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DISAGGREGATING THE DIFFERENCES IN LONG-TERM ENERGY FORECASTS: THE IMPACTS OF METHOD, MODEL AND SCENARIO ASSUMPTIONS

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Overview

Over the years, a vast body of global energy forecasts has been accumulated by authoritative international organizations, such as OECD, IEA and OPEC, as well as by respected private energy consultants, such as Wood Mackenzie. These forecasts are regularly updated to reflect changing view of inputs such as policies, technologies, macroeconomic and geopolitical trends.
However, the changes and forecast accuracies are rarely benchmarked and traced back to the inputs. In addition, forecasts are rarely analyzed on a long-term scale, and the reviews are largely limited to national forecasting studies, such as Craig et al (2002) for the US or Trutnevyte et al (2016) for the UK, or technology studies, such as Zheng et al (2017). In the meantime, having reliable long-term global energy forecasts is essential to underpin ambitious policy targets, such as those fixed in national energy strategies under COP21.

Method

We build on a vast literature on forecast decomposition to apply three different approaches to most-cited global energy market forecasts: IEA, OPEC and EIA. We decompose projections for primary energy demand, as well as for crude oil and natural gas consumption using approaches of unbalanced panel regression with fixed effects and lagged dependent; structural forecast error decomposition (Waggoner and Zha 1999); dynamic factor analysis (Stock and Watson 2002); and forecast time difference decomposition (Mason et al 2016). The decomposition targets forecast differences due to three groups of variables. First one is external assumptions for primary energy consumption, including socioeconomic variables (population, urbanization, GDP, car fleets and structure, housing floors). Second one is mismatches in inter-fuel competition assumptions and structure of the energy trade, such as the prices. We use real-time database for 2005-2016 long-term forecasts for 2030-2040 including external assumptions and projected primary energy demand and trade by fuel.

Results

We show that differences between the forecasts almost could not could be explained by external assumptions, such as population, urbanization, GDP and car fleet size assumptions. Long-term price assumptions also did not prove to be much influence in explaining primary consumption, though they strongly impacted natural gas consumption outputs. While variation of weighted price levels of 1% contributed around 2% to dynamics of primary energy demand at the forecast endpoint, it could drastically change the role of fuel in the resulting energy mix. The results were generally consistent in the approaches used. The most difference due to external assumptions is achieved with EIA and OPEC, while the implied difference due to the model structure is surprisingly largest between EIA and IEA.

Table 1. Main assumptions and long-term primary demand forecasts, 2040 level

	IEA-NPS	IEA-CPS	OPEC	EIA
Population, mn	9152	=	9078	9014
Urbanisation, %	63	=	63	-
GDP, %	3.4	=	3.5	3.3
GDP level, 2015$ tn	242	=	245	246
Cars and LCV, mn	2200	=	2574	2471
Primary energy consumption, Mtoe	17 866	19636	19029	20375

Source: IEA WEO 2016, OPEC WOO 2016, EIA IEO 2016.

Conclusions

The review of socioeconomic assumptions (both as invariant trends and storylines) was not likely to explain much difference in influential long-term forecasts. Given apparent low price elasticity of consumption forecast, it is plausible to assume the effect of external assumptions on the primary energy demand to be very limited in all influential forecasts. This is comforting given low reliability of long-term forecasts. However, where consumption structure is considered, forecast outputs are very elastic in the assumed long-term price levels, thus implying very large role of long-term price outlook as an instrument of policy parametrization. This is, again, hardly surprising, given any LCOE/LACE investment calculation is based on the price. Thus, caution is needed when approaching any long-term energy mix forecast.

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