Data Replication - Global Economic Model

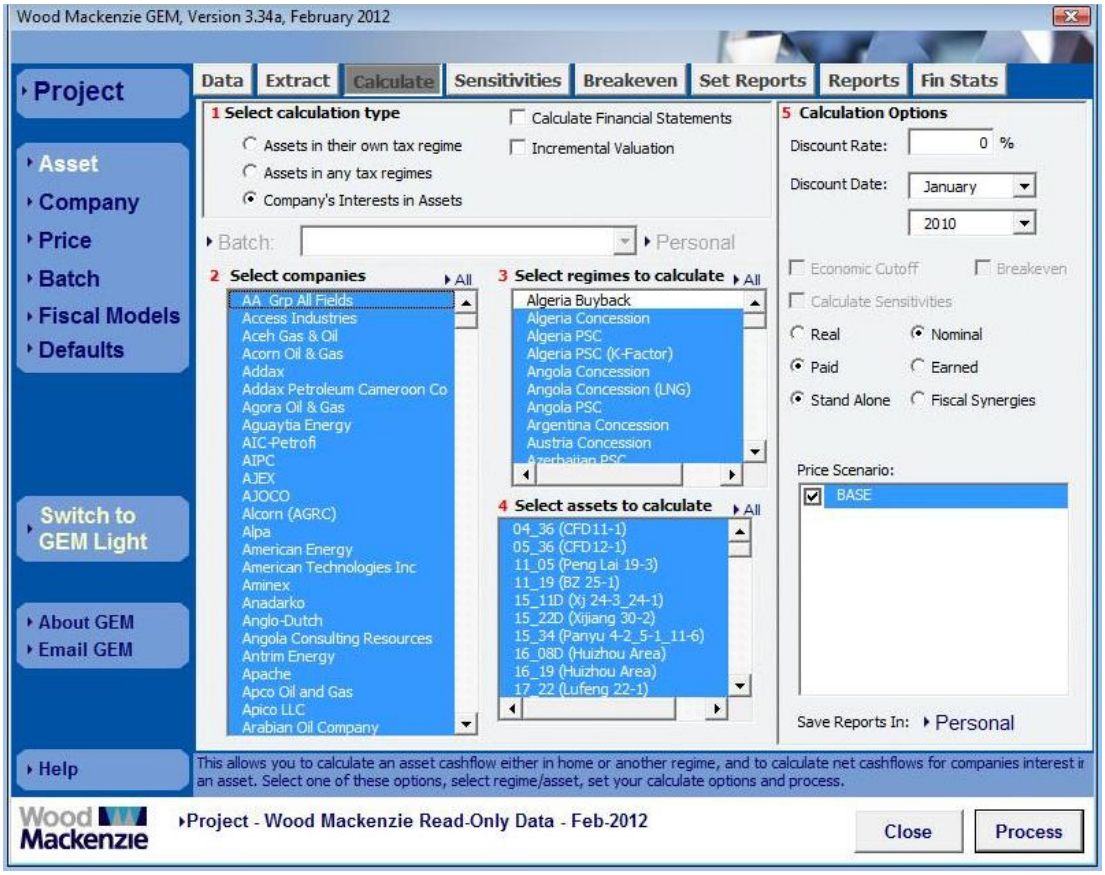
As described in Section 3 of the main text and the online appendix ("Data Description"), we make use of a proprietary data set of fiscal terms for hydrocarbon projects, provided by WoodMackenzie. This data set, the "Global Economic Model" (GEM), cannot be released publicly subject to the terms of a non-disclosure agreement. Researchers interested in getting access to this data set can contact Gillian Doyle (gillian.doyle@woodmac.com) or the Global Energy, Metals & Mining Industries division (energy@woodmac.com).

This document illustrates how we use the GEM to calculate the contract slope γ, our key variable of interest. This is a three step process. First, we run the GEM for all possible country - field - company combinations, at various oil and natural gas prices. Second, we import the resulting cash flows into Excel. Third, we calculate our measure of insurance using equations (1) - (2) in the main paper. We provide more details on each of these three steps below.

Run the GEM advanced sensitivity on oil and gas prices

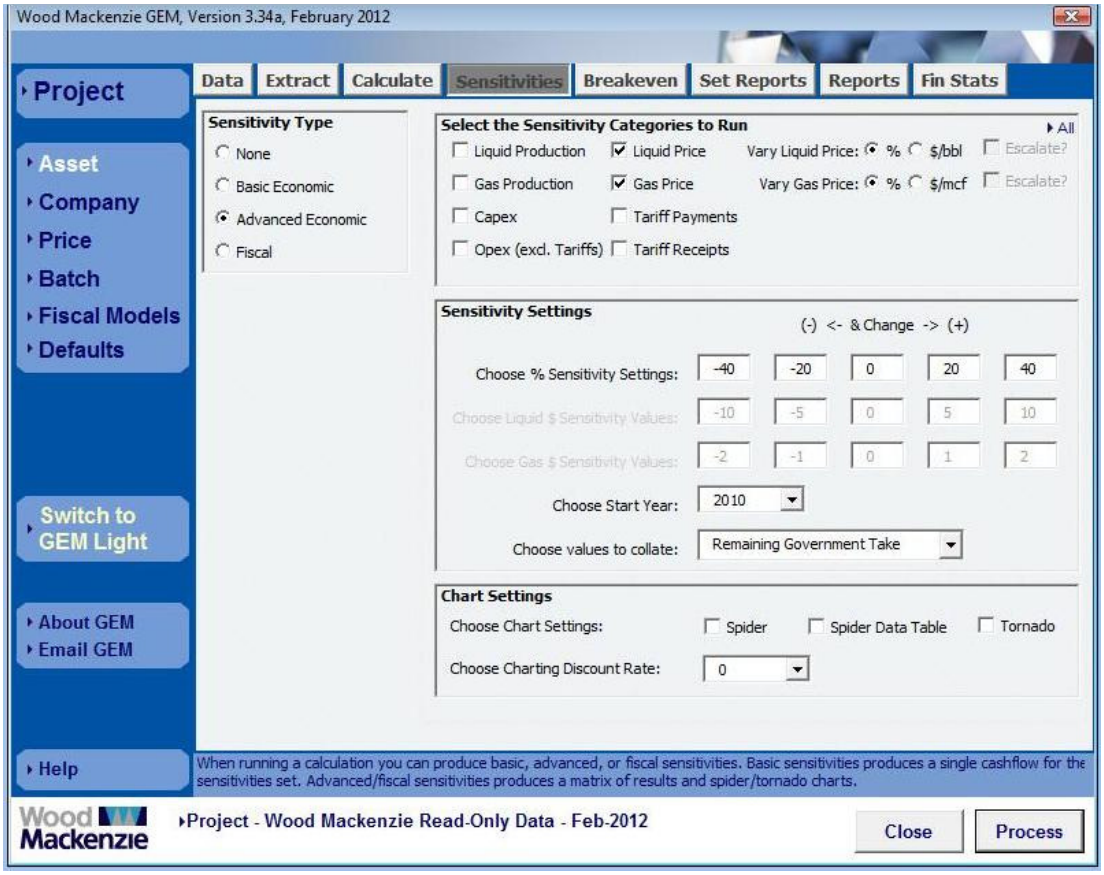
We use the GEM to generate summary reports for each country - field - company combination as described in the online appendix and illustrated in Figure C1 of the section "Calculation of Remaining Government Take". This is done by opening the GEM, selecting the "Asset" tab followed by the "Calculate" tab, then selecting "Company's Interests in Assets" under "Select calculation type", selecting "All" under "Select companies", selecting "All" under "Select regimes to calculate", and selecting "All" under "Select assets to calculate". Under "Calculation Options", we set the discount rate is set to 0%, the discount date to January 2010, and tick "Calculate Sensitivities". Finally, under "Price Scenario", we select a $50 flat real Brent oil price projection and a similarly flat Henry Hub natural gas price projection by creating a price file "50BASE.GP" with flat post-2010 energy prices, no inflation, no capex and opex price escalation, and flat exchange rates. Figure 1 illustrates this selection.

Figure 1: The Asset - Calculate Window



Then, we select the "Sensitivities" tab, click "Advanced Economic" under "Sensitivity Type", and tick "Liquid Price" and "Gas Price" in the "Select the Sensitivity Categories to Run". Under "Sensitivity Settings", we initially select "-40; -20; 0; 20, 40" to generate cash flow reports for oil prices of \$30/bbl, , \$70/bbl (and corresponding natural gas prices). We repeat this procedure to calculate cash flows at additional oil prices. We select "2010" under "Choose Start Year", and "Remaining Government Take" under "Choose values to collate". Then, hit the "Process" button to start the calculations. See Figure 2 for a graphical illustration.

Figure 2: The Asset - Sensitivities Window



Import files into Excel

The procedure described above generates a unique summary report file for each country - field - company combination. The first tab sheet resembles Table C-2 in the online appendix. In a different "Sensitivities" tab sheet, each report calculates the undiscounted sum of future (remaining) government take cash flows, at the five different values for oil/gas prices selected in step 1. We import these values in a consolidated data file, along remaining reserves data (liquids, gas and total), and company type (NOC, partial NOC, IOC).

Use the Excel file to calculate equations (1) - (2) in the main paper

The consolidated data file now contains all information needed to calculate the linearity measures (1) and (2) as described in Section 3 of the paper. We calculate these values for each country - field - company observation, the unit of observation for our regressions.