The FARI Modelling Framework

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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:

Inputs
- Project data, economic assumptions and fiscal regime parameters

Calculations
- Project cash flows and fiscal calculations

Output
- Standardized fiscal outputs and economic indicators
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

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A CLOSER LOOK AT FARI’S MODEL STRUCTURE
Model Structure

CONTROL

Analysis

AETR
METR
Stochastic Analysis
Sensitivity analysis
Sectoral Analysis

Analysis

Fiscal regimes

Country A original
Country A alternative
Comparator regime 1
Comparator regime 2
Comparator regime 3
Comparator regime 4
Comparator regime n

Regime Results

• Select project
• Select price
• Economic assumptions

• Escalated costs
• Commodity prices
• Revenues

• Standard templates, tailored to each regime

Project Examples

• Standardized project examples

• Analysis and comparison between regimes

• Consolidate standard set of outputs from each regime

Project

Project1
Project2
Project3
Project4
Project5
Project n
Individual Fiscal Country Sheets

1. Control
   - Control parameters

2. Project Cash Flows
   - Project Cash Flows
   - Fiscal calculations

3. Regime Results
   - Standardized outputs

- Single Excel sheet
- Can be stored independently
- Copied into/between mission models as required

Three sets of links to other mission model 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))

\[
AETR = \frac{NPV(Gov\ Revenue)}{NPV(Revenue - Expl - Capex - Opex - Decommm)}
\]

- 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

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

- 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

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

- 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 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)

Average Effective Tax Rate (AETR) NPV10

- DROP: 83.6%
- Rfactor: 80.7%
- Royalty + CIT: 84.5%
Breakeven price

Breakeven Price

Oil price required to achieve a 12.5% post-tax IRR in real terms

DROP: 56.5
Rfactor: 55.1
Royalty + CIT: 58.5
Progressivity

Government Share of Total Benefits (Progressivity)

Real pre-tax IRR

Oil price $/bbl in real terms

DROP
Royalty + CIT
Rfactor
For More Information…

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