Inforum Long-Run Modeling

Lift 2100

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Outline

1. Introduction
   - Introduction to Inforum Long-Run Modeling Efforts
   - Related Work

2. The Inforum Lift Model

3. Modeling
   - Calibration
   - Consistency
   - Aggregation

4. Evaluation

5. Conclusions
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- **Macro-InterIndustry Model**
  - Horizon extended beyond typical 25-30 years (to 2100)
  - Consistency of structural model particularly useful

- **Potential Uses**
  - Energy & Climate Change, Alternative Technologies
  - Government Budgets: Retirement and Health, Policy Analysis, Test Consistency of External Forecast Assumptions

- **Results**
  - Indicators of government debt, program sustainability, employment requirements, carbon emissions, water usage, ....
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Related Inforum Work


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Related Inforum Work (Continued)


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Other Related Work

- Congressional Budget Office (standard to 2026, long-run to 2046): Federal revenue and expenditure, economic

- Social Security Administration (2090): Retirement transfers, demographic, economic

- Centers for Medicare and Medicaid Services (2090): Health Spending, Health Transfers

- Energy Information Administration (2040): Energy prices, production, etc
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- Sponsored by the Centers for Medicare and Medicaid Services

- Build a Base Case projection to 2090

- Calibrate the Base Case to exogenous assumptions
  - Real GDP, GDP Inflation, Population, Labor Force, Unemployment, Health Spending, Health Transfer Payments
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- Review results, check consistency of exogenous assumptions

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Project Goals

- Check consistency and feasibility of macroeconomic assumptions:
  - High spending in USA on health, and average age continues to rise
    - Nominal health spending grows (e.g.) at nominal GDP rate +1%
  - Health industry productivity growth slower than average
  - Implies rising health shares of GDP and employment

  - Determined economy-wide requirements of satisfying health care demand
  - This project also considers supply requirements
LIFT – Long-run Forecasting Tool

- 110 Commodities: Output, Prices, Final Demand
- 65 Industries: Employment, Productivity, Value Added, Equipment and Software Investment Purchasing
- 83 Personal Consumption Types
- 19 Private Construction Types
- Federal and State and Local Government: Consumption, Investment, Transfers, Revenue
- 110X110 A Matrix: Commodity by Commodity
- Full Macro Accounting: Real GDP, Inflation, Aggregate Productivity, Personal Income, ....
Began with standard forecast to 2040

- Made initial A and bridge matrix extensions to 2100
- Extended fixes, used earlier work as guide for exogenous terms
- Ultimately smoothed matrix and other projections
- Ultimately revised 2015-2040 projections to correct problems and improve trajectories

Main difficulty was the extension itself (smooth and plausible trajectories); process otherwise similar to standard forecasting
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Lift Calibration

1. Fix purely exogenous features: Personal Health Spending, Health & Retirement Transfer Payments, Energy Prices, ...
2. Real GDP Target: Adjust real final demand growth.
3. Unemployment Rate Target: Adjust productivity growth.
4. GDP Inflation: Adjust wage rates, profits, capital consumption.
5. Go To #2, repeat as necessary until all objectives hold simultaneously.
Consumption Assumption

- 10-Year projections: PCE quantities and prices for Health Care goods, services, insurance.
- 75-Year projections: Nominal total health spending (mainly PCE), assumption about Price-Real split.
- PCE Health Care Quantities and Prices thus largely exogenous.
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- Model: Industry Revenue $\rightarrow$ Nominal Output $\rightarrow$ Output Price $\rightarrow$ Final Demand Price

- Model: Imposed Final Demand Price $\leftrightarrow$ Output Price $\rightarrow$ Nominal Output $\rightarrow$ Industry Revenue (by adjusting industry profits)

- Health Care Prices: Model does not enforce consistency between imposed PCE prices and output prices. Health industry revenue not consistent with spending.

- Health Services Commodities (A Special Case): little/no trade, output driven mainly/entirely by real PCE Health.
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- Output Prices: Attempted to impose (growth) consistency for health services commodity prices (a special case). Output prices a function of output, imports, real consumption, consumption prices, import prices, bridge coefficients.

- Start with nominal supply = nominal demand. Derive for commodity price $p_j$

\[ p_j^q = \frac{q_j + m_j}{q_j} \times \frac{\sum_{h \in H} B_{j,h} \times c_h \times p_h^c}{\sum_{h \in H} B_{j,h} \times c_h} - \frac{m_j}{q_j} \times p_j^m \]

- Derivation and details to follow. Needs review.
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Fixed Weights vs Chain Weights

- Aggregation methods matter. Persistent difference can exist in growth rates.
- Consistency in mapping model variables to the exogenous targets is crucial. For example,
  - Chain-Weighted Real GDP growth
  - Chain-Weighted GDP inflation
  - Overall Productivity Growth: Chain-Weighted Real GDP / Hours
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Fixed Weights vs Chain Weights: GDP
Fixed Weights vs Chain Weights: Productivity
Evaluation

- Hit the required targets and satisfy exogenous details.
- GDP consistent with Potential GDP, Unemployment Rate with Natural Rate. Inflation and saving rate stable.
- Plausible government debt levels and current account balances.
- Stable nominal final demand and factor income shares. (??)
- Other...?
### Evaluation: Nominal Final Demand Shares

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<tbody>
<tr>
<td>Personal Consump Expenditures</td>
<td>62.2</td>
<td>68.6</td>
<td>70.5</td>
<td>70.4</td>
<td>69.9</td>
<td>69.5</td>
<td>69.6</td>
<td>70.6</td>
<td>73.0</td>
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<tr>
<td>Nonresidential Fixed Investment</td>
<td>12.2</td>
<td>12.7</td>
<td>9.2</td>
<td>10.8</td>
<td>10.8</td>
<td>11.1</td>
<td>10.9</td>
<td>11.3</td>
<td>11.9</td>
</tr>
<tr>
<td>Residential Investment</td>
<td>5.7</td>
<td>4.5</td>
<td>2.3</td>
<td>3.2</td>
<td>3.5</td>
<td>4.2</td>
<td>4.4</td>
<td>4.5</td>
<td>4.7</td>
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<tr>
<td>Inventory Change</td>
<td>1.1</td>
<td>0.5</td>
<td>0.4</td>
<td>0.7</td>
<td>0.5</td>
<td>0.3</td>
<td>0.5</td>
<td>0.5</td>
<td>0.4</td>
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<tr>
<td>Net Exports</td>
<td>-1.1</td>
<td>-3.8</td>
<td>-3.5</td>
<td>-2.6</td>
<td>-2.7</td>
<td>-0.7</td>
<td>-0.9</td>
<td>-3.1</td>
<td>-7.1</td>
</tr>
<tr>
<td>Government</td>
<td>19.8</td>
<td>17.4</td>
<td>21.1</td>
<td>17.6</td>
<td>17.3</td>
<td>15.8</td>
<td>16.9</td>
<td>17.6</td>
<td>18.1</td>
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<tr>
<td>Residual</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>-0.1</td>
<td>0.7</td>
<td>-0.1</td>
<td>-1.4</td>
<td>-1.4</td>
<td>-0.9</td>
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</table>
### Evaluation: Factor Income Shares

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2010</th>
<th>2015</th>
<th>2016</th>
<th>2030</th>
<th>2060</th>
<th>2080</th>
<th>2100</th>
</tr>
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<tbody>
<tr>
<td>Labor compensation</td>
<td>58.2</td>
<td>55.0</td>
<td>55.1</td>
<td>55.1</td>
<td>56.0</td>
<td>58.5</td>
<td>61.1</td>
<td>62.2</td>
</tr>
<tr>
<td>Taxes on production</td>
<td>6.7</td>
<td>6.9</td>
<td>7.0</td>
<td>6.9</td>
<td>7.1</td>
<td>7.1</td>
<td>7.1</td>
<td>7.2</td>
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<tr>
<td>and imports, less</td>
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<tr>
<td>subsidies</td>
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<tr>
<td>Gross operating</td>
<td>36.5</td>
<td>37.9</td>
<td>38.6</td>
<td>38.0</td>
<td>36.9</td>
<td>34.3</td>
<td>31.8</td>
<td>30.8</td>
</tr>
<tr>
<td>surplus</td>
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Conclusions

- Substantial progress on baseline projections to 2100
- Correction needed for productivity growth
- Adjustments needed for factor income, final demand, other details
- Identification and evaluation of additional criteria


www.inforum.umd.edu/services/projects/supplysideofhealthcare.html.
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