Modelling the Long-Term Oil Demand Emerging from Petrochemical Feedstocks Worldwide

Raed Al Mestneer, Kapsarc, Riyadh, Saudi Arabia, raed.mestneer@kapsarc.org 0112903087
Carlo Andrea Bollino, Kapsarc, Riyadh, Saudi Arabia, carlo.bollino@kapsarc.org 0112903090

Overview

Oil is presumed to remain the fuel with the largest share in the energy mix over the forecast period, led by demand from transportation and petrochemicals. Combined, oil and gas are still expected to make up more than 50% of the global energy mix by 2040. The Petrochemical sector has experienced a high growth rate for the last twenty years (4% annual). Demand growth in industry is driven mainly by the petrochemical sector, with demand forecast to increase by 4.5 mb/d from 2017–2040, from all regions in the world. The strong performance of the petrochemical industry is expected to require additional volumes of natural gas as feedstock.
In this context, we want to model the demand for the main feedstocks, Naphta, Ethane, LPG, Other oil products for the 10 regions of the world. It is important for the model to track the developments of the industry, due to price changes in the inputs and in the final uses. The model is used to construct alternative scenarios.

Methods

We model demand functions for 9 regions and four feedstocks as function of prices and GDP and other exogenous variables, with annual data in the period 1971 2020. We cast a ARDL model with lag = 1:

$$ln(X_{ij}) = a_0 + a_{ij}\, ln\,(p_{ij}) + b_i\, Y_i + \Sigma_k\, c_{i,k}\, Z_{i,k} + d_{ij}\, ln(X_{ij,t-1}) + e_{ij} \qquad (1)$$

where:

j = Naphta, Ethane, Lpg, Other oil products

i = World, OECD Americas, OECD Asia Oceania, OECD Europe, Africa and Middle East, Non-OECD Americas, Non-OECD Europe and Eurasia, Non-OECD Asia (excluding China), China (P.R. of China and Hong Kong, China)

X_{ij} = quantity demand, by product and region

p_{ij} = prices, by product and region

Y_i= Real GDP, by region

Z_{ik} = other exogenous variables, by region: population, gdp per capita, percentage of urban population

Results

We obtain good and robust econometric results. We validate the estimations with in-sample forecast for the last two periods. We performed the estimation excluding the last two periods of the sample and then we run out of

sample forecast checking whether our dynamic simulation is consistent with historical data of the last two years. We use the root mean squared error or as check.

We compare our results with the existing international sources like the OPEC Report and the IEA World Energy Outlook.

Conclusions

This is the first econometric attempt of KAPSRC to model the petrochemical feedstock demand in a long term perspective for a detailed number of regions of the world separately for the main feedstocks our scenario our model is a useful tool to help policymakers to assess the trajectory and the trends of the long term industrial and technological developments in the field of Petrochemicals

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