Economic Modeling and Environmental Policy Choice

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Which model is best?
The different types of modeling

• Empirical economic models (“program evaluation”)  
  – Best for resolving questions, but backward looking
• Statistical Forecasting models  
  – “top-down” projections of future outcomes based upon historic trends  
  – Best for quantifying uncertainty but dependent upon history
• Equilibrium models  
  – “top down” simulations of high level economic activity based upon historic relationships between sectors
• Techno-Economic models  
  – “bottom-up” exercises that assemble and attempt to aggregate the component costs of all aspects of a policy.
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  – Best for resolving questions, but backward looking
• Statistical Forecasting models
  – “top-down” projections of future outcomes based upon historic trends
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• Equilibrium models (REMI)
  – “top down” simulations of high level economic activity based upon historic relationships between sectors
• Techno-Economic models (PATHWAYS)
  – “bottom-up” exercises that assemble and attempt to aggregate the component costs of all aspects of a policy.
Techno-Economic Models

– Usually forward looking
– “Bottom-up” models that take cost numbers of inputs and processes from a variety of sources (often other TE models) and sums up the costs of all the pieces necessary to implement a policy.
– Highly assumption dependent.
  • Really what they do is aggregate and summarize large sets of assumptions that would otherwise be difficult to interpret
  • Only as good as the assumptions that go into them
– Sometimes the only thing we can do
– Not dependent upon historic trends (unless those are the basis for the assumptions.
– Useful for “ballparking” impacts
  • “How much could it cost for 1/10 of Californians to trade in the ICE vehicle for an EV this year?”
Techno-Economic Models (2)

– Often focus exclusively on the technical “input” costs
  • It takes 500 bricks and 10 lbs of cement to build a brick car
    – Bricks cost $1.00 each and cement $2.00/lb, so replacing one regular car with a brick car costs $520
– Usually do not estimate costs of making policies a reality
  • “How much do we have to spend to get someone to buy a brick car?”
    • Backward looking (program evaluation) is needed to iterate with models to better set these costs
– Not designed to measure convenience “utility”
  • “what if people hate brick cars?”
– Can examine uncertainty but not in a statistical sense.
  • Can test the sensitivity to certain assumptions but not set up to test how likely those different scenarios might be.
Reductions from an Assumed Reference Level

- 671 MMTCO2e cumulative reductions required to achieve 2030 limit
- Reference Scenario
- State's Climate Goals
- 260 MMTCO2e State's 2030 Goal

Emissions (MMTCO2e)

One forecast of BAU Emissions

Actual and Forecast Values
Broad Scope Emissions
Basic Points

• All the models will be wrong
  – But how much are they wrong (sizes of the errors).
  – How bad can it be? (consequences of the errors).

• Models are not forecasts
  – The tools and best practices of forecasting can be of use here.
  – What are the goals of the forecast?

• Policy needs to recognize that reality will not look like the model
  – Policy flexibility
  – Minimize economic losses? Maximize environmental integrity?
Models and Policy Choice

• Current TE models do not optimize choice of policies
  – They ballpark costs of a set of policies identified by other means
• They can try to represent the range of costs of those specific policies
  – But do not really give probabilities of those ranges
• They do not capture the benefit of being able to switch to other policies or solutions if modeled options turn out to not be the least cost options.
  – Can give us a sense of the ballpark costs of a set of specific policies.
  – But not set up to compare the costs/benefits of choice of specific policies vs. taxes vs. caps.
Summary

• All policies have a degree of uncertainty associated with them
• Modeling may make directed policies appear to be more “certain” but that is due to the requirements of a model
  – Reductions from policies are uncertain
  – Levels we are reducing from is uncertain
  – Costs of reductions are uncertain
• Policy process needs to recognize uncertainties and work through acceptable trade-offs in light of them