

Does Risk Sharing Contract Foster the Investment Climate of Malaysian Marginal Oil Fields?

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ABSTRACT

The emergence of Risk Sharing Contract (RSC) in the Malaysian oil and gas industry in 2010 was to improve the investment climate for the growing number of marginal oil fields. Notwithstanding the effort, only six RSCs were signed within five years (2010-2014). This warrants for the examination of whether or not the RSC fosters the investment climate of marginal oil fields in Malaysia. For that purpose, a sequential mixed method approach (scenario analysis and interview) was undertaken. The scenario analysis adopts three measures of investment appraisal (Profitability Index, Access to Gross Revenue and Saving Index), to measure investment climate under two scenarios, namely Revenue/Cost factor Profit Sharing Contract (R/C factor PSC) and RSC. The analysis was conducted under different oil price and reserves level. Results reveal that RSC improves the investment climate of marginal oil fields under low and medium oil prices, while R/C factor PSC is better off under higher oil price. The interview provides a consistent result with the scenario analysis. Further, the interview results recommend a few additional incentives in order to foster the marginal oil fields in Malaysia. The findings would provide insights to policymakers in their effort to enhance the attractiveness of marginal oil fields in Malaysia. In the same vein, the study would benefit other countries that experience an increase in the number of marginal oil fields. In line with its findings, the study highlights the scope for improvement. The direction for future research is also highlighted.

Keywords: Risk sharing contract, Marginal oil field, Profit sharing contract, Investment climate, Scenario analysis, Interview.

JEL Classification: M48 (Accounting and auditing: Government policy and regulation), Q48 (Energy: government policy).

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1. INTRODUCTION

Oil and gas industry plays a significant role in the Malaysian economy. It contributes about 20% of its Gross Domestic Product (GDP) (US-Energy Information Administration, 2013). The sector also contributes to 40% of government revenue (Lee, 2013). It also contributes to the country's domestic energy supply; with oil providing about 39% and gas 37% of Malaysia's energy mix (USEIA, 2013). The importance of this sector has made it listed among the top priority area in the country's economic transformation program designed in 2010 (Economic Transformation Program, 2010). However, a significant volume of Malaysian oil and gas reserves lounge is stranded in marginal oil fields which lead to continuing decline in oil and gas production by 1% to 2% annually (ETP, 2010).

Therefore, with a view to improving the productivity of its remaining reserves including marginal oil fields, oil and gas industry in Malaysia has been experiencing a series of adjustments in petroleum fiscal policies. These adjustments started in 1974 when Petroleum Development Act was promulgated, which not only led to the abolishment of the concessionary fiscal system but also paved the way for the introduction of Production Sharing Contracts (PSC). The PSC itself had undergone several adjustments, which ranges from PSC of 1976, PSC of 1985, deep-water PSC of 1993, and finally to Revenue over Cost (R/C) factor PSC of 1998. The aforementioned changes may be connected with the country's desire to improve the investment climate of its oil and gas fields.

With a view to further improve the investment climate in marginal oil fields through improving rate of return to investors, the Malaysian government introduced a new fiscal regime in November 2010 (Faizli, 2012; Jaipurayar, 2013). This regime changed the fiscal arrangement of marginal oil fields from the PSC to the Risk Service Contract (RSC) and introduced tax incentives. This development eventually led to the amendment of Petroleum Development Act in 2011.

1.1. Objectives of the Study

In line with the above, this paper aims to examine whether or not the RSC improves the investment climate in Malaysian marginal oil fields. Further, the study explores, if any, other tax incentives that can foster marginal oil fields' development in Malaysia.

1.2. Significance of the Study

This study is significant in a number of ways. First, the study provides insights to policymakers on the extent to which the new fiscal regime enhances the attractiveness of marginal oil fields in Malaysia. It highlights the relevance and the scope for improvement in RSC as the current fiscal arrangement development of marginal oil fields in Malaysia. Second, the study would benefit other countries that experience an increase in the number of marginal oil fields, especially those in which similarities exist between those countries and Malaysia. Third, the study recommends additional incentives to foster the development of marginal oil fields.

The paper is organized as follows. The next section reviews the available relevant literature on petroleum fiscal regimes in Malaysia and the investment climate and discusses the conceptual framework that leads to hypotheses development. This is followed by a section on research method. The following section presents the results, which were derived from scenario analysis and interviews. The last section concludes the paper.

2. LITERATURE REVIEW

2.1. Petroleum Fiscal Regimes in Malaysia

Russell and Bertrand (2012) defined a petroleum fiscal regime as a total imposition on investors by the oil producing country based on a petroleum fiscal arrangement. Thus, a fiscal regime is a policy designed by oil producing states with the aim of acquiring a fair share of wealth accruing from their petroleum resources (Ripley, 2011). Like many oil-producing countries, Malaysia has been adjusting its petroleum fiscal regime since the promulgation of the Petroleum Development Act 1974. The reasons for these adjustments were connected with the country's desire to improve the investment climate of its oil and gas fields. The motive is to increase the investment appetite of both domestic and foreign investors.

2.1.1. Concessionary Arrangement

Concessionary arrangements have been the oldest form of petroleum fiscal arrangements in the Malaysian oil and gas industry. In the 1960s, the Shell Oil Company became the first entity being awarded concessionary contracts when Malaysian oil and gas discovery was remarkably increased by the discovery of offshore fields in Sarawak and Sabah at that period. By the late 1960s, still more oil companies turned to Malaysia for concessionary arrangements to explore oil and gas resources.

The tax instruments during the concessionary regime were known to be royalty/taxes. These royalty and taxes were charged by the state governments on whose land oil and gas were discovered (Razalli, 2005; Lee, 2013). The concessionary arrangements were governed by mining enactments of states that possessed oil and gas resources. The concessions were like leasing arrangements, they gave oil and gas company the exclusive right to mine oil in a given area, thereby transferring the ownership of oil and gas to the lease-holder by states or landowners at the wellhead (Lee, 2013).

However, the promulgation of the Petroleum Development Act 1974 transferred the control of oil and gas resources from states to Petronas (the Malaysian National Oil company) (Razalli, 2005). With the shift of control over oil and gas resources from individual states to Petronas, the national oil company of Malaysia, concessionary arrangements were replaced by PSCs beginning in 1974 (Lee, 2013).

2.1.2. Production Sharing Contracts

The PSC emerged in Malaysian oil and gas industry in the 1976 after the promulgation of the Petroleum Development Act 1974. The major components of the Malaysian 1976 PSC are 10% royalty, 20% cost oil and 70% profit oil. The profit oil splits 70:30 in favor of Petronas. Both Petronas and an investor pay a Petroleum Income Tax of 38% to the government. Having faced criticisms about the stringent nature of 1976 PSC, especially on cost oil ceiling and profit oil splits, which had made the investment climate less favorable, the Malaysian government adjusted its fiscal regime under the PSC in 1985. The main differences were that the profit oils splits changed to a sliding scale, and an adjustment was made for the cost oil ceiling, but the royalty and tax rates remained 10% and 38% respectively. Cost oil increased to 50% of gross revenue from 20% earlier, while profit oil split was on a sliding scale based on barrels of oil produced per day. The split begins with a ratio of 50:50 when oil/gas production was 10,000 barrels per day. Then the split moved to the next 10,000 barrels where profits were divided 40:60 in favor of Petronas. Lastly, when oil production exceeded 20,000 barrels per day, profit oil was split into a ratio of 30:70 in favor of Petronas. Moreover, the adjustment was also made in relationship to the cost oil/gas ceiling from a uniform rate of 20% in 1976 to 50% for oil and 60% for gas in 1985.

In 1997, with a view to improving the investment climate in its oil and gas industry, Malaysia introduced the R/C factor PSC with an effective implementation date of 1998 (Putrohari *et al.*, 2007). The fiscal regime under R/C factor PSC was designed to improve the investment climate of oil fields as it enables contractors to recover capital invested during the early stage of project productivity. R/C factor PSC gives an investor a greater cost oil ceiling starting from 70% when R/C factor is 0-1.0. As the R/C factor increases, a contractor's cost oil ceiling reduces. A similar approach is also applied to profit oil splits (Putrohari *et al.*, 2007). However, the R/C factor PC gives Petronas a high share of both cost oil and profit oil as production increases. Another issue brought by Malaysia R/C PSC is the participating interest by Petronas in development and production activities at the rate of 20% (Putrohari *et al.*, 2007). The issue of participation interest did not exist in either the 1976 PSC or the 1985 PSC.

The above review shows that the Malaysian oil and gas industry has experienced a series of fiscal regime changes aimed at improving the investment climate. It is also evident that the PSC has remained the dominant operating arrangement in the Malaysian oil and gas industry. It is estimated that, pre 1998, only five PSCs existed. However, with the improvement of fiscal terms, the number of PSCs increased to 83 in 2012 (Lee, 2013). More recently in December 2013, Petronas celebrated 100 active PSCs (Zainul, 2013). While many PSCs were signed within a few years as discussed above, the arrangement was described as not encouraging the development of marginal oil fields (Abbas, 2011). Big oil companies such as Shell and ExxonMobil have not been keen to develop marginal oil fields under the PSC arrangement. In fact, some of the big oil companies have chosen to relinquish the marginal oil fields that have been operated under a PSC arrangement to Petronas (Abbas, 2011). Thus, the RSC arrangement was introduced into Malaysian oil and gas industry.

2.1.3. Risk Service Contract

The RSC emerged in Malaysian oil and gas industry in 2010, leading to the amendment of Petroleum Development Act in 2011 (Wei, 2011). The aim of this new regime was to improve the investment climate for the growing number of marginal oil fields. In Malaysia, RSC has been defined as a 'contract between the host country and contractors where the host country is the project owner and the contractors will recover the development cost and are paid a fixed fee for services rendered, based on their performance, relative to the development execution and subsequent production' (Petronas, 2011). Under RSC, revenue flows to three parties: the contractor, Petronas and the government. Petronas pays a royalty from its share of gross revenue. The contractor pays a corporate income tax at the rate of 25% while Petronas pays a petroleum profit tax at the rate of 38%. The abandonment cost, which was hitherto the responsibility of the contractor, is now the responsibility of Petronas. These fiscal changes were made to attract investors and improve the investment climate of marginal oil fields. Notwithstanding the attractive fiscal regime, only three RSCs were signed within three years (2010-2012) compared to 17 PSCs signed within the same period. However, RSCs had increased to six by June 2014. This warrants for the examination of the effect of the new fiscal regime on the investment climate of marginal oil fields in Malaysia.

2.2. Petroleum Fiscal Regime and Investment Climate

As indicated earlier, a fiscal regime is a policy designed by oil producing states with the aim of acquiring a fair share of wealth accruing from their petroleum resources (Ripley, 2011). On the other hand, the investment climate is defined as the rate of return and risk associated with an investment, which is influenced by current and expected policies, and institutional and behavioral environments (Stern, 2002; Hallward-Driemeier *et al.*, 2006). By definition, a fiscal regime as a policy can affect the investment climate. In fact, Smith (2012) posited that a fiscal regime could cause investment distortion and influence allocation of risk between governments and investors. Abdo (2010) in his

UK study examined the effect of petroleum fiscal regimes of 1983, 1987, 1988 and 1993 on company revenues. The result shows that petroleum tax relaxation has varying effects on investments in the UK Continental Shelf (UKCS). Specifically, each of the relaxations leads to an increase in cash flow for the oil company. While analyzing the 2011 tax changes in UKCS, [Kemp and Stephen \(2011a\)](#) found that with the removal of supplementary charge under the 2011 tax system, the majority of the fields would pass the threshold of NPV/I of less than 0.3 and NPV/I of more than 0.5. By implication, supplementary charge removal might have improved the investment climate of the fields. Furthermore, it was found by [Kemp and Stephen \(2012a\)](#) that the introduction of additional investment incentives as a complement to 2011 tax increase has positively impacted on investment decisions in UKCS. [Kazikhanova \(2012\)](#) documented similar view in this matter. She asserted that the additional allowances offered in 2012 might be the best way to enhance the attractiveness of investment in small and marginal oil fields in the UKCS.

Conversely, negative influences of a tax increase on the investment were found in other studies. A review of different fiscal regime changes in the UKCS by [Nakhle and Hawdon \(2004\)](#) across 1978-1983 revealed a significant reduction in the profitability of small fields. Similarly, it was concluded by [Nakhle \(2007\)](#) that applying a higher tax rate to small fields regardless of the oil prices increase may likely render the field's investment climate unfavorable. Studies conducted in developing and emerging countries revealed that the petroleum fiscal regime adjustments are sensitive to oil price. For instance, [Njeru \(2010\)](#) revealed that while government take remains unchanged during periods of low oil price, NPV and IRR decrease, and vice versa. Similarly, his findings further disclosed that the reserve levels may also affect the investment climate. [Swe and Emodi \(2018\)](#) compared the PSC system of Myanmar with other eight countries including Cambodia, Indonesia, Australia, Vietnam, Mozambique, Canada and US using three investment decision indicators covering government take (GT), front loading index (FLI), and composite score (CS) and concluded that Myanmar's fiscal regime could be less attractive from investors' viewpoint against the other countries compared due to high royalty rate and cost recovery issues. Thus, recommended that to make the investment climate more favorable Myanmar should make its fiscal regime more attractive by addressing the issues of royalty, tax, profit split, and cost recovery in its PSC regime. [Rulandari et al. \(2018\)](#) compare the conventional PSC and the newly designed gross production split PSC in Indonesia and concluded that the newly introduced gross production split PSC would be more profitable for the government than the conventional PSC. However, [Rulandari et al. \(2018\)](#) recommended for improved improving regulation, transparency and eliminating uncertainties in the implementation process. [Onuoha et al. \(2018\)](#) compares the PSC regime in South Sudan and that of Malaysia, Indonesia and Brunei in terms of contractor's and government's NPVs and concluded New PSC of South Sudan will be more likely to improve investors NPV when both are compared with the PSCs of Malaysia, Indonesia and Brunei.

Despite the global evidence about the effect of a fiscal regime on the investment climate, only a few studies ([Putrohari et al., 2007](#); [Agalliu, 2011](#); [Onuoha et al., 2018](#)) have considered Malaysia. However, these studies focus on an international comparison between Malaysia and other oil producing countries. The publicly available literature has not compared the investment climate of Malaysian marginal oil fields under PSC and RSC fiscal regimes.

2.3. Conceptual Framework and Hypotheses

Scenario analysis has been the most commonly approach used to evaluate the effect of fiscal regime on investment climate using investment appraisal indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), Profitability Index (PI), Access to Gross Revenue (AGR) and Saving Index (SI) ([Nakhle, 2007](#); [Njeru, 2010](#);

Kazikhanova, 2012). Literature documents that change in a petroleum fiscal regime can impact the investment climate in the oil and gas industry measured by those investment appraisal indicators (Kemp and Stephen, 2011a; Kemp and Stephen, 2011b; Kazikhanova, 2012; Kemp and Stephen, 2012a; Kemp and Stephen, 2012b). Moreover, the Theory of Economic Regulation highlights that regulations are often made to benefit the industry; that is to protect them from the powerful competition so as to improve their performance (Stigler, 1971; Gaffikin, 2005). Some regulations can have adverse effects on the industry, particularly those relating to heavy taxation (Stigler, 1971). Other regulations can have positive effects on industries particularly those relating to tax incentives (Gaffikin, 2005). In Malaysia, the influence of NPV and IRR on the investment climate of marginal oil fields have been studied (Mas' ud *et al.*, 2018). It was found that using investor's NPV and IRR the new fiscal regime would likely render investment climate more attractive to investors in the majority of the scenarios except under high oil prices in which production sharing contract would likely be more favorable. While this evidence could offer policy implication to authorities, the evidence is lacking on the evaluation of the investment climate using PI, SI, and AGR which are equally important in line with a study of Nakhle (2007); Njeru (2010); Kazikhanova (2012). Hence, the conceptual framework as depicted in Figure 1 is proposed to explain how favorable changes in government tax regulation in oil and gas sector affect the investment climate of marginal oil fields using PI, SI, and AGR.



Figure-1. Conceptual Framework.

Based on the framework, the following hypotheses were formulated:

$H_{1(a-i)}$ The new marginal oil fields fiscal regime under RSC will have a higher investor's PI than R/C factor PSC under different oil prices and reserves levels.

$H_{2(a-i)}$ The new marginal oil fields fiscal regime under RSC will have a higher investor's AGR than R/C factor PSC under different oil prices and reserves levels.

$H_{3(a-i)}$ The new marginal oil fields fiscal regime under RSC will have a higher investor's SI than R/C factor PSC under different oil prices and reserves levels.

3. RESEARCH METHOD

3.1. Scenario Approach

3.1.1. Variable Measurement

The proxies used mostly for fiscal regimes are taxes and tax allowances contained in a particular country's petroleum fiscal policies, while the proxies for measuring investment climate are investment viability indicators such as Pay Back Period, NPV, IRR, PI, SI and AGR (Kaiser, 2007; Hao and Kaiser, 2010; Njeru, 2010; Mingming *et al.*, 2014; Sen, 2014). Moreover, the most common method of conducting such analysis is the scenario approach, which is based on the projection of NCF for oil and gas production based on fiscal impositions (Nakhle, 2007). This measurement was modified based on the peculiarities of Malaysian fiscal regime for marginal fields.

3.1.2. Cash flow Model Derivations

Because the study evaluates the investment climate of Malaysia marginal oil fields, the investors' NCF model was used. Two models are appropriate: R/C factor PSC and RSC cash flow models in line with [Hao and Kaiser \(2010\)](#); [Nakhle \(2010\)](#):

Model 1

$$PSC_t = CR_t + PO_t - CAPEX_t - OPEX_t - RCESS_t - TAX_t$$

Where;

PSC = Investor's cash flow under the Production Sharing Contract

CR = Cost recovered during the year

PO = Share of investor's profit oil during the year

CAPEX = Capital Expenditure incurred during the year

OPEX = Operating Expenditure incurred during the year

RCESS = Research CESS

TAX = Tax paid by investor

Moreover, investor's cash flow under RSC is presented below. This is expressed in line with the related studies ([Hao and Kaiser, 2010](#); [Nakhle, 2010](#)):

Model 2

$$RSC_t = CR_t + FEEOIL_t - CAPEX_t - OPEX_t - TAX_t$$

Where;

RSC = Investor's cash flow under Risk Service Contract

CR = Cost recovered during the year

FEEOIL = Fee Oil received during the year

CAPEX = Capital Expenditure incurred during the year

OPEX = Operating Expenditure incurred during the year

TAX = Tax paid by investor

Apart from these, however, there is a variation in cost recovery based either on the percentage limits or accelerated capital allowance, which differ under the two fiscal regimes.

3.1.3. Company and Field Assumptions

The study assumes that each single oil field is managed and operated by a single oil and gas company; in an ideal case, an oil field is managed by more than one joint venture, with each company receiving its share and paying its tax separately. The rationale for this assumption is to avoid complications in the computations ([Nakhle, 2004](#); [Njeru, 2010](#)).

3.1.4. Tax Scenarios

The study assumes two tax scenarios relating to the fiscal regime under PSC and RSC. The scenario under PSC uses total imposition on investors under R/C factor PSC while the RSC scenario considers impositions under the new RSC for marginal oil fields. [Table 1](#) presents the two scenarios.

Table-1. Tax Scenarios.

Scenario	Fiscal Terms
R/C factor PSC Scenario	Royalty of 10% on gross production, PIT of 38%, Research CESS of 0.5% Capital allowance for 10 years, Export Duty 10%
RSC Scenario	Royalty paid by PETRONAS on its share, CIT of 25% no Research CESS, Accelerated Capital Allowance for 5 years, Zero Export Duty.

3.1.5. Field Size (Reserves) and Production Assumptions

The study assumes a common case field size consist a reserve of 30 million barrels of oil equivalent (BOE), which is the average field size for marginal oil fields in Malaysia (Faizli, 2012; Na *et al.*, 2012) Therefore, KMB field data was used. It was estimated that the recoverable reserves of a KMB marginal field range from 15 to 35 million BOE (Coastal Energy, 2012). Thus, three reserve levels: small, medium and large with 15, 25 and 35 million BOE respectively were assumed as indicated in Table 2.

Table-2. Reserve, Production, and Depletion Assumptions.

Large Size Marginal Field (≈ 35 million BOE)		Medium Size Marginal Field (≈ 25 million BOE)		Small Size Marginal Field (≈ 15 million BOE)	
Year	Production	Year	Production	Year	Production
2012		2012		2012	
2013	156,600	2013	156,600	2013	156,600
2014	6,901,785	2014	6,901,785	2014	6,901,785
2015	6,487,678	2015	5,452,410	2015	3795982
2016	6,098,417	2016	4,307,404	2016	2,087,790
2017	5,732,512	2017	3,402,849	2017	1,148,284
2018	5,388,561	2018	2,688,251	2018	631,557
2019	5,065,248	2019	2,123,718	2019	347,356
Totl	35,830,802		25,033,017		15,069,354
Annual Depletion Rate	6%		21%		45%

Note. The depletion rates assumed to be 6%, 21% and 45% for marginal oil fields with recoverable reserves of 35 million BOE, 25 million BOE, and 15 million BOE respectively.

However, the two tax scenarios were tested for sensitivities to various oil prices and reserve levels. In this, three field sizes sensitivities were tested at 15, 30 and 35 million BOE based on Coastal Energy estimates that the marginal oil fields reserves in Malaysia range from 15-35 million BOE (Coastal Energy, 2012).

3.1.6. Development and Operation Costs Assumption

It has been estimated that the development cost (capital expenditure - CAPEX) of KMB marginal fields is equivalent to USD 320 million to be expended within three years (Coastal Energy, 2012). Therefore, this assumption was used in this study. No specific operating cost data are available for KMB fields; however, average operational/lifting cost (operational expenditure - OPEX) within Asia is estimated at USD 9.5 per barrel (USEIA, 2013). Therefore, this rate is assumed for KMB fields in this study.

3.1.7. Price Assumption

Three Brent spot crude oil prices were assumed: low, medium and high. The highest average annual Brent spot crude oil prices from 1987-2040 (projection) based on nominal dollar value of 2012 was USD 141.46, while the lowest was USD 17.2 (USEIA, 2013). Therefore, these two prices were used to arrive at the medium oil price (141.46 plus 17.2 divided by 2), which equaled 79.33. The duration of the KMB fields' development project (2012 –

2019) is covered by the Brent oil price projection of 1987-2040, providing sufficient justification for prices assumed in the analysis.

3.1.8. Service Fee Assumptions and Discount Rate Assumption

Lacouture (2013) reported that contractors of Malaysian marginal fields under RSC receive 10% of per barrel revenue as a remuneration fee. Therefore, 10% remuneration fee for RSC contractors was assumed. Similarly, the study assumed a 15% discount rate for computation of DCF (Kaiser and Pulsipher, 2004; Saidu and Mohammed, 2014).

3.1.9. Unit of Analysis

The units of analysis for the scenario analysis were derived from documents gleaned from press releases made by PETRONAS, Coastal Energy (Operator of the KMB field) and the US Energy Information Administration (2013). Similar studies have used similar sources of data (see (Kaiser, 2007; Hao and Kaiser, 2010; Saidu and Mohammed, 2014)).

3.1.10. Analysis Techniques

The investment climate under the two tax scenarios was evaluated using investor's PI, SI, and AGR. Moreover, a sensitivity analysis was conducted for measuring how sensitive the two tax scenarios were to different oil prices and reserve levels. The analysis was carried out using the Excel Package. Formulas were used based on the cash flow derivation model expressed.

$$PI = \frac{PV \text{ of Cash inflows}}{PV \text{ of Cash outflows}}$$

$$AGR = \frac{Investor \text{ Undiscounted Cash Inflows}}{Project \text{ Total Undiscounted Cash Inflows}}$$

$$SI = \frac{Investor \text{ NPV}}{Investor \text{ Undiscounted Cash Inflows}}$$

3.2. Interview

The interview was conducted to provide explanation to the results obtained from scenario analysis. In particular, the interview approach would explore whether RSC is the most desirable fiscal arrangement for marginal oil fields' development in Malaysia. Further, the interview was intended to reveal other possible tax incentives which were not considered by Malaysian government but still relevant to encourage investment in marginal oil fields.

The data from the interview was analyzed using thematic analysis in line with Braun and Clarke (2006). This method enables the researcher to identify, analyze and report themes within data (relevance of RSC and other tax incentives). As outlined by Braun and Clarke (2006) thematic analysis has six phases; data familiarization, initial code generation, search for themes, review of themes, defining and naming themes, and producing a report. Moreover, Braun and Clarke (2006) outlined some advantages which include (1) the method is flexible as it allows wide range of analytics choices; (2) the results of the analysis can easily be used by educated public; (3) it enable comparison of similarities and differences across set of data, and (4) it enables the productive of qualitative analysis for policy formulation. Therefore, in line with its advantages as well as the relevance it has in achieving the related research objective, thematic analysis was used in this study.

4. RESULTS AND DISCUSSION

4.1. Scenario Approach

Five investment appraisal techniques were used to evaluate the influence of the new fiscal regime (RSC and its fiscal provisions) in comparison with the old one (PSC and its fiscal provisions). The investment appraisal tools used were PI, AGR, and SI. The results of these analyses are presented in Tables 3 through 5.

4.1.1. Investor's Profitability Index

Table-3. Results of Investment Climate using Profitability Index (PI).

Hypothesis	Statement	PI		Result
		PSC	RSC	
H _{1a}	New fiscal regime under RSC has higher PI under High Oil Price-High Reserve	117%	84%	Not supported
H _{1b}	New fiscal regime under RSC has higher PI under High Oil Price-Medium Reserve	87%	67%	Not supported
H _{1c}	New fiscal regime under RSC has higher PI under High Oil Price-Low Reserve	84%	45%	Not supported
H _{1d}	New fiscal regime under RSC has higher PI under Medium Oil Price-High Reserve	87%	146%	Supported
H _{1e}	New fiscal regime under RSC has higher PI under Medium Oil Price-Medium Reserve	58%	48%	Not supported
H _{1f}	New fiscal regime under RSC has higher PI under Medium Oil Price-Low Reserve	34%	30%	Not supported
H _{1g}	New fiscal regime under RSC has higher PI under Low Oil Price-High Reserve	-54%	39%	Supported
H _{1h}	New fiscal regime under RSC has higher PI under Low Oil Price-Medium Reserve	-82%	28%	Supported
H _{1i}	New fiscal regime under RSC has higher PI under Low Oil Price-Low Reserve	-112%	15%	Supported

Hypotheses 1a, 1b, and 1c proposed that the new fiscal regime under RSC fiscal terms would have a higher investor's PI under high oil price high reserve, high oil price-medium reserve, and high oil price-low reserve respectively. The results as in Table 3 revealed that the three hypotheses were not supported. Hypotheses 1d, 1e, and 1f postulated that the new fiscal regime under RSC fiscal terms would have a higher investor's PI under medium oil price-high reserve, medium oil price-medium reserve and medium oil price-low reserve respectively. The results revealed that hypothesis 1d were supported but 1e and 1f were not supported. Hypotheses 1g, 1h, and 1i postulated that the new fiscal regime under RSC fiscal terms would have higher investor's PI under low oil price-high reserve, low oil price-medium reserve, and low oil price-low reserve respectively. The results in showed that all these hypotheses were supported. From the result it can be summarized that using PI as an investment climate indicator the investment climate of marginal oil fields under low oil price would be favorable to investors, but such could not be confirmed under medium and high oil prices. This indicates scope for improvement in RSC design to improve its attractiveness under medium and high oil prices. This is consistent with Lee (2013) who posited that there are still scope for improvement in relation to transparency and governance of oil and gas sector in Malaysia. In fact lack of profitability has led to the cessation of one of the RSCs since December, 2015 (The Sun Daily, 2016). On the alternative the existing PSC could be improved for marginal oil fields to reflect the recent development in PSC regimes such as the introduction of gross production split PSC in Indonesia (Rulandari *et al.*, 2018) and new PSC in South Sudan (Onuoha *et al.*, 2018).

4.1.2. Investor's Access to Gross Revenue

Hypotheses 2a, 2b, and 2c postulated that the new fiscal regime under RSC fiscal terms would have a higher investor's AGR under high oil price-high reserve, high oil price-medium reserve and high oil price-low reserve respectively. The results set out in Table 4 revealed that the three hypotheses were not supported. Hypotheses 2d, 2e, and 2f postulated that the new fiscal regime under RSC fiscal terms would have a higher investor's AGR under medium oil price-high reserve, medium oil price-medium reserve, and medium oil price-low reserve respectively.

Table-4. Results of Investment Climate using Investor's Access to Gross Revenue (AGR).

Hypothesis	Statement	AGR		Result
		PSC	RSC	
H _{2a}	New fiscal regime under RSC has higher AGR under High Oil Price-High Reserve	33%	23%	Not supported
H _{2b}	New fiscal regime under RSC has higher AGR under High Oil Price-Medium Reserve	35%	28%	Not supported
H _{2c}	New fiscal regime under RSC has higher AGR under High Oil Price-Low Reserve	38%	32%	Not supported
H _{2d}	New fiscal regime under RSC has higher AGR under Medium Oil Price-High Reserve	34%	64%	Supported
H _{2e}	New fiscal regime under RSC has higher AGR under Medium Oil Price-Medium Reserve	42%	39%	Not supported
H _{2f}	New fiscal regime under RSC has higher AGR under Medium Oil Price-Low Reserve	37%	49%	Supported
H _{2g}	New fiscal regime under RSC has higher AGR under Low Oil Price-High Reserve	48%	120%	Supported
H _{2h}	New fiscal regime under RSC has higher AGR under Low Oil Price-Medium Reserve	67%	142%	Supported
H _{2i}	New fiscal regime under RSC has higher AGR under Low Oil Price-Low Reserve	60%	191%	Supported

4.1.3. Investor's Saving Index

Table-5. Results of Investment Climate using Investor's Saving Index (SI).

Hypothesis	Statement	SI		Result
		PSC	RSC	
H _{3a}	New fiscal regime under RSC has higher SI under High Oil Price-High Reserve	0.22	0.10	Not supported
H _{3b}	New fiscal regime under RSC has higher SI under High Oil Price-Medium Reserve	0.22	0.10	Not supported
H _{3c}	New fiscal regime under RSC has higher SI under High Oil Price-Low Reserve	0.20	0.10	Not supported
H _{3d}	New fiscal regime under RSC has higher SI under Medium Oil Price-High Reserve	0.19	0.10	Not supported
H _{3e}	New fiscal regime under RSC has higher SI under Medium Oil Price-Medium Reserve	0.19	0.10	Not supported
H _{3f}	New fiscal regime under RSC has higher SI under Medium Oil Price-Low Reserve	0.20	0.10	Not supported
H _{3g}	New fiscal regime under RSC has higher SI under Low Oil Price-High Reserve	-0.15	0.10	Supported
H _{3h}	New fiscal regime under RSC has higher SI under Low Oil Price-Medium Reserve	-0.31	0.10	Supported
H _{3i}	New fiscal regime under RSC has higher SI under Low Oil Price-Low Reserve	-0.66	0.10	Supported

The results revealed that hypotheses 2d and 2f were supported while hypothesis 2e was not supported. Hypotheses 2g, 2h, and 2i postulated that the new fiscal regime under RSC fiscal terms would have a higher investor's AGR under low oil price-high reserve, low oil price-medium reserve, and low oil price-low reserve

scenarios respectively. The results revealed that all three hypotheses were supported. It can be deduced from the result that majority of the scenarios are in favor of RSC using AGR as investment climate indicator which can be supported with the view of MacKenze (2012) who posit that the RSC model strikes a balance in sharing risks with fair returns for development and production of discovered marginal fields. One possible justification for RSC to be better than PSC under AGR in Malaysia could be that conventional PSC recently become less attractive, thus oil producing countries are redesigning their PSCs to reflect industry reality such as the case of Indonesia (Rulandari et al., 2018) and South Sudan (Onuoha et al., 2018).

Hypotheses 3a, 3b to 3c postulated that the new fiscal regime under RSC fiscal terms would have a higher investor’s SI under high oil price-high reserve, high oil price-medium reserve and high oil price-low reserve respectively. The results in Table 5 revealed that all these hypotheses were not supported. Hypotheses 3d, 3e and 3f postulated that the new fiscal regime under RSC fiscal terms would have a higher investor’s SI under medium oil price-high reserve, medium oil price-medium reserve and medium oil price-low reserve respectively. The results revealed that all these hypotheses were not supported. Hypotheses 3g, 3h, and 3i postulated that the new fiscal regime under RSC fiscal terms would have a higher investor’s SI under low oil price-high reserve, low oil price-medium reserve, and low oil price-low reserve respectively. The results revealed that all these hypotheses were supported. It can be summarized that while RSC can render investment climate of marginal oil fields favorable based on SI, such cannot be confirmed under medium and high oil prices scenarios, thus, indicating scope for improvement in RSC design which is consistent with the position of Lee (2013) who opined that there is scope for improvement in relation to transparency and governance of oil and gas sector in Malaysia. Additionally, lack of profitability was the reason why one of the RSCs had been ceased since December 2015 (TSD, 2016). This scope for improvement could be either through redesigning RSC to make it more attractive or even the R/C factor PSC in Malaysia. This is to reflect recent global trend that conventional PSC becomes less attractive, thus, making host oil producing countries in devising new PSCs as in the case of South Sudan (Onuoha et al., 2018) and Indonesia (Rulandari et al., 2018).

In order to support the findings of the scenario analysis especially to inquire on how RSC should be improved for attracting investors, interview was conducted. The researchers were able to reach four (4) out of five (5) respondents that indicated interest for a telephone interview. The demographic profiles of interview participants are set out in Table 6.

Table-6. Demographic Profile of Interview Participants.

Demographic Profile	Frequency	Percentage
Gender		
Male	4	100
Female	0	0
Total	4	100
Employer		
Government Institutions (Government)	1	25
Private Oil Companies (Industry)	1	25
Accounting Firms	2	50
Total	4	100
Position		
Directors	3	75
Tax Partners	1	25
Total	4	100

First interview was conducted on the desirability of RSC to foster marginal oil fields’ climate in Malaysia. Therefore, step-by-step thematic analysis of the responses conducted in line with Braun and Clarke (2006) showed

that three out of four participants responded that they are aware of RSC while the other participant replied that he is not aware of the RSC. Further analysis of the responses was carried out as follows. Specifically, the three participants were of the opinion that RSC remains the most desirable fiscal arrangement for marginal oil fields development in Malaysia. However, one of these three respondents further opined that based on current oil price of USD 30-40 he did not believe that any type of fiscal arrangement could have a material impact on the development of marginal oil fields. The last of the four respondents have no detailed knowledge of RSC, hence not commented on its desirability for marginal oil fields' development in Malaysia. The views expressed by the participants are reflected in the following quotes.

"...Currently, I think RSC will be quite appropriate for marginal oil fields as it covers risk, especially the exploration risk. So far I did not see a better contract than RSC for marginal oil fields' development....however looking at the current oil price I don't think any contractual arrangement will make such a material impact on the development of marginal oil fields."

(Participant 1, Director of Finance in Government Institution)

"...I can't say exactly which one is better between the previous production sharing contract and now Risk Service Contract..... but Risk Service Contract offers 100% cost recovery to investors."

(Participant 2, Director of Finance in Private Oil Company)

"...In terms of risk, Production Sharing Contract is better for PETRONAS, but for contractor Risk Service Contract is better to contractors due to 100% cost recovery."

(Participant 3, Director in an Accounting Firm)

".....I am not really aware of this Risk Service Contract."

(Participant 4, Tax Partner in an Accounting Firm)

Based on the above views expressed by the participants who seem knowledgeable on RSC, conclusion can be made that RSC remains the most desirable fiscal arrangement to foster marginal oil fields' development in Malaysia.

Secondly, respondents were asked about other fiscal incentives to foster marginal oil fields development in Malaysia. In order to gather the relevant themes for additional fiscal incentives desirables for marginal oil fields' development in Malaysia, a step-by-step thematic analysis of the responses was conducted in line with [Braun and Clarke \(2006\)](#). Therefore, after familiarization with the data and generating codes relating to RSC and fiscal incentives, themes were also generated for fiscal incentives based on each of the views expressed by the four respondents as follows.

"....I don't think any incentive given may have a material impact on whether marginal oil fields could be developed or not considering the current oil price hammering between USD 40 -50....given an incentive to those who made discovery beyond what has been estimated, I can see that as a motivation producers."

(Participant 1, Director of Finance in Government Institution)

It can be deduced from the above quote that Participant 1 viewed that offering an incentive for additional reserve discovery (theme 1) may encourage investment into marginal oil fields in Malaysia.

"....I think the important incentive is for government or PETRONAS to be so open and transparent to investors regarding the type of operating arrangement.... And need also to create more awareness on the basis of operating arrangement for the marginal oil fields. Giving an additional bonus for enhanced reserve recovery will also encourage contractors."

(Participant 2, Director of Finance in Private Oil Company)

From the view of Participant 2, it can be deduced that being open and transparent (theme 2), creating awareness (theme 3), bonus for enhanced oil recovery (theme 4) may encourage investment into marginal oil fields in Malaysia.

"...The (current) tax rate is okay.... But waiver of GST needs to be made to motivate the contractors.... Incentives need to be given for enhancing oil recovery..."

(Participant 3, Director in an Accounting Firm)

From the above view expressed by Participant 3, waiver of GST (theme 5), incentive for enhanced oil recovery (see theme 4 above) may encourage investment into marginal oil fields in Malaysia.

"...Any additional allowance that can reduce the field's operator cost will be desirable...such as fuel allowances (e.g. diesel allowance given fishermen) and incentives regarding rentals on vessels."

(Participant 4, Tax Partner in an Accounting Firm)

Lastly, the view expressed by Participant 4 indicated that fuel allowances (theme 6), and incentives regarding rentals on vessels (theme 7) may encourage investment into marginal oil fields in Malaysia.

5. CONCLUSION, LIMITATIONS AND FUTURE RESEARCH

This paper examines whether or not the RSC improves the investment climate in Malaysian marginal oil fields. For that purpose, five measures of investment climate were used and tested under different oil prices and reserve levels.

Generally, the findings provide support to Njeru (2010) that the petroleum fiscal regime adjustments are sensitive to oil price and reserve level. In particular, the findings revealed that the RSC fiscal terms is likely to have portrayed better investment climate only during low oil prices. This is indicated by investors' PI, AGR, and SI. This finding can be supported by Faizli (2012) and Lee (2013) view that, under RSC, investors can recover any unexpired costs from the PETRONAS at the expiration of the contract. Thus, in essence, this offsets investors' potential losses from a project during a period of low oil price. This is supported by the interview participants who explicitly claimed that RSC remains the most desirable fiscal arrangement to foster marginal oil fields' development in Malaysia. Their argument for RSC is the exploration risk term, which is 100% recoverable by the contractors.

On the other hand, R/C factor PSC appeared to be better off during higher oil prices as indicated by investors' PI, AGR, and SI. This finding is consistent with that of Onaiwu (2009) and the view of Daniel *et al.* (2010) that the R/C factor PSC with sliding scale profit oil splits is more progressive; that is, its profitability increases when the oil price increases. In essence, this may be the reason for higher investor PI, AGR and SI under the R/C factor PSC fiscal terms compared to RSC in Malaysia during higher oil prices. This could be the reason other oil producing countries are only improving their existing PSC instead of venturing into RSC as in the case of South Sudan (Onuoha *et al.*, 2018) and Indonesia (Rulandari *et al.*, 2018).

During medium oil prices, mixed findings on investment climate are demonstrated. The RSC fiscal terms is likely to have better investment climate as revealed by AGR during medium oil prices. In contrast, the R/C factor PSC fiscal terms will likely have better investment climate as revealed by PI, and SI during medium oil prices. It can be concluded under the medium oil prices the RSC fiscal terms is likely to have better investment climate compared to the R/C factor PSC fiscal terms only for investors' AGR.

The interview participants further recommend seven incentives/areas that can foster marginal oil fields' development in Malaysia, which include: (1) Incentive for reserve addition; (2) Openness and transparency; (3) Creating awareness; (4) Bonus for enhanced oil recovery; (5) Waiver of GST; (6) Fuel allowances; (7) Incentives regarding rentals on vessels.

Although the study provided an answer to the objective set, interpretation should be done with care. This is due to the nature of scenario analysis which is associated with a number of assumptions. Second, the data used for scenario analysis is limited to KMB fields, which at the time of this study had the most comprehensive data available. As data of other fields become publicly available, future studies should consider the application of such data to replicate findings. Despite the limitations, the interview results are expected to complement the current findings.

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