

FISCAL MANAGEMENT OF MINING AND PETROLEUM IN WEST AFRICA

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The FARI Modelling Framework

Diego Mesa Puyo and Alistair Watson
Fiscal Affairs Department



Australian Government
Department of Foreign Affairs and Trade



Ministry of Foreign Affairs of the
Netherlands



Norad



Schweizerische Eidgenossenschaft
Confédération suisse
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Confederaziun svizra
Swiss Confederation

Federal Department of Economic Affairs,
Education and Research SERE
State Secretariat for Economic Affairs SEER

Agenda

- Fiscal Analysis of Resource Industries (FARI)
- FARI's Inputs
- A Closer Look at FARI's Model Structure
- FARI's main uses and Outputs
- Simple illustration
- Questions

FISCAL ANALYSIS OF RESOURCE INDUSTRIES

Background

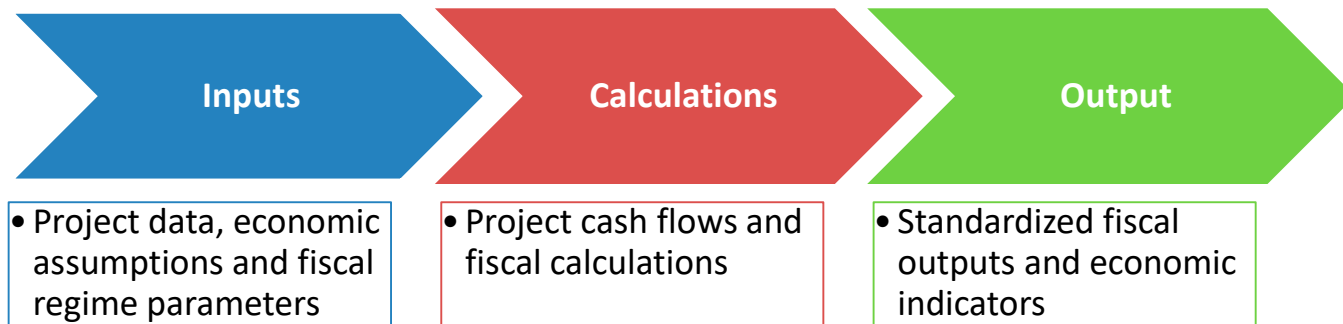
- Over the past 10 years the Fiscal Affairs Department of the IMF developed a consistent modeling framework to evaluate fiscal regimes for extractive industries
- Today FARI is widely used in FAD' technical assistance (TA) missions (over 35 countries), primarily for fiscal regime analysis but increasingly for revenue forecasting and tax administration
- FAD sometimes provides longer-term FARI training to countries, with initial support through short workshops during missions

Design Principles

- Excel based, discounted cash flow model structure
- Simple framework that can be easily picked up by analysts with limited experience on natural resource taxation
- Flexible approach to handle diversity in fiscal regimes
- Standard suite of analytical routines and outputs

Project-specific modeling approach

- The interaction of different fiscal instruments is complex and its effects varies from project to project
 - Limited insight from headline tax rates and fiscal parameters
 - For example, appropriate treatment of depreciation, loss carry forwards, and ring-fencing is important
- Thus, modeling should be project specific:



FARI'S INPUTS

Input Data

- **Production**
 - Petroleum quarterly/annual production, production rates, dates
- **Project costs**
 - Several cost categories are important
 - Exploration - Development
 - Operating - Decommissioning
 - Transportation - G&A
- **Prices**
 - Spot prices, net-back prices at delivery point, etc
- **Economic assumptions** (inflation, interest rates, etc)
- **Fiscal parameters**

Data Collection

- **Challenges**

- Fiscal regimes not contained in one documentary source: production sharing agreements (PSAs), tax laws, sector regulations, others
- Different negotiated contracts
- Project data: production and cost profile has to be constantly updated, as this can change often change

- **Data sources**

- Companies (project development plans, investor's presentations), sector ministries, third data providers
- For project data the principal source of data should be the project operator

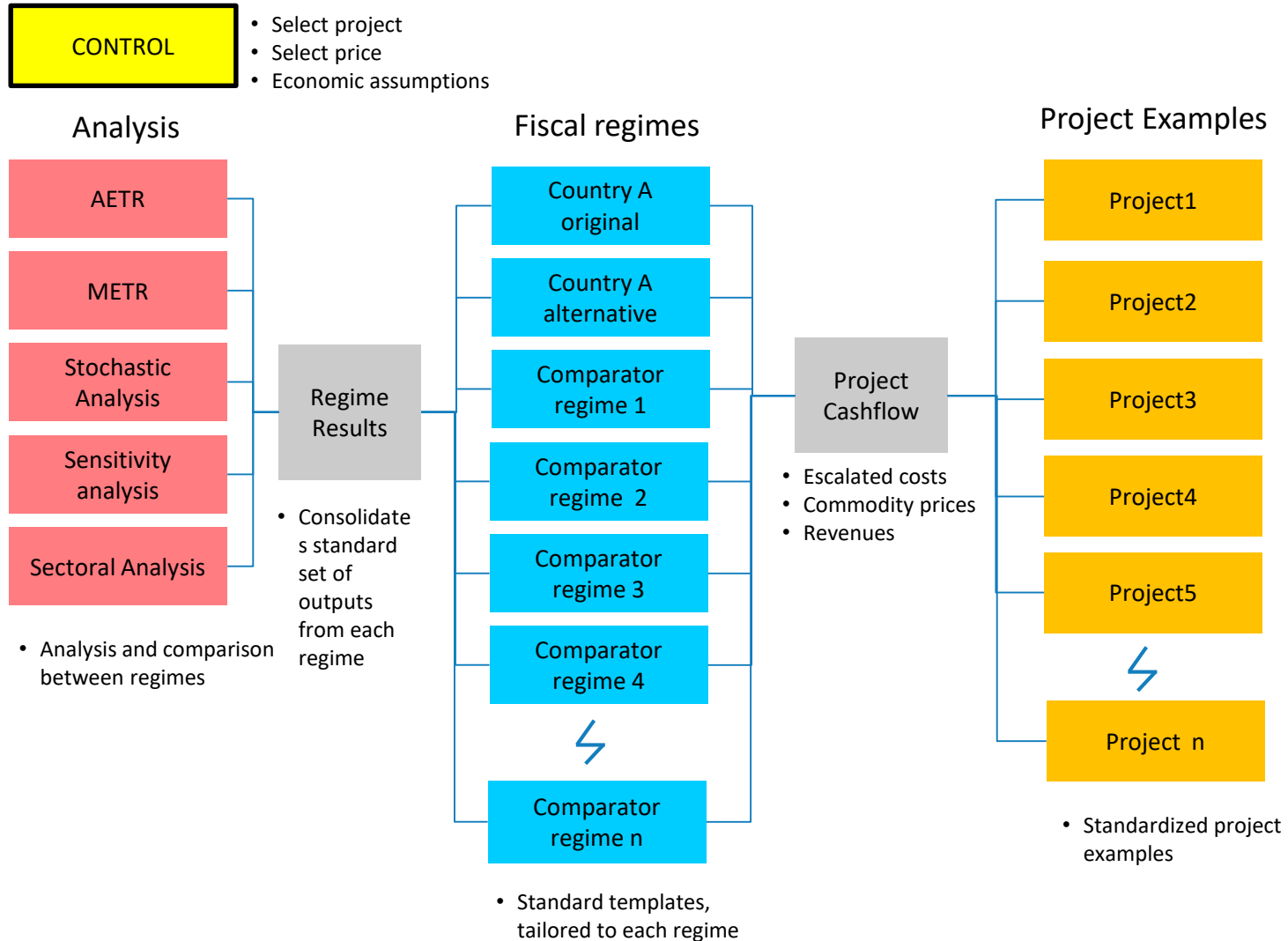
Project Example

- Simplified line items
- Multiple product, Cost breakdown relevant to fiscal calculations

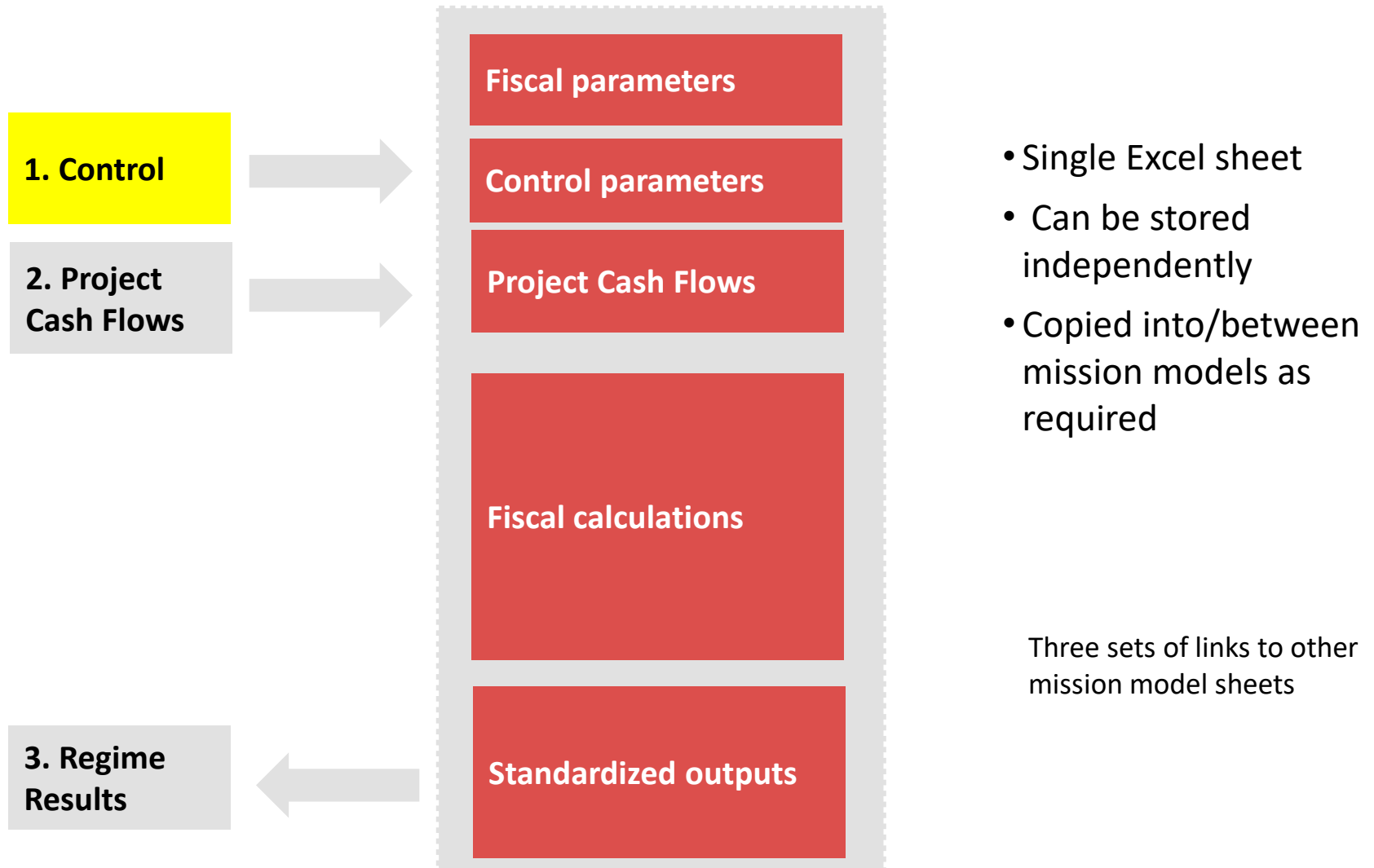
Total PVM 100MMbbl	year	1	2	3	4	5	6	7	8	9	10
106 Production oil	Mbpd						15	15	15	15	15
0.5 Production gas	MMscf/day						10	20	20	20	20
212 Transport and processing after taxing point	\$mm 2012						5	5	5	5	5
135 Exploration costs	\$mm 2012	10	86	39							
700 Development costs	\$mm 2012			100	180	300	220				
300 Intangible development drilling costs	\$mm 2012			60	60	160	120				
100 Replacement capital	\$mm 2012									50	
800 Operating costs	\$mm 2012						42	42	42	42	42
180 Decommissioning costs	\$mm 2012										
2012 Base year for costs	year										

A CLOSER LOOK AT FARI'S MODEL STRUCTURE

Model Structure



Individual Fiscal Country Sheets



FARI'S MAIN USES AND OUTPUTS

FARI's Main Uses

1. Fiscal regime design / negotiations
 - Can be used to evaluate potential fiscal terms (e.g., introduction of R-factor mechanism), to evaluate bids in a competing round, or to perform sensitivity analysis
2. Revenue forecasting
 - Composition and timing of expected revenue streams with aggregation of multiple projects
 - Revenue management and calibration of fiscal rules
 - Stripped down revenue forecasting tool for MOF and integration with macro framework
3. Revenue administration
 - Comparing actual, realized revenues with model results.

Average Effective Tax Rate (AETR)

- The AETR is defined as “the ratio of the NPV of tax payments to the NPV of the pre-tax net cash flows from a successful project” (from Daniel et al 2010, adapted from Devereux and Griffith (2003))

$$AETR = \frac{NPV(Gov\ Revenue)}{NPV(Revenue - Expl - Capex - Opex - Decomm)}$$

- Well-known and easy to understand measure of government take: it attempts to estimate how much tax, as a proportion of pre-tax NCF, a firm will pay on an average investment

Marginal Effective Tax Rate (METR)

- the METR is defined as the wedge that the tax system drives between the minimum after-tax return that the investor requires and the pre-tax project return needed to realize it

$$METR = \frac{Pre\text{-Tax IRR} - Post\text{-Tax IRR}}{Pre\text{-Tax IRR}}$$

- The METR reflects the burden placed by the fiscal regime on a project at the margin of viability, thus indicating the extent to which the regime affects business investment decisions

Breakeven price

- A substitute (or complementary) measure to the METR is the breakeven price, which is defined as the minimum price (path) required to yield a specified post-tax return to capital over the full-life of the project

Government share of total benefits

- Total benefits are defined as revenues less operating costs and replacement capital expenditure after start-up

$$\text{Share of Total Benefits} = \frac{NPV(\text{Gov Revenue})}{NPV(\text{Revenue} - \text{Repl Capex} - \text{Opex} - \text{Decomm})}$$

- They can be thought of as “quasi-rents” in that they represent the project proceeds available to meet the recovery of the original capital investment, the fiscal payments, and a required return to capital.

Other Indicators Easily Calculated

- Profit to investment ratio and payback period
- Impact of changes in prices to government take (ATER)
- Probability distribution of NPV/IRR and variance of returns using stochastic routines
- Tax induced negative NPV
- “Prospectivity gap” (\$ required to match post-tax outcomes for country with similar prospectivity)

A word of caution on model outputs

- As with any similar simulation analyses, FARI results in a single project case may differ from actual project results for three main reasons:
 - (1) an implied assumption of full efficiency in revenue assessment and collection by the relevant authorities;
 - (2) an implied assumption of a full project ring-fence, so that no revenue is lost by deduction of costs carried across from other projects; and
 - (3) for corporate income tax, whether by assessment or withholding, an applied assumption of no losses through international tax planning.
- Each of these assumptions, however, could be relaxed and the model adapted to different assumptions about the resulting effects

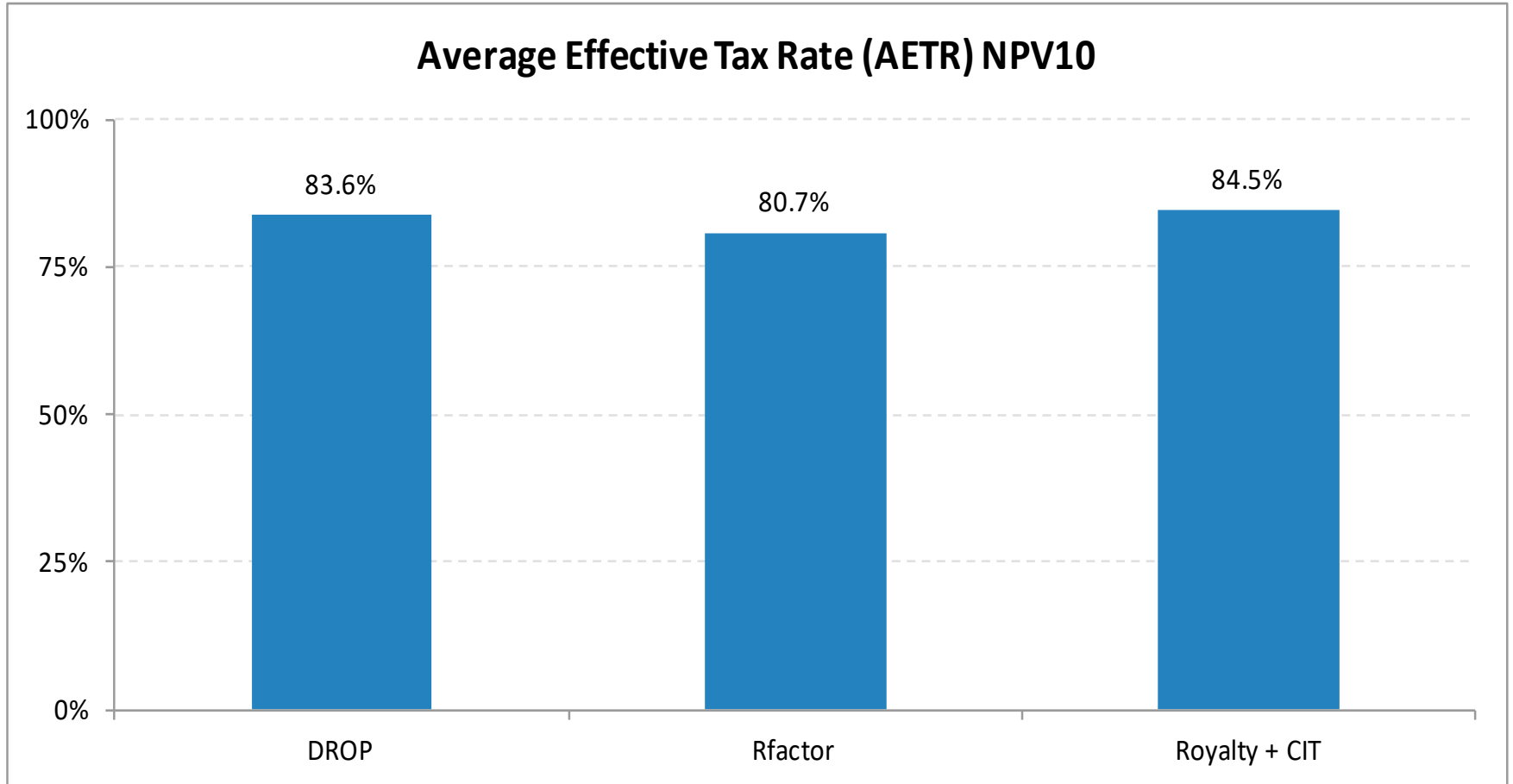
SIMPLE ILLUSTRATION

Simple evaluation for illustration purposes

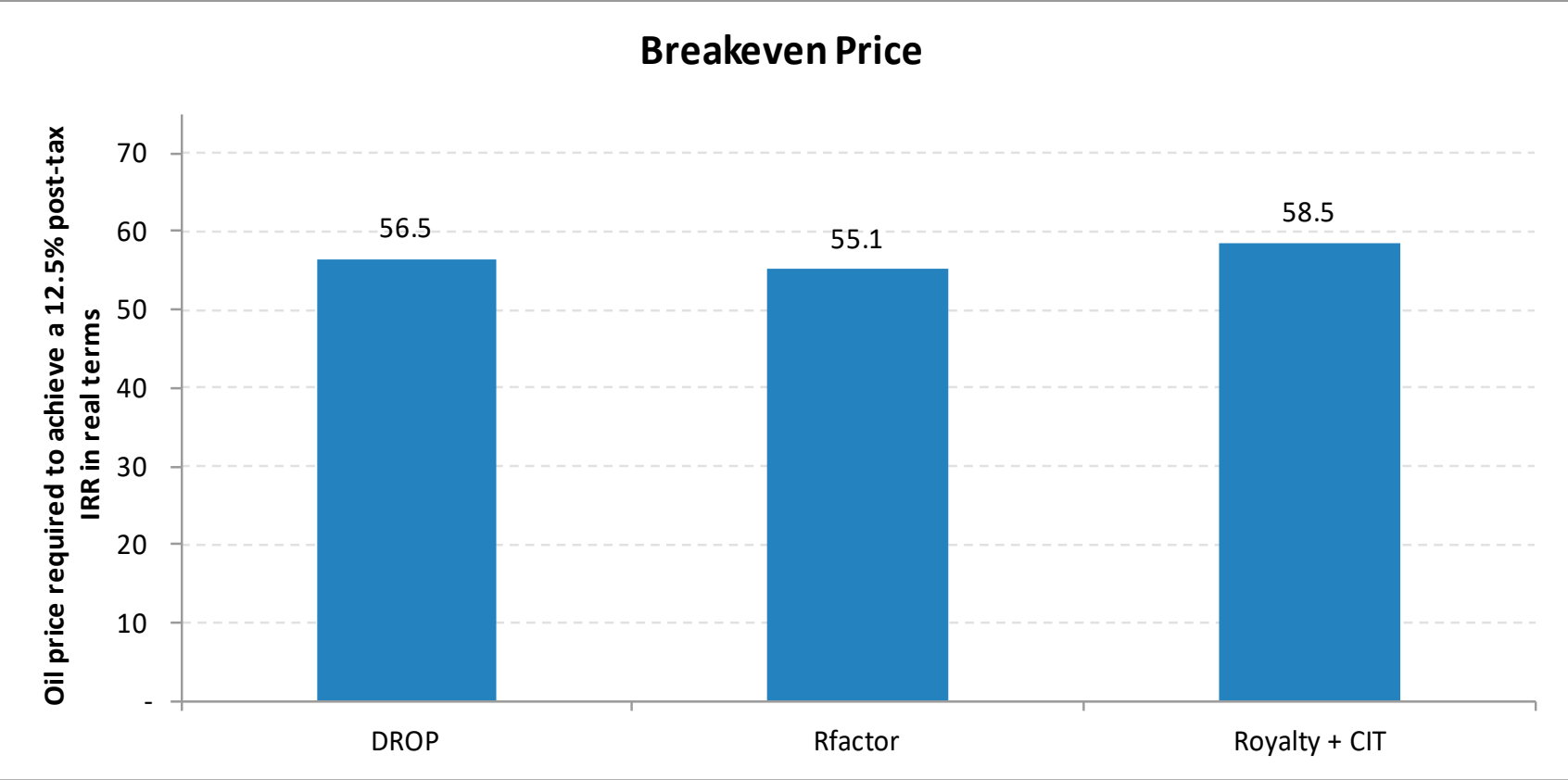
- Simple royalty and corporate income tax regime
- PSC with profit petroleum sharing based on daily rate of production
- PSC with profit petroleum sharing based on an R-Factor scheme

These regimes are evaluated on a 120 million barrel project, with a price of \$60/bbl and a pre-tax IRR of 35.5%

Government take (AETR)

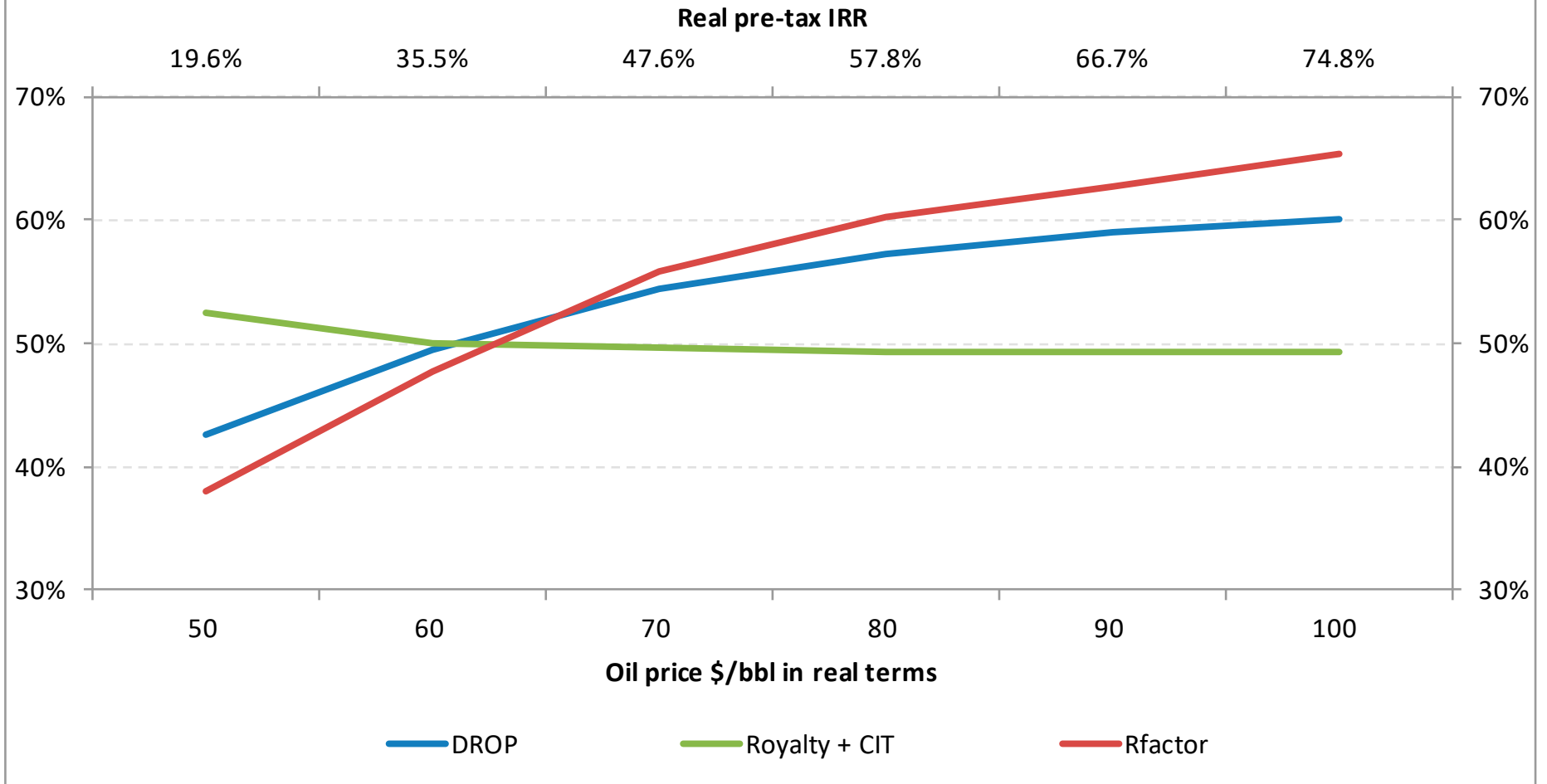


Breakeven price



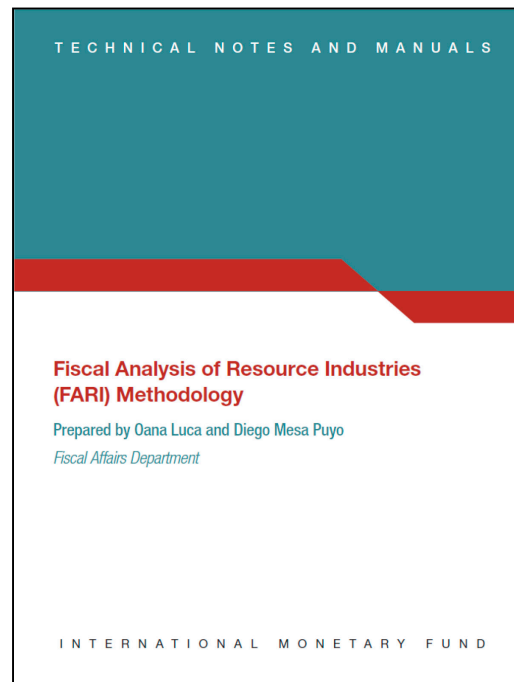
Progressivity

Government Share of Total Benefits (Progressivity)



For More Information...

Please visit: <http://www.imf.org/external/np/fad/fari/>



QUESTIONS