country's oil and gas industry [2].

The primary objective of the government of an oil-producing country is to establish a fiscal system that maximises the wealth derived from natural resources by encouraging an appropriate level of exploration and development activity. Iledare [1] also stated other objectives may be pursued, including efficient resource development, access to technology, skilled national manpower, investment funding for local exploration and production (E&P) activity, and sustainable economic growth. On the other hand, investors tend to be critical of host country tax regimes because of their financial objectives. E & P companies or investors bidding for the right to explore and develop petroleum resources in a host country want to receive a fair and satisfactory return quickly and properly. Therefore, some fiscal instruments and terms are negotiated, while others are determined by the host country's legislative process, keeping in mind the objectives of the host country's government and the E&P companies [3].

Malaysia has been practising a contractual fiscal regime called Production Sharing Contract (PSC) since the middle of 1970s [4]. Since then, this PSC fiscal system has evolved to various stages and adjusted to accommodate the oil and gas industry in the country and attract more international players. However, Malaysia is known for having one of the toughest fiscal systems in South East Asia [5]. An analysis of the global petroleum fiscal regimes shows that Malaysia is one of the countries with a rigid fiscal regime in terms of Government Take (GT), which is recorded as 93 percent [6]. Therefore, thus it is significant to explore the important variables available for the industrial players based on this rigid fiscal regime in promoting more exploration and development of marginal fields in Malaysia. Hence, this paper emerges with the aim of assessing the existing Revenue/Cost (R/C) PSC fiscal regime on marginal gas fields in Malaysia based on a literature review of journals.

2 Literature review

2.1 Marginal field

The definition of marginal field is very contextual and dependent on several technical, commercial and regulatory factors including reservoir characteristics, lack of infrastructure, and prohibitive development costs [7]. The definition is also time-specific, namely a 100-million-barrel field could be marginal, given low oil prices. Generally, a marginal field is defined as one in which economics do not currently meet acceptable rates of return and criteria necessary to justify commercial development [7]. Across the globe, in Texas, USA, marginal fields (stripper wells) range from a 10bbl/d oil well to 50mcf/d gas well [7]. In the context of offshore West Africa, the Nigerian government classifies marginal fields using following criteria's; unapprised discoveries, fields with high gas and low oil reserves, and fields which have remained non-producing for over ten years [8].

In Malaysia, marginal fields are defined as fields with less than recoverable reserves of 30 million barrels of oil or 500 Bcf of gas based on the guideline from the Ministry of Finance under Petroleum Act 1967 and Customs Act 1967. According to Malaysia's Energy Statistics [9], Malaysia is showing a steady decline in crude oil production after peaking in 2004 with a total crude oil production of 38,041 kilo tonnes of oil equivalent (Ktoe). Natural gas production peaked in 2010 with a total production of 71,543 Ktoe, but gradually declined thereafter. The decline is because producing fields have matured after more than three decades of production. To increase discoveries and production growth, the government has encouraged exploration of deep-water fields, stranded marginal fields, enhanced oil recovery (EOR), and improved oil recovery (IOR). However, weak and highly volatile oil prices since 2014 have not been an incentive for exploration of deep-water and marginal fields, as development involves high costs.

Developing marginal fields in an economically attractive way is a major challenge. This is due to high capital expenditures during the exploration and development phase and low revenues from total production, which challenges cost recovery. The uncertain risk associated with developing marginal fields also falls into a high matrix value. According to BMI Research [10], there are about 106 marginal fields in Malaysia, which together could contain about 580 million barrels of oil. Existing PSC arrangements are not very beneficial to marginal oil and gas development because they contain rigid fiscal conditions that result in unprofitable contracting. As a result, many marginal oil and gas fields are classified as stranded and closed to development due to their uneconomic terms and production profile.

In a world full of competition, the areas with the least favourable subsurface, highest cost, and lowest wellhead prices would provide the best fiscal conditions, while the areas with the best geology, lowest cost, and highest wellhead prices would provide the harshest fiscal conditions [11]. The host government designs a fiscal system in which exploration and development rights are acquired by those companies that place the highest value on those rights [5].

Regardless of what fiscal system is used, the bottom line is the financial issue of how costs are covered, and profits distributed. To achieve this, governments must design fiscal systems to provide a reasonable return to government and industry, avoid undue speculation, limit undue administrative burdens, provide flexibility, and create healthy competition and market efficiency [8]. Meurs [8] also noted that the design of an efficient fiscal system must consider political and geological risks as well as potential gains.

2.2 Revenue over cost (R/C)

In Malaysia, the Revenue over Cost (R/C) was introduced as the fiscal term for PSC in 1997. Oil and gas companies tied to existing Revenue to Cost ratio (R/C) Production Sharing Contract (PSC) agreements faces even greater challenge in developing marginal fields with low prices and high development costs. These factors, along with the risk of reserve uncertainty, contribute greatly to the contractor's overall inefficiency in operating. For many independent oil and gas companies in Malaysia, there are several marginal gas fields that are still under review for development". If these fields are not developed within the development time stipulated in the PSC terms, they will be relinquished back to Petroliam Nasional (PETRONAS). However, if the current R/C PSC fiscal terms and condition for the acquired blocks unchangeable, they will remain under contract.

Similarly, a broader analysis comparing petroleum fiscal regimes of about fifty countries between 1998 and 2007 found Malaysia's R/C ratio PSC to be among the most rigid fiscal regimes in terms of GT, although it has recently been adjusted downward by a reduction in GT and an increase in contractor participation (CT) [12]. The rigidity of Malaysia's petroleum fiscal regime is mentioned in Faizli [13]. In a recent analysis of global petroleum fiscal regimes comparing both onshore and offshore fiscal systems, rates Malaysia's fiscal regime is found to be regressive due to the royalty component [6].

Taking advantage of new fiscal incentives in 2010, PETRONAS introduced risk service contracts (RSC) in early 2011 to promote the development of marginal fields and increase the recovery of hydrocarbon resources through innovative solutions [10]. Rather than attempting to improve PSC terms, PETRONAS believed that this model would balance risk sharing with fair returns [14]. However, by the end of 2015, only 5 RSCs were active [15]. The fiscal term of the Risk Sharing Contract (RSC) fiscal term has shifted the payment of royalties from the contractor to PETRONAS [16]. Gerber [16] has reported Malaysia's offshore fiscal regime is ranked as the second highest after Venezuela GT, the fifth lowest in terms of Profitability Index (PI), and the fourth lowest in terms of investors' Internal Rate of Return (IRR).

The most important feature of this R/C PSC, compared to the 1985 PSC is that it allows contractors a faster payback on the capital invested in the early stages of the project. This is because the R/C Ratio PSC gives investors a cost recovery ceiling and profit sharing at different R/C ratios based on a sliding scale with a higher percentage in the early years of production [17]. Unlike the PSCs of 1976 and 1985, in this R/C Ratio, PSC has cost recovery from PETRONAS based on its agreed percent of gross production in PSC agreement. Revenue 'R' is Cumulative Contractor Entitlement, which consists of Cost Recovery and Profit. Cost 'C' is Cumulative Recoverable Cost which consists of Capex and Opex. R/C Factor for oil and gas cost recovery and profit oil and gas are shown in Table 2.1 and 2.2.

Table 2.1 Cost Oil and Gas Recovery R/C Factor [6].

COST RECOVERY			
Contractor's R/C ratio	Cost Recovery Ceiling (percent of gross production)	Contractor's share of excess cost recovery (percent) (i.e., Unused cost recovery)	
		Cum. Production <= Cum. THV	Cum. Production > Cum. THV
0 < R/C <= 1.0	70	Not Applicable	Not Applicable
1.0 < R/C <= 1.4	60	80	40
1.4 < R/C <= 2.0	50	70	40
2.0 < R/C <= 2.5	30	60	40
2.5 < R/C <= 3.0	30	50	40
R/C > 3.0	30	40	20

Table 2.2 Profit Oil and Gas Split R/C Factor [6].

PROFIT SHARING		
Contractor's R/C ratio	Contractor's Profit Share (percent)	
	Cum. Production <= Cum. THV	Cum. Production > Cum. THV
0 < R/C <= 1.0	80	40
1.0 < R/C <= 1.4	70	30
1.4 < R/C <= 2.0	60	30
2.0 < R/C <= 2.5	50	30
2.5 < R/C <= 3.0	40	30
R/C > 3.0	30	10

It can be seen from Table 2.1 and Table 2.2 that cost recovery limits and profit sharing based on the R/C ratio favor the contractor in the early stages of the project, which subsequently decreases as the R/C ratio increases. This enables investors to recover the production proceeds during the early years of production.

2.3 Production sharing contract – Fiscal regime

In summary, PSC consists of two types of models based on profit-sharing and cost recovery; 1) Based on production rate/volume (namely 1976, 1985, and Deepwater PSCs), where the resource owner's take increases along with production rate/volume; and 2) Profitability-based R/C PSC (Revenue over Cost PSC), which the resource owner's take increases as the economic health of the project improves (indicated by a R/C index) [4].

A fiscal regime can be attractive if it consists of some neutral tax instruments, is stable and easy to administer [18,19]. Moreover, Artist [20] suggested that the impact of tax policy on private investors' cash flow can be mitigated by a fiscal regime in place. This suggests that an attractive fiscal regime can have a stimulative effect on the impact of the production-based tax on the investment climate in the frontier.

Although a significant effect of tax incentives on the investment climate in the frontier has been found, there are mixed results in the global literature on the effect of incentives on investment attractiveness [21]. Morisset et al. [22] have reported that incentives generally did not have serious negative effects on the investment climate, nor did they attract the desired externalities. However, it is recommended that stability and simplicity of the fiscal regime would be more desirable than generous tax rebates and incentives for investors in an environment of political and institutional risk [23,24].

In addition, the role of an attractive fiscal regime in stimulating the investment climate is relevant when referring to Moran's dynamic bargaining theory [25]. Since host countries have more leverage in negotiations due to their greater bargaining skills and power, they can be expected to have the power to enact or enforce laws to share economic returns [26]. Thus, if host countries can enact and enforce laws, it also means that they can create an attractive fiscal regime. When an attractive system is in place, multinational oil companies can evaluate the investment climate for marginal development projects. Industry bidding and/or negotiations have been heavily influenced by both increased competition and overly optimistic estimates of oil prices, project costs and schedules, reservoir size, and success rates [12].

Certainly, many countries modified and/or improved their terms over the years particularly during the late 1990s, but relative to the dwindling prospectively during the two decades 1980s and 1990s, as geological basins matured and field-size distribution expectations declined, the fiscal improvements rarely kept pace. Over-estimating reserve potential of an undrilled structure (a 'prospect') has been an extremely common problem in the industry [27]. Besides that, the price volatility changes everything.

All of this has raised the question of whether the existing R/C fiscal regime for marginal gas fields in Malaysia is still workable. In addition, the characteristics of marginal fields with high uncertainty in reserve recovery, high carbon dioxide (CO_2) content, and other impurities make them difficult to monetize, especially in a highly volatile oil price environment and with increasing initial investment.

3 Methodology

An Excel spreadsheet was used to simulate net cash flow economic analysis for a typical marginal field production based on R/C PSC fiscal regime. The flow chart of economic calculation analysis to derive the net cash flow in the spreadsheet is illustrated in Fig. 3.1.

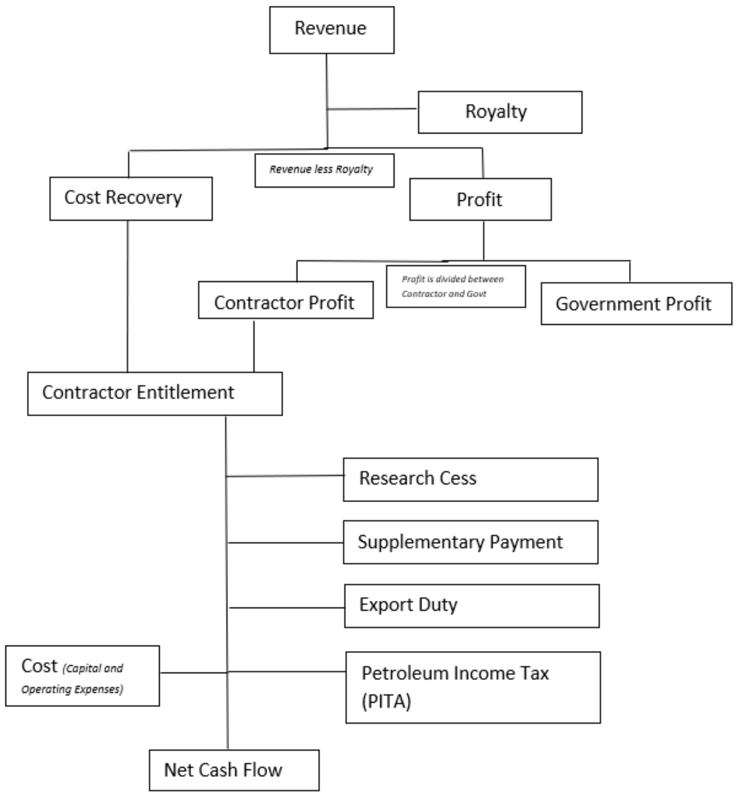

Fig. 3.1 Flow chart for economic calculation analysis.

Revenue is reserve multiply with price. Cost Recovery and Profit portions are obtained after Revenue less Royalty. Profit is further divided to 2 parts; consists of Contractor and Government portion. Contractor Entitlement consists of Cost Recovery and Contractor Profit. Entitlement is the actual revenue given to contractor before any deductions. Research Cess, Supplementary Payment, Export Duty are part of PSC payments. Costs consists of capital and operating expenses. Net Cash Flow is calculated by Entitlement less PSC payments, PITA and Costs.

The following assumption were considered for this analysis:

- A hypothetical data of a typical marginal gas field in East Malaysia was used.
- Assumed wellhead gross gas production for 10 years is 150 Bcf from 2 wells. Condensate is assumed at 1% of total gas production.
- The capital costs (CAPEX) estimated $175 MM consists of initial investment for an assumed field development plan of a satellite platform with minimal facility for marginal production, four-legged jacket, subsea pipeline laying approximately 10 kms, all drilling activities and abandonment costs.
- The assumed operational expenditure (OPEX) estimated $60 MM covers all costs incurred during production years.
- Oil price (USD $42/bbl) is taken as real time value at the average of crude price in 2020. For year 2021, oil price is assumed at $68/bbl average of the year. Subsequent years oil price is assumed at $60/bbl flat starting from 2022 onwards [28].
- Gas Price is assumed at $3.69/mmbtu taken as real time value at the average of natural gas price in 2021 and used for all subsequent years [29].

- Other assumption are PSC payments such export duty (10%), research cess (0.05%), supplementary payment (70%).
- Marginal Petroleum income tax rate (25%) is applied.

The cash flow was analysed using profitability indicators such as Net Present Value (NPV) at a 15% discount rate for the full life cycle of the projects. Carole [30] considers the Net Present Value to be a measure of economic profitability of an investment. NPV is a good tool to evaluate the value of the assets. Hurdle rate of 15% is chosen as this rate is a reasonable expected return for marginal field business valuation considering the risks. It is mathematically represented as:

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$$\text{NPV} = \sum_{i=1}^{n} \frac{NCF}{\left(1+i_d\right)^t}$$

where:
NPV = Net Present Value
NCF = Net Cash Flow
t = the project's economic life (years)
i_d = discount rate

4 Results and discussions

The main intention of using this methodology is to evaluate the profitability of the project or asset. Based on the model developed in Excel with all the assumed data and parameters, the full cycle cash flow yields negative NPV at 15% discount rate for this marginal gas field using R/C fiscal term. The cash flow also raises concern if the initial investment is recoverable since the NPV is less than zero.

Table 4.1 shows the NPV results at 15% discount rate for assumed base settings and tweaked parameters for other PSC payments and capital costs from the excel spreadsheet. Reduction in cost of capital, tax rate or other PSC payments parameters helps to improve the NPV to higher value. Capital reduction plays a significant role in improving the NPV coupled with other terms enhancement however there is a limitation on these reductions. For an example the capital costs follow the market trend and inflation rate hence it can't be reduced more than 25%. On the PSC payments, it follows the government regulation, and some minimal fees need to be applied.

Table 4.1 Net Present Value (NPV) results at 15% discount rate.

Case	NPV 15% Life Cycle (2021) (USD MM)
Base Settings	$-8.25 MM
Capex Reduction by 20%	$17.66 MM
Capex Reduction by 10% and Remove Export Duty	$4.07 MM
Capex Reduction by 10% and Tax is 20%	$0.69 MM
Capex Reduction by 10% and Supplementary Payment is 50%	$2.33 MM

Overall, any reductions give improved returns however the analysis shows the significance of R/C factor in deriving the net cash flow and net present value. In summary the main factor yielding the entitlement revenue is the R/C tranches consists of cost recovery limit, excess cost recovery and profit-sharing percentage. Hence, R/C tranches requires optimization to make the marginal fields commercially viable.

5 Conclusion

This study serves its aim in assessing the existing Revenue/Cost (R/C) Production Sharing Contract (PSC) fiscal regime on marginal gas fields in Malaysia that affect the monetisation and commercialisation of these stranded fields. This study shows the R/C tranches are not favouring marginal field and requires further analysis for identifying the optimum value of the parameters to have a win-win and attractive business model for investors to develop small fields and make it commercially viable.

Declaration of Conflict of Interest

The authors declared that there is no conflict of interest with any other party on the publication of the current work.

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